COLLECTION **FAUNE ET FLORE TROPICALES**

Marine Bivalves of Tropical West Africa

Rudo von Cosel
Serge Gofas

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MARINE BIVALVES OF TROPICAL WEST AFRICA

from Rio de Oro to southern Angola

volume 48

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Oysters (*Crassostrea tulipa*) on mangrove roots, near Niomoune in the Casamance Delta, Senegal. Photo Christian Guy/hemis.fr.

Back cover:
The surf-launch of the Station halieutique de Limbé (Cameroon) used for shallow dredging in Ambas Bay off Limbé, with typical African ambience, November 1985. Photo Rudo von Cosel.

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Series « **Faune et flore tropicales** »
The series comprises nearly fifty published titles. The series publishes, in French or English, books for the identification of animals, plants and fungi from tropical regions. Hitherto published by the Institut de Recherche pour le Développement (IRD), the series is since 2002 continued jointly by that institution and the Muséum. The editorial policy of the series favours works concerning countries with IRD branches and/or based on the Muséum national d'Histoire naturelle collections. It aims to disseminate the most recent knowledge on the systematics and distribution of the different groups, with contents ranging from taxonomic focus to complete illustrated fauna and flora. The volumes include many line figures but for some groups, the collection can take the form of large format albums, illustrated in color. It covers books on vertebrates, invertebrates and plant species in the tropics.

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This book is dedicated to

Théodore Monod

(1902 - 2000)

Formerly Professor at the Muséum national d'histoire naturelle

Member of the Institut de France

and

Maurice Nicklès

(1907 - 1980)

the pioneer of modern West African marine malacology

CONTENTS

Avant-propos (Foreword) 9

Introduction 13
Scope 14
Material and methods 16
Brief history of marine malacology in West Africa 17
The shoreline of tropical West Africa 28
Hydrographic features of West African waters 37
Zoogeographical remarks on West African bivalves 39
Comparison with the other tropical zoogeographical provinces, past and present 43
Brief introduction to the bivalves 48
Collecting bivalves 56
Outline of classification 60
How to use this book 63

The Protobranch families 64

Superfamilies Arcoidea and Limopsoidea 100

Superfamily Mytiloidea 170

Superfamilies Pinnoidea and Pterioidea 220

Superfamily Pectinoidea 236

Superfamilies Anomioidea and Plicatuloidea 272

Superfamily Limoidea 286

Superfamily Ostreoidea 300

Superfamilies Carditoidea and Crassatelloidea 320

Superfamilies Lucinoidea and Thyasiroidea 396

Superfamily Galeommatoidea 466

Superfamily Cardioidea 508

Superfamily Tellinoidea 544

Superfamilies Solenoidea, Hiatelloidea and Gastrochaenoidea 718

Superfamily Mactroidea 754

Miscellaneous heterodont families 798

Superfamily Veneroidea 842

Superfamilies Myoidea and Dreissenoidea 944

Superfamily Pholadoidea 972

The Anomalodesmatan families 1006

List of species excluded from West Africa 1047
List of stations 1049
References 1051
Acknowledgements 1070
Illustration credits 1072
Glossary 1074
Abbreviations 1084
Index 1085

Data of the specimens figured in the text are provided as supplementary material and are available online at: sciencepress.mnhn.fr/sites/default/files/fichierspublis/collections/fft48_material_examined.xls

Avant-Propos

Il a certainement fallu à Rudo von Cosel non seulement une parfaite compétence, mais un grand courage pour pouvoir entreprendre et mener à bien une œuvre aussi considérable que la préparation d'une faune de bivalves des côtes de l'Afrique occidentale tropicale, du Cap Bojador (ex-Sahara Espagnol) à la Baie des Tigres (Angola méridional).

Le travail à accomplir eut en effet de quoi décourager tout autre chercheur en raison de la dimension des fonds marins en cause, de la grande variété des substrats, et, par conséquent, des biocénoses, du nombre et de la dispersion des collections à consulter, enfin de la richesse de la faune en question estimée à 540-550 espèces dont 467 se trouvent traitées dans le présent ouvrage.

Le corps de l'œuvre est constitué par la faune proprement dite, comprenant la description des espèces, des notes sur leur répartition géographique et pour chacune d'entre elles une ou plusieurs excellentes figures représentant le plus souvent, bien entendu, la vue interne d'une ou plusieurs valves.

Une série de chapitres d'introduction précède la partie principale du texte, consacrés à l'Histoire de la Malacologie marine Ouest-Africaine, une description géographique des milieux concernés, l'Hydrographie des eaux côtières et la Biogéographie des bivalves marins Ouest-Africains. On trouvera de même à la fin de l'ouvrage un glossaire, une copieuse bibliographie et, bien entendu, un index.

Les géologues et biologistes familiers avec les méthodes et la pratique de la systématique imagineront sans peine le nombre d'années que l'auteur a dû consacrer à la préparation d'un pareil ouvrage qui restera longtemps la base de nos connaissances sur les bivalves de la côte occidentale d'Afrique.

J'ajouterai que Rudo von Cosel avait d'autant plus de mérite à entreprendre la préparation de cette faune que les bivalves semblent demeurer un peu à bien des égards les mal-aimés de la malacologie : pour les non spécialistes ils apparaissent souvent comme un peu monotones d'aspect et n'étant que très rarement de couleurs vives. Aussi l'amateur va-t-il dans bien des cas lui préférer les gastéropodes de formes si variées et dont les coquilles sont souvent si colorées.

Grace au remarquable travail de Rudo von Cosel, on saura que les bivalves ne présentent pas moins d'intérêt que les autres groupes de mollusques et méritent eux aussi toute l'attention et toute la sympathie du chercheur comme du curieux.

Paris, le 21 mai 1993
Théodore Monod
Ancien Professeur au Muséum national d'histoire naturelle Membre de l'Institut

Foreword

This book should have been printed a quarter of a century ago, when Theodore Monod wrote his presentation which is here reproduced unaltered. A near-complete manuscript was then achieved, with 467 species being illustrated with line drawings and with greyscale plates obtained using film photography. Unfortunately the little missing details and the final vamping of the manuscript were not taken care of at the time so that, year after year, it started drifting away from its near-complete condition.

In the last quarter of a century, a lot has been going on regarding Bivalve taxonomy. Phylogenies are now being addressed using DNA sequence characters and this had a profound impact on the higher classification. The "Assembling the Tree of Life: Bivalvia (BivAToL) project" (Bieler *et al.* 2014) was a large research effort sponsored by the National Science Foundation of the United States, targeted to assemble detailed morpho-anatomical, ultrastructural and molecular sequence data for representative bivalves, in order to investigate the phylogeny of the class. Some highlights are the discovery (Giribet 2008) that Carditoidea and Crassatelloidea are sister to all other heterodont bivalves, the realization that ungulinids and cyrenoidids are after all not closely related to lucinids despite their striking similarity (Taylor *et al.* 2009), or the (re)discovery that razor clams are sister group to the rock-borers of the family Hiatellidae. At the species level, the comprehensive "compendium of bivalves" (Huber 2010, 2015) has been a major landmark; we may have disagreed on particular taxonomic or nomenclatural decisions therein but it has the merit of bringing forward the "big picture" and taking into consideration every bivalve species ever named. The rise of initiatives such as Biodiversity Heritage Library (BHL) and the World Register of Marine Species (WoRMS) also changed the stage, providing easy access to original descriptions and literature otherwise difficult to obtain, even within a major institution such as MNHN.

As a consequence of all this, the manuscript now needed severe reworking before it could be presented. Hardly any new material was collected since year 2000, and Rudo had been incorporating literature updates (including Huber's "Compendium") but still, the supraspecific taxonomy had undergone so many changes that much rearrangements were needed to make it current. Last but not least, both photography and printing techniques have radically changed with the digital era.

From that point, I started to realize that Rudo's huge effort of a lifetime may be lost if it were not consolidated by the publication of the book. It also became obvious, taking into account the first author's dwindling eyesight, that considerable editorial help was needed to bridge the gap. In early 2017, I started taking steps and gratefully acknowledge MNHN's Head of Publications, Laurence Bénichou for supporting the project. She had been involved in the first near-complete stage years ago, nonetheless trusted me to take on the venture. There it was also decided that a book fully illustrated in black-and-white was no longer of age. A rough estimate would tell that pulling out every specimen and redo the photography represented one year's full time labour of one person, so finally only the colourful families (about half of the total) would be redone. Before starting with the imaging task, I was comforted by having three reviewers, among the

most prominent bivalve specialists of this time, warmly supporting the project and patiently going through the hundreds of pages, making suggestions for improvement.

At the eve of summer 2018 and after countless hours in the Zoothèque taking pictures, or behind the computer mounting colour plates or chasing sentences like "this group was recently revised by Keen 1980", the manuscript is finally there. I hope the need for this book, in an area which is still not covered by any comprehensive identification manual, is still as straightforward as it was in the first place.

Paris, July 17, 2018
Serge Gofas
University of Málaga, Spain

Introduction

Amongst the four large tropical marine zoogeographic regions Indo-West Pacific, Caribbean, tropical West America and tropical West Africa, the latter was the first one to receive a popular account on marine molluscs with the book by Maurice Nicklès (1950). It was a rather comprehensive and advanced guide for that time, with 459 species treated, covering the coast from Cap Blanc, Mauritania, to Moçâmedes, southern Angola. Comprehensive guides for the Western Hemisphere appeared only later *e.g.* Warmke & Abbott (1961) for the Caribbean, Rios (1970) on Brazil, and Keen (1958) for the Tropical West America (Panamic-Pacific region). The immense Indo-West Pacific realm, with its exceptional species richness and diversity could not be covered by one comprehensive volume, but some guides treated the molluscan fauna of a part, as did the pioneer works of Cernohorsky (1967) for the Western Pacific, Kay (1979) for Hawaii, and Kilburn & Rippey (1982) for South Africa, to mention only a few.

Most guides have an emphasis on gastropods, and until very recently there existed only very few books dealing especially with the bivalves, besides the popular guide to northwestern European species by Tebble (1966). However, some comprehensive books on bivalves of other regions were published: Lamprell & Whitehead (1992) and Lamprell & Healy (1998) on Australia, Oliver (1992) on the Red Sea, Coan *et al.* (2000) and Coan & Valentich-Scott (2012) for West coast of the Americas, Mikkelsen & Bieler (2007) for Florida Keys, Xu *et al.* (2008) for the Chinese coast, and an online resource (Oliver *et al.* 2016) for the waters surrounding the British Isles. Last but not least, the comprehensive books on worldwide bivalves by Huber (2010, 2015) represent a landmark in the taxonomy of this group although lacking species descriptions and the level of detail of the regional guides.

While many classical books on other regions were updated with revised and enlarged new editions, the knowledge of West Africa remained mostly unchanged, still with the old "Nicklès" as the standing reference. This book, with the passing years, has become out of print and outdated. The new developments of systematics, faunistics, ecology, as well as fisheries research in tropical West Africa, have made a more complete and up-to-date identification manual for the marine molluscs long overdue. A few other books addressed West African molluscs, namely Ardovini & Cossignani (2004, iconography without text) and the regional guides by Edmunds (1978), Bernard (1984) and Rolán (2005), but the latter did not include the bivalves and none of them fills the gap.

The idea of this book was conceived among several biologists at Orstom (now IRD), not to produce just something like a second, enlarged edition of the "Nicklès" but an entirely new identification guide for easy use, intended for systematists, ecologists, fishery biologists, professional as well as amateur malacologists, marine laboratories and museums. The book should cover most of the known littoral and shelf-dwelling molluscs and include, besides the descriptions, all available information on distribution, biological observations, ecology, depth range, synonymy and economic value of the species. Although tropical West Africa has a rather poor fauna compared to other tropical regions, it was obvious that it was not possible to cover all molluscs in a single volume, and the bivalves were given priority.

Four reasons were decisive for choosing the bivalves as the first group to be treated.

1) Most books on West African molluscs emphasize the gastropods and have more-or-less neglected the bivalves: Nicklès (1950): 291 gastropods, 159 bivalves; Edmunds (1978): 111 gastropods, 57 bivalves; Bernard (1984): 224 gastropods, 35 bivalves; Gofas *et al.* (1985): 93 gastropods, 58 bivalves. These figures may be correct but they do not reflect the fact that most of the large and conspicuous species, those that one commonly finds on the beach, are bivalves.

2) Most commercial marine molluscs are bivalves.

3) The tropical West African bivalves are still particularly little-known. One quarter of the species have been discovered in the second half of the 20th century, most of them larger than a centimetre. Twenty eight were described from 1950 to 1988, and the preparation of this volume revealed a further 108 new species (not counting renamed species nor subspecies), among them several quite large.

4) In West Africa, where there are nearly no corals and rather few rocky areas on the coast, but vast soft-bottom areas, coastal lagoons and estuaries, the infaunal bivalves form a major part of the benthic invertebrates. Together with the echinoderms, polychaetes and soft-bottom crustaceans, they are the main group of invertebrates that ecologists and fishery biologists come across, they play an important role in the food chain, and they are often indicators of bottom communities. Their proper identification is absolutely needed for any ecological and bionomic work.

When the making of this book was decided, it was definitely intended with a one-page-one-species format. This presentation, which groups all necessary information on species factsheets with clear and abundant illustrations and a distribution map, avoids having to move between text, plates, maps etc. This format was first employed on a large scale in the species identification guides issued for fisheries purpose by FAO which, unfortunately, are not destined for the grand public (for bivalves examples, see Poutiers 1987). Illustrations, especially that of the interior of the valves, has been emphasized and line drawings are given of the interiors of most eulamellibranchs and some other groups where muscle scars are important for identification. Variation within the species is shown by figuring five to ten specimens wherever possible, taken in different part of their geographic range.

Scope

The northern geographic limit of the present work is situated about in the middle of the coast of the West Sahara region (Cape Bojador, 26°N), and the southern half, Rio de Oro, is included. The northern half, Seguia al Hamra, is very poorly known but considered to belong to the European realm. Together with Morocco, the Azores, the Madeira Archipelago (Madeira, Porto Santo and the Selvagens) and the Canary Islands, it forms part of the region which is covered by the European Register of Marine Species, now a regional portal of the World Register of

Marine Species (currently hosted at VLIZ, Oostende, Belgium <www.molluscabase.org>). Several works on bivalves of the European region or parts of it exist, *e.g.* Tebble (1966) and Oliver *et al.* (2016) for the British seas, Gofas *et al*. (2011) for southern Spain, Hernández *et al*. (2011) for the Canary Islands and Segers *et al*. (2009) for Madeira, the three latter covering both bivalves and gastropods.

The southern geographic limit is situated in Southern Angola (Baia dos Tigres, 17°S), near the border with Namibia. The oceanic islands included are: Cape Verde Islands, São Tomé, Ilha do Principe, Annobon, Ascension and St. Helena, these latter two with very few species, some of which are endemics.

Bathymetrically, the species included are all named bivalve species from the littoral zone (often found on the beach or on rocky shores), and the continental shelf to 200 m (which may be taken in trawls and other fishing nets), as well as a few species from the upper slope commonly brought up by fishing gear. The deep-water species, taken in bathyal and abyssal depths, are listed at the end of every family entry and the reader is referred to the appropriate literature records.

In total, 462 species (three of which are represented by two different subspecies), are treated in detail. In addition, 150 bivalve species known from tropical West Africa and adjacent waters down to abyssal depths are listed after each family heading. Most of the listed deep-sea species are taken from Allen (2008), Allen & Morgan (1981), Allen & Turner (1974), Knudsen (1970) and Payne & Allen (1991) but also from Locard (1898); this part of the list is uncritical, and much taxonomic work still remains to be done. Species that are not certainly present in West Africa were excluded. These and species erroneously reported from West Africa are summarized in an Appendix.

This brings the total number of presently named West African bivalves to roughly 620. Undescribed species may still be expected, particularly in the smaller size range, in deep water and in some or the poorly explored parts of the coast, so that the total number of tropical West African marine bivalves might be estimated at least 620 and possibly 700. The worldwide species number that is given herein for each family, in following the tradition of Nicklès, is drawn from the World Register of Marine Species (WoRMS Editorial Board 2018) and its subregister MolluscaBase (2018).

In general, the systematic arrangement follows Bieler *et al.* (2010). Subfamilies are omitted with few exceptions. On the generic level, usually a conservative approach was applied, using subgenera when necessary rather than raising each subgenus to generic level. The latter move is not seen as justified without a thorough, world-wide revision at supraspecific level and, when in doubt regarding proper generic groupings, the "lumper's" position was always adopted. The specific names have been updated and this has caused some familiar names to be changed. Only essential or well-known synonyms are given in the text, the citations of the original binomens and references of original descriptions are accessible on the World Register of Marine Species and MolluscaBase, most often with links to the full texts and are not repeated in this volume.

A companion volume on the gastropods is not under work, but it is hoped that in the future young malacologists may be able to "attack" this task.

Material and methods

This work is mostly based on the collection in the Muséum national d'Histoire naturelle (MNHN), Paris, which is the largest collection of marine molluscs of tropical West Africa existing today (more than 10,000 lots of bivalves). Other collections consulted were that in the Universitets Zoologisk Museum (ZMC), Copenhagen, Denmark (the next important West African collection), the Dautzenberg collection in the Institut Royal des Sciences Naturelles de Belgique (IRSNB), Brussels, Belgium, the bivalve material of the R/V *Meteor* in the Forschungsinstitut und Naturmuseum Senckenberg (SMF) Frankfurt, Germany and the collection of West Africa and Cape Verde Islands material in the Rijksmuseum van Natuurlijke Historie (now: Nationaal Natuurhistorisch Museum) Leiden, The Netherlands (RMNH). Other museums and institutions visited were the British Museum (Natural History) (now: The Natural History Museum), London (BMNH), the Zoologisches Institut und Museum of the University of Hamburg, Germany (ZIM), the Swedish Natural History Museum, Stockholm (SMNH), the Museum für Naturkunde der Humboldt-Universität Berlin (ZMB), the Centro de Zoologia of the Instituto de Investigação Tropical, Lisbon, the Academy of Natural Sciences of Philadelphia, Philadelphia (ANSP) and the collection of the Ifan (Institut fondamental d'Afrique noire) in Dakar.

When the first author started to work in the Paris Museum in 1983, data on West African molluscs were scattered in many separate collections originating from different collectors, from different localities or oceanographic expeditions, often with unsorted material. Therefore, all the bivalve material had first to be sorted out, to be united and curated properly. Extensive areas on the West African coast were still to be explored, and the field work carried out mostly in the 1980's (see below) has produced the essential part of the material for this volume. The distribution ranges given herein were in part established using this material with reliable locality data; further data were taken from other material or the literature (mostly from Nicklès 1955). The northern limits of species occurring also in Europe were taken from the existing faunal lists (*e.g.* Hoisæter 1986; Ockelmann 1959) as well as from material in MNHN.

The species distributions are marked in a geographical sense and not in a political one. For instance, the West Sahara region (former Spanish Sahara), which politically is administrated by Morocco as its southernmost province, is a marine biogeographic entity apart from Morocco north of Agadir. Its regions are here cited by their geographic names. The same applies also to Casamance which, biogeographically, is quite distinct from the rest of the Senegal coast. The island groups are marked as such, "Madeira" comprises the whole archipelago.

The illustrations in this book consist of line drawings, b/w photos and colour photos. Drawings of the interior, mostly executed by professional artists, are presented where muscle impressions, pallial line, pallial sinus and hinge teeth are of importance. It was not feasible economically to draw *all* species treated, and therefore families where internal characters are less important (*e.g.* Pectinids) have no drawings. Unless otherwise noted, specimens drawn or photographed were selected from the MNHN collection, those taken from other collections are marked so in the caption. With few exceptions, the illustrated specimen(s) originate from the area covered by this volume, even for species ranging mostly outside West Africa. It was not always possible to

have both illustrated valves from the same specimen because not infrequently muscle impressions were better seen on single valves, or, in a few cases we had only single valves available.

For the preparation of most drawings, the outline and the internal impressions were drawn in pencil using a camera lucida on a Wild M 7 stereomicroscope; when muscle impressions or pallial line were hardly visible or visible only under certain angles of light incidence, the lines were first traced on the shell itself with a very fine pencil. The drawings were then executed and completed by the artist with pen and ink. Larger specimens were photographed or placed on a scanner in order to obtain a draft with the exact outline and position of the impressions.

Most b/w photos were taken by the first author during the early phase or preparation of this book with an Olympus OM 2n on low-speed film. The negatives finally selected for the book were then digitized as positive greyscale images. Some very small species additionally have been illustrated as SEM micrographs. Most of the colour photographs were taken by the second author during the final phase of editing, using a Canon EOS digital camera at MNHN or, for the smaller specimens, a Nikon DXM1200 digital captor mounted on a Nikon SMZ1000 stereomicroscope at University of Málaga. The images of the species on the same plate are not exactly to scale, but efforts have been made to respect the relative size of the specimens. Some additional colour images were taken by photographer J.P. Delagarde (Paris), originally intended for colour plates, and here used for representing the featured species at the beginning of each section.

The captions given along with the figures include locality data, size of specimen, type status if appropriate, repository if distinct from MNHN. The sizes refer, unless otherwise noted, to the antero-posterior length, occasionally to the dorso-ventral height (then denoted by "ht") in some species which are higher than long. More complete captions, including the names of research vessels and collectors and dates of collection are given in the supplementary material; this is intended as a sort of illustration of the history of West African malacology and also to provide appropriate full data in case these occurrences are registered in such databases as Obis or GBIF.

Brief history of marine malacology in West Africa

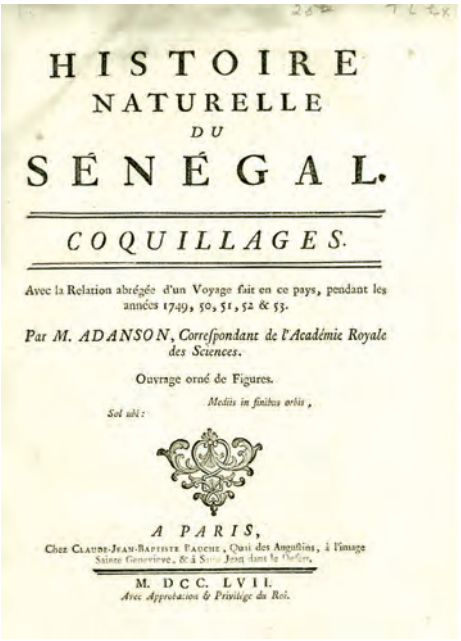
The coast of tropical West Africa is, together with the northern Red Sea, the tropical environment closest to Europe. So it is not astonishing that molluscs have been collected there for a long time by many travellers, and that the most common and spectacular West African shells are present in many old museum collections and figure in classic works since the origin of descriptive conchology.

The first naturalist who systematically collected and studied West African molluscs was Michel Adanson. He arrived in Senegal in 1749 and stayed there more than four years as an employee with the Compagnie des Indes (see also Rosso 1972 and Carteret 2012). During this time he dedicated himself not only to the molluscs but made also a large amount of other zoological and, to an even greater extent, botanical observations. Back in France, he immediately started writing down the results of his studies in a *Histoire naturelle du Sénégal*, the first volume of

which (finally the only one published, apart from botanical works) was, after a detailed narrative of his voyage and stay, entirely dedicated to the shells (Adanson 1757) (Fig. I.1). The book is accompanied by a detailed map showing the coast from Mauritania (Cap Blanc) to Sierra Leone and many engraved plates.

One year prior to the publication of Linnaeus' *Systema Naturae*, Adanson had elaborated a nomenclatural system, with species and genus, and he even had the concept of a type species for each genus. He employed artificial species names which he obtained by mixing, drawing and combining randomly two or three cards with syllables written on them, something like an 18th century version of computer-generated words.

It can be said that Adanson was the founder of descriptive malacology. He was the first to consider not only the shell, like the conchologists of that period, but he also carefully observed, described and figured the animal of species he had collected alive, and did not neglect the operculum of the gastropods. He established the first identification keys in the form of tables, employing both shell and animal characters. This form of key was successfully revived by Nicklès (1950). Unfortunately, because of being pre-Linnean, his specific names are not available under the rules of zoological nomenclature, but some of them were validated by posterior authors using binomial nomenclature (*e.g. Cardiocardita ajar* (Bruguière, 1792)) and so survived into modern use. Many of his generic names have survived in a latinized form, *e.g. Natica, Chama, Dosinia, Sunetta*, *Mutela*, *Tivela*, to mention only a few. Some names have entered the French


HISTOIRE
NATURELLE
DU
SÉNÉGAL.

COQUILLAGES.

Avec la Relation abrégée d'un Voyage fait en ce pays, pendant les années 1749, 50, 51, 52 & 53.

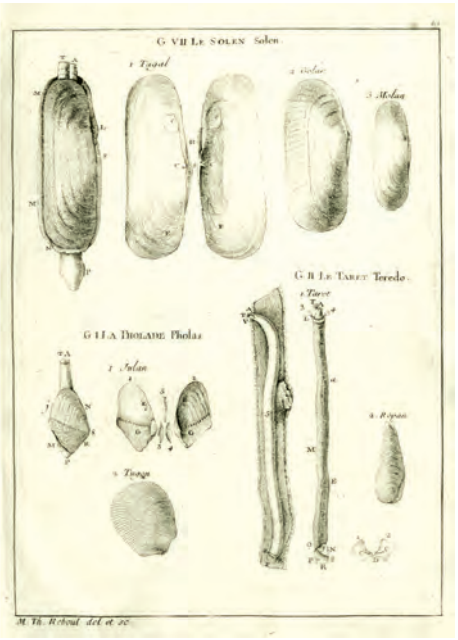
Par M. ADANSON, Correspondant de l'Académie Royale des Sciences.

Ouvrage orné de Figures.

Meditis in finibus orbis,
Sol ubi:

A PARIS,
Chez Claude-Jean-Baptiste Fauche, Quai des Augustins, à l'image Sainte Geneviève, & à Saint Jean dans le Désert.

M. DCC. LVII.
Avec Approbation & Privilège du Roi.



I.1. Title page of Adanson (1757), and a plate from the same book showing living animals of the "Tagal" (currently *Tagelus adansonii* (Bosc, 1801), "Julan" (currently *Zirphaea* sp.) and "Taret" (currently *Psiloteredo senegalensis* (Blainville, 1824)) (reproduced from Adanson 1757; Biodiversity Heritage Library).

language as vernacular name, *e.g.* "taret" for the shipworms (Teredinidae). As Nicklès did in his classical work, Adanson's names for West African bivalves are cited in this volume as a tribute to this great naturalist. Due to his position with the Compagnie des Indes, Adanson also obtained from the trading ships shells from the Caribbean and the Indo-Pacific and described them as coming from Senegal. However, that does not impair Adanson's work as a major contribution to the knowledge of West African molluscs.

The Adanson collection remained for nearly two centuries with his heirs, being only sporadically accessed by scholars (*e.g.* Mörch 1871, who could see it in Cette (now Sète, southern France) when Adanson's grandson Émile Doumet was mayor of that town). It was eventually transferred to the family mansion "château de Balaine" in central France, until 1939 when it was donated by Adanson's great-great-great grandson, Hugues Marie Auguste Michel de Rocquigny-Adanson to the Muséum national d'Histoire naturelle (for details see Fischer-Piette 1942). Therefore, the collection was not available for study when Édouard Lamy carried out his comprehensive monographs on the Paris Museum bivalves. The West African gastropod *Natica rocquignyi* Fischer-Piette, 1942, was named in honour of the donator.

For almost a century, the fauna of West Africa remained largely ignored, except for isolated specimens brought back by travellers and described in the classical conchological monographs. The next really significant contribution was a littoral collection brought together by the surgeon Georg Tams in 1841-1842, mostly in Angola, and described by Dunker (1853). More publications exclusively dedicated to West African molluscs, including bivalves, appeared in the 19th century: Menke (1849) on Gambia, Menke (1853) on the Cape Verde Islands, E.A. Smith (1872) on Whydah (today Ouidah, Bénin), Stearns (1893) featuring a very preliminary *Report on the United States Scientific Expedition to West Africa with the Pensacola to Cape Verde Is., Sierra Leone, Ghana, Angola, St. Helena and Ascension*. Dautzenberg (1910: 48-51) provided a detailed account on this body of literature.

A major impulse was initiated during the late 19th century by the great oceanographic expeditions. However, these were focused on the deep sea, and most of them addressed only marginally West Africa (*e.g.* the *Challenger* Expedition, 1873-1876 in the Cape Verde Islands, or the Deutsche Tiefsee-Expedition by the Imperial German research steamer *Valdivia* 1898, in Congo and Baia dos Tigres, Thiele & Jaeckel 1931). Interesting material was dredged by the dispatch-vessel of the French navy *Talisman*, commissioned in 1883 to continue off NW Africa the French deep-sea exploration (Locard 1897-1898) and is now in MNHN. At the beginning of this century, the Prince of Monaco's expedition on board his yacht *Princesse Alice II*, in 1901, worked from Morocco southward, but in the West African province, he collected samples only around the Cape Verde Islands (Dautzenberg & Fischer 1906).

Between 1905 and 1910, French biologist Abel Gruvel carried out a major project of sampling the entire coast of West Africa, commissioned by the French government with the view of surveying potential fisheries resources. He collected at many localities from Mauritania (Baie du Lévrier) to southern Angola (Moçâmedes) but could not complete his goal of bridging the gap with South Africa. By shallow dredging and additional shore collecting, he assembled an important collection, in which 519 mollusc species were counted, many of them represented

by plentiful lots of more than 20 specimens, and with exceptionally detailed locality data for that time; 60 of these species were new. This was the first large-scale coastal expedition in West Africa with precise localities. Molluscs of the "Mission Gruvel" were published by Dautzenberg (1910, 1912), this being the first comprehensive work on West African marine molluscs since Adanson. The material of Mission Gruvel is now in MNHN and RBINS, and a few samples are in the Ifan collection, Dakar. Other papers were devoted to West African molluscs in the first quarter of the 20th century, by Tomlin & Shackleford (1914-1915) on São Tomé, Dautzenberg (1921, 1927) on Cameroon, Lamy (1923) on Guinea-Bissau, Odhner (1923) on Angola. A review of the molluscs of the Portuguese colonies in West Africa was published by Nobre (1909).

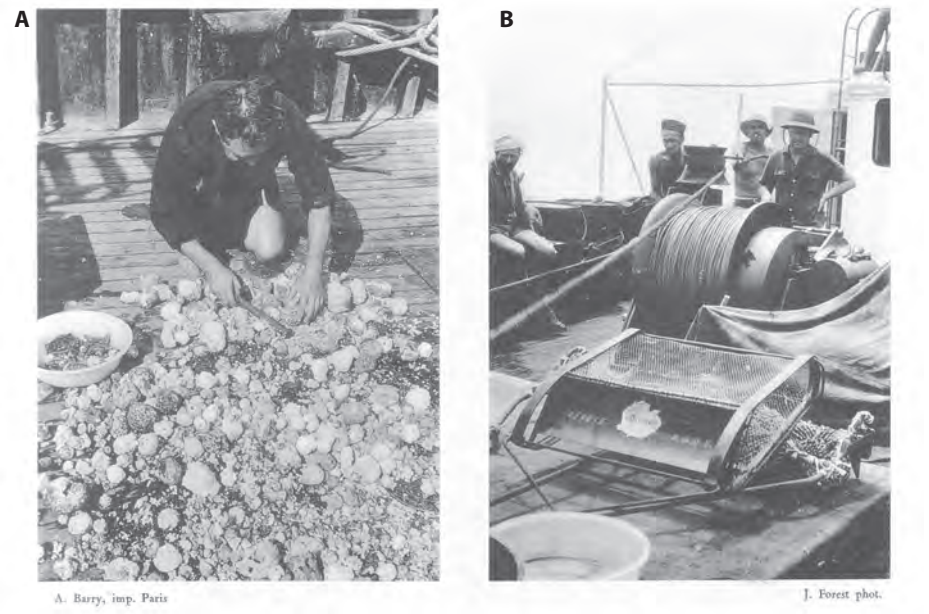
Nearly unnoticed in Europe because of World War I, the American Museum of Natural History (New York) during 1915 carried out the American Museum Congo Expedition, which worked in Spanish Guinea (now Equatorial Guinea), the then Belgian Congo (now Democratic Republic of Congo) and Cabinda (extreme northern enclave of Angola). Besides other marine invertebrates, interesting molluscs were collected, mostly from inshore, lagoonal and estuarine localities; however, the molluscan results were never published. The material is now in ANSP and the bivalves were examined for this volume.

A long period of near complete inactivity followed World War I, largely due to a widespread belief that the survey of most faunas, among them West Africa, was now complete. Between 1933 and 1942, a rather important littoral collection was assembled by the French geologist Maurice Nicklès during his service with the Service géologique de l'AOF (Afrique occidentale française, French West Africa) along the whole tropical West African coast. This material was donated to the Ifan (then Institut français d'Afrique noire) in Dakar in 1946. At the same time, the Ifan received also west African molluscs collected by J. Chautard, A. Gruvel, Th. Monod, A. Villiers and later by I. Marche-Marchad. It was united there with Nicklès' material, and from this important stock, material was selected to form the then official collection of the Ifan (Nicklès 1947); the contents of this collection were published (Nicklès 1947; Marche-Marchad 1958; and Ndiaye *et al.* 1998) and formed the main base for Nicklès' classic guide (Nicklès 1950). Most of the material is still at Ifan (now "Institut fondamental d'Afrique noire") in Dakar, where the first author could study it in 1988; a smaller part, including the types, is now in MNHN.

Oceanographic expeditions resumed immediately after World War II. The Danish private 35 m-schooner-rigged yacht with auxiliary motors *Atlantide* (Fig. I.2) was placed by its owner at the disposal to the University of Copenhagen free of charge, it was transformed into a research vessel and equipped with small laboratory facilities, a winch, dredges, trawls, bottom grabs, plankton nets and the necessary hydrographical instruments. With Anton Bruun as chief scientist, the *Atlantide* sampled the coast of tropical West Africa from the Cape Verde Islands and Dakar to northern Angola (Luanda) from December 1945 to April 1946, mostly from depths shallower than 200 m. Interesting molluscs were found, among them many new species. The bivalves and the scaphopods (Nicklès 1955, 1979) and part of the gastropods (Knudsen 1950, 1952, 1956) are published. The material is now in ZMC Copenhagen.

In 1956, Captain Cousteau's famous vessel *Calypso* (Fig. I.3) was chartered by the French Research Council (CNRS) and accomplished under the leadership of J. Forest (MNHN) a dredging and

I.2. R/V *Atlantide* in the harbour of Copenhague (archives of Maritime Museum of Denmark/Museet for Søfart, reproduced with permission).



I.3. **A**, sorting a haul on a rhodolith bottom in the islands of Gulf of Guinea during the *Calypso* expedition. **B**, the gear used for dredging (reproduced from Forest 1959, pl. 2).

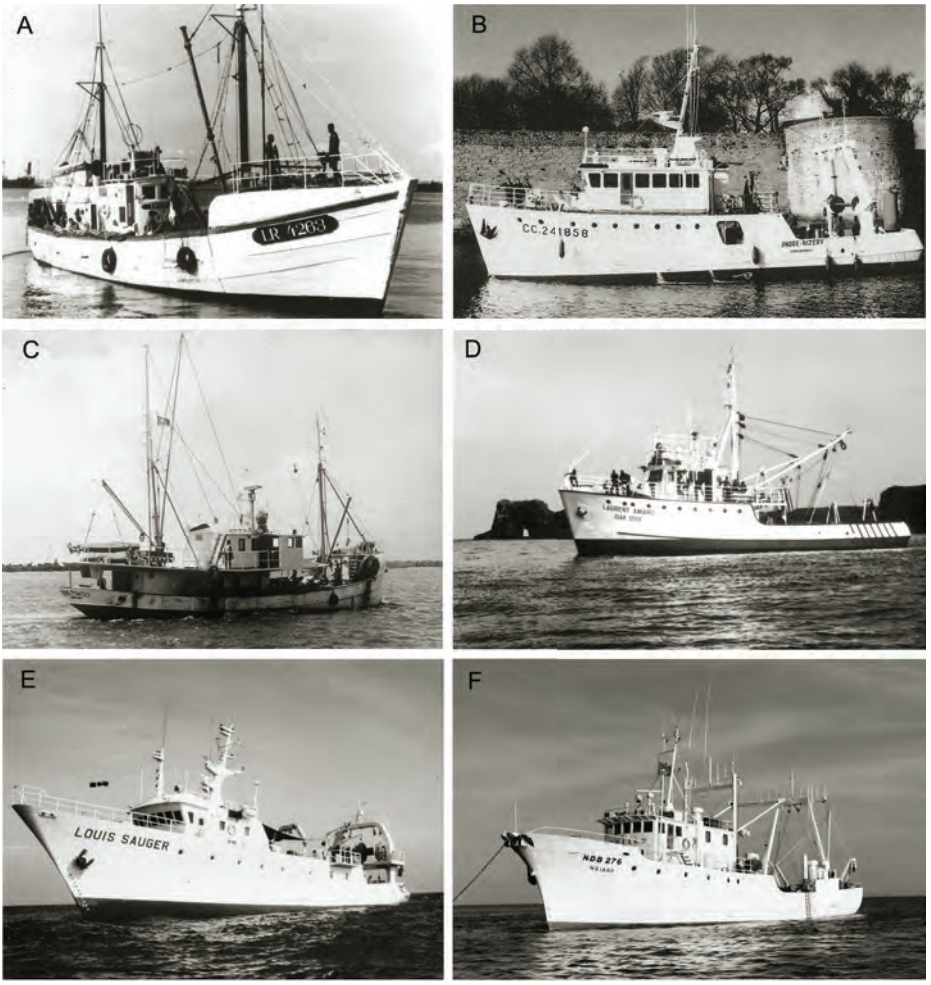
diving cruise on the tropical West African coast, especially in the Gulf of Guinea, with emphasis on the hitherto little-known islands of São Tomé, Principe and Annobon, but also with many stations on the continental shelf. A similar cruise to the Cape Verde Islands followed in 1959. Only a little has ever been published from both *Calypso* cruises (for details and station lists, see Forest 1959, 1964); most samples are in MNHN and the bivalves are included herein.

Shore collecting and mostly shelf dredging was done mainly during the 1950s (from 1952 onward) and into the 1960s in considerable quantity by the Ifan, guided by I. Marche-Marchad, around Dakar and along the Senegalese and Mauritanian coast, occasionally also more southward, to Côte d'Ivoire (Marche-Marchad 1958). Several ships were used, principally the fisheries research trawler *Gérard Tréca* of the then Direction de l'Élevage et des Industries animales d'Afrique occidentale française (Section technique des Pêches), and on some occasions the hydrographical and buoy-keeper vessel *Léon Coursin* of the Mission hydrographique des Travaux Publics de l'AOF, as well as the French Navy ships *Tenace*, *Commandant Henri Gomis* and *Beautemps-Beaupré*. The launch *Yahr* of Ifan was employed for near-shore work in Gorée Bay. The vessel, from which the samples off Côte d'Ivoire were taken, was most probably the *Reine Poukou* (see below). Only a small part of the mollusc material has been reported on (Marche-Marchad 1958). The greater part of this collection is in MNHN and was one of the main sources for this book, other material is in Ifan. Finally, a remaining part of Marche-Marchad's material turned up unexpectedly in December 1995 in the flea market of Bonneuil, a suburb of Paris, where specimens and lots were offered for sale separately; the unsold material was discovered accidentally by a member of the French Shell Club AFC (Boyer 1996) and eventually joined the collection of MNHN. Unfortunately, Marche-Marchad codified the localities on his field labels, without writing down full data. As we could get hold of only a part of his logbooks, numerous lots remain without any precise data and often only with station numbers; so that only approximate localities (*e.g.* Dakar region or Abidjan region) could be attributed, and thus that material is of much less scientific value than it might have been.

At the beginning of the 1960s, a new period of systematic fisheries reconnaissance cruises started with investigation of demersal fishes and the benthos. After an isolated program in Ghana (Buchanan 1954, 1958; Bassindale 1961) and another one in Sierra Leone (Longhurst 1958), the *Guinean Trawling Survey* (GTS) took place as a vast operation from September, 1963 to May, 1964, in two parts ("Guinean I" and "Guinean II") on the continental shelf of the tropical zone in the broad sense, from Cap Roxo (Casamance) to the mouth of the Congo River. The French commercial side-trawlers *La Rafale* and *Thierry*, which had been transformed into fishery research vessels, were chartered for this purpose. A total of 967 trawl hauls were made on 63 transects at right angles to the coast, with a distance of 40 miles between each other. During the cruises, a number of accompanying bottom grab samples and dredge hauls also were carried out. A general report was published by Williams (1968). Most of the molluscs taken on this occasion are in the USNM, Smithsonian Institution, Washington, whereas the material dredged by G. Cherbonnier on board *La Rafale* ("Guinean II") as well as a few duplicates of trawled material are in MNHN.

Based at the marine biological laboratory of Orstom on the shore of Pointe-Noire Bay (Congo Brazzaville) (on museum labels: "Office Pointe-Noire") from 1958 to 1970, the R/V *Ombango*, a

German-built coastal side-trawler with wooden hull of the KFK (Kriegsfischkutter) type anteriorly used as a mine-sweeper (Fig. I.4A) was employed between 1962 and 1969 in numerous cruises mostly for fish and shrimp trawling off the coast of Equatorial Africa (Togo, Bénin, Cameroon, Gabon and mostly Congo), which were mostly directed by Orstom biologist A. Crosnier as chief scientist (see also Crosnier (1964) and Crosnier & Berrit (1966)). At the same time, shore and shallow-water collecting in the vicinity of Pointe-Noire was done by J. Marteau. Most of the molluscan material resulting from these missions is now in ANSP Philadelphia, USA, and only rather few lots, donated by A. Crosnier, are in MNHN.



I.4. Some of the research vessels which had in important role in the preparation of this book. **A**, R/V *Ombango* (Orstom Pointe-Noire, photo Deissier, courtesy IRD Brest). **B**, R/V *André Nizery* (Orstom Lomé, photo IRD fonds Brest, reproduced from Perrois & Monnet 1994). **C**, R/V *Reine Pokou* (CRO-Orstom Abidjan, reproduced from a picture in CNRO Abidjan). **D**, R/V *Laurent Amaro*, built with FAO funds and used by Orstom, based in Dakar (Photo © IRD). **E**, R/V *Louis Sauger*, a Senegalese vessel used collaboratively by Crodt-Orstom (Photo © IRD). **F**, R/V *N'Diago* of the Centre de Recherches océanographiques (CRO), Nouadhibou.

In 1970, the *Ombango* was replaced by the R/V *André Nizery* (Fig. I.4B), funded by the FAO and placed under the administration of Orstom. During the first half of the 1970s, this vessel made four sampling cruises on the upper shelf of the southern part of Gabon, Congo and Cabinda using a Rallier du Baty dredge, in preparation of a sediment chart (Giresse 1980; Giresse *et al.* 1981). More than 400 stations were covered. Part of the molluscs were treated locally at Brazzaville University, and some of these were published by Kouyoumontzakis (1975). Another part of this material, as well as non-sorted residues of several stations were sent for sorting and identification to J.-C. Rosso (see below), and eventually entered MNHN with his collection.

From 1965 to 1972, Orstom biologist P. Le Lœuff undertook a survey of the continental shelf of Côte d'Ivoire on board the Ivorian research trawler *Reine Pokou* (Fig. I.4C) using a *Gulf of Mexico*-type semiballoon shrimp trawl and a Charcot dredge. Most molluscs obtained during these operations are now in MNHN. A survey of the shrimp and macrobenthos populations on the transect off Grand Bassam was carried out monthly during 1969 and 1970 (Le Lœuff & Intès 1998), and many roughly located mollusc lots marked "région d'Abidjan" may come from these transects. Moreover, in February-March1962, the *Reine Pokou* sailed to St. Helena where a few molluscs were taken by dredge; some of these are included herein. The Côte d'Ivoire transect was repeated in August 1998 on board the new Orstom/IRD research catamaran *Antéa*, the successor of the *André Nizery*, with P. Le Lœuff and the first author on board. Smaller mollusc species were obtained in additional dredge hauls and bottom samples on each station and yielded considerable further information on distribution patterns. The bivalves of the research programs from both Congo (Brazzaville) and Côte d'Ivoire form an essential part of the material used for this guide.

The West German research vessel *Meteor* (first of that name after WWII) was used at the end of the 1960s and the beginning of the 1970s (to 1975) for a large interdisciplinary program on upwelling phenomena on the NW-African coast. During several cruises along the coasts of Rio de Oro (southern West Sahara) and Mauritania, numerous samples were taken by dredging and bottom grabbing. Most bivalves are in SMF, while some others are in the collection of the Geological Institute of Kiel University; the Kiel molluscs were listed by Lewy (1975). The gastropods are in the Zoologische Staatssammlung, Munich, Bavaria, Germany.

The coast of the then Spanish Sahara was also covered in 1971 by expeditions of the Spanish research vessel *Cornide de Saavedra*, The mollusc samples were taken using a Van Veen grab (see Altimira 1974). In July 1974, the same vessel worked off Mauritania using bottom grabs and dredges; the molluscs collected were listed by Talavera (1975).

In 1974, the Orstom biologist F. Domain carried out a program of bottom grab sampling on the whole continental shelf of Senegal as a preparation for a sediment chart (Domain 1977), on board the research vessel *Laurent Amaro* (Fig. I.4D), which also had been funded by FAO and used by Orstom in cooperation with the Centre de Recherches océanographiques Dakar-Thiaroye (CRODT). Some of the Mollusca were studied by Rosso & Saubade (1984); however, the whereabouts of this collection is unknown to us.

The late J.C. Rosso, a grammar school teacher of Marseille, worked on West African Mollusca mostly during the 1970s and the 1980s, with emphasis on the Quaternary faunas of Mauritania, Senegal, Gabon and other West African regions (Rosso 1973, 1974, 1975, 1976; Rosso *et al.* 1978; Rosso & Weydert 1979) and on ecology (Élouard & Rosso 1977; Monteillet & Rosso 1978; Rosso & Saubade 1984). A manuscript for a popular book with colour plates on west African marine molluscs from Cap Bojador to Moçâmedes, entitled *Coquillages des côtes occidentales d'Afrique*, reached the stage of galley proofs, but unfortunately was never published. J.C. Rosso was friendly with many scientists, especially palaeontologists and sedimentologists, and frequently received West African mollusc material for identification or collaboration. His mollusc collection was bequeathed to the MNHN together with his scientific assets and library.

At the beginning of the 1980s, the Petite Côte of Senegal was covered by K.D. Leung Tack of Dakar University, in 1981-1982, with many dredging stations on the upper shelf for an ecological study, with R/V *Laurent Amaro*. Most of this material is now in the "Musée de la Mer" on Gorée Island, a dependency of the Ifan, some in MNHN.

At the same time, 1981-1982, a sampling program for a sediment chart by means of a Smith-McIntyre grab (Domain 1985), as well as trawl hauls, was carried out on the Mauritanian shelf and slope by the Orstom biologists B. Richer de Forges and F. Domain on board the Mauritanian R/V *N'Diago* (Fig. I.4F) of the Centre de Recherches océanographiques (CRO) Nouadhibou, Mauritania (now Institut Mauritanien de Recherche océanographique et des Pêches, IMROP). Besides this, trawling surveys were accomplished by the same vessel between 1981 and 1983. Most of the mollusc material is in MNHN and is included in the present study. The research vessels *Ernst Haeckel*, *Alexander v. Humboldt*, *Walter Barth*, *Karl Wolff* and *Eisbär* of the former German Democratic Republic were included in the same program and worked repeatedly off Mauritania. The mollusc material taken by the first two ships is in ZMB Berlin, but still unsorted, the whereabouts of the rest of the material is unknown. It may still be in Rostock, where the Fisheries Institute of the former GDR was located. Very few samples from these cruises are in MNHN.

From 1980 to 1985, the second author, at that time a petroleum geologist working in Luanda (Angola), collected extensively on the coast of northern and southern Angola, employing all collection methods except scuba diving but including deeper dredging from small boats and participation in repeated hauls on board the shrimpboat *Victoria*, based in Luanda. Unfortunately, the central portion of Angola between Cabo Ledo and Benguela, including the whole Cuanza-Sul province coast with Novo Redondo, could not be sampled then because of political unrest, and its mollusc fauna still remains largely unknown. This material, which is now mostly in MNHN, is the largest collection from Angola ever assembled and has permitted the establishment of the southern distribution limits for most of the species treated herein. A lavishly printed popular book (Gofas *et al.* 1985), sponsored by Elf Aquitaine Angola oil company at the occasion of the first offshore oilfield discovery is also based on this material. A noncritical check-list of the marine Mollusca of Angola, compiled from literature and unpublished material, appeared in 1999 (Rolán & Ryall 1999).

The first author completed several important field trips for the preparation of the present volume. Already in 1969, West Cameroon (Victoria (now Limbe) Ambas Bay Morton Bay and Kribi), a

region at that time untouched by tourism and rarely visited by scientists, could be sampled during a two-weeks trip. During two and a half months (October-December 1985), collecting was made on the coasts of Congo Brazzaville, Gabon and Cameroon with commercial operations of the shrimpboat *Campo Star* (Cameroon) and the fish trawler *Kounda* (Congo Brazzaville). Numerous shallow dredgings were made in the Bay of Pointe-Noire (Congo Brazzaville) and in Morton Bay (Cameroon) using dugout canoes and a surf launch (Fig. I.5). In spring 1988, one month's shore collecting took place on the coast of Casamance and later in the same year, in Guinea (Conakry area and Iles de Los). More material was obtained during a fisheries cruise on board R/V *Louis Sauger* (Fig. I.4E), the then new research vessel of CRODT, off Casamance, with a small triangular dredge and a larger rectangular dredge.

Also in 1988, the already mentioned R/V *André Nizery* made two trawling surveys covering the upper shelf (7-25 m) off the coasts of Guinea and Guinea-Bissau and two sediment and benthos sampling cruises over the whole Guinean shelf to a depth of 200 m, with bottom grabbing, trawling and dredging. The grab samples were taken with a Smith-McIntyre grab of 1/10 square metre for a sediment chart of the Guinean shelf (Domain & Bah 1993). The first author participated in all four cruises, and added several dredge and trawl stations to the grab samples. A 10-foot shrimp try net with 20 mm mesh, some additional chain on the footrope and doubled codend was used with excellent results for obtaining benthic animals. In total over 1100 stations were covered, and a considerable number of interesting ecological and biogeographical results could be incorporated in the present work. The entire material is in MNHN, most of it unsorted. Four years later, from October 22 to November 15, 1992, the same vessel accomplished a trawling survey on the whole shelf of Guinea, with sampling of some larger

I.5. The surf-launch of the Station halieutique de Limbé (Cameroon) used for shallow dredging in Ambas Bay off Limbé, with typical African ambience, November 1985 (photo Rudo von Cosel).

invertebrates including molluscs, resulting in a brief synthesis of the benthic communities on the northern part of the Guinean shelf (Le Lœuff 1995).

In 1988, the Netherlands research vessel *Tyro* worked off Mauritania and gathered important material, now in RMNH, mostly with a Van Veen grab and by dredging. Many of the bivalves were studied for this book. In February, 1988, the German research vessel *Meteor* (second of name after WWII) sampled three transects off the Congo river mouth and off northern and southern Angola, between 30 and about 4500 m, using mostly a large box corer. Several rare and unusual molluscs were taken, and most bivalves were also examined for this volume. The material is still under study at the Paleontological Institute of Würzburg University and will eventually be deposited in SMF, Frankfurt.

Two small but very interesting collections could be studied for this book. During two sampling cruises for a sediment chart (Giresse *et al.* 1996) on the shelf of Cameroon in March 1991 and March 1992 on board the R/V *André Nizery*, the molluscs were collected by J. Monteillet and a list of 213 species (129 gastropods, 84 bivalves) was published in an annex to the chart; a selection containing mostly small species was donated to MNHN. The second collection was assembled during 1995 by L. Bigot on the deeper shelf around offshore oil drilling platforms off Pointe-Noire, Congo Brazzaville.

Two deep-sea cruises were conducted on cold seep sites on the Congo–Angola margin, in year 2000 on board the R/V *Thalassa* (second of that name) and in 2004-2005 on board R/V *l'Atalante* within the Zaiango and Biozaire programs of Ifremer, both with the first author on board. Molluscs were published by Cosel (2006), Cosel & Olu (2009), Warén & Bouchet (2009) and Krylova & Cosel (2011), the material, collected by beam trawl, manned submersibles (*Nautile*) and the remote operated vehicle (ROV) *Victor 6000*, is now in MNHN.

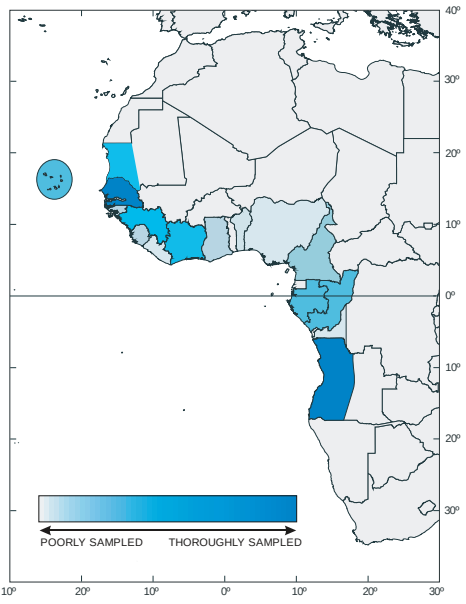
The latest sampling operation took place in January-February 2012, when the first author participated in a 2-weeks benthos monitoring cruise in the Bay of Pointe-Noire, in view of a future iron ore port. This survey used the converted harbour tug *Entouka*, dredging and trawling between 7 and 19 m; at the same time, a diving team worked on the hard bottom unsuitable for trawling in the same depth range. The molluscs are in MNHN.

Among the amateur collectors who contributed to this work in donating a large part of their material to the MNHN, the late M. Pin (of Dakar) assembled during the 1980s and early 1990s a large material mostly from his own dredgings in the Dakar region, but also from shrimpboats working off Casamance. Another collector, the late P. Bernard, lived in Gabon between 1983 and 1988. He collected mainly in the Libreville area and wrote a popular identification book (Bernard 1984), in which the common species are figured in colour. His material (now in MNHN), as well as some interesting material collected by C. Chevalier in the Port-Gentil area between 1981 and 1989 and by P. Ryall around Takoradi, Ghana, is also included in the present study.

The early history of malacological research on the Cape Verde Islands is treated in detail in Cosel (1982) and Burnay & Cosel (1987). The first collecting in modern times on the Islands was made by J. Cadenat in April-June 1950 on the Islands of Santo Antão, São Vicente, Sal and São Tiago. He

collected mainly beach material, which was published by Marche-Marchad (1957) and which is in MNHN. Research in the Cape Verde Islands resumed in December 1978 with a joint German-Portuguese expedition, in which the first author took part and on which predominantly shore collecting and skin diving was done (Cosel 1982, and references therein). A few years later, the "First Iberian Scientific Expedition to the Cape Verde Archipelago" (July-August, 1985), destined to Centro de Zoologia, Lisbon and MNCN, Madrid, explored several islands and the material has been examined for this volume. An extensive collecting effort around the Cape Verde Islands was produced with the Dutch CANCAP-project, a long-term programme of biogeographically oriented marine research funded by the Netherlands national programme for ocean research. Dredging was carried out in 1982 on board the Netherlands research vessel *Tydeman* as the last of several cruises to Atlantic Islands (van der Land 1987). Only a few of the molluscs have been reported on and, among the bivalves, only the Pectinoidea (Dijkstra & Goud 2002). The material is in RMNH and was also consulted.

Several regions of tropical West Africa (Fig. I.6) still have been sampled very inadequately and will continue to be so in a foreseeable future due to political unrest or lack of funds, *e.g.* Sierra Leone, Liberia, Nigeria and Equatorial Guinea. Therefore, missing records of species from these countries, which are all situated within the so-called "typical tropical regions", may in a few cases not mean real distribution gaps (as in many other cases) but are more "sampling gaps", due to the lack of well-localized material, especially from the deeper shelf. Better-sampled countries are Guinea-Bissau, Ghana, Cameroon, Gabon and Congo Brazzaville. The countries with most exhaustive material, including deeper shelf samples are Mauritania, Senegal, Guinea, Côte d'Ivoire and Angola. All these countries except Cameroon are situated within the regions with seasonal upwelling.



I.6. An estimate of the sampling effort within tropical West Africa, based on counts of figured specimens in this book. Sampling effort in areas outside the scope of this book is not assessed.

The shoreline of tropical West Africa

Compared to other coastlines of the World, the shoreline of tropical West Africa is rather homogenous, unindented and unprotected. It is interrupted by only few and small bays. Most of the coast is sandy, the rocky parts being relatively short and isolated. The almost complete absence of coral reefs on the mainland is an outstanding feature of this tropical region and only to be compared with the Panamic-Pacific faunal province.

I.7. The beach at N'Gor, near the western tip of Cap Vert peninsula, with a small island facing the coast (photo Patrice Petit-De Voize).

The coast of West Sahara consists of cliffs, 10-20 m high, alternating with sandy, surf-beaten beaches. Narrow strands are situated in front of the cliffs and are exposed only at low tide. The Bay of Dakhla (formerly Villa Cisneros) has sandy beaches, where the difference between tides is about 1.5 m.

Cap Blanc at the end of the Nouadhibou (Port-Etienne) Peninsula is rocky. From Baie du Lévrier to Cap Timiris the coast is very flat. There are vast sandy beaches, sandy flats and shoals, the largest bank being the Banc d'Arguin. A few relict mangroves exist north of Cap Timiris. This area is very interesting for molluscs, as all kinds of intertidal and subtidal soft-bottom-dwelling species can be collected (see Élouard & Rosso 1982). The tide difference is about 1.20 m. The offshore part of the Banc d'Arguin and its mollusc fauna was recently treated by Michel *et al.* (2011).

The coast from Cap Timiris southward to the mouth of the Senegal River is generally a rather steep sandy beach. In its northern part it is not surf-beaten and is interrupted by few points with beachrock, but from its middle part southward, the beach is fully exposed to strong wave action, especially in its southern part, and only a few molluscs such as *Donax rugosus, Tivela bicolor* and *Mactra glabrata* are found (for details, see Lanjamet 1988). South of the Senegal River, the steep, surf-beaten beach with clean, rather fine sand (the "Grande Côte") continues to Yof on the north coast of the Cape Verde Peninsula. The drift line there consists mainly of valves of *Donax*.

I.8. A brackish water inlet of the Saloum area, near Keur Bamboung (photo Patrice Petit-De Voize).

The shore of the Cape Verde Peninsula (Fig. I.7), including the Dakar area, is mostly rocky with inserted small beaches. There are interesting areas on which collecting is possible at low tide. The northern and western part of the peninsula is generally surf-beaten, whereas the southern shore (Baie de Gorée) is calm, except with southwesterly winds. The coast from Bel-Air/Hann (NE of Dakar Harbour) to Thiaroye consists of a gently inclined beach with very fine, clear grey, somewhat gluey sand and occasionally with mactras, tellins and other rather thin-shelled bivalves on it. Then, from Thiaroye east-and southward to Rufisque and further south to Joal-Fadiouth (the "Petite Côte") the beaches become more-or-less steep, with coarser white sand and are more surf-beaten. Some rocky areas are intercalated, especially at Rufisque, Popenguine and Cap de Naze (for details, see Sourie 1954, 1957; and Lawson 1966). Apart from a few spots, most of these beaches are generally not very rich in shells but occasionally interesting things can be found, especially where fishermen are cleaning their nets. Periodically, masses of algae are cast ashore on the beaches from Bel-Air southward and impede shell collecting partly or completely. In the Baie de Gorée dredging yields a great diversity of species.

From M'Bour southward to Joal, the beaches mostly consist of coarse white sand. They are less surf-beaten than further north and have a vast rocky foreshore which is exposed at low tide and offers excellent collecting possibilities in clear water. The tide difference is about 1.2 m; the beach drift usually contains more shells than further north.

South of Joal-Fadiouth, mangroves along the coast become common. Detailed information and maps of the mangrove areas on the whole West African coast (and worldwide) coast are given by Spalding *et al.* (2010). The coast is interrupted by the mouths of three "rivers": the Saloum

I.9. Typical Senegalese sea-going fishing pirogue in heavy surf on the beach of Kafountine (Casamance) (photo Rudo von Cosel, March 1988).

River (Fig. I.8), the Gambia River and the Casamance River. Actually, these are not real rivers but more correctly "rias", that means, very narrow bays or fjords stretching deep into the land. Hydrographically they are "inversed estuaries" in which the salinity increases towards upstream due to high evaporation and low rainfall rates. The tide difference at the mouth of the Casamance River is about 1.50 m; the influence of the tides reaches up to 100-150 km inland. Where the salinity is not too high, the river banks are formed by mangroves. Fully marine molluscs have been dredged *e.g.* in the Casamance River off Ziguinchor (Monteillet & Plaziat 1981; my own fieldwork). The main "rias" branch into smaller creeks, called "bôlons". Ecological surveys with habitat descriptions and mollusc population lists are presented by Élouard & Rosso (1977) for the Saloum Delta, by Monteillet & Rosso (1978) for the Senegal estuary and by Monteillet & Plaziat (1981) for the Casamance River system (for this latter, see also Paulus & Paulus 1948).

From the south of the Gambia River along the Casamance coast to Cap Roxo and the Rio Cacheu (North of Guinea-Bissau) the coast is sandy, the beaches consist of fine, firm sand (Fig. I.9) and are more-or-less flat and rich in shells, mostly bivalves, but rather poor in species. There are a few rocks at Cap Skirring-Cap Roxo, however, because of the rather murky water, diving is generally not possible.

The Bissagos (Bijagos) Archipelago (Fig. I.10) forms the greater part of the coast of Guinea-Bissau. It is a labyrinth of channels with sandy beaches, sandbanks, rocky areas and vast mangrove swamps which also occur along large parts of the continental coast. The water is mostly murky. A remarkable large muddy area is situated on the shelf NW of the mouth of the Rio Geba, in a depth of 10-15 m, with a special molluscan assemblage.

I.10. The Bijagos archipelago (here, Canhabaque Island) features a diverse but always shertered environment, including rocky, sandy and muddy substrates (Photograph by Jean-Louis Delemarre).

The coast of Guinea is generally sandy, with numerous estuaries and mangrove areas intercalated. The access is often difficult. A nearly continuous zone of muddy bottom is situated parallel to the coast at a depth of about 3-6 m. The Cap Verga area has rocks and fine sandy beaches. The shores of the Conakry Peninsula are rocky with fine sand or more-or-less soft mud at low tide level; the water is very murky and seston-laden. The Iles de Los (Fig. I.11), a ring-shaped archipelago of volcanic origin, are rocky with some sandy beaches between the rocks, they present a diversity of habitats. Diving is occasionally possible, however, during most of the year the murky waters from the coast surround the islands and visibility is too low; the only collecting method which promises certain results is dredging or sifting while diving blind. The continental shelf off Guinea is exceptionally broad. The bottom beginning at 10-15 m is mostly sandy or mixed with mud, sand, gravel and stones. The water more offshore is clear, and scuba diving from a boat might be possible. The tide difference here and in Sierra Leone is quite important: 2-3 m.

The coast of Sierra Leone is very irregular, consisting mostly of sandy beaches and some rocky areas, interrupted by several bays, rivers and estuaries with mangroves. Liberia has a less irregular coast. Sandy beaches alternate with rocky points or areas. The shelf diminishes considerably in width from southern Sierra Leone southward. Nothing is known about shelling possibilities in both countries.

The extreme western part of Côte d'Ivoire (from Tabou eastward) is rocky with sandy beaches in between; east of Fresco, the coast is low with a sandy beach and a series of lagoons behind them, the largest lagoon being Lagune Ebrié. For details of these biotopes and their molluscs, see Zabi & Le Loeuff (1993) and Le Lœuff & Intès (1998); a collection of papers on the marine environment and the benthic, pelagic and demersal communities of this coast is presented

I.11. Beach and rocky shore at Kassa Island, Iles de Los (Guinea) (photo Fabio Giardina, www.globeholidays.net)

by Le Loeuff *et al.* (1993). The beaches of Côte d'Ivoire are mostly very steep and surf-beaten, exposed to the full ocean swell from the South, especially during the cold season. Beachcombing there is very unrewarding; dredging on the shelf well outside the influence of the surf, however, may give interesting results. In the region of Assinie, the extreme eastern part of Côte d'Ivoire, the beach is flatter and harder than further west, with calmer water, and beach drift collecting yields several interesting bivalve species. The lagoons have a special, rather poorly known fauna, the most important molluscs being the mangrove oyster *Crassostrea tulipa*, the soft bottom bivalves *Potamocorbula adusta* and *Senilia senilis*, and gastropods of the genus *Pachymelania*.

The coast of Ghana is generally flat and sandy, but in some parts, mostly in the western part around Takoradi and Cape Three Points, there are several rocky points and coast strips, often with small bays and short beaches between them. Eastward of the Volta River mouth with mangroves, the beach becomes very steep, with coarse sand.

Togo and Bénin (Dahomey) have a sandy coastline with more-or-less steep beaches and often with lagoons behind them. On the Nigerian coast, these beaches continue eastward to Lagos. Generally they are not very interesting for shelling due to the heavy surf and the steep gradient. Between Lagos and the Cameroon border the coast is sandy, interrupted by numerous outlets and creeks of the Niger delta with mangrove swamps and reduced salinity during the rainy season.

The coast of West Cameroon around the Cameroon Mountain consists of rather steep, surf-beaten beaches mostly with fine, firm, dark volcanic sand, interrupted by some rocky outcrops and generally with only few shells. The Limbé (Victoria) area offers some shelling possibilities with the rocky islands Ambas and Mondoleh and the fine sandy beach of Morton Bay in the

I.12. Bay of Santa Maria in southern Angola. The waters are always transparent and the intertidal fringe of the islet is lined with large oysters (*Saccostrea cucullata*). The bottom surrounding the islet is 10-20 m deep and supports Maërl beds (photo Serge Gofas).

innermost part of the rather sheltered Ambas Bay. South of the Bimbia, Cameroon and Douala estuary system with vast mangrove swamps, the coast is sandy and rather uniform south to Kribi, with moderately steep beaches and with rocky points further southward. The tide difference is about 1-1.2 m.

The coast of Equatorial Guinea and the northern part of Gabon south to Port-Gentil is indented with the Bahia de Corisco, the broad and deep estuary of the Gabon (Komo) and, further southward, Cap Lopez. Sandy beaches of different grain size and gradient alternate with mangrove areas, mud flats and some rocky zones. The Corisco Bay in general is very shallow with sandbanks and a few small islands (*e.g.* Ile Banié). It is very rich in sand-dwelling molluscs and seems to be a good place for dredging, but also for diving, at least in the dry season. Several species occur in much shallower water here and in the Bay of Port-Gentil than elsewhere in West Africa. The Bay of Port-Gentil with its many different biotopes is another very attractive locality where skilled field workers might obtain a lot of interesting species in a rather small area within a relatively short period.

From the mouth of the Ogowé River southward to Congo Brazzaville, the coast is formed by more-or-less narrow, surf-beaten beaches which are separated by rivers and lagoon inlets. In the Congo, the Bay of Pointe-Indienne and the Bay of Pointe-Noire, both open to the North and with rocky peninsulas, interrupt the coastline. In the Bay of Pointe-Noire and near Pointe-Indienne, the bottom of soft sediments is interrupted by rocky outcrops parallel to the coastline from directly under the low water line to depths of more than 20 m. This explains the presence

I.13. Beach and jetty at Baia de Lucira, Namibe province, Southern Angola (photo S. Gofas , january 1983).

of shells of Petricolidae and other hard-bottom dwelling species in the driftline. Whereas shelling on the open beaches is not promising, the two sheltered bays offer good collecting possibilities by beachcombing, shore collecting, local small dredging (attention to rocks!) and, in the dry season, snorkelling and diving, although even then, the visibility is rather limited. However, ongoing land-claiming and port construction activities in the vicinity of Pointe-Noire make naturalist's work more and more difficult, and interesting biotopes are in danger of destruction.

Another bay of the same type is situated on the coast of Cabinda. The short coast strip of Congo Kinshasa (formerly Zaïre) with the estuary of the Congo River is predominantly sandy with creeks and mangroves behind the beach; however, north of Banana there are areas with low cliffs behind a steep and narrow beach (for details on this part of the coast, see Dartevelle 1934, 1950; Dartevelle & Schwetz 1937), and some rare and not easy-to-obtain bivalves may be found there.

Going southward from the mouth of the Congo River to Luanda, the coast of northern Angola is mostly a low cliff bordered by a narrow rocky or sandy strand uncovered at low tide. The water has much suspended clay from the erosion of the cliffs and is even more murky around the mouths of small coastal rivers. The rocks and beaches of Cacuaco and São Tiago north of Luanda are excellent shelling grounds. The Luanda area has two major sand spits enclosing shallow calm bays. Ilha de Luanda is within the city and a place for landing and cleaning fishing nets with shells; Mussulo sand spit encloses a much larger bay with many inlets, channels and mangroves. The coast continues with a cliff, narrow beaches and turbid waters south to Lobito.

I.14. Abrupt shore and small sandy beach at Carriçal, São Nicolau, Cape Verde Islands (photo Diego Moreno, Iberian expedition to CVI 1985).

Contrasting with the remainder of West Africa, the coastline of southern Angola between Benguela and Moçâmedes (now Namibe) province is rocky (Fig. I.12, Fig. I.13), with clear water and depths of several hundred metres coming quite close to the shore. There are numerous sheltered bays, remote but with a very original fauna with many short-range endemics. The coast south of Moçâmedes is sandy, with two large sand spits at Porto Alexandre and Baia dos Tigres, which also is called the Great Fish Bay.

The mollusc fauna of Namibia is virtually unknown and literature is very scarce (Penrith & Kensley 1970a, b). It is presumed to be temperate like it is in southern Angola at Baia dos Tigres. Most of the Namibian coast is sandy and surf-beaten except the two inlets of Walfisch Bay and Lüderitz.

The Cape Verde Islands (Fig. I.14) have mostly rocky shores, often with intercalated more-or-less short beaches of different gradient and grain size in bays. There are longer beach strips on Ilha do Sal (from Algodoeiro southward to Santa Maria) and Boavista (Sal Rei); Santo Antão, Brava and Fogo have nearly no beaches at all. The water is clear.

Besides the Cape Verde Archipelago, the offshore islands in the Gulf of Guinea (Ilha do Principe, São Tomé and Annobon) are the only places in tropical West Africa with a few isolated spots with reef-building corals. Details on the reef coral fauna around the islands and among the West African mainland coast are given by Laborel (1974). The shores of the islands consist of volcanic rock, although there are some bays with more-or-less short beaches. The island of

Bioko (formerly Fernando Poo), however, is on the continental shelf of Cameroon and does not have oceanic conditions.

Hydrographic features of West African waters

The hydrography of the tropical eastern Atlantic has been summarised by Longhurst (1962), Berrit (1973), Laborel (1974), Intès & Le Loeuff (1984) and Le Loeuff & Cosel (1998).

The West African coast is characterized by three main hydrographic regions: a region of permanent and seasonal coastal upwelling in the northern subtropical and warm-temperate part under the influence of the cold Canary current, a tropical zone and a region of permanent and seasonal coastal upwelling in the southern subtropical and temperate zone under the influence of the cold Benguela Current. The southern and northern ends of these zones form major biogeographical limits.

The northern permanent upwelling zone comprises part of Morocco and the West Sahara; its southern limit is situated at Cap Blanc, northern Mauritania. It is called the Northern External Tropical Region by Intès & Le Loeuff (1984) or better "Canarian Region". From there southward follows the "Northern Transitional Zone" (Williams 1968), or "Northern Alternant Region" (Berrit 1973; Intès & Le Loeuff 1984; Le Loeuff & Cosel 1998) a zone of seasonal upwelling along the coast of Mauritania, Senegambia and Guinea-Bissau. It ends at Cap Verga, Guinea, but occasionally upwelling may occur as far south as Conakry. The seasonal duration of the upwelling, which is correlated to the northern winter and has its maximum in February-March, follows a gradient and diminishes continuously from North to South. At Nouakchott it lasts on average 9 months of the year, further southward 7 months, at Dakar 5.5 months, in Casamance about 3 months, in Guinea-Bissau about 2 months, at Cap Verga (Guinea) less than 1 month, and off Conakry not more than 14 days if at all. The upwelling front moves southward during autumn and winter and northward in spring and summer.

The upwelling is caused by the trade winds, which blow from a north-north-easterly to north-easterly direction parallel to the coast of West Sahara and slightly towards offshore in Mauritania. These mostly longshore winds together with the Coriolis force drive the surface water away from the coast so that upwelling colder water from near the bottom, rich in nutrients, replaces it. Phytoplankton production in these upwelling zones is very high and explains the high population density of fishes and benthic animals along the Mauritanian and Senegalese coast and, to a lesser extent, more southward. During dredging operations along the coast of Guinea, a clear increase in density of the molluscan population could be seen from south to north, especially from north of Cap Verga to Guinea-Bissau.

Both the Canary Current and coastal upwelling cause a negative anomaly in the surface water temperature, which is most pronounced in the Cap Blanc area. In April, mean water temperature there is by 6.7° C lower than the normal average temperature in these latitudes (Open University Oceanographic Course Team 1989). In the Dakar area, the minimum surface water temperature in Winter (February) can drop to 16° C, whereas the summer maximum (August-September) may

reach 28° C. In Casamance, the winter minimum is slightly higher, above 18° C. Permanent tropical conditions with water temperatures never falling below 21° C can be expected only south of 12°N (Guinea-Bissau). In certain summers, however, the warm water of the North Equatorial countercurrent and the Guinea Current drift more northwards than usual and push the limit of permanent upwelling up to 24°N. The Baie du Lévrier can then remain warmer than usual for a longer time than the open sea, which causes drastic temporary changes in its faunal composition.

The proper tropical zone is by no means as uniform as one might think. Between the coasts of southern Guinea, Sierra Leone and Liberia in the north (the "Western Tropical Zone" of Williams 1968; "Northern Typical Tropical Region" of Intès & le Loeuff 1984; or "Western Typical Tropical Region" of Le Loeuff & Cosel 1998) and Nigeria, Cameroon and northern Gabon in the south (the "Southern Typical Tropical Region", or "Eastern Typical Tropical Zone" of Le Loeuff & Cosel 1998), all with permanent water temperature over 25° C, there is a rather weak zone of seasonal upwelling. This zone starts at Cape Palmas (Liberia), and comprises the coasts of Côte d'Ivoire, Ghana, Togo and, to a lesser extent, Bénin and the extreme western part of Nigeria. The eastern limit of the influence of the upwelling is normally observed at 2°E (Crosnier & Berrit 1966), however, the effects may occasionally be detectable as far East as Lagos (Nigeria). The mean surface water temperature there is slightly lower (below 25° C in southern winter), the western and eastern limits for this zone are given by the average position of the 24° isotherm (Williams 1968). The occurrence of this upwelling seems to be quite irregular, but it is most obvious in the period from June to August and may last until October. The monthly mean surface temperature goes down to 23°-24° C in August; near Abidjan, the August surface water temperature sometimes falls to 20° C. The water of this upwelling comes from depths within or below the thermocline, which in this region is situated in a depth between 30 and 60 m (Longhurst 1962). The surface temperature measured in the centre of the upwelling zone corresponds then to the temperature below the thermocline. The intensity of the upwelling phenomenon varies considerably from one year to the other (for some more details, see Le Loeuff *et al.* 1993).

The distribution patterns or distribution discontinuities for several species (*e.g. Fulvia fragilis congoensis*, *Heterodonax parvus*) are most probably due to this upwelling. Similar distribution gaps were observed in Polychaeta. The zone is called "Central Upwelling Zone" by Williams (1968) and "Atypical Tropical Region" by Intes & Le Loeuff (1984) and Le Lœuff & Cosel (1998).

A zone of seasonal upwelling in southern winter, the "South Transitional Zone" (Williams 1968), or "Southern Alternant Region" (Berrit 1973; Intès & le Loeuff 1984; Le Loeuff & Cosel 1998) starts just south of Cap Lopez (Gabon) and stretches along southern Gabon and to Congo Brazzaville. Although conditions there are still tropical throughout most of the year, the surface temperature can drop at Pointe-Noire to 17.6° C during a short period in August (Longhurst 1962). Pointe-Noire is hence the northernmost point of a northern Angolan faunal subregion with endemics such as *Pitar erubescens* and *Scissodesma angolensis*. The upwelling increases gradually along northern Angola to middle Angola, and becomes predominant along southern Angola in the Benguela province. The zone ends between Baia dos Tigres (southern Angola) and Cape Frio (northern Namibia) where it joins the southern zone of permanent upwelling, the "Southern External Tropical Region" (Intès & Le Loeuff 1984) or "Benguelan Region". The transition zone between the rather weak upwelling zone in the North and the permanent upwelling in the

South, between Lobito and Porto Alexandre, with a minimum surface temperature of 17° C at Benguela, has a molluscan fauna of special composition, with a lot of endemic species.

The Cape Verde Archipelago, an important centre of endemism in the tropical West African region, is the northernmost region with entirely tropical conditions (water surface temperature not below 21° C) in the Atlantic. However, in a global hydrographic sense, it is still included in the "Northern Alternant region". Although the islands are situated further north than the Cap Vert in Senegal, the water temperature between summer and winter is much more balanced, between 21-22° C in February and 25-26° C in August-September; the difference is only 4-5° C, in contrast to 12-13° C in the Dakar area. In fact, the upwelling zone does not touch the Cape Verde Islands which are too far from the coast, and the waters of the Canary current reach the archipelago only after having passed along the Mauritanian coast and after having already been considerably warmed up by the sun to 21° C or more. During summer, warm Guinean water also is transported with the Canary Current to the islands (see Cosel 1982). Therefore, some species which thrive on the continental coast only south of Guinea-Bissau or Guinea, are already present and common around the Cape Verde Islands (*e.g. Nemocardium aeolicum*).

The oceanic islands in the Gulf of Guinea are counted within the "Southern Alternant Region". Although situated in part just north of the Equator, they may still be under the influence of the Benguela Current for a short period of the year.

On the West African coast, the mean salinity is always high, between 35-36‰, in the northern and southern upwelling zone, but in the two typical tropical zones, it becomes slightly lower. The mean salinity in the Gulf of Guinea is 34‰, and in the inner part of the Gulf of Guinea (Niger Delta and Cameroon-Wouri Estuary), where the influx of fresh water and precipitation rates are very high, it may drop to 30‰. Other important river mouths which largely contribute with fresh water are that of the Ogowé (Gabon) and of the Congo River. Seasonal low salinities (down to less than 31‰) are also encountered off southern Guinea (Conakry) and Sierra Leone (Sherbro River). More detailed accounts on the hydrographic and environmental conditions (salinity etc.) and the biota of West African estuaries and lagoons are given by Zabi & Le Lœuff (1992, 1993), Le Lœuff & Zabi (1993) and Le Lœuff (1999).

Zoogeographical remarks on West African bivalves

The distribution patterns established for the West African marine bivalves in this work, represented on the small map accompanying each species entry, are mainly based on the studied material and to a less extent on the available literature. Few papers have so far addressed the zoogeography of tropical West African marine molluscs. Odhner (1923), Paes da Franca (1968) and Kensley & Penrith (1973) discussed briefly the situation of Angola, and a general synthesis of distribution patterns of benthic animals along the coast of tropical West Africa was published by Le Lœuff & Cosel (1998).

The general distribution patterns of the bivalve species in tropical West Africa are rather consistent with the hydrographical regions previously described. It is striking that many of the species

show a non-continuous distribution along the West African coast with one or even two distribution gaps. Admittedly, some of these discontinuities on the coasts of Sierra Leone, Liberia, Nigeria, Cameroon and Equatorial Guinea coincide with the least sampled regions (Fig. I.6) of the tropical West African coast and may be filled in the future. Nevertheless, the greater part of the discontinuous distribution patterns is documented (*e.g.* in Cameroon which is adequately sampled) and this section will attempt to provide an explanation.

The most common continuous distribution patterns are the following:

- species living on the whole coast, including zones of permanent upwelling (Morocco to southern Angola)
- species living throughout tropical West Africa, including the zones of seasonal upwelling or larger parts of them (Cap Blanc or Cap Vert to northern Angola)
- species restricted to the tropical zone proper (Casamance or Guinea to Gabon or the Congo Brazzaville)
- northern temperate species extending more-or-less into the West African realm (Europe or Morocco to Cap Blanc or Cap Vert).
- species endemic to the northern subtropics or "Northern Alternant Zone" (Cap Blanc or Cap Vert to Guinea)
- species endemic to the southern subtropics or "Southern Alternant Zone" (Congo to northern or southern Angola)
- insular endemic species

A rather high number (155 species, approximately one out of every three) shows a disjunct distribution; the most common patterns are the following:

- from Europe to Cap Blanc or Cap Vert and again from Congo Brazzaville or northern Angola to southern Angola or South Africa
- from Cap Blanc to Guinea and again from the Congo Brazzaville to northern or southern Angola
- from Guinea to Liberia and again from east Nigeria or Cameroon to Gabon
- species with two gaps: distributed from Europe or Cap Blanc to Guinea, then from Côte d'Ivoire to Bénin and finally from northern to southern Angola or more southward.

Even if some of the distribution gaps might be artefacts due to insufficient sampling, the number of species with one or two proven distribution discontinuities remains highly significant.

The distribution patterns cited here include species with rather high temperature tolerance, living both in the Mediterranean and in a large part of the West African realm, but also more stenothermal species. The stenothermal species may be grouped according to their degree of tropicality following the hydroclimatic zones shown on Fig. I.15:

- warm-temperate species living in the northern or southern zone of permanent upwelling, or in both
- subtropical species living in the northern or southern zone of seasonal upwelling, or in both
- subtropical-tropical species living in one or both zones of seasonal upwelling (or a part of them) and also in the zone of intermittent seasonal upwelling in the Gulf of Guinea

- tropical species living in the entire tropical zone including the "Atypical Tropical Region" in the Gulf of Guinea
- strictly tropical species living exclusively in the two "Typical Tropical Regions", with a distribution gap in the "Atypical Tropical Region" in the Gulf of Guinea.

I.15. Hydroclimatic regions on the West African coast. Neighbouring external regions are the Atlantic coast of NW Africa and Europe to the North, and Namibia and Atlantic coast of South Africa. to the South (redrawn from Le Loeuff & Cosel 1998).

Intès & Le Loeuff (1984) have found this scheme applying as well for some polychaete species. However, only very few bivalves seem to fit into it properly: most species might either be less stenothermal or other factors such as salinity tolerance, substrate etc. influence their distribution.

The distributional discontinuities observed for several species may be the result of one or more vicariance events that have taken place in the Pleistocene. With warming occurring after a cold period, species which then had a continuous distribution along West Africa could have been forced to retreat towards "colder" zones north and south dominated by upwelling, leaving gaps in the warmer, tropical parts. Although these events were too recent to cause speciation, slight differences between northern and southern populations may already be observed in a number of species.

The tropical zone of the West African coast is, in terms of latitudinal extension, the smallest one in comparison to the other three large zoogeographic regions. During the glaciation periods of the Pleistocene, it may have been considerably narrower. The constriction of the tropical zone in the Atlantic during ice ages was in fact much more marked in the eastern Atlantic than in the Western Atlantic, nevertheless, a small tropical zone on the West African coast persisted (Briggs 1987: 238). Sea-level was much lower during the glacial periods: traces of old littoral zones with intertidal soft bottom or mangrove communities and the corresponding biofacies (*e.g.* mangrove communities with *Senilia senilis* and *Potamocorbula adusta* or open-sea beach communities with *Donax* and *Tivela*) can be observed along the whole West African coast in a depth of 60-100 m along the coastline of today (Einsele *et al.* 1977; Rosso & Saubade 1984. The northern zone of permanent or preponderant upwelling must then have reached south to the region of Cap Verga, Guinea, as suggested *e.g.* by rich shell concentrates of *Donax burnupi*, a warm-temperate species restricted today to Mauritania, the northern part of Senegal and South Africa.

For a few species with a sufficiently long free-swimming larval phase (*e.g. Aequipecten commutatus, Planktomya magna*), a dispersalist interpretation might also be assumed: the planktonic larvae are able to cross the tropical zone and bridge the distribution gap in the tropical zone although conditions there are not favourable for settling.

The influence of the fresh water influx by the large rivers (Niger and Congo principally) on the mollusc distribution is not yet well studied, but it is evident. It is less important than that of the Amazon River system for the distribution of molluscs of northern South America. Nevertheless, the two "Typical Tropical Regions", separated by the "Atypical Tropical Region", are characterized by rather calm, turbid, seston-laden water with more-or-less reduced salinity. The degree of influence of river discharge can change considerably from one year to another according to the intensity of the rainfall. Nevertheless, clean water with full salinity and high temperature during most of the year is restricted to the offshore islands in the Gulf of Guinea.

Comparison with the other tropical zoogeographical provinces, past and present

During the Cretaceous and the early Tertiary (Paleogene), there was a nearly continuous circum-tropical sea around the globe, named Tethys Sea by geologists, stretching east-west between Africa, Eurasia and the two Americas, which were still separated. This sea covered a large part of today's Europe, with a succession of transgressions and regressions of sea level. During the Tertiary, culminating in the Miocene (about 12-18 million years ago), the seaway between the eastern end of the Mediterranean region and the Indo-Pacific was definitively closed as a consequence of continental plate movements and sedimentary infilling, while the Atlantic broadened more and more. Another major barrier was erected with the formation of the Panamian Isthmus during the Pliocene (3.1 million years ago). The differentiation of the formerly rather homogeneous Tethyan fauna became more tropical zone: Indo-Pacific, Eastern Pacific, Western Atlantic and Eastern Atlantic. These provinces are now separated by stable barriers: two formed by the large oceans, the Atlantic and the Pacific, which cannot be crossed by the majority of animals, and two continental barriers (see Cowman & Bellwood 2013).

An estimate of the affinity with other regions is given by the percentages of shared faunal elements, at the species level (including alternative subspecies) and at the genus level, taking into account only very similar congeners which in any case should belong to the same subgenus or species-group (Table 1). Species living in driftwood and in brackish waters are excluded from these counts, as well as species which do not enter the West African faunal province (14 species with their southern limit at Cap Blanc, and three species present only in St. Helena), therefore the number of species considered in these counts is 427.

Among these, the number of species having a sibling (or the same) species in one of the other regions is reported in Table 1. The species involved are usually mentioned in the remarks for each species entry.

Table I. Numbers and percentages of shared faunal elements with other faunal provinces, past and present, at the species level (including alternative subspecies) and at the genus level (100% is 427 species).

	species	%	genus	%
Southern European Pliocene	58	(13.6%)	161	(37.7%)
Miocene of Aquitaine Basin	24	(5.6%)	120	(28.1%)
Mediterranean	109	(25.5%)	152	(35.4%)
European Atlantic	73	(17.1%)	100	(23.4%)
Caribbean faunal province	26	(6.1%)	71	(16.6%)
Indo-Pacific faunal province	11	(2.6%)	104	(24.4%)
Panamic faunal province	3	(0.7%)	54	(12.6%)

The southern European Pliocene

A considerable number of Recent West African species or their ancestors are known from the Pliocene of southern Europe, especially northern Italy (Sacco 1887, 1897, 1898a, b, 1899, 1900,

1901; Cavallo & Repetto 1992) but also Tunisia (Fekih 1975), or the Redonian (Lauriat-Rage 1981). Some of these Pliocene species or their close descendants have survived only in the endemism pockets already mentioned. Examples of bivalves are *Hinnites corallinus* on the Angolan cost, the sand-dwelling *Pharus chenui* from Agadir (Southern Morocco) within the zone of permanent upwelling to Casamance within the northern zone of seasonal upwelling, and the today exclusively tropical *Globivenus libellus* inhabiting rocky bottoms offshore in clear water. In fact, the physiognomy of the West African molluscan fauna so strongly recalls that of fossil molluscan faunas of the Mediterranean Pliocene, that Italian palaeontologists have a strange impression of time-travel when collecting in recent West African waters. Many species have remained so unchanged that names introduced in the classical Italian Pliocene literature may be used for the recent species; in other cases there are slight differences but the identity of the Pliocene forerunner is obvious. The percentage of similar and identical species is slightly below than comparing West Africa with today's Mediterranean but is still higher than for all other regions. The very close relationship to the southern European Pliocene is the highest of those assessed here at the subgeneric and generic levels.

The Miocene of Aquitaine Basin

The affinity of the lower Miocene of the Aquitaine Basin with the West African fauna is less marked than that of the Pliocene, but still evident. This statement is based on Cossmann & Peyrot (1909-1914) but recent extensive field work in several outcrops of this region is bringing more species to light and might show further affinity with the Recent West African fauna (Lozouet & Maestrati pers comm.; see also ter Poorten & La Perna 2017 and La Perna *et al.* 2018). Regarding the Miocene, the relationships are mostly at the subgeneric and generic levels, and the percentage of identical or sibling species is rather low. However, species like *Tugonia anatina/nobilis* and *Senilia senilis* (see Lozouet & Gourgues 1995) have a close ancestor in the Miocene (of Aquitaine Basin) and have not yet been reported from the Pliocene. During the Neogene, a large tropical eastern Atlantic faunal province, known as Euro-West African province (Lozouet1997) extended from the north of France southward to Angola.

The Mediterranean and the eastern Atlantic

In the Recent, the greatest affinity of West Africa is with the Mediterranean, where the proportion of identical or sibling species outnumbers all other faunas, both recent and fossil. The figures for the European Atlantic are much lower, because many of the relevant Mediterranean species are not distributed north of the Straits of Gibraltar or reach their northern limit within the Ibero-Moroccan Gulf.

Following the climatic deterioration during the Pliocene, the Euro-West African tropical province was reduced more and more to finally correspond to the modern tropical West African region. The Pleistocene showed repeated and abrupt climatic changes between glaciations and warm interglacial periods, which were more drastic than those of the Pliocene and which caused the contractions and extensions of the tropical West African province. Unlike the Western Atlantic, where a considerable part of the original tropical fauna persisted, only a much smaller part of the original Tethyan and tropical Euro-West-African fauna had remained in West Africa during

the Pliocene and the early Pleistocene after the climatic deterioration (Ekman 1953); a large part of it was replaced by a more temperate fauna. The high proportion of Mediterranean-Atlantic species in West Africa are consequences of these events.

The Indo-Pacific

During the preparation of this volume, it became increasingly apparent that the bivalve fauna of tropical West Africa has much more in common with the Indo-Pacific than with the Caribbean, at least at the generic level. This affinity may be explained by two factors: the Tethyan heritage and vicariance events with the Indian Ocean around the Cape of Good Hope.

The marine fauna of tropical West Africa is derived primarily from the Tethyan fauna (Oliver & Cosel 1993b), and during the Lower Tertiary, the Mediterranean fauna had an Indo-Pacific character (Ekman 1953). This affinity was largely lost at the end of the Miocene, with the closure of the Tethys, the salinity crisis in the Mediterranean, the abrupt climatic changes and the large scale disappearance of the tropical fauna and its replacement by a warm-temperate one. Still, a rather high number of species of Indo-Pacific origin, now extinct in the Mediterranean and in the European Atlantic, have persisted in tropical West Africa. These or their close forerunners are found in the Southern European Pliocene (*e.g. Saccostrea cuccullata*, *Nemocardium aquitanicum/aeolicum*, *Spisula proaspersa*, *Florimetis papyracea*, *Callista puella/floridella*) and many of them also in the Lower Miocene.

For other species which are not present in the Miocene or Pliocene of southern Europe, a vicariance event might be hypothesized. These species occur in the Indian Ocean, reaching eastern South Africa, are missing around the Cape and along Namibia, and reappear in northern Angola and further northward. A possible scenario is that they were once distributed along the whole coast, then died out in South Africa and Namibia during a cold period of the Pleistocene. In some cases, separation at the subspecies level (*Fulvia fragilis*) or species level (*Dosinia isocardia/hepatica*; *Mactra glabrata/lilacea*) is possible. Such former distribution around the cape is documented by the presence of Pleistocene fossils in South Africa and Namibia (Kensley & Pether 1986; Kilburn pers. comm.). Two of these species have today a disjunct distribution on the West African coast: *Fulvia fragilis congoensis* in the zone of seasonal upwelling in the Congo Brazzaville and northern Angola and in the atypical tropical zone in Côte d'Ivoire and Ghana, and *Saccostrea cuccullata* likewise in both zones and also in the clear waters of São Tomé. This latter species seems more controlled by its need for clear water than by strictly high temperatures.

The rather intensive upwelling area on the southern Arabian coast (Dhofar to Masirah Island) seems to act as a refuge for temperate-water species that are endemic to that region but several of them form a sibling species pair with West African or European-West African species, *e.g. Arca symphenacis/A. noae*, *Talochlamys* cf. *tincta/T. multistriata*, *Lyrocardium anaxium./L. aeolicum*, *Tellina* cf. *incarnata/T. incarnata*, *Gastrana multangula/G. matadoa*, and among the gastropods *Trochita dhofarensis* Taylor & Smythe, 1985/*T. trochiformis* (Born, 1778), the latter from Cape Verde Islands; Angola, Quaternary of Morocco (see also Taylor & Smythe 1985; Bosch *et al*. 1995 and Oliver & Chesney 1997).

The Western Atlantic

Of the 536 species of marine and brackish-water bivalves listed in the European Register of Marine Species (http://www.marbef.org/data/erms.php), about fifty species occur along the coasts of eastern North America and, via Newfoundland to Greenland, Iceland and Faroe extend to northern Europe (Scotland, Norway or the North Sea), and some of them still further south. These are cold water species which, at their southern limits, are restricted to deep water and, in the northern part of their range, have a rather continuous distribution. Their planktonic larval phase can be rather short.

The species treated in this book (mostly tropical and subtropical species), however, are more or less stenothermal and among them, twenty-six amphiatlantic species are shared with the Caribbean and/or Brazil. Most of the known amphiatlantic species are gastropods of the of the families Ranellidae, Burrsidae or Architectonicidae with a very long ("teleplanic", Scheltema 1971) planktonic larval phase which is capable of crossing the Atlantic eastwards by following the Equatorial Countercurrent (mostly the undercurrent which is also called Lomonossow Current) to the Gulf of Guinea and northward to Guinea and the Cape Verde Islands, or via the Gulf Stream and then the Canary Current southward to the Canary Islands. A westbound transport via the North Equatorial Current and the Caribbean Current might also be possible. A dispersalist interpretation should be adopted for those amphiatlantic species which have a planktonic larval phase (*e.g. Nodipecten nodosus*, *Pinna rudis*, *Leiosolenus aristatus*, *Hyotissa mcgintyi*, *Laevicardium sybariticum*, *Papyridea soleniformis*, *Semele modesta*). It is not known if the larvae of these species are all really "teleplanic", some of them might have shorter larval lives today than they had during the Pliocene, so that they are not capable of swimming the Atlantic any more. The same applies also to amphiatlantic sibling species pairs (*e.g. Semele lamyi/S. proficua*).

Many of the amphiatlantic mollusc species coming from the west have a rather restricted range in the eastern Atlantic; either only on the oceanic islands (Canary Islands, Cape Verde Islands, islands in the Gulf of Guinea) or, additionally, on a very short coast strip of Gabon. This phenomenon is also known for amphipacific species of Indo-Pacific origin, many of which reach the offshore islands (Cocos, Clipperton, Revillagigedo etc.) only (Salvat & Ehrhardt 1970; Emerson 1967, 1991) and not the West American mainland. The islands of St. Helena and Ascension have a very poor but genuine fauna with a much higher portion of Western Atlantic species than the tropical West African coast and several endemics (Smith 1890, 1892; Rosewater 1975)

At the genus level, the relationships of the tropical Western Atlantic bivalve fauna to the West African fauna are quite limited. It can be presumed that this originates from Tethys times. Although the tropical sea was still continuous, two distinguishable provinces were already present in the tropical Atlantic during the Eocene and Oligocene, an Indo-European faunal province and an American faunal province. With the closing of the two continental barriers and the climatic changes during the Neogene, this difference was accentuated. The difference in extinction rates of the tropical fauna between the eastern and western Atlantic is well known (Ekman 1953).

The tropical eastern Pacific

The affinity of the bivalve fauna of the tropical West American (or Panamic-Pacific) province (see Coan *et al.* 2000; Coan & Valentich-Scott 2012) with West Africa is by far the lowest, as is the number of sibling or identical species. This is most probably due to the combination of two effects: the existence, already in Tethyan times, of two differentiated provinces, and the onset of two barriers: the marine barrier of the Atlantic, and the continental barrier of the Panamian Isthmus.

However, the ecological similarities between tropical West Africa and the Panamic-Pacific province are evident: the most outstanding common feature of both provinces is the almost complete absence of reef-building corals on the continental coast; there are only a few small reefs or agglomerations of isolated corals around the oceanic islands and sometimes also on islands on the continental shelf with clear water (such as Isla Gorgona off the Colombian coast in the Panamic-Pacific province) and perhaps a few dispersed coral patches on the continental coasts.

The predominant substrates in both regions are sandy beaches and soft bottoms ranging from coarse and medium sand to mud, mostly consisting of mineral sediment and rarely calcareous (with a few exceptions, *e.g.* some spots on the Guinean shelf). Areas of rocky shore are only occasionally intercalated. About 85% of the West African coast is sandy. The portion of mangrove shores and estuaries with turbid water, laden with organic matter and with more-or-less reduced salinity is rather high in the strictly tropical parts of both provinces. Other common characteristics are the considerable tidal range in certain parts and the presence of upwelling with clear, agitated water (and a desertic climate) at the extremities of the provinces.

The soft-bottom benthic communities are consequently dominant in both provinces, and infaunal bivalves (Anadarinae, Lucinidae, Cardiidae, Solenoidea, Mactridae, Tellinidae, Psammobiidae, Semelidae, Veneridae) and soft-bottom-dwelling gastropods (*e.g.* Turritellidae, Turridae) form the essential part of them.

Large-scale endemism, local radiations

The West African fauna as a whole is distinctive, having 282 species (66% out of 427) endemic at the species level. Ekman (1953) cited a very similar proportion of 63 % for the molluscs altogether. There are only 18 genera (*Lazariella, Cardiocardita, Akardita, Crassatina, Afrophysema, Lozouetia*, *Cardium, Bucardium, Europicardium, Rostrimacoma, Nasopharus, Sinupharus, Sinucultellus, Leptospisula, Huberimactra, Ungulina, Lamysia, Circomphalus*, *i.e.* 8% out of the 223 genera) of bivalves endemic to West Africa, to which may be added a few endemic subgenera (*e.g. Tellina (Senegona), Diplodonta (Felania)* and the nearly freshwater *Galatea*. This is very little compared to the other three tropical provinces.

Some local radiations at the specific level are observed, with 2-5 species each. Similar local radiations are known from several bivalve families in the Panamic-Pacific province, although different genera are concerned. Some of the West African local species radiations are endemic at the generic (*Cardiocardita, Crassatina, Europicardium, Nasopharus* and *Sinupharus*) or subgeneric

level (*e.g. Felania*). The most obvious example is among the gastropods: the volutid genus *Cymbium* encompassing large voracious snails profits from the high bivalve diversity in their diet; this genus, with about 10 species, has most probably derived from Indo-Pacific ancestors.

Locally endemic species are encountered around the oceanic islands off the West African coast (Cape Verde Islands and São Tomé, Principe and Annobon) and on the continental shelf along short coast strips with special hydrographic conditions within the northern and southern zone of seasonal upwelling, so-called endemism pockets. The high endemism rate of the mollusc fauna of the Cape Verde Islands concerns mostly gastropods, the greater part of which lack a planktonic larval phase: Buccinidae, Marginellidae, Conidae (see Cosel 1982; Duda & Rolán 2005). The endemic bivalves are represented only by seven species, in the families Mytilidae, Donacidae, Condylocardiidae and Veneridae. Three more endemic bivalves are reported from the islands in the Gulf of Guinea. The most important endemism pocket on the West African coast is nevertheless situated in southern Angola, between Lobito (Benguela) and Moçâmedes (Namibe) and characterized by a mostly rocky shore, and by clear and agitated water with a minimum water temperature well below 20° C. Many of the endemic species found there belong to the same families as the Cape Verde Islands endemics: Condylocardiidae among the bivalves, and among the Gastropods Marginellidae and a large array of Conidae, but also include the spectacular *Hinnites corallinus*. A similar location in the northern zone of seasonal upwelling is situated along the coast of Senegal from the area of the Cape Verde Peninsula (Dakar) southward to Joal (Petite Côte).

Brief introduction to the bivalves

Bivalves (Class Bivalvia) are molluscs (Phylum Mollusca) and are one of the seven classes of this large phylum, the second largest after the Arthropoda in the animal kingdom. They were also called lamellibranchs (Lamellibranchiata, Lamellibranchia) or, mostly in America, pelecypods (Pelecypoda), but Bivalvia is now universally adopted in the modern literature. Over 9000 species are known worldwide, including fresh water (MolluscaBase 2018) which makes this the second largest mollusc class after the Gastropoda.

General morphology of soft parts

Introductions to anatomy and morphology of bivalve molluscs are to be found in many general textbooks (*e.g.* Morton *et al.* 1998, therein an extensive bibliography; Mikkelsen & Bieler 2007; Coan & Valentich-Scott 2012) with many interesting details regarding anatomy, ecology and morphology.

The body of the bivalve animal conforms to the molluscan basic body plan with a ventral foot, a dorsal visceral mass, and a mantle projecting laterally from the body and delimiting a large pallial cavity where the gills are enclosed. The body is surrounded by the two valves of the shell which are secreted by the mantle. Bivalves have no head and lack the radula, a characteristic teeth-bearing ribbon present in most other molluscs. Bivalves have a basic bilateral-symmetry, but many species (*e.g.* scallops, oysters and others) are inequivalve and thus asymmetrical.

The **mantle** consists of two flaps of soft tissue, one on each side of the body: they are symmetrical, joined dorsally and of the same size as the valves. Their margins may be completely separate along the opening of the valves, as is the case in protobranchs and pteriomorphs. In many heterodont bivalves, however the ventral lobes are fused to some extent, leaving only two posterior siphonal openings and one anterior opening for the foot. This is advantageous for burrowing in the sediment and keeping particles from entering the pallial cavity. Occasionally, a fourth opening, the so-called fourth aperture, is present on the ventral side, *e.g.* in *Ensis*. The mantle margin may bear tentacles or light-sensitive organs, and in some groups (Pectinidae, Limidae) real eyes.

The siphons are posterior prolongations of the mantle. They serve to separate the inhalant flow that carries food particles and oxygenated water into the mantle cavity from the exhalant flow that carries excreta and de-oygenated out of the mantle cavity. They can be tubular and separate or fused into one larger tube with two ducts in it. Their length determines how deep in the sediment the species may live. The siphonal tubes are generally more-or-less retractable, in some groups however (*e.g. Tugonia*, *Panopea*), they cannot be withdrawn into the shell and there is a large posterior gape of the valves to accommodate them. The inhalant siphon is somewhat longer than the exhalant siphon and is often crowned by tentacles to prevent larger particles from being drawn in, whereas the exhalant siphon has a smooth edge.

The **foot** of bivalves is homologous to the creeping foot of gastropods but is cylindrical or laterally compressed. It may be extended out between the valves on their anterior end, in the antero-ventral part or in the ventral part. When the bivalve is burrowing, the foot penetrates with its pointed tip into the sediment, then the anterior part swells by an influx of blood into the blood sinus, so that the end of the foot is anchored in the sediment, and by muscle contraction, the bivalve is drawn partly into the sediment. Then the movement is repeated until the animal is completely buried. Some species, *e.g.* Cardiidae, Solenidae and Pharidae, can leap in free water by rapidly bending and stretching out the foot. In epifaunal species the foot is usually reduced in size and little or not used for locomotion. On its posterior part, the foot of many bivalves has a byssus gland which secretes horny threads, the byssus, with which the animal attaches itself to a hard substrate. The byssus bundle leaves the shell cavity by a special byssal notch in one ear (Pectinidae, Isognomonidae), through a slight gape between the valves (Arcidae, Mytilidae, Pteriidae) or through a special hole in the lower valve (Anomiidae).

The bivalve animal has two **gills**, one on each side. In the subclass Protobranchia (the protobranchs, meaning those with primitive gills), the gills are feather-shaped, similar to those found in other molluscan classes and consist of a simple axis flanked on each side by short lamellae. In the other subclasses, each gill is usually formed by two sheets (the demibranchs) of very long filaments which are covered by cilia. This kind of gill found in most bivalves is called lamellibranch (hence one of the names for the class) and is attached longitudinally to the body along the postero-dorsal roof of the pallial cavity. A further distinction can be made between filibranch type (found in the subclass Pteriomorphia), where the adjacent filaments are held together only by the means of interlocking ciliary tufts, and eulamellibranch gills (found in the subclass Heterodonta) where the adjacent filaments are physically united by tissue junctions at various points along their length, giving more strength to the gill. In a very peculiar group known as

septibranchs (family Cuspidariidae and allied), there are no filaments at all but only a muscular, perforated septum which divides the mantle cavity into dorsal and ventral chambers.

Feeding

Feeding mechanisms in bivalves are different in the Protobranchia, where the gills are reduced in size and principally serve a respiratory function, and in all other bivalves where the gills are not only respiratory organs but also a "sorting table" for the food they take in with the water through the inhalant siphon.

Most Protobranchia are deposit-feeders which take food particles from the sediment using their outermost labial palps, prolonged by a mucus-covered proboscis. Conversely, most bivalves with a lamellibranch gill use it as the main feeding structure. The beating of cilia along the gill filaments produces a water current, which takes in microscopical particles (planktonic micro-organisms or parts of them) of food through the inhalant siphon. When arriving at the gills, these particles are sorted, wrapped in mucus and transported to the mouth. Further sorting is done by the labial palps, which, in filter feeders, are short triangular or elongated flaps situated at both sides of the mouth. Species with short, non or little retractable siphons belong to this feeding type, but also some species with longer siphons.

Deposit feeders are also found among bivalves having lamellibranch gills. All such species have long siphons and bend the inhalant siphon down to the sediment surface and move it around with its opening over the sediment surface like a vacuum cleaner, sucking in the detritus within the maximum extension length of the siphonal tube. This feeding type is found mostly in the superfamily Tellinoidea and their labial palps may be accordingly very large.

Some groups of bivalves are wholly or partly dependent for nutrition on symbiotic bacteria, located in the gills. These bacteria may be thiotrophic (utilising sulphides) or methanotrophic (utilising methane) that they extract from the water taken in by the bivalve and passing over the gills. All Solemyidae and Lucinidae are chemosymbiotic while only the larger members of the family Vesicomyidae and only parts of the Mytilidae and Thyasiridae are dependent on this feeding mode. Two other families have unusual feeding modes involving symbiosis. Some members of the family Cardiidae (mainly the large species of the subfamily Tridacninae), like many corals, house photosynthetic microalgae (zooxanthellae) in their tissues, but so far this has not been seen in any of the West African cardiids. The Teredinidae (shipworms) feed on the wood fragments eroded from their tunnels, which requires the cooperation of cellulolytic bacteria housed in oesophageal pouches.

The predominantly deeper-water septibranchs are unusual among bivalves in being carnivorous. By contraction of their muscular septum, they create a sudden flush of water through their inhalant siphon and suck in small preys such as minute crustaceans (see *e.g.* Morton 1981).

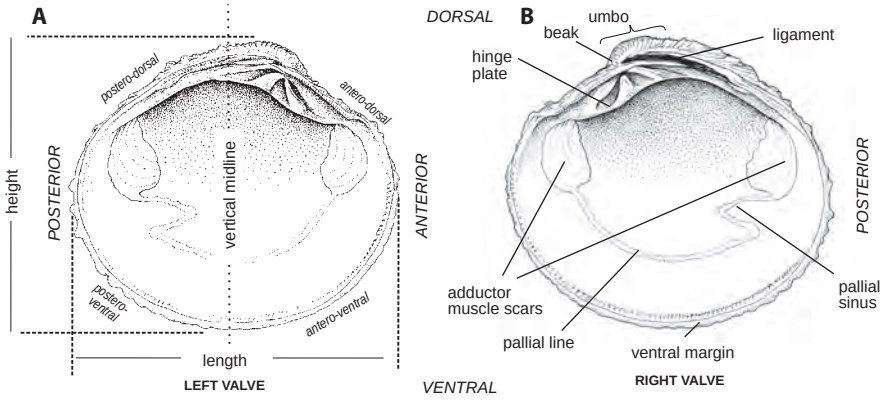
The stomach of many bivalves contains the so-called crystalline style, which is secreted in a style-sac and which is the principal organ of extracellular digestion. This crystalline style is a round, gelatinous, straight or curved stick and serves as an enzyme reservoir. It is continuously

formed at its far end and with the other (free) end pushed into the contents of the stomach, where the enzymes are set free and used for digestion.

The bivalve shell

The bivalve shell consists of the two rigid valves whose mineral component is calcium carbonate (lime), articulated on their dorsal side. The **hinge** is the dorsal part of the bivalve shell comprising the hinge plate, hinge dentition, ligament, and other structures involved in the articulation of the valves. The highest part on the dorsal side of a valve which rises more or less above the margin is the **umbo** (or umbone, both spellings are widely used), and its extremity, the origin of growth where the embryonic shell is situated is the **beak**. The two terms are often used indifferently without a good explanation, but umbo is preferred in inflated and more or less enrolled valves such as those of many Cardiidae or Veneridae, and beak refers only to the point of origin of growth, bearing the larval shell. In many families *e.g.* Tellinidae and Psammobiidae, umbo and beak are in fact the same. The position of the beaks may be in the middle, behind or in front of the vertical midline, anteriorly subterminal or terminal (as *e.g.* in most Solenidae). They may be strongly bent forward (then called prosogyrous) as in Veneridae or Glossidae, or more or less vertical like in Pectinidae, many Cardiidae and Mactridae, some Ungulinidae. Only occasionally they are bent backwards like in Nuculidae (then called opisthogyrous). Fig. I.16 shows the principal terms used in describing the bivalve shell, for the general outline (Fig. I.16A) and morphological details (Fig. I.16B).

The valves are attached to the soft parts by the mantle muscles or pallial muscles, the foot retractor muscles, the byssus retractor muscles (if present) and the adductor muscle(s). All these muscles have corresponding scars on the inside of the valves, and these scars are important characters in bivalve taxonomy. The adductor muscles are responsible for closing the valves, and consist of two parts, a striated muscle for quick reactions and rapidly closing the valves in case of danger, and a larger smooth muscle which can maintain the valves tightly closed for a long time. The ligament is an elastic structure which connects the valves and tends to open them, being thus antagonistic to the adductor muscles. This is why in dead bivalves the valves tend to be open. Most bivalves have two adductors of equal size (dimyarian, isomyarian) or of unequal size with a smaller anterior muscle (anisomyarian). In some species the anterior muscle is completely absent (monomyarian). The foot retractor muscles serve for drawing in the foot. Their scars (two on each valve) are situated on the dorsal side near the adductor scars, but mostly hardly or not visible. They have taxonomic value *e.g.* in Mytilidae and Anomiidae, where also byssus retractors are present. The pallial muscles are attached to the valves parallel to the ventral margin; their scar, mostly continuous, is called the pallial line and links the two adductor scars. Below the posterior adductor scar, this pallial line can be more or less deflected inwards. This is the pallial sinus, and the muscles attached there serve for drawing in the siphons. The depth of the pallial sinus is proportional to the length of the siphonal tubes. The sinus may be broad to narrow, rounded to pointed. Ventrally it can be confluent with the ventral pallial line or separate from it. In species with very short siphons that are not retractable (*e.g.* Cardiidae, Glossidae, Astartidae), the pallial sinus is reduced or absent. Pholadidae often have additional accessory plates which are explained in the general chapter on the group.



I.16. Terminology used in describing the general morphology of a bivalve shell for general outline (on the left valve) and for particular structures (on the right valve).

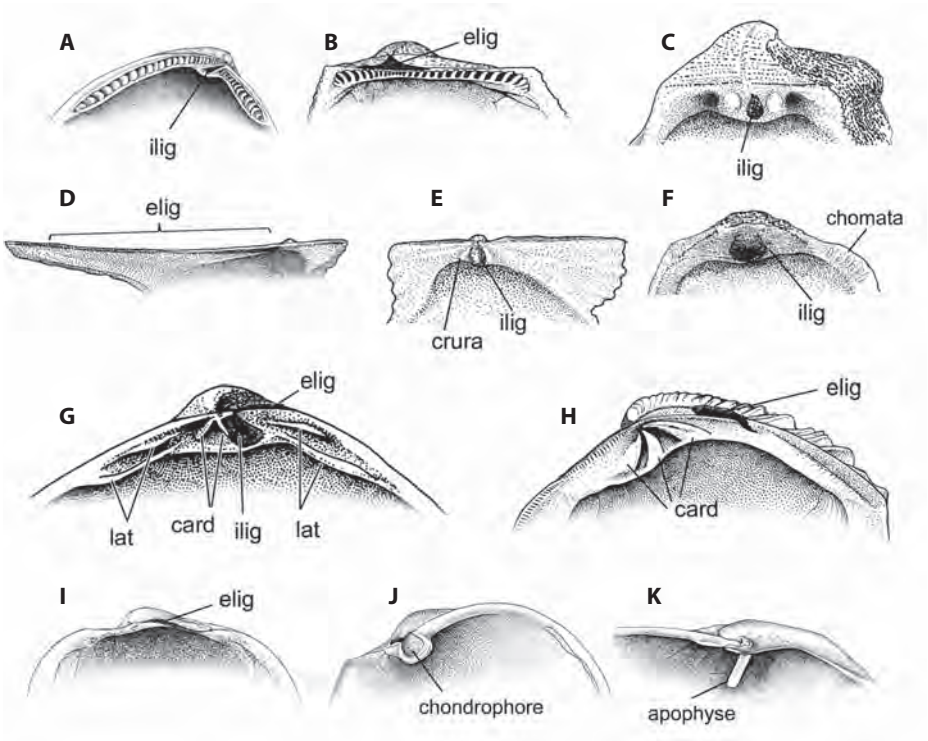
The hinge

The **hinge plate** is a more-or-less thickened elaboration of the dorsal margin of the shell and bears the hinge teeth, projections or knobs which on the opposite valves have corresponding hollows or sockets, and the ligament. These keep the valves in the same position against each other. Hinge morphology provides crucial characters for the definition of genera and higher taxa, and may also provide some clues for species diagnosis. Different forms of hinge dentitions exist (Fig. I.17), the most important ones being the taxodont hinge (Arcoidea, Nuculoidea) with many similar teeth and the heterodont hinge (most bivalves, especially Eulamellibranchiata) with fewer, unequal teeth. These are grouped in **cardinal teeth** (or cardinals) which usually short and are placed under the beaks, and **lateral teeth** (or laterals) which are found along the antero-dorsal and postero-dorsal margin further away from the beaks. Frequently the laterals are only partly present or entirely missing. A few species have completely toothless hinges.

The **ligament** is an elastic part of the shell which unites the valves and tends to keep them open, whereas it is the action of the adductor muscles which keeps them closed. In many species there are two separate parts of the ligament, one external behind the umbones and one internal (called a resilium by Dall 1895). The dorsal part of the valve margin, to which the external ligament is attached, is the ligamental **nymph**. The depression of the hinge plate to which the internal part of the ligament is attached is called a **resilifer**. When this resilifer is protruding like a spoon, it is called a chondrophore.

Orienting a bivalve shell

Left and right valve of an empty shell are determined by holding the shell with the anterior end forewards and the posterior backwards, the dorsal margin upwards and the ventral margin downward. The ligament and the pallial sinus are *always* posterior to the beaks. On valves with one muscle impression much larger than the other, or with only one impression, the largest (or sole) impression is always situated posterior to the vertical midline. This being set, the right valve



I.17. Types of dentition found in Bivalves. **A**, Taxodont (as in Nuculidae, with internal ligament separating two series of teeth). **B**, Taxodont (as in Arcoidea with external ligament and more or less continuous series of teeth). **C**, Isodont (as in Spondylidae, with few, deeply interlocking teeth and an internal ligament). **D**, Hinge line devoid of teeth (as in Pteriidae, with external ligament along the whole hinge line). **E**, Hinge without teeth (as in Pectinidae, with small internal ligament delimited by crura). **F**, Hinge without teeth (as in Gryphaeidae, with partly internal ligament). **G**, Heterodont (as in Mactridae, with both internal and external ligaments, and with both cardinal and lateral teeth). **H**, Heterodont (as in Veneridae, with only cardinal teeth and posterior external ligament). **I**, Hinge without teeth (as in some Lucinidae, with deeply sunken posterior ligament). **J**, Hinge without teeth (as in Myidae, with internal ligament on a protruding chondrophore. **K**, Hinge without teeth (as in Pholadidae, with apophyse). elig: external ligament; ilig internal ligament; card: cardinal teeth; lat: lateral teeth.

is on the right, and the left valve on the left. A few bivalves *e.g. Glycymeris*, have the ligament centred below the beaks, have no pallial sinus and have equal muscle scars, making orientation virtually impossible without the soft parts (where the foot is anterior and the gills, posterior).

Sculpture

The external surface of the valves may be smooth with more-or-less apparent growth lines or sculptured mostly radially, commarginally (parallel to the margin) or with a combination of both thus having a cancellate or nodulose pattern (Fig. I.18). Some species have a non-commarginal, more-or-less oblique sculpture, mostly in the form of fine incisions (mostly among Tellinidae, Psammobiidae and Solecurtidae). Other species have irregular sculpture, or their surface is decorated with commarginally or radially arranged lamellae, scales or spines. In thin

or not too thick-shelled species, the outside sculpture may to a certain extent be reflected on the inside, especially in Cardiidae and other groups with strong radial ribs.

On the dorsal surface of many species, mainly soft-bottom dwelling eulamellibranchs, two more-or-less well-defined areas can be distinguished: the lunule in front of the beaks and the escutcheon behind the beaks, with the ligament in its centre-line. The lunule is mostly lanceolate or heart-shaped, it may be on the surface level, delimited by a groove only, or more-or-less deeply sunken in. The escutcheon is longer, narrow, sunken or not sunken and often separated by a ridge from the rest of the surface. In some groups, *e.g.* certain Veneridae, it is more developed in one valve than in the other valve. Frequently, a keel, an angle or a ridge extends from the umbos to the posterior or postero-ventral margin. This is called the posterior angle or umbonal ridge, and the region between this and the escutcheon is the posterior area or the corselet (Carter 1967); this latter term, however, is very little used. Occasionally, the posterior angle may be foliate or bear spines. The area between the beaks in ark shells, sometimes very broad, is the cardinal area, and the irregular incisions in it are the ligamental grooves.

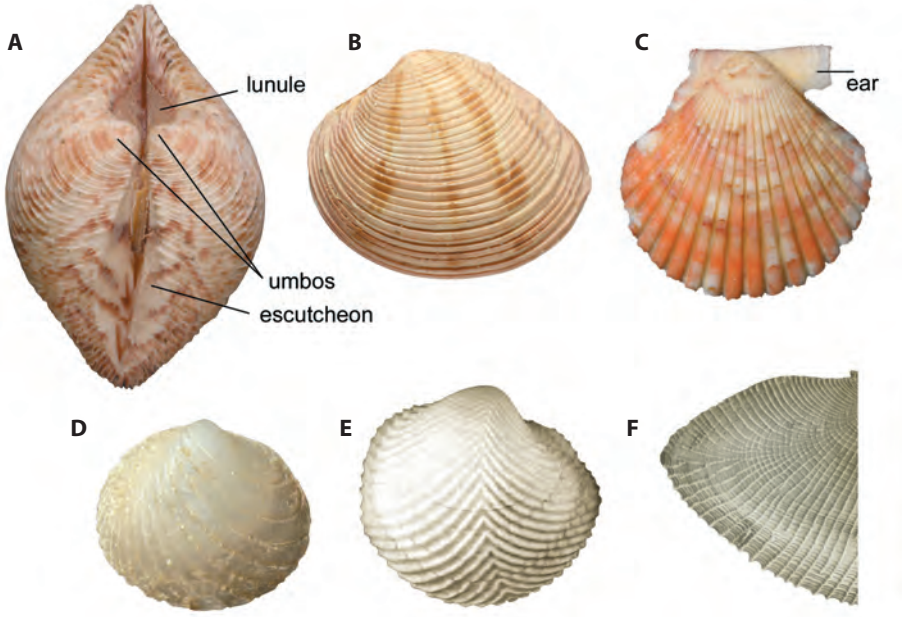
Living specimens or freshly dead shells are covered on the exterior by a layer of conchiolin, the periostracum. It is thin to quite thick and strong, nearly colourless through yellowish, to green to dark brown or black, smooth to hairy or velvety and more or less folding over the margin. In many species it is extremely thin or partly to completely eroded.

Life history traits

The sexes in most bivalves are separate; some species, however, are hermaphrodites with female and male gonads in the same individual. Fertilisation in bivalves is usually external: sperm and eggs are at the same time released into the water through the exhalant siphon. There the eggs are fertilized and develop in the plankton via a trochophore into a veliger larva, which is still planktonic but which after a certain period, which depends on the particular species, sinks to the bottom and begins life and growth as a benthic bivalve. The veliger has a tiny shell, the embryonic shell, protoconch or prodissoconch which is easily distinguished from the postlarval teleoconch or dissoconch. In some species, fertilisation and passage of larval stages take place in the mantle cavity or among the gills, the young are released only as complete tiny bivalves which immediately start to live on the ground. This brooding is typical *e.g.* for Condylocardiidae and some Carditidae.

After having found a place on a suitable substrate and settled, the young bivalve begins to grow by adding shell material around the whole margin of the larval shell. Growth is quickest around the parts of the margin furthest from the beaks and slowest near the beaks.

Very young bivalves that already have started postlarval growth do not always resemble miniature adult specimens. Juvenile Pharidae are mostly shorter and more oval than the adults. A spectacular differentiation in shape between juvenile and adult specimens occurs in Chamidae: very young specimens, *ca.* 1-2 mm across, have an aspect like small venerids; they are trapezoid, regular and have concentric lamellae; only later they become irregular. Clavagellidae are regular in their early growth stage.



I.18. Sculpture of the external surface on bivalve shells. **A**, Dorsal view of a venerid, showing the lunule (anterior to the umbos) and the escutcheon (posterior). The ligament is visible within the escutcheon. **B**, commarginal sculpture (as in Veneridae). **C**, radial sculpture (as in Pectinidae, with "ears" prolonging the hinge line and also bearing radial sculpture). **D**, oblique sculpture (as in Astartidae). **E**, divaricate sulpture (as in Lucinidae). **F**, antimarginal sculpture (as in Galeommatidae).

Most bivalves inhabit soft bottoms from mud over muddy sand, silt, fine sand, medium sand and mixed sand to coarse sand. The greatest species diversity is found in fine muddy-sandy and fine sandy habitats. Other species live on gravel or rubble between stones or in sandy pockets. Most sediment-dwelling bivalves are not very deeply buried; species with short siphons often have the posterior or postero-dorsal part or their margin exposed to the water or just under the sediment surface, species with longer, retractible siphons are buried more deeply, to about 20 cm. Generally they are orientated vertically in the sediment, but many Tellinidae are lying horizontally on one valve, with the posterior end slightly bent laterally and thus pointing upwards. Some groups with rather short siphons can nevertheless burrow very deep, mainly Solenoidea and *Tagelus*. They live in more-or-less vertical tubes in the sediment in which they quickly descend in case of danger. Some other very deep burrowing species (*e.g. Panopea*) remain always in the same depth, but they have extremely extensible siphons which they withdraw when disturbed.

Rocky shores and hard bottoms imply an entirely different mode of life. In this type of environment, bivalves can only survive by cementing themselves to the rocks or other hard substrate (Chamidae, Spondylidae, Ostreidae) or attaching themselves with byssus threads (Arcidae, Mytilidae, Pectinidae etc.) as well as being firmly stuck in crevices or under stones (*e.g.* some Ungulinidae, Hiatellidae) or boring mechanically into the hard substrate (Petricolidae, Pholadidae)

or by means of acid (*Lithophaga*). Teredinids and some pholadids bore with the anterior edge of their valves in wood which may be drifting at the surface of the sea or lying on the seabed.

Bivalves have many predators. They are eaten by fishes, crustaceans, carnivorous gastropods and mammals, and among these, not to forget, man. They are an important link in the food chain, this is illustrated by the fact that many young fishes eat *e.g.* small, thin-shelled tellinids, mactrids, semelids, solenids or pharids on soft muddy or soft muddy-sandy bottoms, where they have easy access to these bivalves. One such region on the West African shelf is the already-mentioned "Grand Banc of Geba", the vast muddy plain off Guinea-Bissau which is the most important nursery for the fishes caught off Senegal, Guinea-Bissau and Guinea.

Larger and thicker-shelled bivalves may be cracked by crabs; gastropods such as Naticidae or Muricidae can drill a hole in the shell and insert their proboscis through the hole and eat the bivalve animal. Other gastropods sit on the bivalve they want to eat and wait until the prey relaxes its adductor muscle a little, or they open the valves directly forcing a part of their outer shell lip between them and then introduce their proboscis through the slit.

Collecting bivalves

Many collectors certainly became first acquainted with bivalves by picking up valves or entire shells in the drift line of a beach. Beachcombing is in fact one of the main methods for obtaining bivalves, more than for gastropods. Presence, composition and richness of a beach deposit as well as the preservation conditions of the shells are mainly dependent on the exposure of the beach to currents, waves, wind and tides, the inclination of the beach, the grain size of the sand, the presence of tidal flats, sandbanks or other barriers in front of the beach, and the availability of adequate bivalve biotopes in the region. There is no strict rule of what a certain beach may offer to the collector. Many beaches may be full of interesting shells at one time but barren and empty some time later, that can change even from one tide to the next.

On certain types of beaches, the probability of shell deposits is higher than on others. However, a clear classification of beaches is impossible because of the many different conditions which may influence the formation of shell deposits. Steep beaches with heavy surf and often with coarse sand are very rarely interesting for the collector, the same is frequently also the case with very exquisite and well-known bathing beaches, many of which are cleaned at least once a day. Beaches with a gentle slope, fine sand and with sandbanks or more or less narrow tidal flats or shallow subtidal regions in front of them are often quite good for bivalves, especially in a region with strong tides. The uppermost and mid-tide drift lines contain mostly medium-sized and large bivalves, whereas on the lowest drift lines which are exposed only at low tide, small, thin and delicate specimens such as Pharidae and small tellinids may be found (sometimes together with small, light pieces of wood, peat or lignite), when the offshore sandbank is very close and the water between it and the beach is calm. In West Africa, part of the Casamance beaches belongs to this type, but there small and delicate specimens were found commonly only at one particular place at Cap Skirring (Fig. I.19) in the middle of the tourist beach just in front of the Club Méditerranée. However, compared with famous and popular "shell-beaches"

I.19. Rather flat sandy beach near Cap Skirring (Casamance) at high tide (photo RvC).

like Sanibel Island, Florida and *e.g.* some beaches on the Algarve Coast, Portugal, the Casamance beaches and many other West African beaches are rather poor, and exceptionally rich strandlines are comparatively rare and may be confined to short beach strips, often near lagoon inlets.

Another type of beach which may be interesting for shell collecting are situated in more or less deep sandy bays, generally delimited by rocks at both sides and not exposed to full wave action. On these beaches, the shells often accumulate on one side by longshore drift action. Typical examples are some of the small beaches in the rocky part of the Cape Verde Peninsula (Dakar) and numerous short beaches on the offshore islands. In certain aspects, the Plage Mondaine in the Bay of Pointe-Noire has also to be counted among this beach type.

The next step after beachcombing is collecting of live bivalves between tide marks, mostly at low tide. When the tide comes in again, some species might pop up from the sand, others do not and are only available by digging. Small holes on the sediment surface may indicate the presence of bivalves, *e.g.* key-hole shaped holes are typical for razor shells. After severe weather, live bivalves are often cast ashore. Intertidal and shallow subtidal collecting is also interesting on rocky shores for bivalves dwelling on hard bottoms such as arks, *Isognomon*, oysters, mussels etc.

A possibility for collecting infaunal bivalves is also snorkelling over sandflats with rich bivalve populations in calm water, preferably in bays. On such flats, fresh empty shells or valves of specimens recently eaten by predators can nearly always be found. Empty shells are also occasionally entangled in the nets of local fishermen who work with dugout canoes (pirogues) from the beach. Places where they clean their nets should always been looked at.

The most important and most successful collecting method for live bivalves is dredging. The smallest "dredging gear" is a hand net with a strong rectangular frame, short handle and a fine

mesh (1-2 mm) plastic net. This hand net is pushed by a diver with its lower frame into the sediment and then pushed forward while swimming with the fins. While continuing swimming, the net is then lifted from the bottom and cleaned from the sediment, the coarser fraction with the molluscs remains in the net and can already be put under water in a plastic bag; it is later sorted under a lens. This kind of net was used on several localities in West Africa (Los Islands; Morton Bay, Cameroon; Mindelo, Cape Verde Islands) and elsewhere with good results in mud, muddy sand and fine sand for catching small species such as nuculas, tellins, pharids, small solens and others in depths from 1 to about 5 m. The same kind of net attached to a long stick can be used as a light version of the hand dredge for foot-collecting, *e.g.* on seagrass bottoms (see the following chapter).

Another very effective collecting method is the use of a hand dredge consisting of a strong rectangular frame with a blade on the lower side. The frame is fixed to a long and strong broomstick and a firm metal screen net with a mesh of about 3-5 mm is attached the frame. This tool can be very effective to take molluscs in the surf zone and in very shallow water where walking is still possible. The hand dredge is drawn through the sediment while slowly walking backwards and then is lifted for sifting the sand in the water. In calm water, it may be emptied from time to time into a floating plastic tub tied by a rope to the collector's belt.

Dredging from a boat requires more skill and experience than the equipment depicted above. The easiest-to-use dredge is the so-called naturalist's dredge, its use goes back to English naturalists in the 19th century such as MacAndrew and Forbes. This dredge has a triangular or rectangular iron or mild steel frame with opening of 30-50 cm to which a fine mesh 9-10 mm net is attached and, when necessary, doubled with a finer net of 4-6 mm inside.

Most of the light dredging operations in preparation for this book were done using a triangular dredge (Fig. I.20) of 30 cm frame opening, made of flat iron bars 6 mm thick and 4 cm broad to which additional iron bars (*e.g.* 8 mm thick and 3 cm broad) can be screwed as ballast weight to allow the dredge to dig more into the seabed. The frame is attached to the towing rope by three 60 cm-long round iron bars of 8 mm diametre with eyes at both ends as towing arms or bridles (four in case of a rectangular dredge); these are connected with the frame by stainless shackles. The dredge can be used from very small boats without a winch to a depth of about 30 m; it was operated with much success from dugout canoes, a rowing boat (in the Cape Verde Islands) and outboard motor boats, as well as from the large research vessels *André Nizery*, *Louis Sauger* and *Antéa*, using the hydrographic winch with its 5 or 6 mm wire. In that case, the required very low speed was frequently obtained by letting the ship drift by current or wind.

Another advantage of this small dredge is that it can easily be disassembled and taken along on the airplane, the bridles in the suitcase and the heavy frame and additional weight bars in the hand luggage (the control officers at the airports were always puzzled when they saw the triangular frame in the X-ray picture and asked me to open my board case!).

On several occasions, a light 50 cm-rectangular dredge with sledge-like iron runners, similar to the heavy "Warén" rock dredge but lighter, was employed, with nearly the same results.

I.20. The first author and a local seaman operating the triangular dredge for shallow sampling.

The insertion of a swivel shackle between the dredge and the towing rope is essential and should never be forgotten; about 2-3 m of reasonably heavy chain should also be intercalated to give more weight and to make sure that the dredge is towed parallel to the bottom and not lifted upwards. The towing rope should be preferably synthetic, of 10-12 mm diameter and, if possible, plaited to prevent twisting under strain. The length of the paid-out warp should generally be three times the depth. The speed should be about 1 knot, perhaps even slower, and not exceed 2 knots. A haul in shallow water (to about 10 m) should last about 5 minutes, in deeper water the dredge should be towed for a longer time, up to 20 minutes in 50 m depth. The nature of the seabed can be felt by touching the rope or cable with the hand while dredging, especially when the dredge is on mixed and coarse sand or sand with gravel or shells. If a hand winch or powered winch, a capstan or even a "vire-ligne" (device for hauling in fishing longlines) is available, one can work with the naturalist's dredge under very favourable circumstances down to 200 m and deeper.

On the research vessels, heavier and larger dredges are employed, mostly rock dredges Warén-type but also other dredges such as the Rallier du Baty with a very heavy circular frame, particularly effective for collecting infaunal bivalves. A special device for obtaining very small specimens living in the uppermost layer of the sediment with the detritus is the epibenthic sled. A smaller and lighter version of this, the so-called Ockelmann-sled, can be used from small boats of about 4 m length in the same way as the naturalist's dredge.

Several medium-sized and larger bivalve species are regularly taken in bottom trawls by fishing vessels. Fish trawls with very thick rubber or bobbin footrope and larger mesh are not likely to procure many of the infaunal bivalves but in nets with small rubber and/or chains on the footrope and perhaps an additional tickler chain, bivalves are commonly caught as by-catch, especially in the smaller-mesh shrimp trawls, but also fish trawls rigged up like shrimp trawls may give some results; for example, the holotype of the infaunal *Solecurtus afroccidentalis*, a live specimen without any damage, was taken in such a fish trawl during one of the cruises off Guinea.

For scientific trawling of benthic animals, the beam trawl ("chalut à perche") is the most commonly used gear on European research vessels. The beam trawl used on French ships is a slightly modified trawl (beam length about 4-6 m but occasionally also smaller) of the type which is employed by the shrimp fishermen working from the port of Honfleur in the mouth of the Seine river, with 10 mm mesh net. An advantage of the beam trawl is the possibility to change the degree of digging in by placing the shackles for the bridles in holes placed more upwards or more downwards on the towing edge of the runners. This type of trawl is used to depth of 4000 m and more, often with a weight of at least 250 kg placed about 50 m before the trawl in order to reduce the length of warp paid out. A scientific version of the beam trawl is the Agassiz trawl or Blake trawl.

The small 10 ft. (3.5 m) shrimp try-net ("chalut témoin") with otter boards, which is a miniature model of the big semi-balloon standard Gulf of Mexico shrimp trawl and normally used on shrimp boats for locating catch, also gives excellent results for macrobenthos sampling, and in comparison to the surface covered in trawling and the time being towed, it yields a better catch of benthos than the big main shrimp trawls. However, it requires more seamen's skill, especially during paying out, than the rigid beam trawl. As already mentioned, the try-net was used on the benthos stations during the cruises off Guinea in depths from 5 to 120 m. With heavier footrope chain and doubled codend, the catch even of small (down to 1 cm) molluscs was close or equal to that of a beam trawl and even a dredge on some types of bottom. However, for greater depths, the use of a beam trawl is preferable.

It is self-understood that the elementary rules of nature protection are employed while collecting: taking only as few live specimens as necessary, turning back all rocks, stones and other hard pieces after examination respecting the local laws and by-laws concerning collection of live animals and where necessary obtaining the appropriate permits.

Outline of classification

The higher classification of the Bivalvia has been subject to considerable reworking in the past decade, and the details of phylogenetic hypothesis are not discussed here in detail. A consensus seems to have been reached in defining four subclasses Protobranchia, Pteriomorphia, Palaeoheterodonta and Heterodonta, and to have the formerly recognized subclass Anomalodesmata considered as forming part of the latter. The Paleoheterodonta include on the one hand the relict genus *Trigonia* only found nowadays off the Australian coasts and on the other hand the vast radiation of freshwater Unionoidea. The other three subclasses

are represented in West African waters and treated in this book. Classification at intermediate levels, between Subclass and Superfamily ranks, is still in a state of flux (see Bieler *et al*. 2014) and is omitted here.

Subclass **PROTOBRANCHIA**

Shells equivalve, nacreous or cross-lamellar, with two equal adductors. Hinge without teeth or taxodont, ligament generally amphidetic. The subclass is essentially characterized by anatomical characters, the most prominent of which is the presence of protobranchiate gills, i.e. with short lamellae on either side of their axis.

Subclass **PTERIOMORPHIA**

Chap. 1
Superfamily Solemyoidea
Family Solemyidae
Superfamily Nuculoidea
Family Nuculidae
Superfamily Nuculanoidea
Family Nuculanidae

Species living byssally attached or cemented on hard substrate, more rarely free living or infaunal; animals often with more or less reduced foot and with anterior adductor reduced or absent. Gills of the filibranch type i.e. with long filaments connected to adjacent filaments by ciliary tufts only. Mantle margins usually free, without siphons. Shells shape diverse, with taxodont hinge or without teeth. Ligament internal or external.

Subclass **HETERODONTA**

Chap. 2
Superfamily Arcoidea
Family Arcidae
Family Noetiidae
Family Glycymerididae
Superfamily Limopsoidea
Family Limopsidae

Chap. 3
Superfamily Mytiloidea
Family Mytilidae

Chap. 4
Superfamily Pinnoidea
Family Pinnidae
Superfamily Pterioidea
Family Pteriidae

Chap. 5
Superfamily Pectinoidea
Family Pectinidae
Family Propeamussiidae
Family Spondylidae

Chap. 6
Superfamily Anomioidea
Family Anomiidae
Superfamily Plicatuloidea
Family Plicatulidae

Chap. 7
Superfamily Limoidea
Family Limidae

Chap. 8
Superfamily Ostreoidea
Family Gryphaeidae
Family Ostreidae

Animal generally with two normally equal adductor muscles, more or less fused mantle lobes, short to long siphons. Gills of the eulamellibranchiate type i.e. with long filaments which are connected to each other by tissue (except in some of the Anomalodesmata). Shells very small to very large, short and more or less circular to very elongate, regular or irregular, equivalve to strongly inequivalve, usually with well-developed hinge plate. Hinge teeth differentiated into cardinals and laterals, absent in some groups; external ligament behind the beaks when present, internal ligament (resilium) present or absent, no lithodesma except in the Anomalodesmata. Pallial line entire or with more or less deep pallial sinus.

Infraclass **ARCHIHETERODONTA**

This group comprises two superfamilies whose molecular characters have demonstrated to be phylogenetically related, and to be the sister-group of all the other heterodont bivalves. Morphological characters are not obvious and had never, previously, given a clue to this phylogeny.

Chap. 9
Superfamily Carditoidea
- Family Carditidae
- Family Condylocardiidae

Superfamily Crassatelloidea
- Family Astartidae
- Family Crassatellidae

Infraclass **EUHETERODONTA**

The remaining heterodonts comprise Imparidentia (a name coined by Bieler *et al.* 2014) with usually a heterodont hinge, and Anomalodesmata with a commonly edentulous hinge. The details of classification between order and family level are not yet settled and are intricate. For this we invite the reader to consult the recent Bivatol synthesis (Bieler *et al*. 2014) and to check the World Register of Marine Species fur updates under the Bivalvia factsheet.

Chap. 10
Superfamily Lucinoidea
- Family Lucinidae

Superfamily Thyasiroidea
- Family Thyasiridae

Chap. 11
Superfamily Galeommatoidea
- Family Galeommatidae
- Family Lasaeidae
- Family Basterotiidae

Chap. 12
Superfamily Cardioidea
- Family Cardiidae

Chap. 13
Superfamily Tellinoidea
- Family Tellinidae
- Family Donacidae
- Family Semelidae
- Family Psammobiidae
- Family Solecurtidae

Chap. 14
Superfamily Solenoidea
- Family Solenidae
- Family Pharidae

Superfamily Hiatelloidea
- Family Hiatellidae

Superfamily Gastrochaenoidea (incertae sedis, placed here for convenience)
- Family Gastrochaenidae

Chap. 15

Superfamily Mactroidea
- Family Mactridae
- Family Cardiliidae

Chap. 16

Miscellaneous heterodont superfamilies grouped for convenience

Superfamily Chamoidea
- Family Chamidae

Superfamily Ungulinoidea
- Family Ungulinidae

Superfamily Cyrenoidea
- Family Cyrenoididae

Superfamily Arcticoidea
- Family Trapeziidae

Superfamily Glossoidea
- Family Vesicomyidae

Chap. 17

Superfamily Veneroidea
- Family Veneridae
- Family Neoleptonidae

Chap. 18

Superfamily Myoidea
- Family Myidae
- Family Corbulidae

Chap. 19

Superfamily Pholadoidea
- Family Pholadidae
- Family Teredinidae

Chap. 20

Anomalodesmatan families

Superfamily Thracioidea
- Family Thraciidae
- Family Periplomatidae

Superfamily Clavagelloidea
- Family Clavagellidae

Superfamily Pandoroidea
- Family Pandoridae

Superfamily Poromyoidea
- Family Poromyidae

Superfamily Verticordioidea
- Family Verticordiidae

Superfamily Cuspidarioidea
- Family Cuspidariidae
- Family Spheniopsidae

How to use this book

The systematic part features all the species of marine bivalves for which material has been obtained in the above mentioned surveys. Morphological terms used in bivalve descriptions are explained pp. 51-53 and in a Glossary (pp.page 1051 and following).

In the headings for each family, generic descriptions are illustrated with thumbnails of one of the included species, so as to serve as a visual orientation. On the drawings and plates, we have displayed as a rule the left valves to the left and the right valves to the right, with only few exceptions when required by the composition of the plate, and strived to illustrate representative specimens from throughout the range, arranged from North to South. The book is profusely illustrated with line drawings and photographs, so as to be accessible to the non-specialist reader as well. It must be borne in mind that the species represented result from a considerable sampling effort over many years; therefore the odds of finding a common species not treated herein are low. This may happen in the least explored areas (see map p. 28), in the least explored offshore habitats, or in the case where a non-indigenous species would become introduced. Otherwise, any bivalve collected in marine littoral environments of West Africa should be in the book.

Superfamily **SOLEMYOIDEA**

Family **SOLEMYIDAE**
- Genus ***Solemya*** Lamarck, 1818 – 1 species
- Genus *Acharax* Dall, 1908 – 1 species (not treated)

Superfamily **NUCULOIDEA**

Family **NUCULIDAE**
- Genus ***Nucula*** Lamarck, 1799 – 8 species (7 treated)
- Genus ***Ennucula*** Iredale, 1931 – 3 species (1 treated)
- Genus *Brevinucula* Thiele, 1934 – 1 species (not treated)

Superfamily **NUCULANOIDEA**

Family **NUCULANIDAE**
- Genus *Nuculana* Link, 1807 – 2 species (not treated)
- Genus ***Saccella*** Woodring, 1925 – 1 species
- Genus ***Jupiteria*** Bellardi, 1875 – 1 species
- Genus ***Lembulus*** Risso, 1826 – 5 species
- Genus ***Costatoleda*** Roth von Telegd, 1915 – 1 species
- Genus ***Yoldiella*** Verrill & Bush, 1897 – 12 species (2 treated)
- Genus *Ledella* Verrill & Bush, 1897– 8 species (not treated)
- Genus *Bathyspinula* Allen & Sanders, 1982 – 2 species (not treated)

Family NEILONELLIDAE
- Genus *Neilonella* Dall, 1881 – 2 species (not treated)

Family MALLETIIDAE
- Genus *Malletia* Desmoulins, 1832 – 2 species (not treated)
- Genus *Katadesmia* Dall, 1908 – 1 species (not treated)

Family TINDARIIDAE
- Genus *Tindaria* Bellardi, 1875 – 3 species (not treated)

Family SILICULIDAE
- Genus *Silicula* Jeffreys, 1879 – 1 species (not treated)

The Protobranch families

This group is represented in West Africa only by the three subfamilies Solemyoidea, Nuculoidea and Nuculanoidea. Its members are very diverse in shape but all characterized by retaining the ancestral feather-like gill, and not having evolved the lamillibranchiate gill found in all other bivalves.

Superfamily SOLEMYOIDEA
Family SOLEMYIDAE

Shells small to very large (the largest species, from Fiji, up to 240 mm long), elongate, mostly elongate-oval, equivalve, markedly inequilateral, with more or less long anterior part and short posterior part, compressed to inflated, thin and fragile, gaping at both ends. No lunule, no escutcheon in most species. Surface mostly smooth, with thick, horny, glossy periostracum which extends well beyond the margins of the valves. These projecting periostracal fringes can be folded over the margins and drawn between them by special muscles when the animal closes the valves. Margins smooth. Hinge without teeth, ligament behind the beaks, internal (genus *Solemya*) or external (genus *Acharax*). Two adductor muscle impressions and more or less developed internal radial reinforcement just in front of the posterior adductor scar. Pallial line often indistinct.

There are 35 species worldwide, among them 2 from West Africa. They are soft bottom dwellers, mostly in fine sand or mud, where they burrow with their large, specially adapted foot; they are found from low tide to more than 3500 m. The solemyids are characteristic of reducing sediments and are partly or completely associated with symbiotic chemoautotrophic bacteria contained in the hypertrophied ctenidia. The digestive tract is either reduced but still functional or more reduced and non-functional; in certain species, completely lacking. For more details, see Reid & Bernard (1980), Kuznetsov & Shileyko (1984), Métivier & Cosel (1993), Reid (1998), Taylor *et al.* (2008).

Genus *Solemya* Lamarck, 1818. Shells small to medium-sized, elongate-oval, thin and fragile, compressed, strongly inequilateral with long anterior part. Surface smooth, periostracum glossy. The typical incisions vertical to the margin in the projecting part of the periostracum are "artefacts", the periostracum cracks when the shells are dried. Ligament internal, on a chondrophore behind the umbos, reinforced by a radial buttress.

Species treated (1)
Solemya togata (Poli, 1795).

Other species reported in the area (1)
Acharax gadirae Oliver, Rodrigues & Cunha, 2011. Ibero-Moroccan Gulf to Mauritania (19°43'N, 17°44'W), 1600-1900 m; off Nigeria; off mouth of the Congo, 3000-4000 m. Associated to cold seeps.

Superfamily NUCULOIDEA
Family NUCULIDAE

Shells very small or small (smallest species hardly above 1 mm, largest over 30 mm), thin to thick and solid, nacreous inside, triangular to somewhat oval in outline, mostly more or less compressed. Surface smooth, with commarginal ridges, fine, radial ribs or divaricate sculpture. Beaks generally well behind the vertical midline. Hinge line with internal ligament in a short, forward-directed resilifer situated under the umbo, and with numerous, small, prominent teeth anteriorly and posteriorly to it, forming two similar series increasing in size towards both ends. Inner ventral margin crenulate or smooth. Periostracum matt to glossy. Muscle impressions equal-sized, no pallial sinus. There are 168 species worldwide, at least 11 from West Africa. For illustrations of European nuculid species and their protoconchs, see Salas (1996) and Gofas & Salas (1996).

Genus *Nucula* Lamarck, 1799. Shells small, triangular-oval, smooth or with radial sculpture, commarginal sculpture or both. Periostracum strong, with a matt or glossy surface according to species. Inner ventral margin crenulated.

Genus *Ennucula* Iredale, 1931. Shells similar to *Nucula* but with smooth inner ventral margin. *Nuculoma* Cossmann, 1907 or *Leionucula* Quenstedt, 1930 are also characterized by a smooth inner margin but those genera are based on Mesozoic type species and, for this reason, the Recent species were rather placed (Gofas & Salas 1996; Huber 2010) in *Ennucula*.

Species treated (8)

Nucula nitidosa Winckworth, 1930; *Nucula crassidens* Nicklès, 1955; *Nucula nucleus* (Linnaeus, 1758); *Nucula sulcata* Bronn, 1831; *Nucula mariae* Nolf, 2005; *Nucula nicklesi* Cosel, 1995; *Nucula crassicostata* E.A. Smith, 1872; *Ennucula decipiens* (Philippi, 1844).

Other species reported in the area (4)

Nucula atacellana Schenck, 1939. Off Guinea Bissau, 1796-3861 m; off Liberia, 2514-3547 m; off Angola 2031-4595 m (Rhind & Allen 1992).

Brevinucula verrillii (Dall, 1886) = *guineensis* (Thiele, 1931). Gulf of Guinea-Congo, 44-2500 m (Thiele & Jaeckel 1931); off Liberia, 3196 m (Knudsen 1970); off Guinea-Bissau, 1976-3861 m (Rhind & Allen 1992).

Ennucula corbuloides (Seguenza, 1877) = *bushae* (Dollfuss, 1898). Ibero-Moroccan Gulf (Salas 1996); off Guinea-Bissau, 1796-2357 m (Rhind & Allen 1992); Cape Verde Basin to Angola Basin, 500-2800 m.

Ennucula aegeensis (Forbes, 1844). Mediterranean and Ibero-Moroccan Gulf, one record in Mauritania, 800 m.

Superfamily NUCULANOIDEA

The members of this superfamily have small to medium-sized shells, generally rostrate or bicuspid posteriorly, and never nacreous inside. The ligament is either mostly external (families Malletiidae, Tindariidae, Neilonellidae) with no resilifer, or mostly internal (family Nuculanidae) in a resilifer situated beneath the umbo. Recent molecular work (*e.g.* Sharma *et al.* 2013) questioned the importance of the position of the ligament as an essential taxonomic character at the family level, but much remains to be done to investigate the taxonomy and phylogeny of this difficult group. Together with the Anomalodesmata, this is a very successful group in the deep sea.

Family NUCULANIDAE

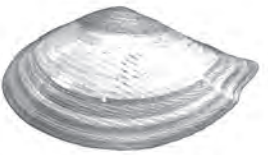
Shells usually small (a few millimetres to above 40 mm), not nacreous inside, thin to thick and solid, very variable in shell form, mostly more or less elongate, some species short-oval or very elongate. Posterior end often rostrate or bicuspid. Beaks mostly in front of the vertical midline or more or less median. Surface smooth or commarginally, occasionally also with oblique sculpture. Hinge with partially internal ligament and a resilifer, with numerous, small, prominent teeth anteriorly and posteriorly to it, forming two similar series increasing in size towards both ends. Inner margin always smooth. Muscle impressions nearly equal in size, pallial sinus very shallow to deep.

Some authors (*e.g.* Coan *et al.* 2000; Coan & Valentich-Scott 2012) considered Yoldiidae as a separate family, distinguished from Nuculanidae in having a larger resilifer and a deeper pallial sinus; however these characters do not discriminate convincingly the species treated here and, following thereby Ockelmann & Warén (1998) and Killeen & Turner (2009), a single family will be considered. About 200 species of Nuculanidae *s. str.* and 160 of Yoldiidae are known worldwide, among them 10 shallow water and another 26 deep water species in tropical West Africa.

Genus *Saccella* Woodring, 1925. Shells small, moderately elongate and inflated, with sharply pointed, non bicuspidate posterior rostrum, a dense and well-marked commarginal sculpture and an ill-defined ridge running from the umbo towards the antero-ventral part. Pallial sinus deep. Protoconch with a reticulate sculpture.

Genus *Jupiteria* Bellardi, 1875. Shells small, rather short, very inflated, with glossy surface and a blunt, albeit pointed, posterior end. Postero-dorsal area concave, delimited by a blunt ridge running on each valve from the umbo to the posterior end. Pallial sinus not very deep. Protoconch smooth. See La Perna *et al.* (2004) for an overview of European Tertiary species and a comparison with *Saccella*.

Genus *Lembulus* Risso, 1826. Shells more or less elongate, with a glossy surface bearing oblique sculpture, with or without a bicuspidate posterior rostrum. The genus has its distribution centre in the eastern Atlantic.



Genus *Costatoleda* Roth von Telegd, 1915. Shells small, elongate-rostrate, somewhat compressed, with a tapering, rostrate posterior end. Postero-dorsal area concave, delimited by a marked ridge running on each valve from the umbo to the posterior end. Surface with a sculpture of commarginal ridges in the median part of the shell, replaced abruptly by radially aligned tubercles on the anterior and posterior parts. Pallial sinus moderately deep. Huber (2010) noted the striking similarity of the Recent West African species with the type species of *Costatoleda*, described from the Jurassic of Hungary. The sculpture is so unique that it is likely to indicate a real relationship rather than convergence.

Genus *Yoldiella* Verrill & Bush, 1897. Shells small (usually less than 10 mm), more or less suboval, inequilateral, inflated, bluntly pointed posteriorly, with smooth surface and indistinct pallial sinus.
Most species live in deeper water. For more information on the group and bibliography, see Warén (1989), Allen *et al.* (1995) and Killeen & Turner (2009).

Speces treated (10)

Saccella commutata (Philippi, 1844); *Jupiteria paucicaelata* (Nicklès, 1955); *Lembulus pella* (Linnaeus, 1758); *Lembulus gruveli* (Nicklès, 1952); *Lembulus wolffi* (Nicklès, 1955); *Lembulus montagui* (Gray, 1825); *Lembulus bicuspidatus* (Gould, 1845); *Costatoleda tuberculata* (E.A. Smith, 1872); *Yoldiella philippiana* (Nyst, 1845); *Yoldiella orstomi* Cosel, 1995.

Other species reported in the area (37)

Family Nuculanidae

Nuculana vestita (Locard, 1898). Off Senegal, 2324-3200 m (Locard 1898); W Sahara, 2500-3000 m; SW Africa, 2278-3200 m; off Equatorial Guinea, 2550 m; off Gabon, 2770 m (Knudsen 1970); Sierra Leone Basin, 2842-2891 m and Angola Basin, 527-2031 m (Allen & Sanders 1996).

Nuculana cornidei Altimira, 1974. Off Mauritania (Altimira 1974) and Sénégal (Lompoul), 600-1020 m; N-Angola, 700 m.

Ledella acinula (W. H. Dall, 1890). Guinea Basin, 1261 m (Allen & Hannah 1989).

Ledella galatheae (Knudsen, 1970). Off Côte d'Ivoire, 5160 m (Knudsen 1970), Guinea Basin, 4279 m and Sierra Leone Basin, 4934-4980 m (Allen & Hannah 1989).

Ledella lusitanensis Allen & Hannah, 1989. W European Basin, 1995 m, Cape Verde Basin, 1624-2934 m and Angola Basin, 2864 m.

Ledella pustulosa (Jeffreys, 1876). Cape Verde Basin, 2051-2357 m (as *Ledella pustulosa hamsoni* Allen & Hannah, 1989); other subspecies in West European and Argentine basins.

Ledella sandersi Allen & Hannah, 1989. Angola Basin, 2117-2154 m.

Ledella sublevis Verrill & Bush, 1898 = *modesta* (Thiele, 1931). Gulf of Guinea, 2278 m (Thiele & Jaeckel 1931); Cape Verde Basin, 293 m and Guinea/Sierra Leone Basin, 2470-2514 m (Allen & Hannah 1989).

Ledella verdiensis Allen & Hannah, 1989. Cape Verde Basin, 3150-3155 m.

Ledella ultima (E.A. Smith, 1885) = *crassa* Knudsen, 1970. Gulf of Guinea, 3196-5160 m (Knudsen 1970); Cape Verde Basin, 2934-3861 m, Guinea Basin, 2114-4279 m and Angola Basin, 5100-5225 m, also North American, Brazil, Argentine, West European and Cape basins (Allen & Hannah 1989).

Bathyspinula filatovae (Knudsen, 1967). Gulf of Aden; Guinea Basin, 1261-1376 m and Cape Verde Basin, 1684-1796 m (Allen & Sanders 1982); also West European Basin.

Bathyspinula hilleri (Allen & Sanders, 1982). Cape Verde Basin, 2842-2891 m, Sierra Leone Basin, 2231-3034 m and Angola Basin, 2044-4597 m (Allen & Sanders 1982); also West European, Brazil and Argentine basins.

Bathyspinula thorsoni (Filatova, 1976). Romanche Trench, 5420-6400 m.

Yoldiella abyssorum Knudsen, 1970. Off Libéria, 3196 m (Knudsen 1970); Cape Verde Basin, 3070-3861 m and Angola Basin, 3797-4630 m (Allen, Sanders & Hannah 1995).

Yoldiella africana Allen, Sanders & Hannah, 1995. Cape Verde Basin, 2514-3964 m, Sierra Leone Basin, 2185-3984 m and Angola Basin, 109 m (Allen *et al.* 1995, as subspecies of *Yoldiella inconspicua* (Verrill & Bush, 1898), raised to species rank by Huber 2015).

Yoldiella artipica Allen, Sanders & Hannah, 1995. Angola Basin, 2514-2754 m.

Yoldiella bilanta Allen, Sanders & Hannah, 1995. Cape Verde Basin, 1944-2357 m.

Yoldiella clarkei Knudsen, 1970. Off Gabon, 4020 m.

Yoldiella sootryeni Knudsen, 1970. Off Liberia, 3196 m.

Yoldiella curta Verrill & Bush, 1898. Sierra Leone Basin, 1124-2185 m (Allen, Sanders & Hannah 1995); also in North European, West American, Guyana, Brazil, Argentine and Cape basins.

Yoldiella ella Allen, Sanders & Hannah, 1995. Sierra Leone Basin, 3861 m, Guinea Basin, 2614 m and Angola Basin, 2842-4530 m; also West European and North American basins.

Yoldiella fabula Allen, Sanders & Hannah, 1995. Sierra Leone Basin, 3459-3814 m and Angola Basin, 3764-4595 m; also West European, North American and Argentine basins.

Yoldiella jeffreysi (Hidalgo, 1877). Cape Verde Basin, 2952-3119 m and Angola Basin, 4592-4597 m (Allen, Sanders & Hannah 1995): also West European, Canary, North American, Guyana, Argentine and Cape basins.

Yoldiella minuta (Allen, Sanders & Hannah, 1995). Angola Basin, 527-542 m.

Yoldiella similis Allen, Sanders & Hannah, 1995. Angola Basin, 4566-4630 m.

Microgloma yongei Sanders & Allen, 1973. Angola Basin, 1964-2754 m.

Family Neilonellidae

Neilonella guineensis (Thiele, 1931). Off Liberia, 3196 m; off Gabon, 2770-4020 m (Knudsen 1970); also Indian Ocean.

Neilonella erebus (Clarke, 1969) = *galatheae* Knudsen, 1970. Off Gabon, 4020 m (Knudsen 1970); Cape Verde Basin, 3814-3861 m, and Angola Basin, 2466-2754 m (Sanders & Allen 1977).

Family Malletiidae

Malletia estheriopsis Barnard, 1963. Off Gabon, 2770 m (Knudsen, 1970), also off South Africa; placed in synonymy of *M. johnsoni* A.H. Clarke, 1961 by Huber (2010), without a discussion.

? *Malletia obtusa* G.O. Sars, 1878. Off Sénégal, 3200 m (?) (Locard 1898).

Katadesmia pallida (E.A. Smith, 1885). Off Gabon, 4020 m (Knudsen 1970, as *Nuculana pallida*). S-Atlantic; also Tasman sea.

Family Sareptidae

Pristigloma alba Sanders & Allen, 1973. Angola Basin, 2864-4597 m.

Pristigloma nitens (Jeffreys, 1876). Angola Basin, 3739-4597 m (Sanders & Allen 1973).

Family Siliculidae

Silicula filatovae Allen & Sanders, 1973. Cape Verde Basin, 3861 m and Angola Basin, 4565-4630 m (Allen & Sanders 1973).

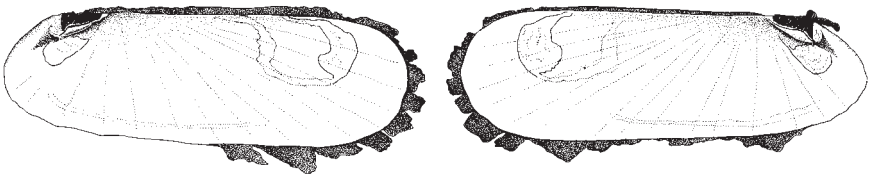
Family Tindariidae

Tindaria callistiformis Verrill & Bush, 1897. Angola Basin, 4592-4630 m (Sanders & Allen 1977).

Tindaria hessleri Sanders & Allen, 1977. Cape Verde Basin, 1944-2357 m; also West European Basin.

Tindaria minuscula Sanders & Allen, 1977. Angola Basin, 4559-4630 m.

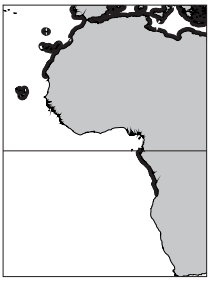
Solemya togata (Poli, 1791)



1.1. Port-Gentil, Gabon, low tide (45 mm).

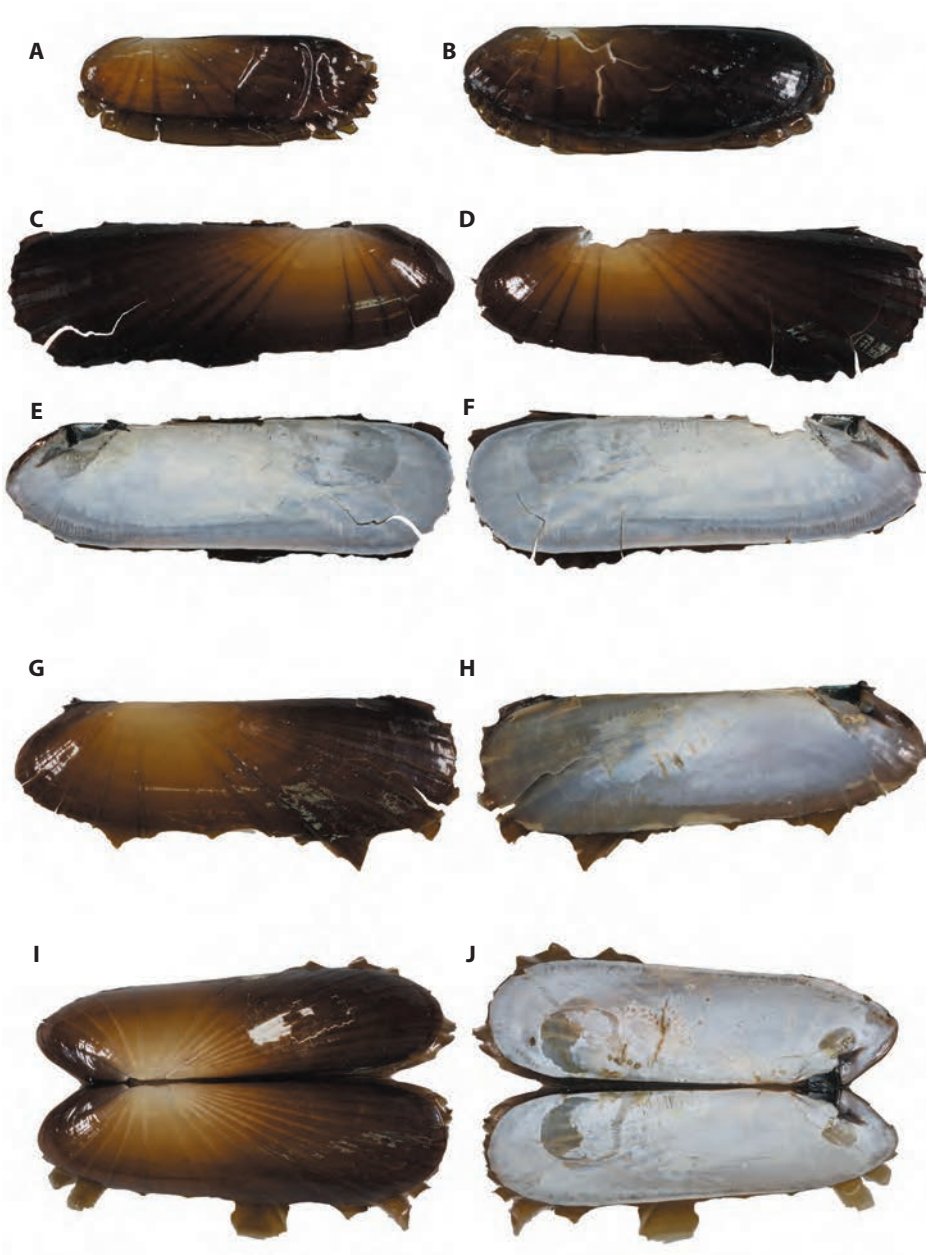
Shell up to 55 mm long (largest West African specimen examined 47 mm), variable in size and outline, elongate-oval with almost parallel dorsal and ventral margin, thin and fragile, compressed, slightly gaping at both ends, inequilateral, beaks near the posterior end. Anterior margin broadly rounded, posterior margin more narrowly rounded. Surface smooth. Ligament internal, in a chondrophore behind the beaks. Periostracum thick, glossy, extending well beyond the valve margins. Valves white, the external colour being given by the periostracum which is straw-coloured to yellowish brown in young specimens, dark brown, with a few widely spaced, narrow, lighter rays in adult specimens.

Distribution. Northern Spain (Ria de Vigo) southward to Mauritania; Gabon (Port Gentil) and southern Angola (Moçâmedes, Namibe province); Madeira, Canary Islands, Cape Verde Islands (Guerreiro & Reiner 2000); throughout the Mediterranean.



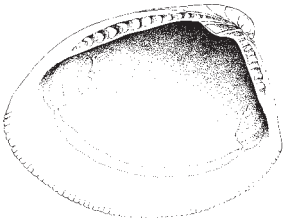
Biotope. Mostly in fine sand, from low tide level to about 30 m, not common. In Libreville, Gabon, small specimens were found in low intertidal sand-banks at the bottom of tube-like burrows, the rather firm walls of the burrows being rusty brown in colour.

Remarks. This is the type species of the genus *Solemya*. Detailed anatomical studies of the species were published by Deshayes (1844-1848) and Stempell (1898). *Solemya mediterranea* Lamarck, 1818 is a synonym.



1.2. ***Solemya togata*** **(Poli, 1791)**. **A**-**B**, Mauritania, 17°17'N - 16°30'W, 85 m (18 mm, 21 mm). **C**-**F**, Ile aux Pigeons, Port-Gentil, Gabon, shallow water (47.1 mm). **G**-**H**, same locality (45.2 mm). **I**-**J**, same locality, view of joint valves (41.3 mm).

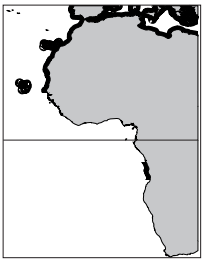
Nucula nitidosa Winckworth, 1930



1.3. Baie de Cansado, Mauritania, 10 m (rv, 5.5 mm).

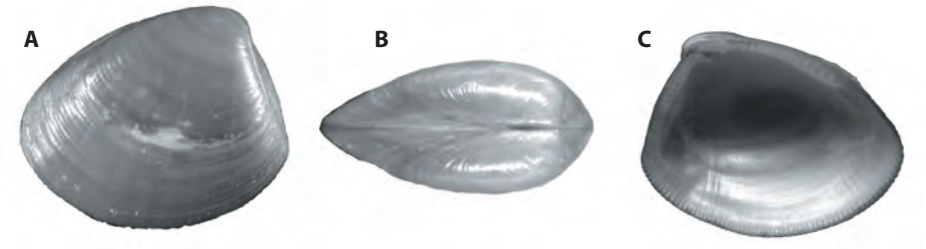
Shell up to 12.5 mm long (West African specimens only up to 8.5 mm), triangular-oval, thick and solid, not very inflated. Anterior margin narrowly rounded, posterior margin rather sharply angled, postero-dorsal margin truncated and straight or with a slight convexity in the middle. Antero-dorsal margin and ventral margin strongly convex. Lunule narrow, escutcheon rather broad, both ill-defined. Beaks behind the vertical midline, within the posterior fourth of the valves. Surface with fine growth lines and numerous dense, extremely fine, shallow, radial ribs, often becoming obsolete on the umbonal part of the valves. Posterior angle well-marked. Periostracum strong and glossy. Hinge plate with 18-30 anterior, slightly chevron-shaped teeth and 8-14 posterior teeth. Ventral margin finely crenulate. Outside whitish with a yellowish-olive periostracum, commonly with darker or lighter rays. Inside nacreous.

Distribution. Norway (61°N), Faroe, British Isles southward to Senegal (Dakar); northern Angola (Luanda); Mediterranean; Canaries and Cape Verde Islands.



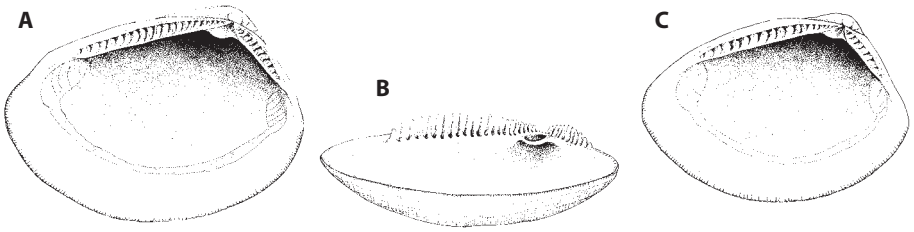
Biotope. In sandy mud, muddy sand and fine sand, from about 10 to 250 m, locally common.

Remarks. This is a temperate species which shows a large distribution gap in the tropical zone. Synonyms are *N. nitida* (G.B Sowerby I, 1833) (*non* (Brocchi, 1814)) and *N. turgida* Leckenby & Marshall, 1875 (*non* Gould, 1846).



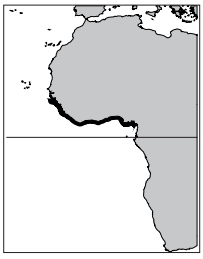
1.4. *Nucula nitidosa* Winckworth, 1930. A-B, Baie de Cansado, Mauritania, 10 m (8 mm). C, same locality (7.5 mm).

Nucula crassidens Nicklès, 1955



1.5. **A-B**, Abidjan area, Côte d'Ivoire (larger rv, and ventral view showing the teeth, 7.0 mm). **C**, Grand Bassam, Côte d'Ivoire, 20 m (smaller rv., 4.7 mm).

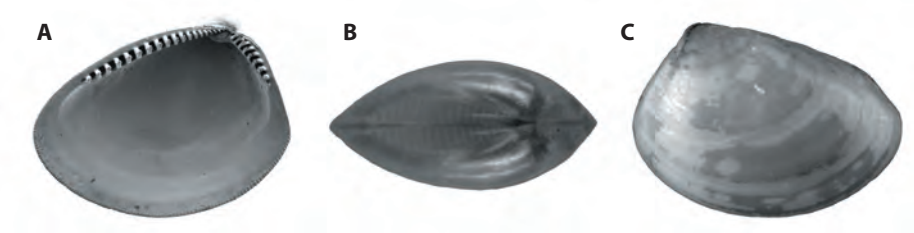
Shell up to 4-7 mm long, oval, wedge-shaped, rather solid, not very much inflated. Anterior margin narrowly rounded, posterior margin bluntly pointed, postero-dorsal margin curved near the beaks, posteriorly straight. Antero-dorsal margin gently convex, ventral margin well and evenly rounded. Lunule not defined, escutcheon broad and hardly visible. Beaks just behind the limit between the third and the posterior fourth of the valves. Surface smooth, with faint, irregular growth lines. There are also extremely fine radial striae, only visible under a lens (x 20-40). Posterior angle rounded and ill-defined. Periostracum thin, glossy. Hinge plate with 20-25 rather thin, broad, lamellate anterior teeth, 9-12 more or less chevron-shaped posterior teeth and a deeply inset resilifer. Ventral margin extremely finely crenulate. Outside greyish-white with light yellowish green periostracum, inside nacreous.



Distribution. Senegal (Casamance: Cap Skirring) to Cameroon (Victoria/Limbe area), not yet recorded further south.

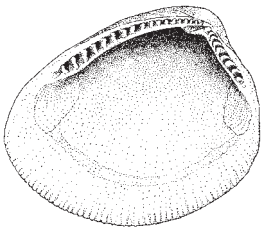
Biotope. In muddy sand and fine sand, from 1 to about 35 m, not common.

Remarks. This entirely tropical shallow water species is close to *N. nitidosa*. However, the shell is more elongate, the anterior hinge teeth are more numerous than in West African *N. nitidosa*, and broader, thinner and laminar, with only the most anterior ones being slightly chevron-shaped. Inner margin of anterior hinge plate straight and not curved as in *N. nitidosa*. The crenulations on the ventral margin in *N. crassidens* are much finer.



1.6. ***Nucula crassidens* Nicklès, 1955. A**, W of Ile Tannah, Guinea, 7 m (rv, SEM, 3.7 mm). **B**, Victoria (now Limbe), Cameroon, 1-3 m (dorsal view, 4.1 mm). **C**, off Abidjan, Côte d'Ivoire (6.6 mm).

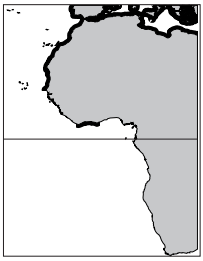
Nucula nucleus (Linnaeus, 1758)



1.7. Vridi, Côte d'Ivoire, 220 m (rv, 7.9 mm).

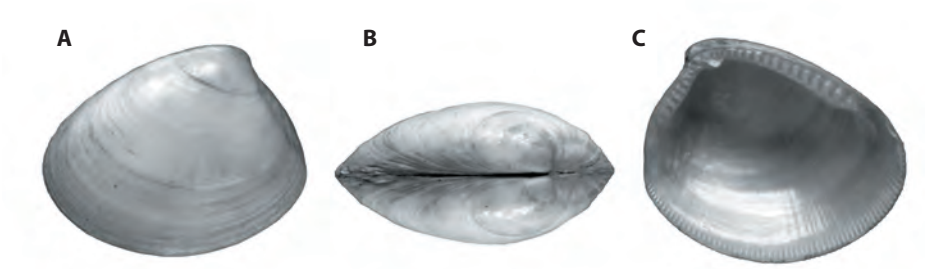
Shell up to 13 mm long, triangular, solid, inflated. Anterior margin narrowly rounded, antero-dorsal margin slightly convex, ventral margin well rounded. Posterior margin weakly convex, passing into the ventral margin by a slight sinuosity and a rounded, not well marked corner. Lunule long and narrow, ill-defined; escutcheon long and rather broad, with well-defined delimitation. Beaks situated in the posterior fourth of the valves. Surface with a few strong, irregularly spaced growth stages, finer growth lines and fine, regular radial striae, often visible only under a lens (x 10-20). Posterior angle rounded but well-marked. Periostracum strong, matt and dull. Hinge plate with 16-25 anterior and 11-14 posterior teeth, on both sides rather thin, dense, pointed and hardly chevron-shaped. Ventral margin crenulate. Valves dirty whitish, outside covered by the yellowish-olive periostracum, inside nacreous.

Distribution. Norway (68°N), British Isles southward to Senegal (Dakar); Côte d'Ivoire (known only from the Abidjan region); an isolated record of worn empty valves from northern Angola (Luanda); throughout the Mediterranean.



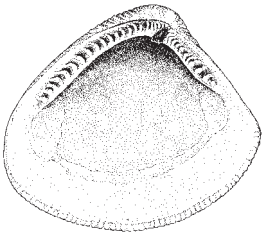
Biotope. In muddy coarse sand or mud with gravel or shell debris, offshore from 150 to 250 m, rarely going up to about 100 m (in Europe also shallower, from 10 m downwards), not common.

Remarks. The absence of any record between the Dakar region and Côte d'Ivoire may indicate a distribution gap of this temperate species in the tropical zone proper.



1.8. *Nucula nucleus* (Linnaeus, 1758). **A**-**B**, Vridi, Côte d'Ivoire, 220 m (lv and dorsal view, 8.6 mm). **C**, same locality (7.9 mm).

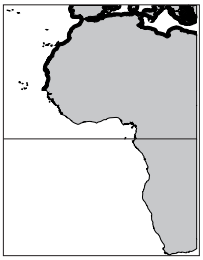
Nucula sulcata Bronn, 1831



1.9. Mauritania, 17°54'N, 16°32'W, 200 m (rv, 9.8 mm).

Shell up to 19 mm long, triangular, thick and solid, rather compressed. Anterior margin narrowly rounded, antero-dorsal margin convex, ventral margin well rounded, often in the middle more convex than anteriorly and posteriorly. Posterior margin obliquely truncated, postero-ventral corner narrowly rounded and well marked. Lunule long and narrow, occasionally slightly impressed, slightly protruding in its central part and covered by rough corrugations; escutcheon broad and ill-defined, also sculptured. Beaks at the limit between the third and the posterior fourth of the valves. Surface with conspicuous, fine, dense, irregular, sometimes slightly undulate, commarginal ridges which may be anastomosing or bifurcate posteriorly and become obsolete in the middle of the valves. There are also fine, radial striae, often only visible under a lens (x 10-20). Posterior angle rounded but well-marked. Periostracum strong, dull. Hinge plate with 18-27 anterior and 10-13 posterior teeth, on both sides rather thin, dense, pointed and hardly chevron-shaped. Ventral margin crenulate. Valves dirty whitish, outside covered by the yellowish olive to brownish periostracum, inside nacreous.

Distribution. Norway (61°N), British Isles southward to Senegal (Dakar); throughout the Mediterranean.

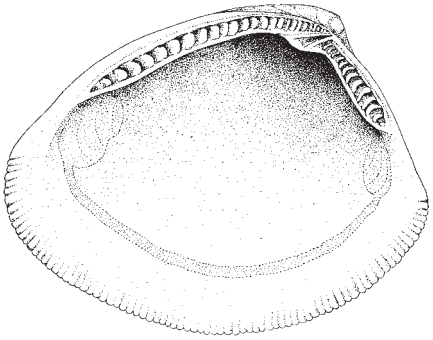


Biotope. In mud, muddy sand, clay or mud with shell debris, offshore from 50 to 400 m, most common between 150 and 250 m, locally not uncommon.

Remarks. This species is characterized by its peculiar, well-marked sculpture. Specimens from Côte d'Ivoire and Angola were mistaken for *N. sulcata* and distinguished as *N. mariae* Nolf, 2005, see next entry.

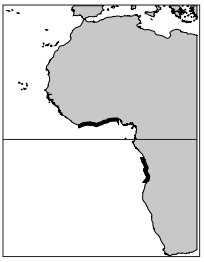
1.10. *Nucula sulcata* Bronn, 1831. A, Mauritania, 17°54'N, 16°32'W, 200 m (9.8 mm). B-C, Dakar area, Senegal, 14°53.5'N, 17°30.5'W, 205-300 m (16.4 mm).

Nucula mariae Nolf, 2005



1.11. Côte d'Ivoire, 5°01'N, 5°17'W, 40 m (rv, 22.2 mm).

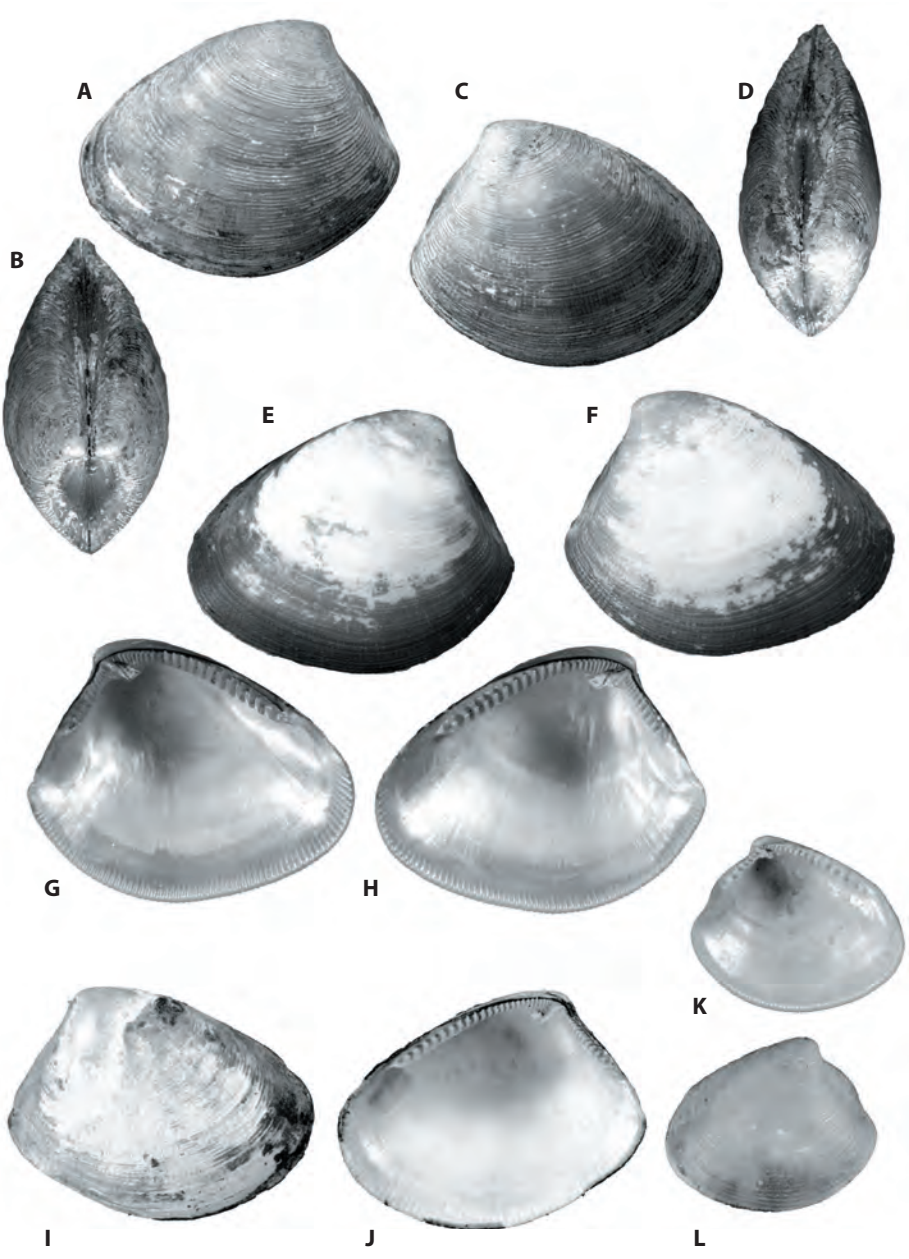
Shell up to 30 mm, long triangular, thick and solid, rather compressed. Anterior margin narrowly rounded, antero-dorsal margin convex, ventral margin well rounded, often in the middle more convex than anteriorly and posteriorly. Posterior margin obliquely truncated, postero-ventral corner narrowly rounded and well marked. Lunule long and narrow, occasionally slightly impressed, nearly smooth; escutcheon broad and ill-defined. Beaks at the limit between the third and the posterior fourth of the valves. Surface with conspicuous, fine, dense, somewhat irregular, sometimes slightly undulate, commarginal ridges which may become obsolete in the middle of the valves. There are also fine, radial striae, often only visible under a lens (x 10-20). Posterior angle rounded but well-marked. Periostracum strong, olive-yellow to brownish, dull. Hinge plate with 18-27 anterior and 10-13 posterior teeth, on both sides rather thin, dense, pointed and hardly chevron-shaped. Ventral margin crenulate. Valves dirty whitish, outside covered by the yellowish olive to brownish periostracum, inside nacreous.



Distribution. In the atypical tropical zone from Côte d'Ivoire to Benin; northern Angola from Zaïre province to Luanda (Mussulo). The absence of records between these zones may indicate a distribution gap.

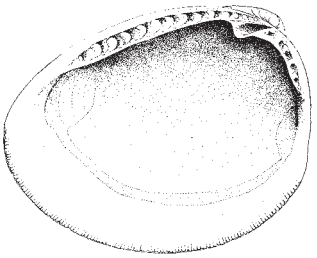
Biotope. In mud, muddy sand, clay or mud with shell debris, offshore from 50 to 400 m, most common between 150 and 250 m

Remarks. This species is distinguished by the outer sculpture of regular commarginal ridges, not irregular and anastomosing as in *N. sulcata*, by less prominent and smooth lunule and escutcheon (sculptured in *N. sulcata*) and the larger size. It is the largest eastern Atlantic nuculid and was described from northern Angola (Nolf 2005b); our material extends its range northward to Côte d'Ivoire.



1.12. *Nucula mariae* Nolf, 2005. A-B, Côte d'Ivoire, 5°01'N, 5°17'W, 40 m (23.1 mm). C-D, same locality (23.5 mm). E-H, W of Jacqueville, Côte d'Ivoire, 62 m (23.6 mm). I-J, off Luanda, N-Angola, 200-250 m (30.1 mm). K-L, Mussulo, N-Angola, 90-100 m (7.1 mm).

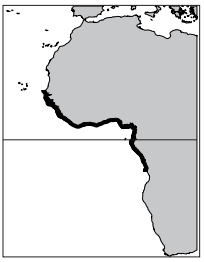
Nucula nicklesi Cosel, 1995



1.13. Vridi, Côte d'Ivoire, 35 m (rv of holotype, 3.1 mm).

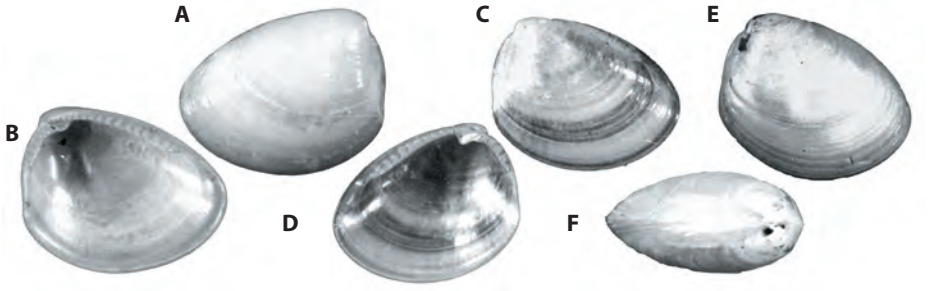
Shell very small, up to 5 mm long, oval, more or less thick and solid, rather inflated. Anterior margin rounded and gradually passing into the evenly convex antero-dorsal margin and the well rounded ventral margin. Posterior margin abruptly truncated and mostly slightly sinuous, postero-dorsal margin very short and well rounded, postero-ventral corner rounded and not well marked. Lunule not apparent, escutcheon broad and ill-defined. Beaks within the posterior fourth of the valves. Surface glossy, with slightly irregular commarginal ridges which are most pronounced on the marginal part of the valves and generally obsolete on the umbonal part. There are also fine growth lines and a few coarse and well-defined growth stages, occasionally also extremely fine radial striae are visible. Posterior angle rounded and hardly visible. Periostracum thin. Hinge plate with 11-14 anterior and 4-5 posterior teeth, both narrow, rather thick and slightly chevron-shaped; resilifer quite large. Ventral margin with extremely fine crenulations. Valves translucent whitish, outside with very pale yellowish green periostracum, inside nacreous.

Distribution. Senegal (Dakar) to northern Angola (Luanda).



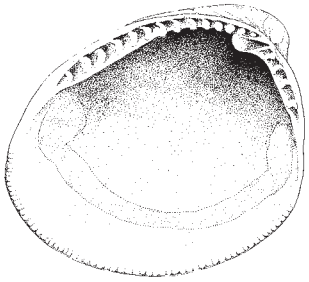
Biotope. In muddy sand and fine sand, from 1 m to about 80 m, not uncommon.

Remarks. This species has been mistaken for young *N. nitidosa*. Apart from being much smaller, it is more inflated, the hinge plate is narrower, the postero-dorsal margin is more curved than in that species and the postero-ventral margin lacks an angle. The marked growth stages typical for *N. nicklesi* are not present in *N. nitidosa*. Empty valves are occasionally found in the grit on certain beaches.



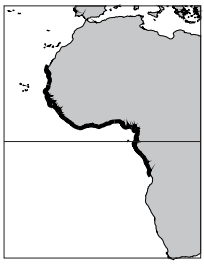
1.14. *Nucula nicklesi* Cosel, 1995. A-B, Dakar, Senegal, 7 m, (3.6 mm). C-D, Vridi, Côte d'Ivoire, 35 m (rv, holotype, 3.1 mm). E-F, same locality (rv and dorsal view (paratype, 3.5 mm).

Nucula crassicostata E.A. Smith, 1872



1.15. Abidjan area, Côte d'Ivoire (rv, 2.5 mm).

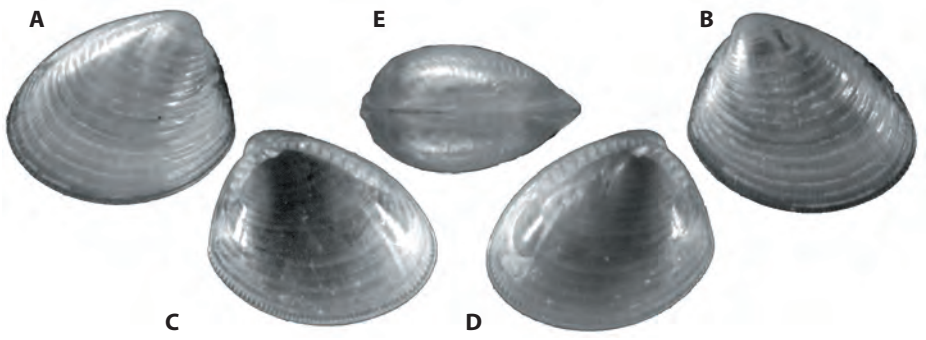
Shell very small, up to 3 mm long and high, short, triangular-oval and somewhat wedge-shaped, thick and solid, very inflated. Anterior margin narrowly rounded, postero-dorsal and ventral margin strongly and nearly equally convex. Posterior margin vertically truncated and reaching nearly to the beaks. Postero-ventral corner rounded. Lunule not seen, escutcheon broad and ill-defined. Beaks nearly posterior-terminal. Surface with 15-30 dense, more or less prominent, commarginal cords and sometimes marked growth stages. Occasionally, fine radial striae in the interspaces of the commarginal cords. Posterior angle rounded. Periostracum thin, glossy. Hinge plate with 12-15 anterior and 3-5 posterior teeth. Ventral margin finely crenulate. Valves whitish, somewhat translucent, outside covered by the straw-coloured to nearly colourless periostracum; interior nacreous.



Distribution. West Sahara (Cap Barbas, 22°44'N) to northern Angola (Luanda, rare).

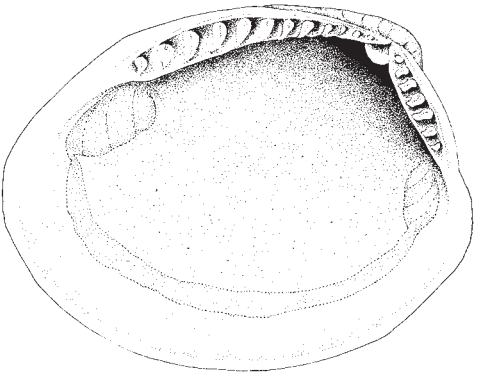
Biotope. In muddy sand and fine sand, from shallow water (about 6 m) to well offshore (170-200 m), not common.

Remarks. This species is easily recognized by its high, tumid valves and the marked commarginal sculpture. The species with such a sculpture are often grouped in the subgenus *Lamellinucula* Schenck, 1944.



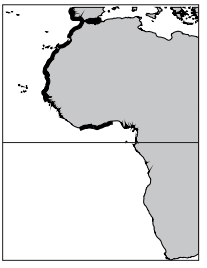
1.16. *Nucula crassicostata* E.A. Smith, 1872. A-E, Nouadhibou, Mauritania, 20°20'N, 16°22'W, 10 m (2.3 mm).

Ennucula decipiens (Philippi, 1844)



1.17. Between Vridi and Jacqueville, Côte d'Ivoire, 170 m (rv, 6.0 mm).

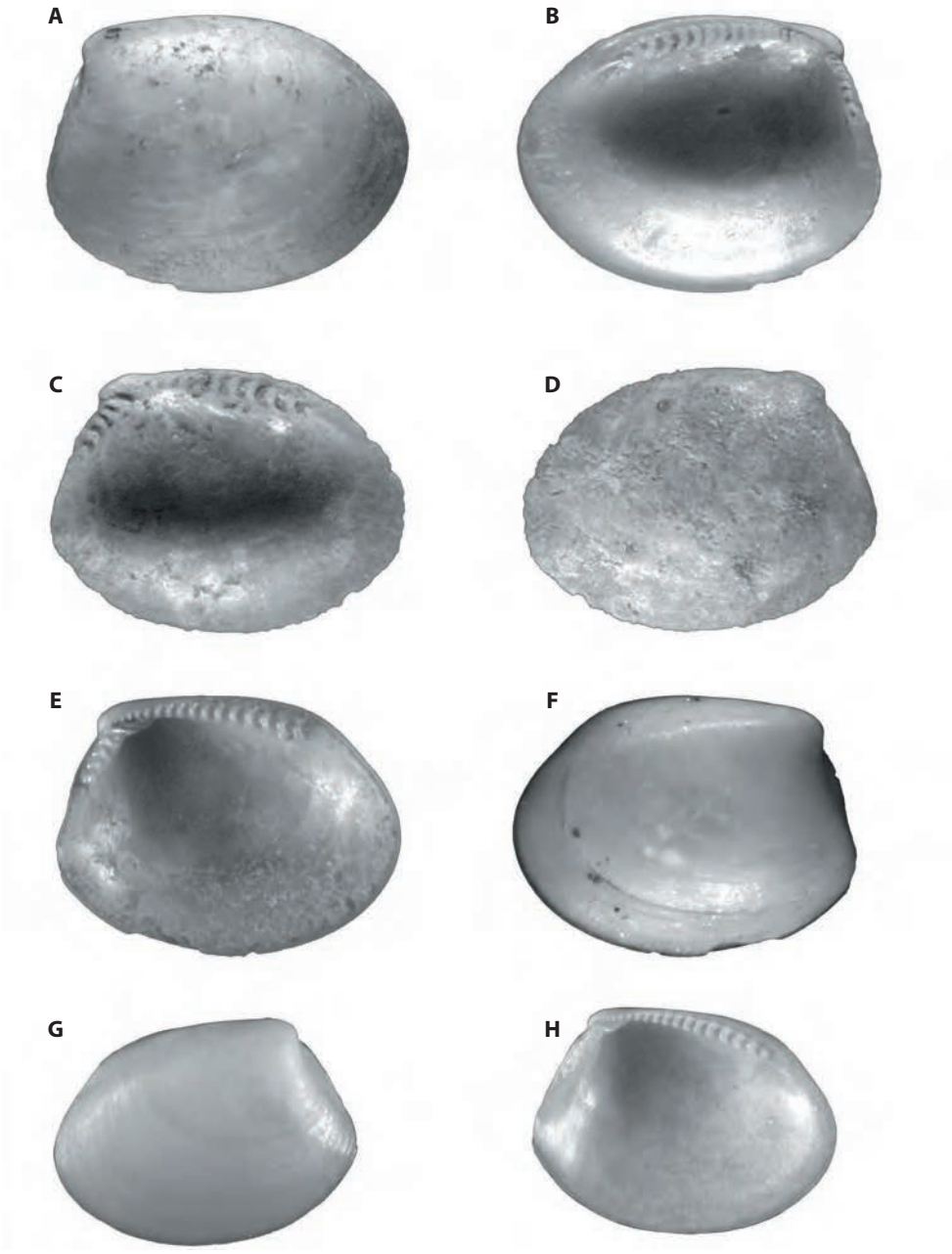
Shell up to 7 mm long, oval, rather solid, weakly inflated. Anterior margin rounded, antero-dorsal margin strongly convex, only the most anterior part straight. Ventral margin evenly rounded, posterior margin obliquely truncated, postero-dorsal margin weakly convex. Postero-ventral corner narrowly rounded. Lunule very narrow, escutcheon rather short and broad, both ill-defined. Beaks situated within the posterior fourth of the valves. Surface smooth and glossy, with only faint growth lines. Posterior angle rounded. Periostracum pale olive, thin and glossy. Hinge plate with 16-20 anterior and 5-7 posterior teeth, on both sides dense, rather thin and broad, only slightly chevron-shaped. Inner margin smooth. Valves translucent white, inside nacreous.



Distribution. Known so far from the Ibero-Moroccan Gulf (Salas 1996) and Alboran Sea, Mauritania and Senegal (Dakar region) and from Côte d'Ivoire (Abidjan region) to Benin.

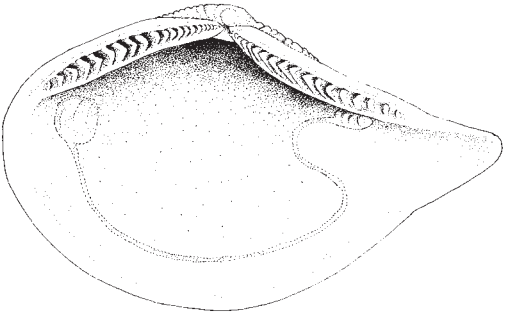
Biotope. Most probably in mud and muddy sand, well offshore from 165-230 m, rare.

Remarks. This species was described as a fossil from Sicily, but the very similar Recent specimens from West Africa are here considered conspecific. They are easily distinguished from the Mediterranean-Lusitanian *Ennucula aegeensis* (Forbes, 1844) by its stronger shell with less oval outline, the denser and much more numerous anterior teeth (11-12 in *E. aegeensis*) and the beaks which in *E. decipiens* are more posteriorly directed than in *E. aegeensis*. The resilifer in *E. aegeensis* is directed only slightly forward and lies under the beaks, whereas in *decipiens* it has a definite forward direction and is situated in front of the beaks.



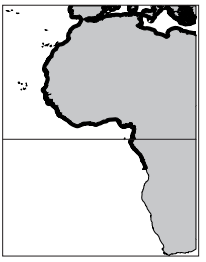
1.18. *Ennucula decipiens* (Philippi, 1844). **A-B**, Cap Vert Peninsula, Senegal, 205-230 m (rv, 6.5 mm). **C-F**, off Côte d'Ivoire (lv, 9.5 mm). **G-H**, W of Iles de Los, Conakry, Guinea, 9°29'N, 16°03'W, 132 m (lv, 4.7 mm)

Saccella commutata (Philippi, 1844)



1.19. Liberia, 6°40'N, 11°23'W, 51 m (rv, 8.4 mm).

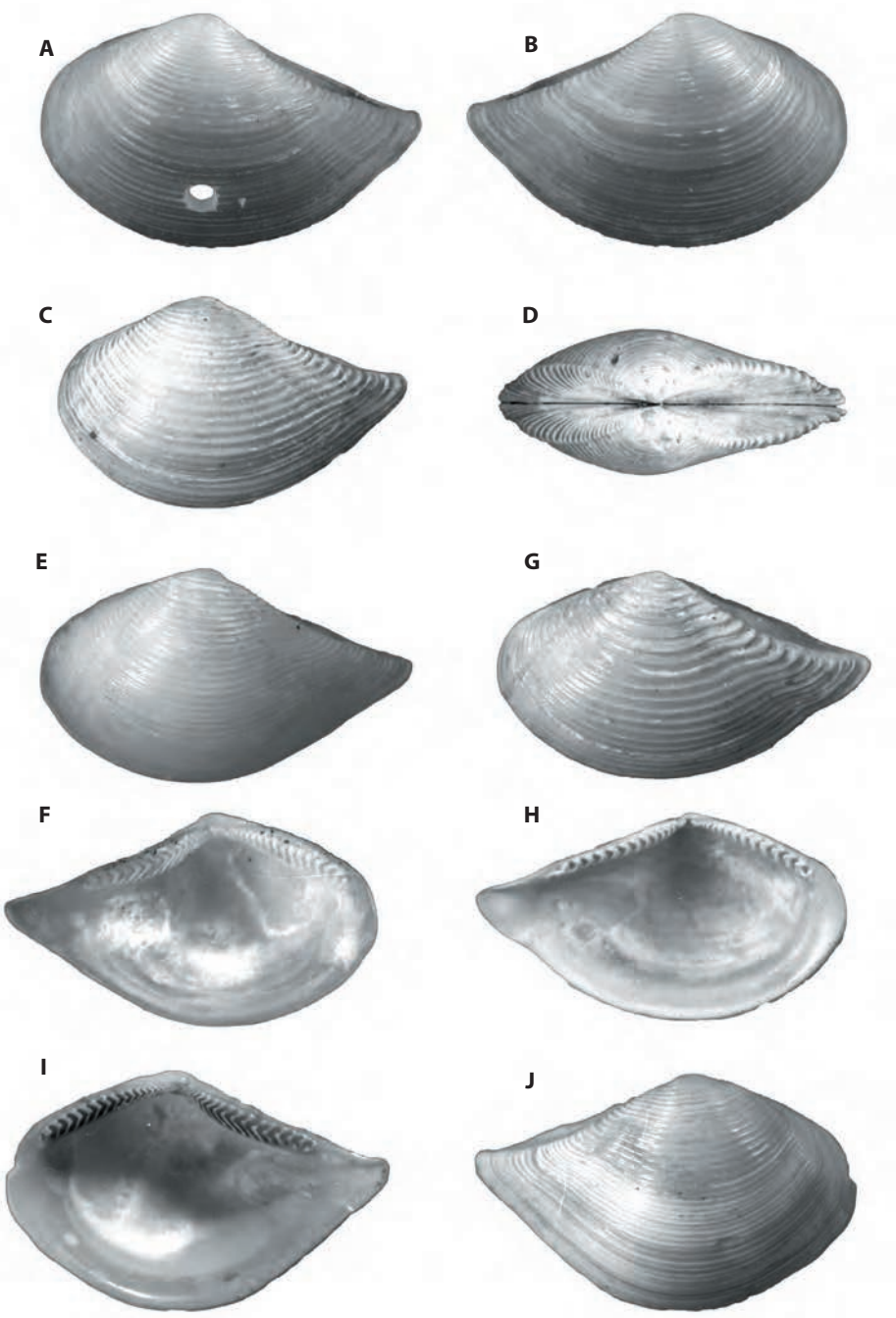
Shell up to 8 mm long, somewhat variable in size, shape, sculpture and width of the hinge plate, transverse, oval-rostrate, rather solid, inflated. Anterior margin rounded, posterior part rostrate, with sharply pointed posterior end. Antero-dorsal margin slightly convex, postero-dorsal margin straight to somewhat convex next to the beaks and slightly concave just anterior to the end. Ventral margin strongly and more or less evenly convex, with a slight, postero-ventral sinuosity. Beaks just in front of the vertical midline. Lunule narrow, indistinct, escutcheon narrow, rather long and delimited by a faint ridge from a shallow, postero-dorsal depression. Surface with numerous, strong, close-set, commarginal ridges, which may be slightly variable in distance. A faint radial flexure and behind it a shallow ridge running from the beaks to the antero-ventral margin. Posterior angle strong and rather sharp, separating the postero-dorsal depression from the rest of the valve. Periostracum very thin, straw-coloured to nearly colourless, mostly eroded. Hinge plate more or less broad, with 16-22 anterior and 14-18 posterior, thin, close-set, strongly chevron-shaped teeth. Resilifer very small and deeply sunken. Valves entirely dirty whitish.



Distribution. Bay of Biscay (S of Belle-Ile) southward to northern Angola (Luanda); Mediterranean.

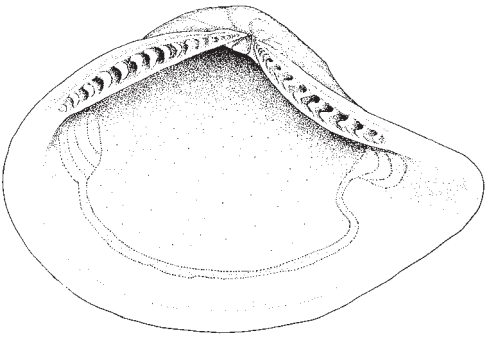
Biotope. In fine, muddy sand and sandy mud, from 10 to about 200 m and deeper, locally not uncommon.

Remarks. Although West African specimens may have a less pronounced anterior radial ridge than European specimens and are often somewhat shorter with a slightly broader hinge plate, they are provisionally considered to fall within the variability of *Saccella commutata*. Both forms with intergrades are found *e.g.* in Côte d'Ivoire. The species has often been cited under its earlier, but invalid name *Nuculana fragilis* (Chemnitz, 1784).



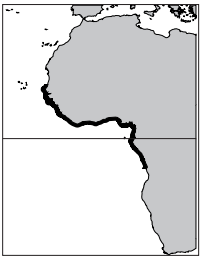
1.20. *Saccella commutata* (Philippi, 1844). **A**-**B**, West Sahara, 25°25'N, 17°57'W, 200 m (7.5 mm). **C**-**D**, Mauritania, 17°30'N, 16°33'W, 168 m (lv and dorsal view, 5.9 mm). **E**-**F**, Abidjan area, Côte d'Ivoire (lv, 6.3 mm). **G**-**H**, same locality (lv, 6.4 mm). **I**-**J**, Ilha de Luanda, N- Angola, 120 m (rv, 6.5 mm).

Jupiteria paucicaelata (Nicklès, 1955)



1.21. Ilha de Luanda, Angola, 120 m (rv, 7.5 mm).

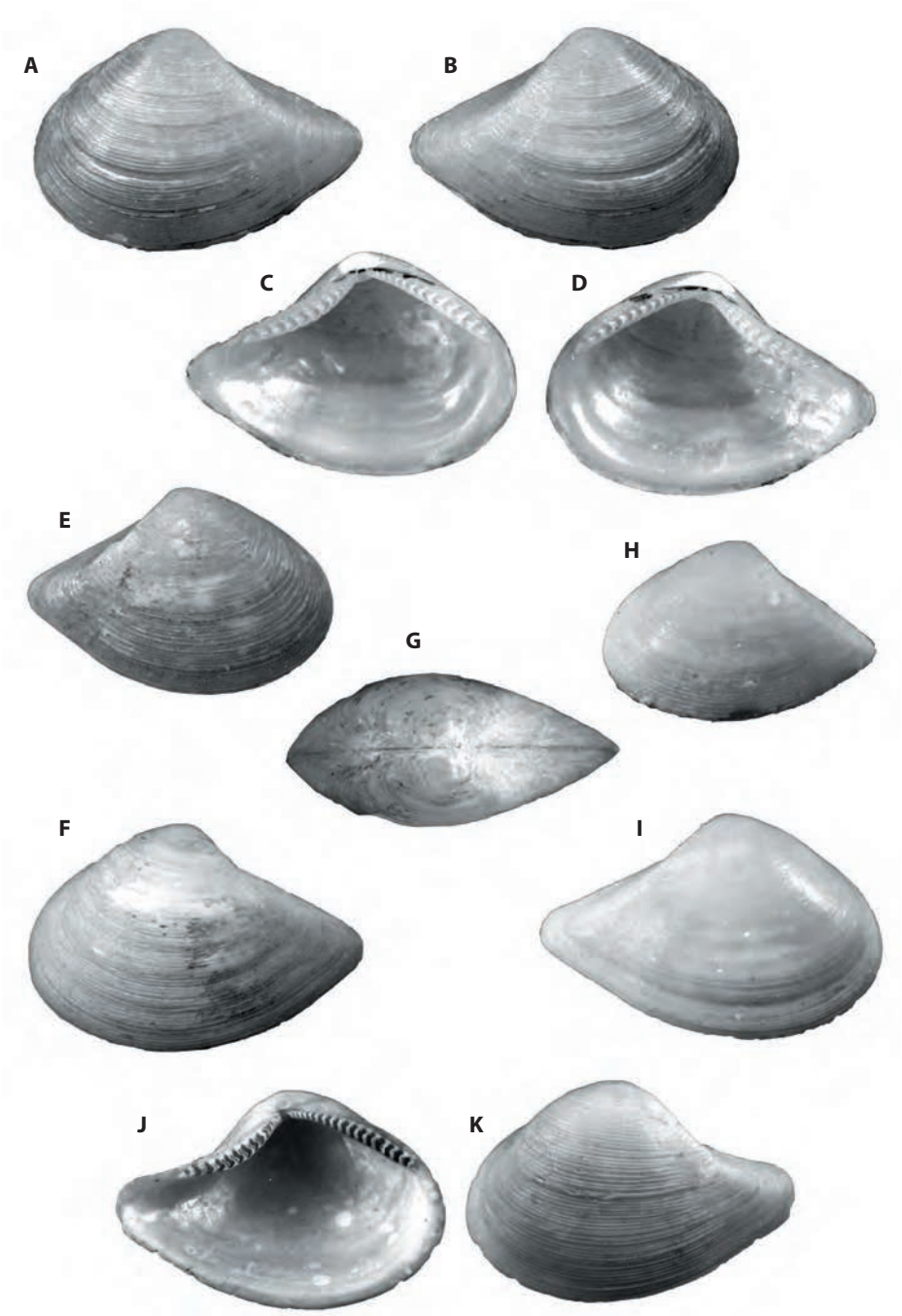
Shell up to 11 mm, quite variable in outline, subtriangular, thick and solid, rather inflated. Anterior margin rounded, posterior end rostrate, with narrowly rounded posterior margin. Antero-dorsal margin slightly convex, postero-dorsal margin straight or slightly concave. Ventral margin strongly convex. Beaks approximately median or slightly behind the vertical midline. Lunule and escutcheon indistinct. Surface with numerous, fine, close-set, commarginal ridges, on the anterior slope coarser and broader with some bifurcating towards posterior. Posterior angle rounded, in young specimens often bearing short, oblique striae. Periostracum rather strong, dull and olive-brown. Hinge plate with 17-18 anterior and 14-15 posterior, slightly chevron-shaped teeth. Resilifer triangular, rather high and deeply inset. Valves translucent white.



Distribution. Senegal (Kayar, N of Dakar) to northern Angola (Luanda).

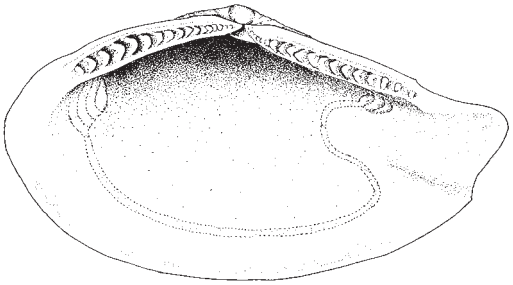
Biotope. In mud and sandy mud, from about 70 to 250 m and perhaps deeper, not common.

Remarks. This species is characterized by its somewhat triangular outline, the fine commarginal ridges, the well marked posterior angle and the thick shell. It cannot be confounded with any other West African nuculanid, although the type species *Jupiteria concava* (Bronn, 1831) from the upper Pliocene of Italy is very similar. Huber (2010) placed this species in *Ledella* but this is not supported, the latter having a more compressed shell, more pointed posteriorly and lacking the concave postero-dorsal area.



1.22. *Jupiteria paucicaelata* (Nicklès, 1955). A-D, Baie de Gorée, Senegal, 80-250 m (7.5 mm). E, same locality (rv, 5.8 mm). F-G, Abidjan area, Côte d'Ivoire, 220 m (rv and dorsal view, 7.0 mm). H-I, Abidjan area (lv, 5.6 mm, rv, 4.5 mm). J-K, Mussulo, N-Angola, 90-100 m (lv, 8.1 mm).

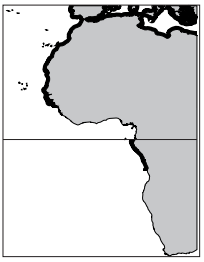
Lembulus pella (Linnaeus, 1758)



1.23. Casamance, 12°46.9'N, 17°29.9'W, 45 m (rv, 8.6 mm).

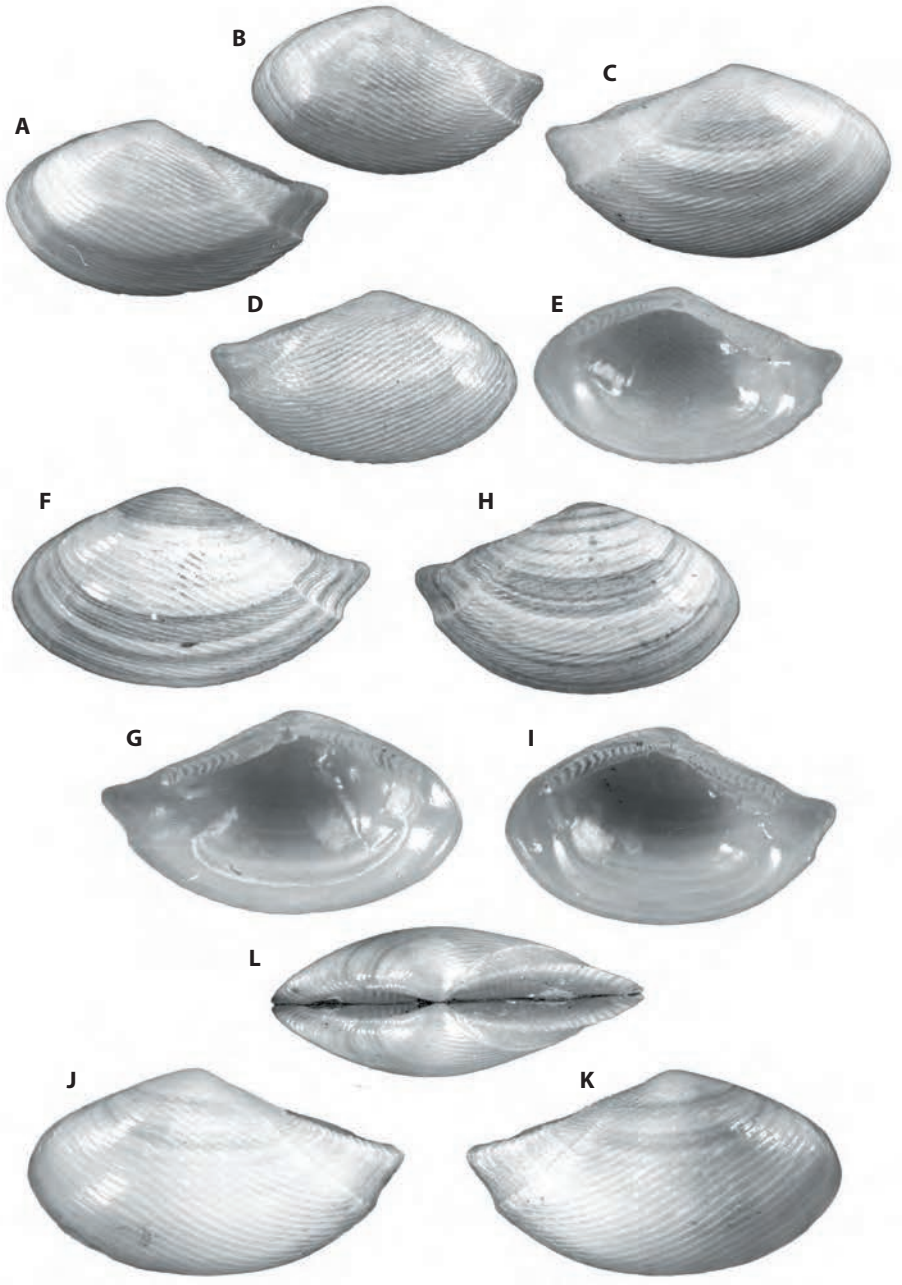
Shell up to 11 mm long (European specimens up to 15 mm), elongate-oval, rather thick and solid, inflated. Anterior margin narrowly rounded, posterior end rostrate, the small cusp on the postero-ventral margin making it slightly bicuspidate. Antero-dorsal margin convex, postero-dorsal margin faintly concave to straight, with a sinuosity anterior to the end; ventral margin up to the lower cusp well and evenly rounded. Beaks approximately median. Lunule narrow, long and well defined, escutcheon nearly equal in form and size, delimited by a faint ridge from the rather deep postero-dorsal depression. Surface with numerous, irregular and somewhat wavy, close-set, oblique striae. Sharp keel running from the beaks to the postero-ventral margin. Posterior angle situated behind the keel and bearing short scales. Ridges on the field between keel and posterior angle less oblique and more close-set. Periostracum very thin, nearly colourless and mostly eroded even on live specimens. Hinge plate with 19-21 anterior and 15-20 posterior, chevron-shaped, close-set teeth. Resilifer small, triangular and deeply sunken. Valves entirely white.

Distribution. Portugal (Algarve) southward to Guinea (9°30'N), Gabon (Libreville) to northern Angola (Ambrizete to Luanda); throughout the Mediterranean.



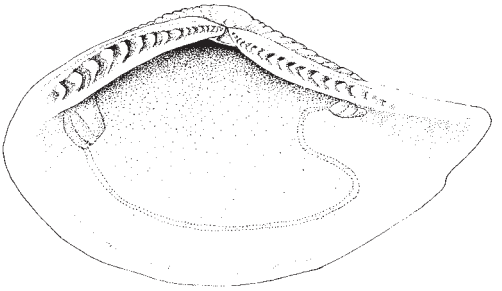
Biotope. In muddy sand and fine sand, offshore from 30 to about 120 m and occasionally deeper, in Europe also shallower.

Remarks. This more temperate species has a distribution discontinuity in the tropical zone. This is the type species of the genus *Lembulus*.



1.24. ***Lembulus pella*** **(Linnaeus, 1758).** **A**, Casamance, 12°46.9'N, 17°29.9'W, 45 m (lv, 8.1 mm). **B**, same locality (lv, 8.8 mm). **C**, same locality (rv, 9.4 mm). **D**-**E**, Ambrizete, N-Angola, 45 m (rv, 8.7 mm). **F**-**G**, same locality (lv, 10.3 mm). **H**-**I**, same locality (rv, 9.4 mm). **J**-**L**, Palmeirinhas, Luanda prov., N-Angola, 60-80 m (9.6 mm).

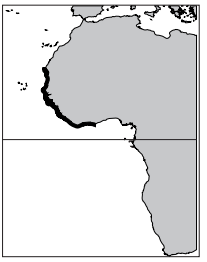
Lembulus gruveli (Nicklès, 1952)



1.25. Abidjan area, Côte d'Ivoire (rv, 7.6 mm).

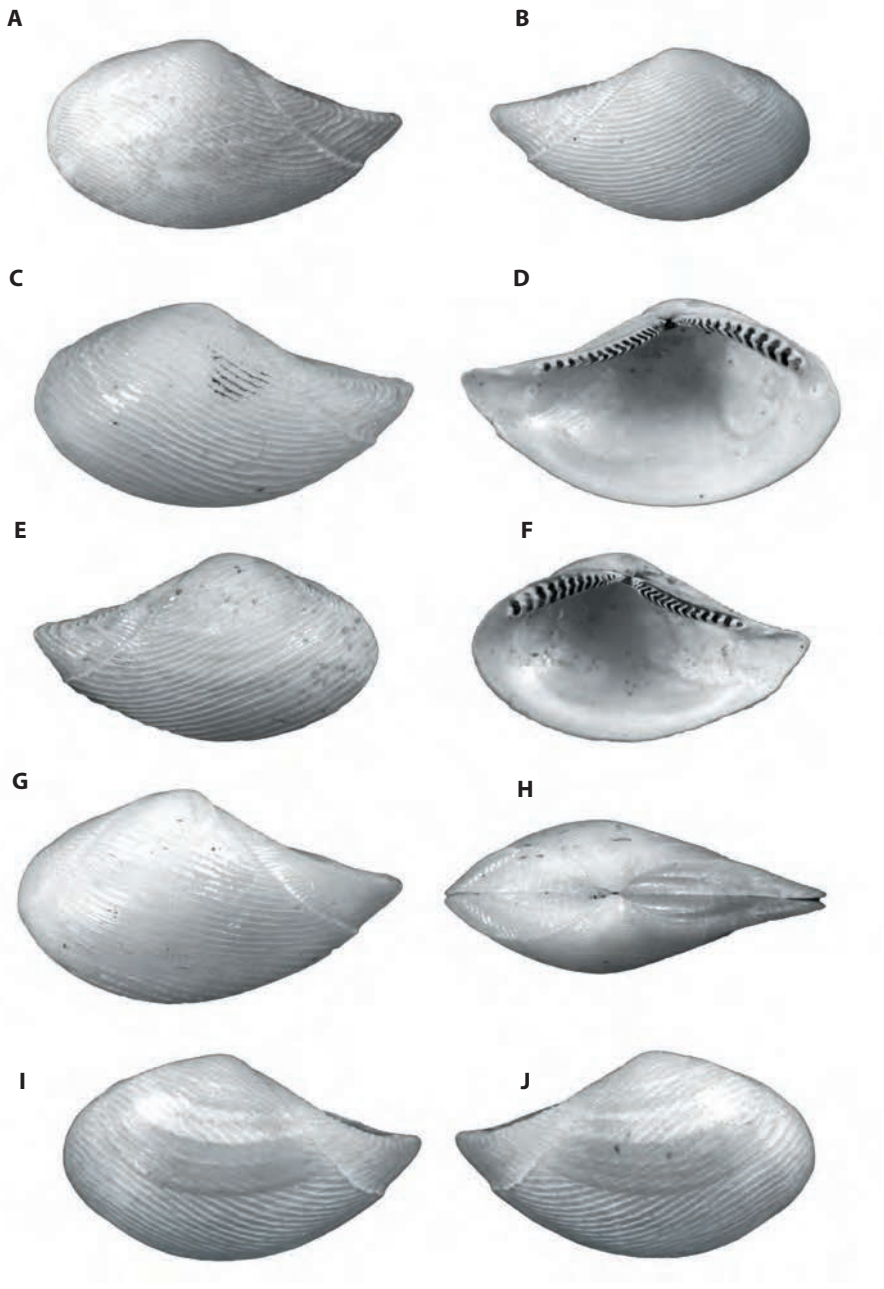
Shell up to 8 mm long, somewhat oval, quite thick and solid, inflated. Anterior margin rounded, posterior end sharply rostrate and somewhat pointing upwards. Antero-dorsal margin weakly convex, postero-dorsal margin concave, with a faint sinuosity, which may be obsolete, anterior to the end. Ventral margin evenly rounded, with a very small cusp near the posterior end. Beaks nearly in the middle or just in front of the vertical midline. Lunule long and rather narrow, escutcheon long, delimited from the shallow postero-dorsal depression by a partly ill-defined ridge. Surface with irregular and occasionally somewhat wavy, close-set, oblique striae. A narrow radial rib running from the beaks to the anterior margin and a sharp keel from the beaks to the postero-ventral margin. Posterior angle situated behind the keel and bearing small nodules or scales. Striae on the area between keel and posterior angle less oblique and sometimes more close-set. Periostracum very thin, pale straw-coloured to nearly colourless, mostly eroded. Hinge plate with 12-17 anterior and 12-17 posterior chevron-shaped, close-set teeth. Resilifer small, triangular and deeply inset. Valves entirely white.

Distribution. Mauritania (Cap Blanc) southward to Côte d'Ivoire; also known from the Quaternary of Port-Gentil, Gabon.



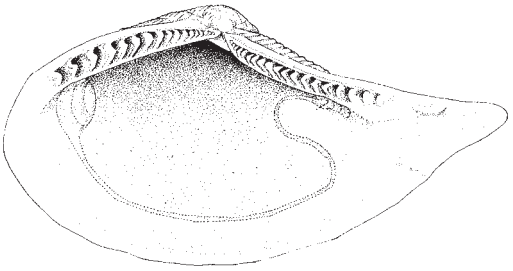
Biotope. In muddy sand and fine sand, from about 5 to 50 m, occasionally deeper, uncommon.

Remarks. This species is very close to *L. pella*, but is distinguished by the less oval outline with narrower and more pointed rostrum and the concave postero-dorsal margin.



1.26. *Lembulus gruveli* (Nicklès, 1952). **A**, Kiaoné, Mauritania, 20°02'N, 16°22'W, 6 m (lv, 6.6 mm). **B**, same locality (rv, 6.0 mm). **C**-**D**, Dakar area, Senegal (lv, 7.6 mm). **E**-**F**, same locality (rv, 6.7 mm). **G**-**H**, Abidjan area, Côte d'Ivoire (lv and dorsal view, 8.1 mm). **I**-**J**, same locality (7.9 mm).

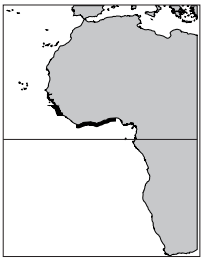
Lembulus wolffi (Nicklès, 1955)



1.27. Port-Gentil, Gabon, harbour (rv, 8.7 mm).

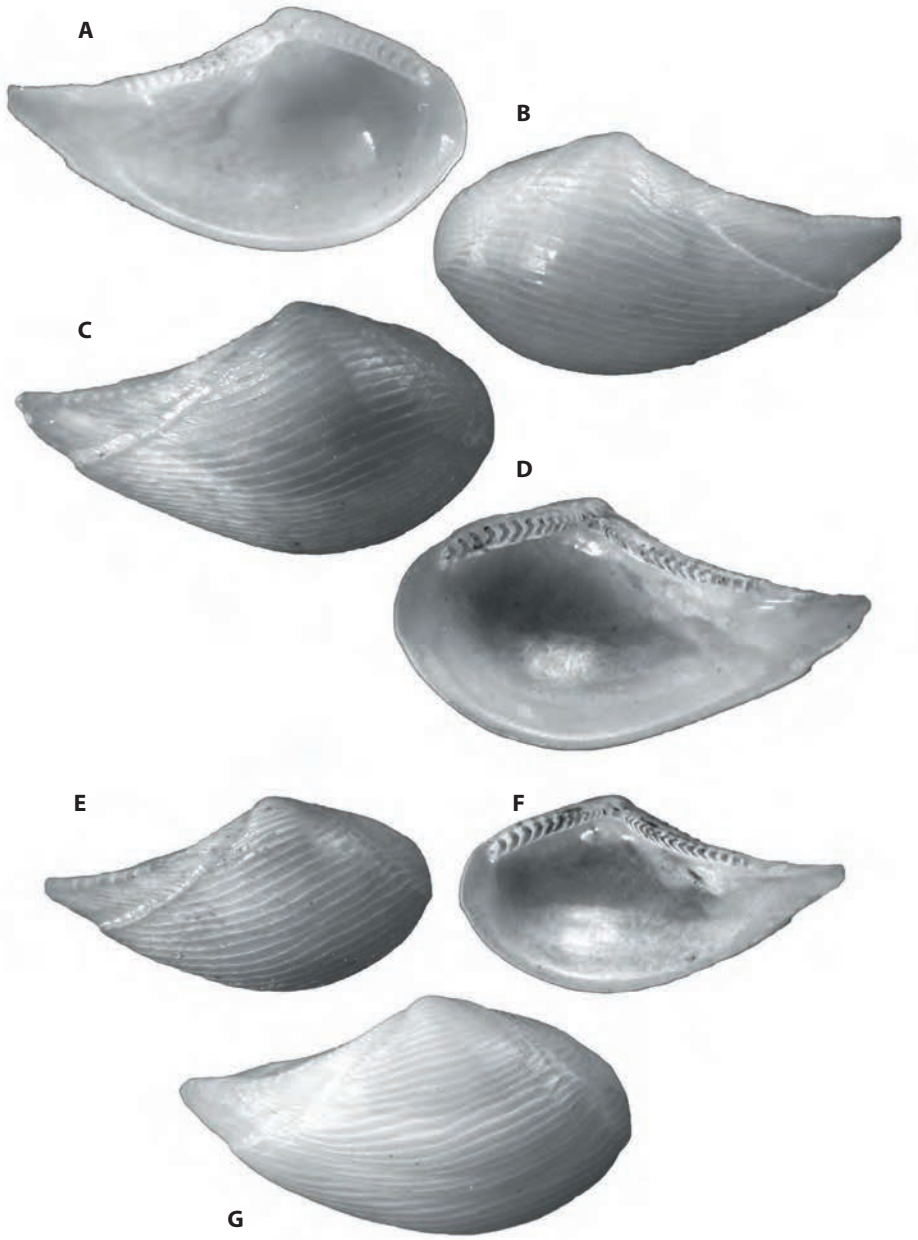
Shell up to 9 mm long, somewhat variable, elongate-rostrate, thick and solid, inflated. Anterior margin rounded, posterior end with a narrow, more or less elongated rostrum. Antero-dorsal margin convex, postero-dorsal margin concave, with a slight, often obsolete sinuosity anterior to the end. Ventral margin with its anterior half well rounded, posteriorly slightly convex to straight. Very small cusp near the posterior end. Beaks mostly well in front of the vertical midline, but occasionally near the middle. Lunule long, narrow and ill-defined, escutcheon long, delimited from the shallow postero-dorsal depression by a partly ill-defined ridge. Surface with irregular, more or less close-set, oblique striae. A narrow radial rib running from the beaks to the anterior margin and a sharp keel from the beaks to the postero-ventral margin. Posterior angle situated behind the keel and bearing small nodules or scales. Striae on the area between keel and posterior angle less oblique and generally more close-set. Periostracum very thin, nearly colourless and mostly eroded. Hinge plate with 15-17 anterior and 15-17 posterior, chevron-shaped, close-set teeth. Resilifer small, triangular and deeply inset. Valves entirely white.

Distribution. To date, only known from Guinea, Côte d'Ivoire and Nigeria.



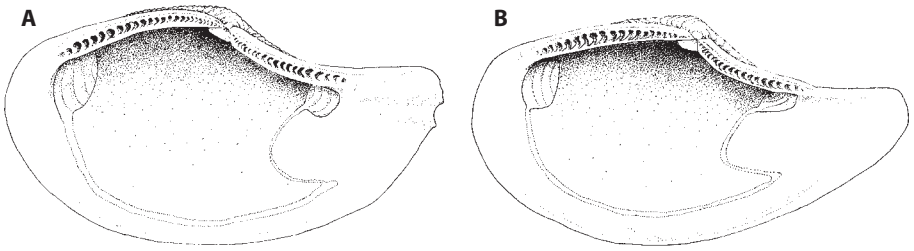
Biotope. Most probably in fine sand and muddy sand, from about 10 to 40 m, rare.

Remarks. This species is very close to *L. gruveli* and is only distinguished from it by its somewhat more elongate shell and the longer and more slender rostrum. Nicklès (1955) cited as a further difference the less crowded oblique striae in *L. wolffi*, but this character is not always seen. More material of *L. wolffi* might reveal that both *L. gruveli* and *L. wolffi* may belong to one variable species. *Lembulus forlii* Palm & Dell'Angelo, 2010, from the Italian Pliocene, is also so similar that it is probably the same species.



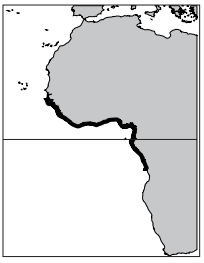
1.28. *Lembulus wolffi* (Nicklès, 1955). **A**-**B**, W of Kaporo, Guinea, 9°35.6'N, 13°53.8'W, 18-30 m (lv, 5.8 mm). **C**-**D**, Iles de Los, Guinea, 8-18 m (rv, 8.7 mm). **E**-**F**, same locality (rv, 7.3 mm). **G**, off Côte d'Ivoire, 10-30 m (rv, 7.9 mm).

Lembulus montagui (Gray, 1825)



1.29. A, Kribi, Cameroon, beach (rv, 20 mm). B, Cap Skirring, Casamance, 13 m (rv, 13.7 mm).

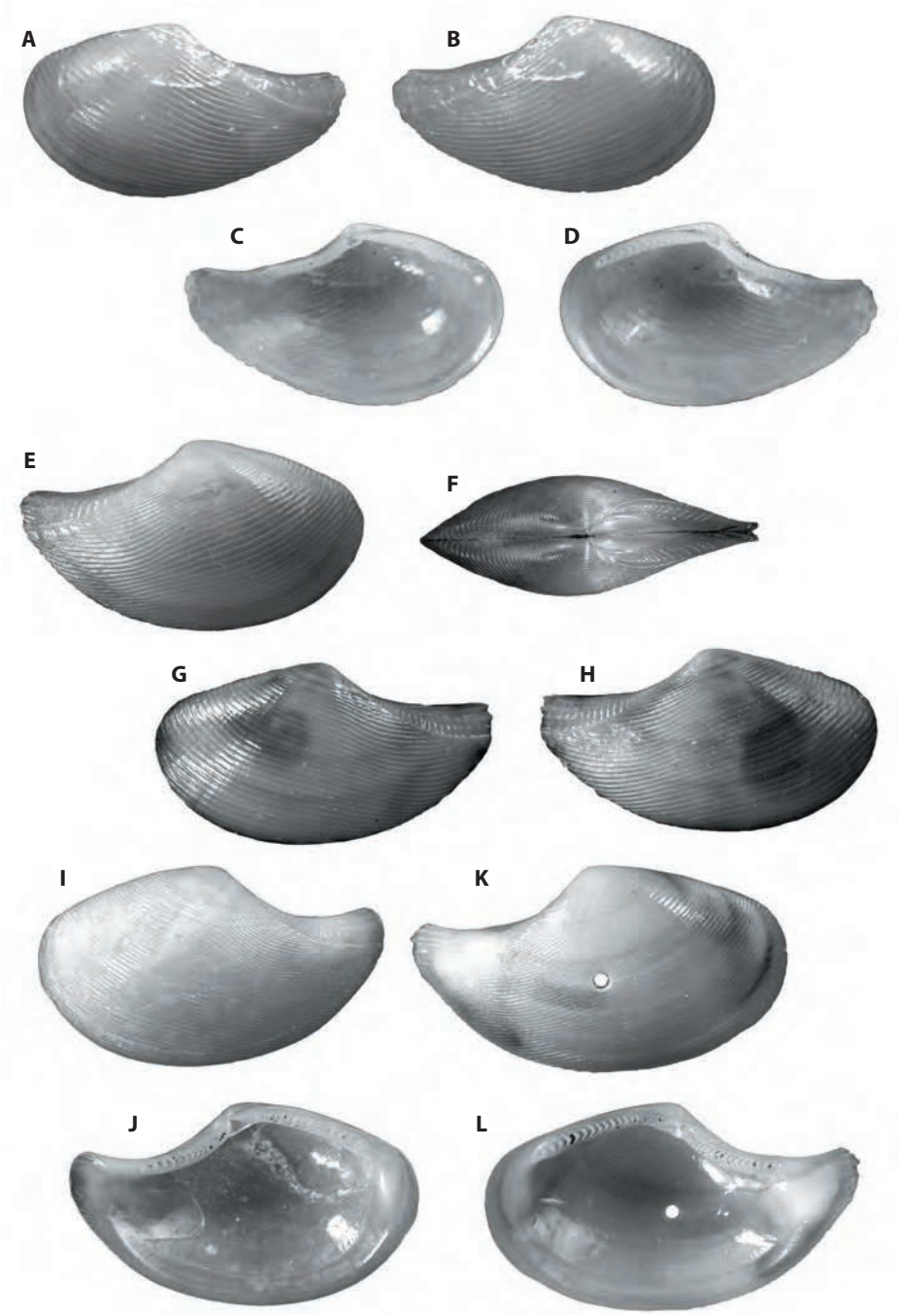
Shell up to 24 mm long, variable in outline and size, oval-rostrate, rather thin but solid, inflated, with posteriorly slightly gaping rostrum. Anterior margin rounded, posterior part broadly rostrate, with irregularly rounded posterior margin. Antero-dorsal margin slightly convex, postero-dorsal margin markedly concave near the beaks and less concave towards the end. Ventral margin evenly rounded or slightly less convex on its posterior part. Beaks more or less median. Lunule long and narrow, escutcheon only slightly shorter and broader, both well defined, no postero-dorsal depression. Surface with more or less close-set, mostly slightly curved and oblique striae which sometimes end slightly anterior to the posterior radial ridge. Area posterior to the keel with strong, rather widely-spaced, commarginal ridges, which often become obsolete near the margins, and with 1-5 narrow, radial ribs. Periostracum very thin, pale greyish olive to nearly colourless. Hinge plate with 19-25 anterior and 15-24 posterior, chevron-shaped, close-set teeth. Resilifer small, triangular, rather broad and deeply inset. Valves entirely white.



Distribution. Senegal (S of Casamance River) to northern Angola (Barra do Dande, N of Luanda).

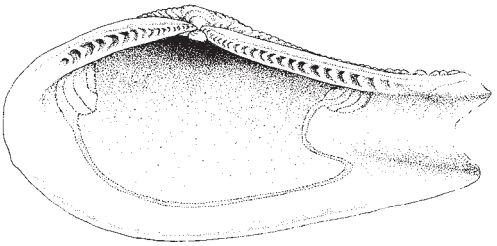
Biotope. In fine, muddy sand, from 2-10 m (in sheltered bays) to about 30 m, locally common. Often found together with *Anadara senegalensis* *Stenocista gambiensis*, *Scissodesma micronitida* and *Pitar longior*.

Remarks. This species has long been known as *Leda rostrata* (Montagu, 1808), however, Montagu's *Arca rostrata* is a primary homonym of *Arca rostrata* Bruguière, 1789. There are two different forms, one smaller and slightly more slender form (right drawing) which is commonly dredged, and a larger, more oval form, which is less common in collections and of which mostly empty valves from the beach drift, have been examined. The largest specimens of this larger form come from the intermittent upwelling zone at Côte d'Ivoire and Ghana. Intergrades between the two forms lead to the assumption that only one variable species is concerned.



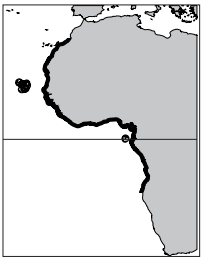
1.30. ***Lembulus montagui*** **(Gray, 1825)**. **A**-**D**, Casamance, 12°20.7'N, 16°53.1'W, 15 m (10.6 mm). **E**-**F**, Princess Beach, Takoradi, Ghana, 15-20 m (rv and dorsal view, 17.0 mm). **G**-**H**, same locality (16.6 mm). **I**-**J**, Miamia Bay, Ghana, 10-15 m (lv, 22.1 mm). **K**-**L**, same locality (rv, 24.0 mm).

Lembulus bicuspidatus (Gould, 1845)



1.31. Santo Antonio, Angola, 5-10 m (rv, 11.6 mm).

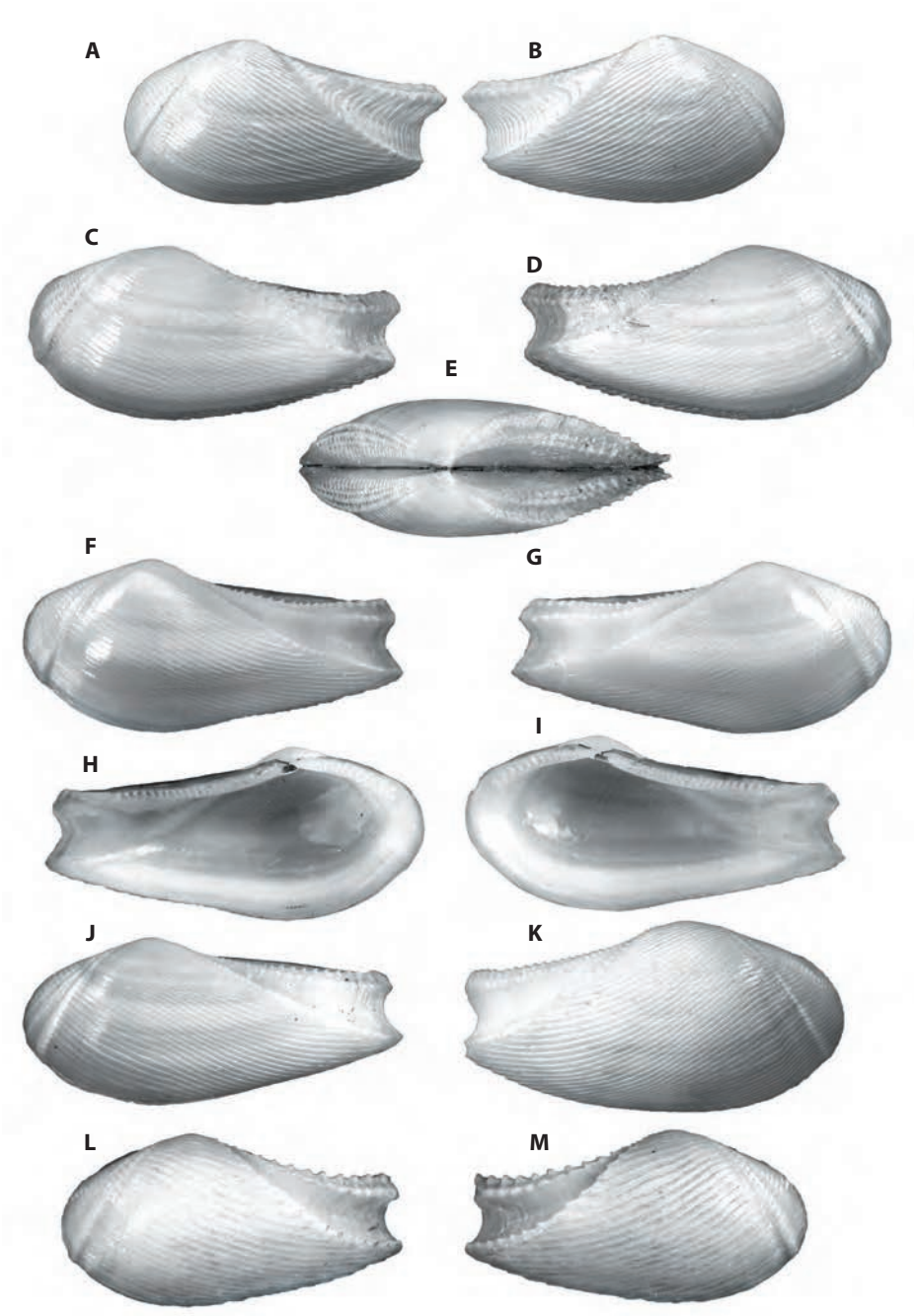
Shell up to 19 mm long, transverse, bicuspidate, thick and solid, rather inflated. Anterior margin rounded, posterior end markedly bicuspidate. antero-dorsal margin weakly convex, postero-dorsal margin slightly concave to straight. Ventral margin convex anteriorly, weakly convex to nearly straight towards the posterior end. Beaks slightly in front of the vertical midline. Lunule long and very narrow, escutcheon very long and rather broad, delimited by a strong, radial double-rib bearing transverse scales. Surface with numerous, slightly irregular, close-set, oblique striae. Radial rib and narrow depression posterior to it running from the beaks to the antero-ventral margin. Posterior angle sharp and bearing nodules. Posterior area deeply concave, with growth lines only. Periostracum very thin, pale straw-coloured to nearly colourless, often eroded on live specimens, but persistent on lunule and escutcheon and occasionally near the margins. Hinge plate with 16-21 anterior and 20-28 posterior, close-set, chevron-shaped teeth. Resilifer small but rather broad, deeply inset. Valves entirely white.



Distribution. Atlantic Morocco (Agadir) to southern Angola (Baia dos Tigres); Cape Verde Islands; São Tomé, Ilha do Principe.

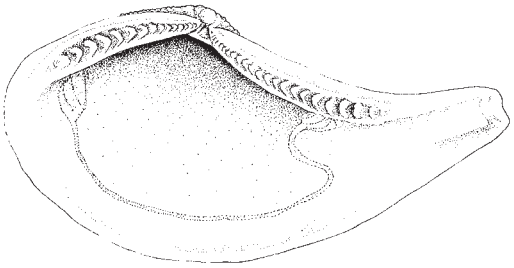
Biotope. In mud, fine, muddy sand and fine sand, from 1 to about 60 m, occasionally deeper, in very shallow water mostly in sheltered bays, common to abundant.

Remarks. This species is only tentatively placed in the genus *Lembulus*. It differs substantially from other species of *Lembulus* in having a typically bicuspidate posterior end with a smooth posterior area and a double rib delimiting the escutcheon, and should be separated into another genus. A somewhat similar species from the Italian Pliocene is *L. undatus* (Defrance, 1825). Empty valves are occasionally cast ashore.



1.32. ***Lembulus bicuspidatus*** **(Gould, 1845)**. **A**-**B**, Mauritania, 20°10'N, 16°30'W, 16 m (12.2 mm). **C**-**E**, Casamance, 12°25.5'N, 17°07.1'W, 15-16 m (16.7 mm). **F**-**I**, Côte d›Ivoire, 15 m (16.4 mm). **J**, same locality (Iv, 16.5 mm). **K**, Porto Alexandre, S-Angola, 10 m (18.8 mm). **L**-**M**, Santo Antonio, Benguela, S-Angola, 5-10 m (11.1 mm).

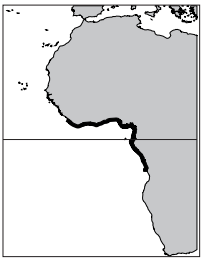
Costatoleda tuberculata (E.A. Smith, 1872)



1.33. Abidjan area, Côte d'Ivoire (rv, 8.4 mm).

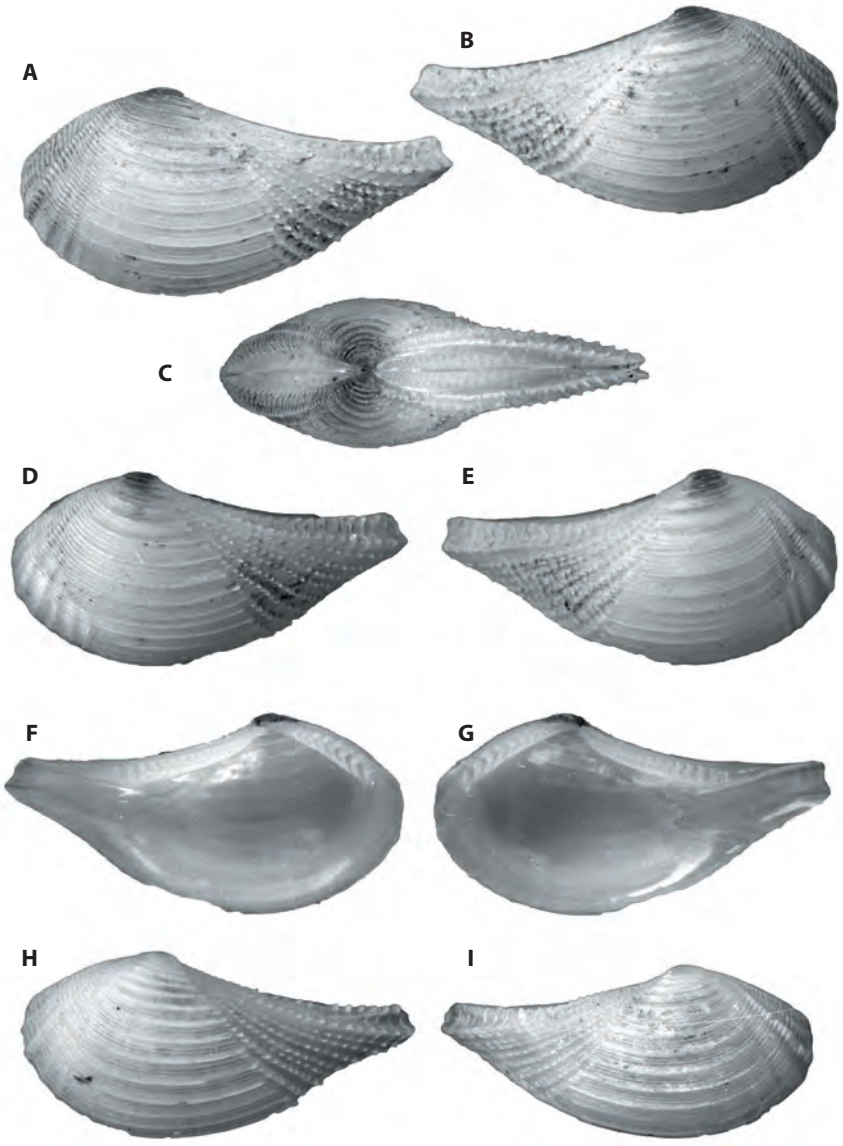
Shell up to 9 mm long, elongate-rostrate, thin but rather solid, inflated. Anterior margin rounded and slightly undulate, posterior end rostrate. Antero-dorsal margin weakly convex, postero-dorsal margin faintly concave, occasionally nearly straight. Ventral margin evenly rounded, with a slight sinuosity just anterior to the posterior end. Beaks well in front of the vertical midline. Lunule long and rather narrow, escutcheon of same breadth, but longer. Surface divided in three parts: anterior part with numerous, fine, commarginal cords crossing 3-5 rounded, radial ribs. On the middle part, every fourth commarginal cord becomes prominent and lamellate posteriorly to the last radial rib. Posterior part with 7-9 radial rows of nodules or scales, no commarginal cords. Rostrum with a strong dorsal and ventral keel, each bearing small scales, and with a depression between them bearing transverse threads. Periostracum very thin, dull and nearly colourless. Hinge plate with 14-18 anterior and 20-23 posterior, close-set, chevron-shaped teeth. Resilifer triangular, deeply inset. Valves entirely white to cream.

Distribution. Liberia (Monrovia) southward to northern Angola (Luanda).



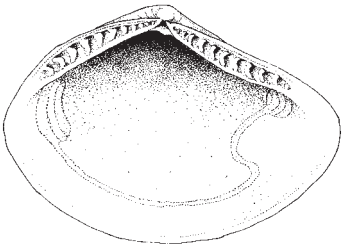
Biotope. In fine, muddy sand and fine sand, from 2 to about 30 m, uncommon.

Remarks. This species is characterised by its peculiar sculpture, not found in any other Recent member of the Nuculanidae. Empty valves may occasionally be encountered on certain beaches such as that of the bay side of Pointe-Noire.



1.34. *Costatoleda tuberculata* (E.A. Smith, 1872). A-C, Gonzagueville, Côte d'Ivoire, 20 m (8.0 mm). D-G, same locality (8.0 mm). H, Pointe-Noire, Congo, 10 m (7.6 mm). I, Pointe-Noire, Congo, Plage Orstom, 5 m (7.3 mm).

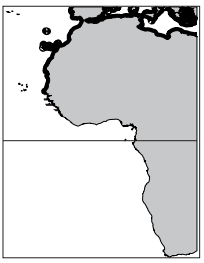
Yoldiella philippiana (Nyst, 1845)



1.35. Dakar, S of Cap Vert Peninsula, 14°27'N, 17°33'W, 150-250 m (rv, 3.7 mm).

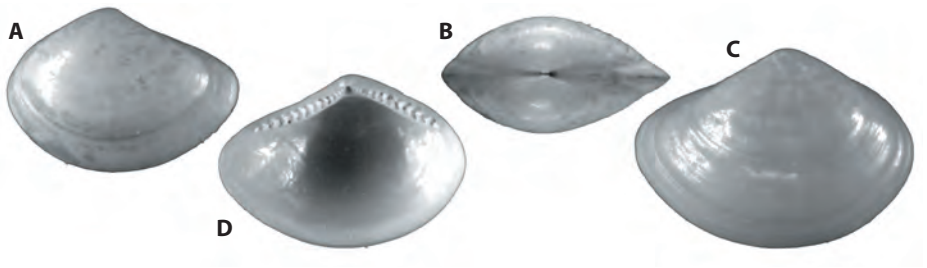
Shell up to 4 mm long, somewhat variable in size, shape and width of the hinge plate, suboval, thin but rather solid, inflated. Anterior margin rounded, posterior part bluntly rostrate, posterior margin narrowly rounded. Antero-dorsal margin slightly convex, postero-dorsal margin nearly straight, ventral margin well and evenly rounded. Beaks just in front of the vertical midline. No visible lunule and escutcheon. Surface smooth and glossy, only with few irregular growth lines and coarser growth stages. Posterior angle rounded and indistinct. Periostracum very thin, pale straw-coloured to nearly colourless, often more or less eroded. Hinge plate with 10-14 anterior and 11-15 posterior teeth, all close-set and chevron-shaped. Resilifer small, triangular and deeply sunken. Valves entirely white.

Distribution. Norway (71°N) southward to Senegal (Petite Côte) and Guinea (one record, no precise locality); Madeira; Mediterranean.



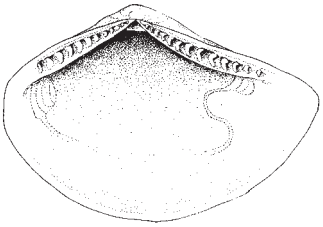
Biotope. In muddy bottom, 80-300 m, not common.

Remarks. The West African population seems to fall within the variability of this otherwise European species. Synonyms are *Nucula tenuis* Philippi, 1836 (preoccupied name), *Y. tomlini* Winckworth, 1932, and it was misidentified as *Leda pygmaea* (Münster, 1837) by Jeffreys (1863). The species is also known from the Pleistocene of Sicily (Salas 1996).



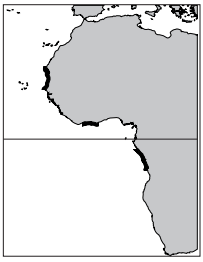
1.36. *Yoldiella philippiana* (Nyst, 1845). **A**-**B**, Dakar, Senegal, 14°00'N, 17°29.5'W, 200 m (lv and dorsal view, 3.2 mm). **C**, Gorée, Senegal, 170-200 m (rv, 4.0 mm). **D**, same locality (lv, 3.5 mm).

Yoldiella orstomi Cosel, 1995



1.37. Grand Bassam, Côte d'Ivoire, 200 m, holotype (rv, 4.0 mm).

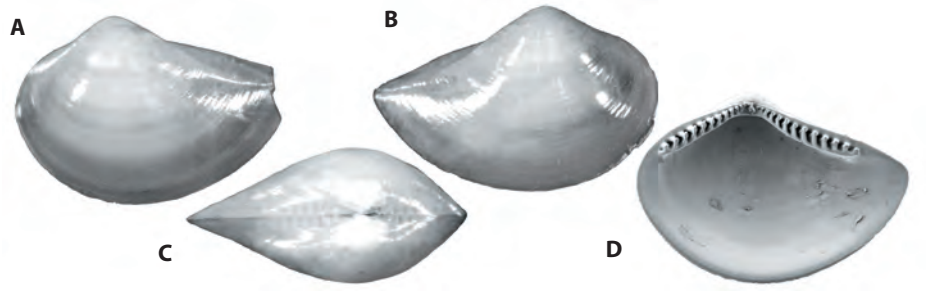
Shell up to 4 mm long, oval-rostrate, quite solid, inflated. Anterior margin rather narrowly rounded, posterior part rostrate, posterior margin tapering, its termination very narrowly rounded. Antero-dorsal and postero-dorsal margin straight, ventral margin strongly and evenly rounded. Beaks just in front of the vertical midline. Lunule narrow and ill-defined, escutcheon narrow and delimited by a rather faint ridge. Surface smooth with fine irregular growth lines and a few slightly coarser growth stages. Posterior angle rather sharp but not keeled. Periostracum thin, glossy and nearly colourless, eroded on the umbos. Hinge plate with 10-11 anterior and 13 posterior teeth, all close-set, rather strong and more or less chevron-shaped. Resilifer small, high-triangular and deeply sunken. Valves entirely white.



Distribution. Mauritania (21°15'N) to Senegal (Dakar region); Côte d'Ivoire (Abidjan region), Congo Brazzaville to N-Angola.

Biotope. In muddy bottom, 200-600 m and deeper, rare.

Remarks. This species is distinguished from *Y. philippiana* by its much more pointed posterior end, the well developed posterior angle and the distinct escutcheon. The ventral margin is more evenly convex. This species, together with the similar South African species *Y. elinguor* Kilburn, 1994 and *Y. lingulifer* Kilburn, 1994, has been moved to *Yoldiella* by Huber (2010) on the basis of the pointed posterior end, however those lack the characteristic sinus on the postero-ventral margin below the pointed tip, and the definite ridge from umbo to rostrum, characteristic of *Ledella*.



1.38. *Yoldiella orstomi* Cosel, 1995. **A**, off Mauritania, 21°15'N, 17°48'W, 795 m (paratype, 4.9 mm). **B-C**, off Mauritania, 21°15'N, 17°38'W, 400 m (paratype, rv and dorsal view, 5.1 mm). **D**, off Grand Bassam, Côte d'Ivoire, 200 m (holotype, SEM, rv, 4.0 mm).

Superfamily ARCOIDEA

Family ARCIDAE
- Genus ***Arca*** Linnaeus, 1758 – 3 species
- Genus ***Barbatia*** Gray, 1842 – 3 species
- Genus ***Mesocibota*** Iredale, 1939 – 1 species
- Genus ***Calloarca*** Gray, 1857 – 1 species
- Genus ***Acar*** Gray, 1857 – 1 species
- Genus ***Bathyarca*** Kobelt, 1891 – 3 species (1 treated)
- Genus *Bentharca* Verrill & Bush, 1898 – 1 species (not treated)
- Genus ***Anadara*** Gray, 1847 – 7 species
- Genus ***Senilia*** Gray, 1842 – 1 species

Family NOETIIDAE
- Genus ***Sheldonella*** Maury, 1917 – 1 species
- Genus ***Stenocista*** Oliver & Cosel, 1993 – 1 species
- Genus ***Congetia*** Huber, 2010 – 1 species
- Genus ***Striarca*** Conrad, 1862 – 1 species with three subspecies
- Genus ***Arcopsis*** Koenen, 1885 – 1 species

Family GLYCYMERIDIDAE
- Genus ***Glycymeris*** da Costa, 1778 (6 species)

Superfamily LIMOPSOIDEA

Family LIMOPSIDAE
- Genus ***Limopsis*** Sassi, 1827 – 6 species (2 treated)

Superfamilies Arcoidea and Limopsoidea

These are the two superfamilies of Recent Pteriomorphs with a taxodont hinge. Arcoidea includes currently the families Arcidae, Noetiidae and Glycymerididae. Oliver & Holmes (2006) provided an overview of the relationships within this group and promoted the inclusion of the Glycymerididae in Arcoidea rather than in Limopsoidea as was previously accepted. Phylogeny was further investigated by Combosch & Giribet (2016) using molecular characters.

Family ARCIDAE

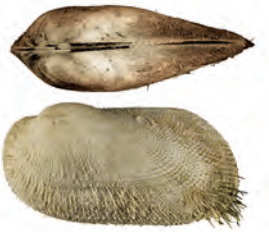
Shells small (a few millimetres) to large (over 150 mm), trapezoidal to oval in outline, regularly shaped or distorted, moderately thick to mostly very thick and solid, equivalve or slightly inequivalve, slightly inequilateral, with beaks generally in front of the vertical midline, inflated to very inflated. Surface with radial ribs, riblets or costae, often with commarginal sculpture on them. Periostracum usually thick, often with bristles. Hinge plate long, narrow to broad, straight to very slightly arched, with usually numerous, small, straight or chevron-shaped teeth which can be more or less oblique at both ends of the hinge plate. Ligament external, on both sides of the beaks (amphidetic) or, more rarely, posterior to them (opisthodetic). Dorsal area between umbos narrow to very broad, partly to nearly entirely covered by the ligament, often with chevron-shaped or tent-shaped incisions under the ligament. These incisions and the degree of covering of the dorsal area by the ligament are important diagnostic characters. Adductor muscle scars subequal, pallial line entire. There are 271 species of Arcidae known worldwide, 27 of them belonging to the tropical West African fauna.

The arks are either byssally attached and living on hard bottoms (*e.g. Arca*), or partly or entirely infaunal (*e.g. Anadara*). The latter are frequently also byssally attached but mostly to small objects in the sediment. For a taxonomic revision of the Arcidae and Noetiidae of West Africa, see Oliver & Cosel (1993a, b).

Genus *Arca* Linnaeus, 1758. Shells medium-sized to large (over 100 mm), elongate, trapezoidal to subrectangular, moderately thick, very inflated, equivalve, with a broad dorsal area and beaks well in front of the vertical midline. Hinge line straight and very long, very narrow and parallel-sided, with numerous, tiny, equal teeth. Ventral margin with smooth inner edge and a distinct byssal gape. Surface with irregular radial ribs and riblets. Periostracum well developed, commonly foliated.

Genus *Barbatia* Gray, 1842. Shells small to medium-sized (over 50 mm), elongate, suboval in outline, often more or less deformed, rather thin to solid, compressed to somewhat inflated, equivalve, with a narrow dorsal area and beaks well in front of the vertical midline. Hinge line dorsally more or less straight and slightly arched along its ventral (inner) edge, with teeth distinctly increasing in size towards the ends. Ventral margin with smooth inner edge and a more or less distinct byssal gape. Surface with fine, irregular radial ribs or riblets, often dividing or bifurcating. Posterior angle not keeled. Periostracum with short to long bristles as reflected by the generic name.

Genus *Mesocibota* Iredale, 1939 (= *Nipponarca* Habe, 1950). Shells medium-sized (over 50 mm), subrectangular, oblong, equivalve, somewhat compressed, inequilateral with beaks in the anterior third. Hinge plate long and straight, with numerous small teeth. Ligamental area almost flat, narrow, tapering at both ends. Ventral margin with indistinctly crenulated inner edge and a relatively short and narrow byssal gape. Surface with few radial ribs, the median ones bifurcate and nodulose, the posterior ones rather broad, flat and weakly sculptured, separated by narrow grooves. Periostracum dense, with long bristles arising from the interspaces of the posterior angle.



Genus *Calloarca* Gray, 1857. Shells small to medium sized (to over 40 mm), subrectangular to subtrapezoidal, resembling *Barbatia* in the general outline but with conspicuous chevrons-bearing lamellar ligament entirely posterior to the umbos, and anterior part of the cardinal area covered only by a thin layer of fibrous ligament like in *Acar*. Muscle impressions relatively small and not raised above the internal surface. The posterior situation of the lamellar ligament in *Calloarca* and *Acar* should not be confused with the position in some *Barbatia* where the entire ligament may be more or less posterior (Kilburn 1983).

Genus *Acar* Gray, 1857. Shells small (usually up to 10-30 mm, rarely over 40 mm), subrectangular to subtrapezoidal, more or less deformed, rather solid, inflated, equivalve, with a narrow dorsal area and beaks well in front of the vertical midline, usually within the anterior fourth. Lamellar ligament restricted to the post-umbonal part of the dorsal area, the anterior part covered only by a thin layer of fibrous ligament. Ventral margin with a crenulated inner edge, except around the byssal gape where it is smooth. Byssal gape narrow. Surface with strong decussate sculpture and the posterior angle as a well developed keel.

Hinge line arched on the interior; muscle impressions large, conspicuous and slightly elevated.

Genus *Bathyarca* Kobelt, 1891. Shells small (a few millimetres to over 20 mm), oval to suboval, with narrow anterior and broad posterior part, rather thin, somewhat compressed, inequivalve with slightly larger left valve. Dorsal area narrow, beaks in front of the ligament. Hinge line dorsally more or less straight, slightly arched along its ventral (inner) edge, teeth not very numerous (commonly less than 10) increasing in size towards the ends, the distal ones distinctly oblique. Surface with fine radial riblets and commarginal growth lines. Periostracum sparse, with small bristles.

Genus *Anadara* Gray, 1847. Shells small to very large (over 150 mm) and heavy, always regularly shaped, higher than long to longer than high, rhomboidal-oval, oblong, subtrapezoidal or subquadrate in outline, generally tumid to extremely inflated, commonly slightly inequivalve, at least in the juvenile stage, with the left valve larger than the right valve and discordant ventral margins. Ligamental area normally bearing a few chevrons. Hinge plate straight dorsally, slightly arched on its lower edge, with numerous elongate teeth, minute under the umbo, increasing in size towards the anterior and posterior ends. Ventral margin with distinctly crenulated inner edges usually tightly appressed, however, in a few species occasionally slightly gaping in adult specimens on the antero-ventral part. Surface with strong radial ribs non-bifurcating but occasionally bifid, ribs smooth or bearing weak to very strong nodules. Periostracum mostly dark brown, strong and bristly. Byssus always consisting of distinct threads, not forming a sheet. Anadaras are mostly infaunal and inhabit mud, fine muddy sand, fine sand or mixed sand. However, some species live on harder bottom such as coral sand and coarse sand with calcareous algae, shell debris, gravel and stones; they are usually only partly buried and always byssally attached. Several genera and subgenera have been proposed within the subfamily Anadarinae, however, many are without sound background and are based on vague shell characters only. A worldwide, critical revision of Anadarinae is long overdue. Herein, all West African species are grouped in the genus *Anadara*.

Genus *Senilia* Gray, 1842. Shells large (reaching over 100 mm), very thick and heavy, subrhomboidal-triangular, with widely separated and distinctly prosogyrous umbos. Hinge line very broad,

with a straight dorsal edge and a slightly arched ventral edge, with numerous, narrow and irregular teeth set mostly vertically. Surface with broad, smooth radial ribs. The genus is monotypic and endemic of West Africa, but the Panamic Pacific *Anadara grandis* (Broderip & G.B. Sowerby I, 1829) is strikingly similar, especially regarding the hinge architecture.

Species treated (18)

Arca noae Linnaeus, 1758; *Arca bouvieri* P. Fischer, 1874; *Arca avellana turbatrix* Oliver & Cosel, 1993; *Barbatia complanata* (Bruguière, 1789); *Barbatia gabonensis* Oliver & Cosel, 1993; *Barbatia legumen* (Lamy, 1907); *Mesocibota allocostata* (Oliver & Cosel, 1993); *Calloarca ionthados* (Oliver & Cosel, 1993); *Acar olivercoseli* Huber, 2010; *Bathyarca pectunculoides* (Scacchi, 1835); *Anadara gibbosa* (Reeve, 1844); *Anadara corbuloides* (Monterosato, 1881); *Anadara eborensis* Oliver & Cosel, 1993; *Anadara subglobosa* (Kobelt, 1889); *Anadara senegalensis* (Gmelin, 1791); *Anadara camerunensis* Oliver & Cosel, 1993; *Anadara geissei* (Dunker, 1891); *Senilia senilis* (Linnaeus, 1758).

Other species reported in the area (4)

Arca tetragona Poli, 1795. Cape Verde Is. 600 m (Dautzenberg & Fischer 1906).

Bathyarca inequisculpta (E.A. Smith, 1885) = *dakarensis* (Locard, 1898). Sénégal, 3200 m (Locard, 1898); off Guinea-Bissau, 1944-3828 m and off Namibia, 1964-5175 m (Oliver & Allen 1980a); also Caribbean and Bay of Biscay.

Bathyarca orbiculata (Dall, 1881). off Libéria, 3196 m and off Angola, 2370 m (Knudsen 1970); also S. Atlantic and Pacific oceans.

Bentharca asperula (Dall, 1881). off Liberia, 3196 m and off Equatorial Guinea, 2550 m (Knudsen 1970); off Namibia, 3138-4630 m (Oliver & Allen 1980a); also Caribbean, Indian Ocean and Pacific Ocean.

Family NOETIIDAE

Shells small to medium sized (up to 80 mm in genus *Noetia*), mostly subtrapezoidal, ovoid or subtriangular, equivalve, inequilateral. Surface with radial sculpture consisting of fine to strong ribs or costae, often with intercalated secondary riblets, these latter may form the principal ribs in adult specimens. Hinge with teeth configuration as in Arcidae. No byssal gape. The Noetiidae are distinguished from the Arcidae only by the vertical orientation (instead of chevron-like pattern) of the fibrous and lamellar elements in their ligament. - The species are infaunal in soft sediments or epifaunal and byssally attached to hard substrate such as the undersides of stones. There are 38 species known worldwide, 4 in West Africa revised in Oliver & Cosel (1993b).

Genus *Sheldonella* Maury, 1917. Shells small, resembling *Arca* with broad posterior part, equivalve, inflated to very inflated, with beaks well in front of the vertical midline, pointing forward. Surface with radial sculpture, dominated by the secondary riblets. Posterior angle in young specimens keeled, in adult sometimes rounded.

Genus *Stenocista* Oliver & Cosel, 1993. Shells small, oblong, equivalve, rather thin, typically compressed, inequilateral with beaks well in front of the vertical midline and not pointing forward. Dorsal area narrow, entirely covered by the ligament. Surface with radial sculpture, mostly formed by the secondary ribs.

Genus *Congetia* Huber, 2010. Shells small, trapezoidal, rather high, anteriorly broader, posteriorly narrow and truncated, quite solid, inflated, equivalve, with narrow to rather broad dorsal area. Beaks slightly behind the vertical midline. No byssal gape. Surface with numerous radial ribs or riblets and fine commarginal growth lines. Posterior angle well developed. Periostracum thick and scaly. - The species inhabit soft sediment. Based on a wrong assumption of the type species, Oliver & Cosel (1993b) used the genus *Noetiella* for the species included here.

Genus *Striarca* Conrad, 1862. Shells small, subrectangular to suboval, oblong, rather solid, inflated, equivalve, with rather broad dorsal area. Beaks generally more or less in front of the vertical midline. No byssal gape. Surface with small radial ribs or riblets, often with interstitial riblets. Hinge plate narrowing in the median part, bearing a continuous series of teeth. Periostracum with fine bristles.

Genus *Arcopsis* Koenen, 1885. Shells small, subrectangular, oblong, solid, equivalve, with narrow dorsal area. Beaks in front of the vertical midline. Surface with small but rather strong radial ribs and intercalated riblets. Periostracum with short bristles. Ligament consisting only of a shallow and short resilifer under the beaks, which makes an easy distinction from *Striarca*. Hinge plate parallel-sided but with differentiated anterior and posterior series of teeth, separated under the umbos.

Species treated (5, one with 2 subspecies)
Sheldonella minutalis Oliver & Cosel, 1993; *Stenocista gambiensis* (Reeve, 1844); *Congetia congoensis* (Thiele, 1931); *Striarca lactea scoliosa* Oliver & Cosel, 1993; *Striarca lactea epetrima* Oliver & Cosel, 1993; *Arcopsis afra* (Gmelin, 1791).

Family GLYCYMERIDIDAE

Shells rather small to large (over 100 mm), circular or subcircular to subtriangular in outline, thick and solid to very thick and heavy, equivalve and mostly equilateral with beaks near the vertical midline. Surface smooth or with fine to coarse radial sculpture. Periostracum usually conspicuous, variably developed according to the species, sometimes thick with a velvety

aspect. Hinge plate broad to very broad, curved, with strong, close-set, straight or chevron-shaped teeth. Dorsal area between umbos narrow to broad and deeply inset; chevrons present. Inner margin crenulate. Inside with muscle impressions about equal-sized, often raised on platforms. No pallial sinus. – There are 107 species known worldwide, six on the coast of tropical West Africa (Gould & Gulden 2009; Nolf & Swinnen 2013). The glycymerids live in soft bottom from muddy fine sand to coarse sand and gravel, mostly on subtidal shelf environments.

Genus *Glycymeris* da Costa, 1778. Shells medium-sized to large, nearly circular, almost equilateral or slightly inequilateral, with small umbos. Surface smooth or with fine radial sculpture.

Species treated (6)
Glycymeris scripta (Born, 1778); *Glycymeris stellata* (Bruguière, 1789); *Glycymeris rafaelmesai* Nolf & Swinnen, 2013; *Glycymeris formosa* (Reeve, 1843); *Glycymeris vanhengstumi* Goud & Gulden, 2009; *Glycymeris concentrica* (Dunker, 1853).

Superfamily LIMOPSOIDEA

Following inclusion of Glycymerididae in the Arcoidea, this superfamily currently includes only the families Limopsidae, which superficially resemble the Glycymerididae, and Philobryidae, a group of small, edentulous epifaunal bivalve distributed mostly in the Southern Hemisphere.

Family LIMOPSIDAE

Shells small to moderately large (usually 10 to 20 mm, largest species over 80 mm), thick and solid, equivalve, rounded to obliquely ovate in outline and usually inequilateral with the postero-ventral part larger and beaks more or less in front of the vertical midline, often higher than long. Surface with faint commarginal sculpture, radial lines, or both, sometimes smooth. Dorsal area narrow to rather broad, smooth, with ligament restricted to a more or less deeply inset resilifer. Hinge plate rather broad, more or less curved, with close-set, straight or chevron-shaped, more or less oblique teeth. Ventral margins closely appressed, inner margin smooth or crenulate. Muscle impressions slightly unequal: anterior scar slightly smaller than posterior scar. No pallial sinus. Periostracum well developed, usually with long stiff bristles more or less aligned along radial lines.

Most limopsids are deep water species inhabiting soft bottoms. There are 84 species known worldwide, 6 from West Africa. Several subgenera have been named according to characters of the ligament, the sculpture, or the crenulation of the ventral margin, but so far they have not proved to be consistently diagnosed and are not considered here. For general information and anatomy, see Oliver & Allen (1980b) and Oliver (1981).

Genus *Limopsis* Sassi, 1827. With characters of the family considering only one genus.

Species treated (2)
Limopsis pyrenoides Oliver & Cosel, 1995; *Limopsis aurita (*Brocchi, 1814).

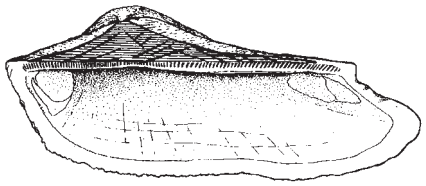
Other species reported in the area (4)
Limopsis galatheae Knudsen, 1970. Off Côte d'Ivoire, 5160 m (Knudsen 1970); off Guinea Bissau, 3814-3828 m and off Namibia, 4279-4829 m; also Western Atlantic (Oliver & Allen 1980b).

Limopsis minuta (Philippi, 1836). Cape Verde Is., 628-875 m (Dautzenberg & Fischer 1906).

Limopsis tenella (Jeffreys, 1876) = *pelagica* E.A. Smith, 1885 = *guineensis* Thiele, 1931. Off Congo, 4020 m and off Namibia, 3115 m (Knudsen 1970); also Indian Ocean.

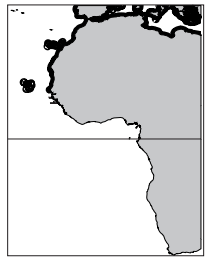
Limopsis cristata lanceolata Oliver & Allen, 1980. Off Angola and Namibia, 900-1590 m (Oliver & Allen 1980b).

Arca noae Linnaeus, 1758



2.1. West Sahara, Cap Barbas, 21°05'N, 17°14'W, 43-45 m (rv, 71 mm).

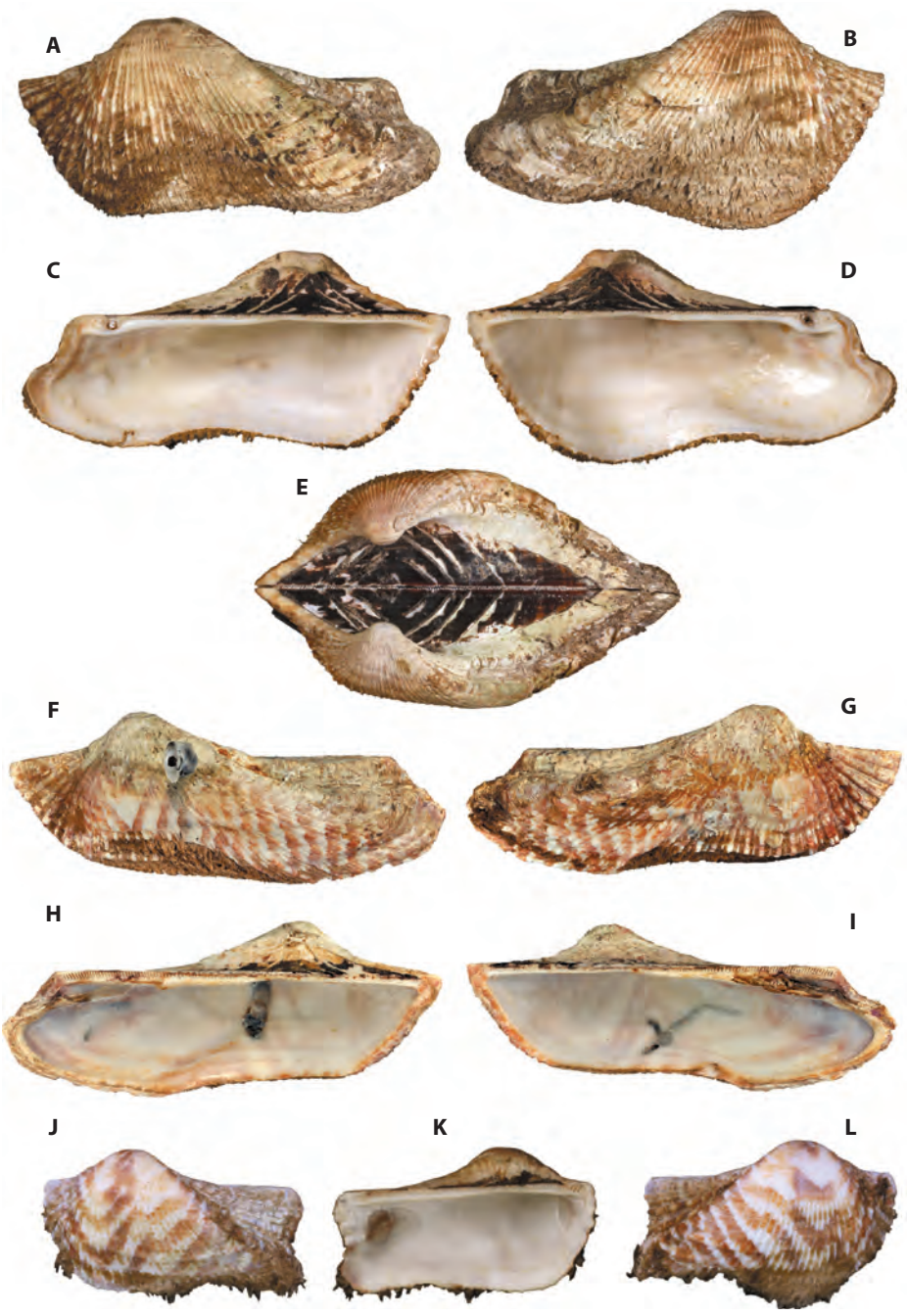
Shell up to 90 mm long, narrowly elongate, subtrapezoidal, solid, very inflated, equivalve, inequilateral with beaks in front of the vertical midline. Posterior angle carinate, becoming rounded towards the margin. Surface with narrow, radial ribs, riblets and raised threads, in juvenile specimens with 30-35 more or less uniform riblets, in fully grown specimens with 4-6 riblets on the anterior area, 10-15 riblets on the middle part, 5-8 narrow ribs on the postero-median zone and 2-3 broader, nearly obsolete ribs on the posterior area. Periostracum bristly, usually eroded, persistent along the margins and particularly around the byssal gape. Dorsal area very long, broad to very broad, more or less flat, in adult specimens nearly entirely covered by the ligament with numerous chevron-like incisions. Hinge plate very long and narrow, with an anterior set of up to 40 teeth and a posterior set of up to 60 teeth, all straight, more or less vertical and minutely serrated.Outside with white to cream background colour and densely spaced, oblique, somewhat zigzag bands of buff to rust brown; periostracum brown. Inside whitish, somewhat tinged with brown on the ventral margins.



Distribution. southern Portugal (rare at Lagos, Algarve) to Senegal (Saloum, 14°N); Canary Islands, Cape Verde Islands; throughout the Mediterranean. A few empty, most probably subfossil valves were found as far south as Guinea, 9°06'N.

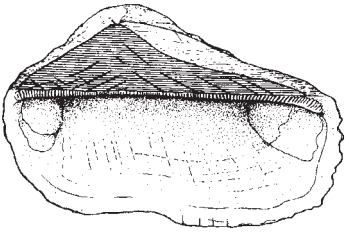
Biotope. Byssally attached to hard substrate such as rocks and stones, mostly among algal mats or in crevices; also on isolated stones, shells or other hard objects, from about 1 to 50 m, common.

Remarks. This species forms a species group with *Arca bouvieri* (see next entry), the Caribbean *A. zebra* Swainson, 1833, the Indo-Pacific *A. navicularis* Bruguière, 1789, and the Panamic-Pacific *A. pacifica* (G.B Sowerby I, 1833). The closest relative, however, and probably a sibling species is the recently discovered *A. symphenacis* Oliver & Chesney, 1994 which is endemic to the Southern Arabia upwelling area (see Oliver & Chesney 1994). Oliver & Cosel (1993a) considered *Arca despecta* P. Fischer, 1876 as a synonym, but Huber (2010: 559) instead considered it as a valid species differing from *Arca noae* in having more central umbos (*e.g.* Fig. 2.2F-I herein), the umbonal area flat (centrally elevated in *noae*) and in a paler colour pattern.



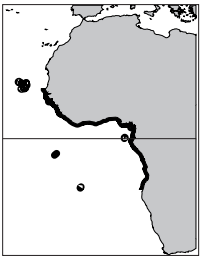
2.2. ***Arca noae*** **Linnaeus, 1758**. **A-E**, Pointe des Maures, Mauritania (82.5 mm). **F-I**, Port-Etienne (now Nouadhibou), Mauritania (83.1 mm, morphotype representative of *Arca despecta* P. Fischer, 1876). **J-L**, M'Bour, Petite Côte, Senegal, on beach (33.7 mm).

Arca bouvieri P. Fischer, 1874



2.3. Corimba, Luanda prov., Angola, 10-20 m (rv, 56.2 mm).

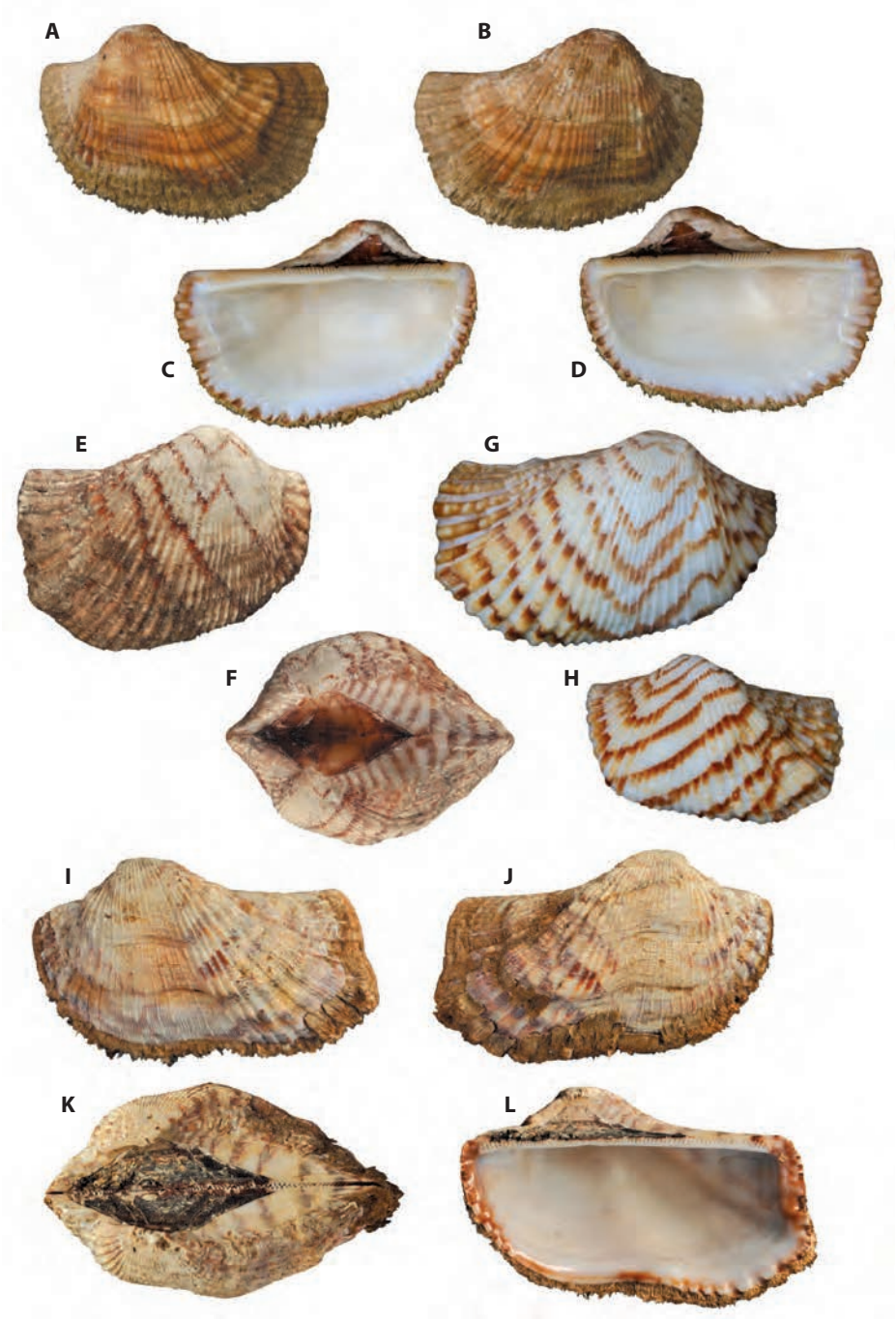
Shell up to 70 mm long, oblong-subtrapezoidal, solid, very inflated, equivalve, inequilateral with beaks in the anterior third. Posterior angle in juvenile specimens carinate, later becoming rounded. Surface with radial ribs, riblets and raised threads, juvenile specimens with about 30-35 more or less uniform riblets, those on the posterior area being much larger. In fully grown specimens anterior area with 4-6 ribs, median area with numerous riblets and raised threads and posterior and postero-median area with 8-10 rounded ribs and up to 6 raised threads in the interspaces. Periostracum consisting of thin, commarginal lamellae, mostly eroded and in adult specimens persistent only near the margins. Dorsal area long, very broad and nearly flat. Ligament with chevron-like incisions, in juvenile and half-grown specimens restricted to a triangular area between the beaks and only in fully grown specimens covering most of the dorsal area. Hinge plate narrow, with an anterior set of up to 40 and a posterior set of up to 50 teeth, all more or less vertical, straight and finely serrated. Outside cream with broad, oblique, sometimes zigzag bands of brick red to purplish red; posterior area often tending to an orange tinge. Periostracum light brown. Inside mostly white, marginally brick red.



Distribution. Senegal (Dakar) to southern Angola (Moçâmedes, Namibe Province); Cape Verde Islands, São Tomé, Ilha do Principe, Annobon; St. Helena, Ascension.

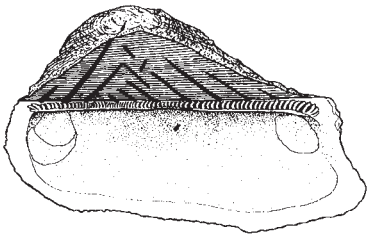
Biotope. Byssally attached on primary and secondary hard substrate such as rocks, stones, shell agglomerations, shells or pebbles on sand, mostly with calcareous algae, from 2 to about 60 m, not uncommon.

Remarks. This species differs from *A. noae* in being shorter and more quadrangular, in having a less protruding postero-ventral angle and in having well defined posterior ribs contrasting with the smaller median ones. *Arca bouvieri* is in fact closer to the Caribbean *A. zebra* Swainson, 1833 and *A. navicularis* Bruguière, 1789 than to *A. noae*. Its distribution range overlaps with that of *A. noae* in Senegal and the Cape Verde Islands. Empty valves are occasionally found on certain beaches, *e.g.* in the Cape Verde Islands. A synonym is *A. sanctaehelenae* E.A. Smith, 1890.



2.4. ***Arca bouvieri*** **P. Fischer, 1874**. **A-D**, Dakar area, Senegal, 14°2.5'N, 17°09'W (48.5 mm). **E-F**, São Tomé, shore (39.5 mm). **G-H**, Ile aux Pigeons, Port-Gentil, Gabon (57 mm, 43 mm). **I-L**, Corimba, N-Angola, 10-20 m (57.1 mm).

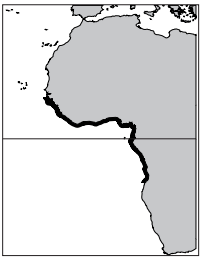
Arca avellana turbatrix Oliver & Cosel, 1993



2.5. Santo Antonio, Benguela prov., Angola, low tide (rv, 31.6 mm).

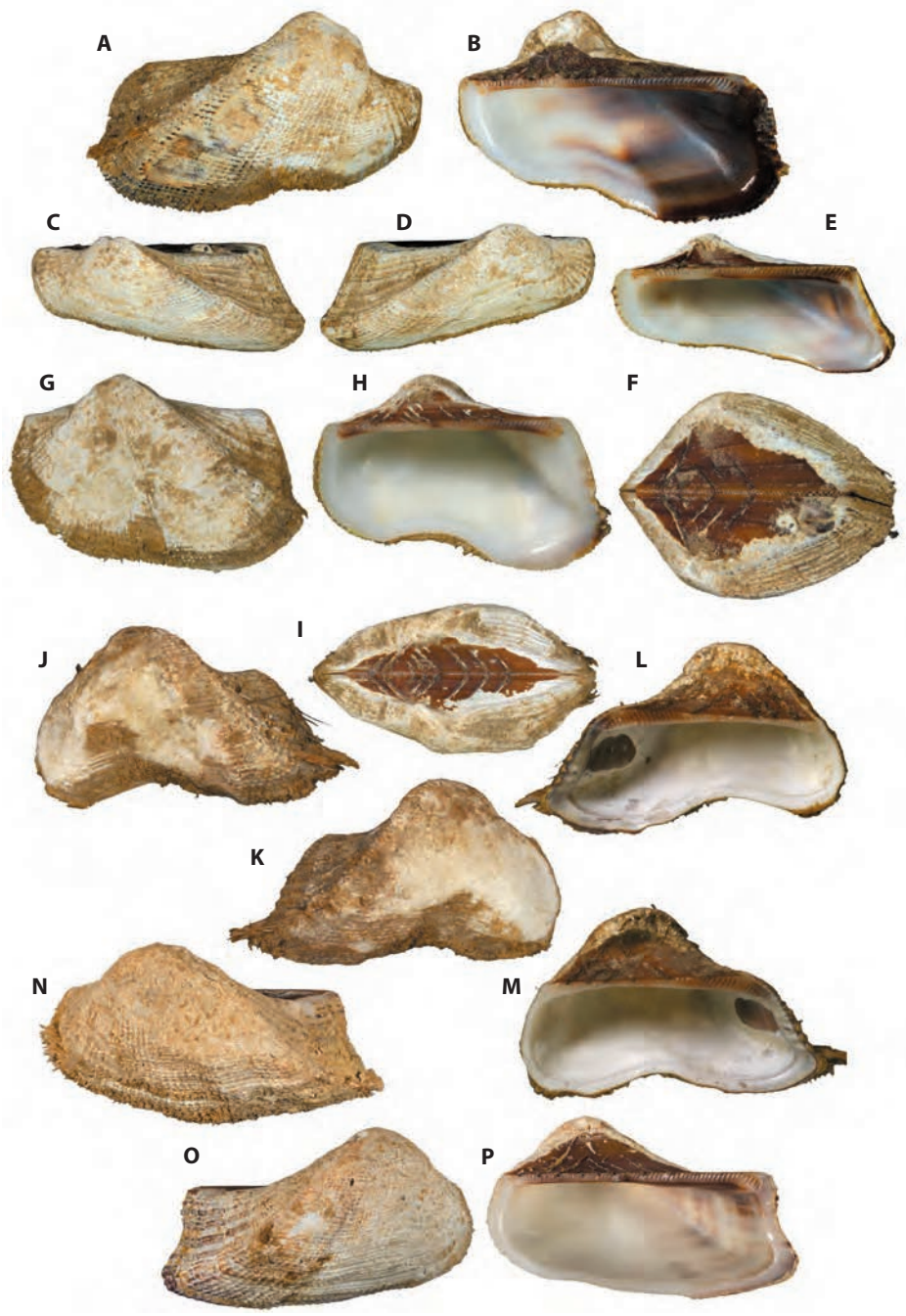
Shell up to 35 mm long, variable in shape and often distorted, subtrapezoidal to nearly rectangular, somewhat elongate, solid, very inflated, equivalve, inequilateral, with beaks well in front of the vertical midline. Posterior angle prominent and often carinate. Surface with numerous, nodulose, radial ribs or riblets of different strength, most prominent on the posterior area and narrower on the anterior and middle part, often with threads in the interspaces. Periostracum commarginally laminar, persistent mostly around the byssal gape and on the posterior angle where it forms a row of long bristles. Dorsal area very broad to extremely wide, in adult specimens nearly entirely covered by the ligament, with irregular chevrons, up to 10 in fully grown specimens. Hinge plate narrow, with an anterior set of up to 38 teeth and a posterior set of up to 43 teeth, all minutely serrated, the posterior marginal teeth becoming chevron-shaped, the others straight and vertical. Outside dirty-cream, with a mauve-brown tinge along the posterior margin, occasionally extending onto the posterior third, over the hinge plate and onto the anterior area; periostracum brown. Inside whitish, occasionally tinged with dark mauve-brown in the posterior part.

Distribution. Senegal (Casamance, rare), Guinea (Conakry) to southern Angola (Lucira, Namibe province).



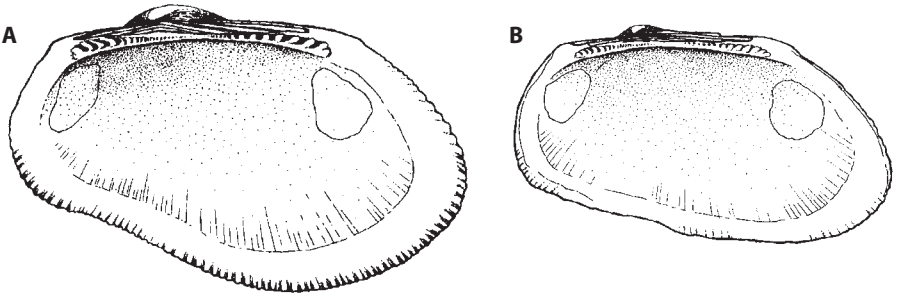
Biotope. Byssally attached to rocks and stones, generally on the underside, from low tide level to about 20 m, only locally common. The species is mostly found in turbid, more or less sediment-laden waters and seems to prefer periodical influence of fresh water with somewhat reduced salinities. On the Iles de Los, Guinea, it was found together with *Barbatia complanata*, *Mesocibota allocostata*, *Brachidontes niger*, *Crassostrea tulipa*, *Isognomon dunkeri* and the gastropod *Turritella gemmata* Reeve, 1849.

Remarks. This species had been erroneously identified as *A. tetragona* Poli, 1795 and *A. imbricata* Bruguière, 1789. The West African subspecies forms a group with the Caribbean *A. imbricata* and the Indo-Pacific *A. avellana avellana* Lamarck, 1819. From both it is distinguished mostly by its smaller size and the frequently more whitish interior. Huber (2010) raised *A. turbatrix* to species level and used the forgotten name *Arca patriarchalis* Röding, 1798 for the Indo-Pacific counterpart; however, the West African form is so similar to Indo-Pacific specimens that it is here considered as a geographic subspecies.



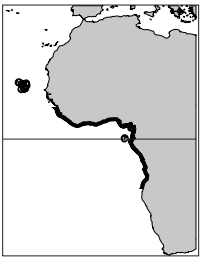
2.6. ***Arca avellana turbatrix*** **Oliver & Cosel, 1993**. **A-B**, Ambas Island, off Victoria (now Limbe), Cameroon (31.2 mm). **C-F**, same locality (26.5 mm). **G-I**, same locality (28.3 mm). **J-M**, Cap Esterias, Gabon, between rocks at low tide (20.2 mm). **N-P,** Santo Antonio, S. Angola, low tide (holotype, 28.3 mm, photo Manuel Caballer/Recolnat).

Barbatia complanata (Bruguière, 1789)



2.7. **A,** Canal de Vridi, Abidjan, Côte d'Ivoire (large rv, 48 mm). **B**, Caotinha, Benguela prov., Angola (small rv, 40 mm).

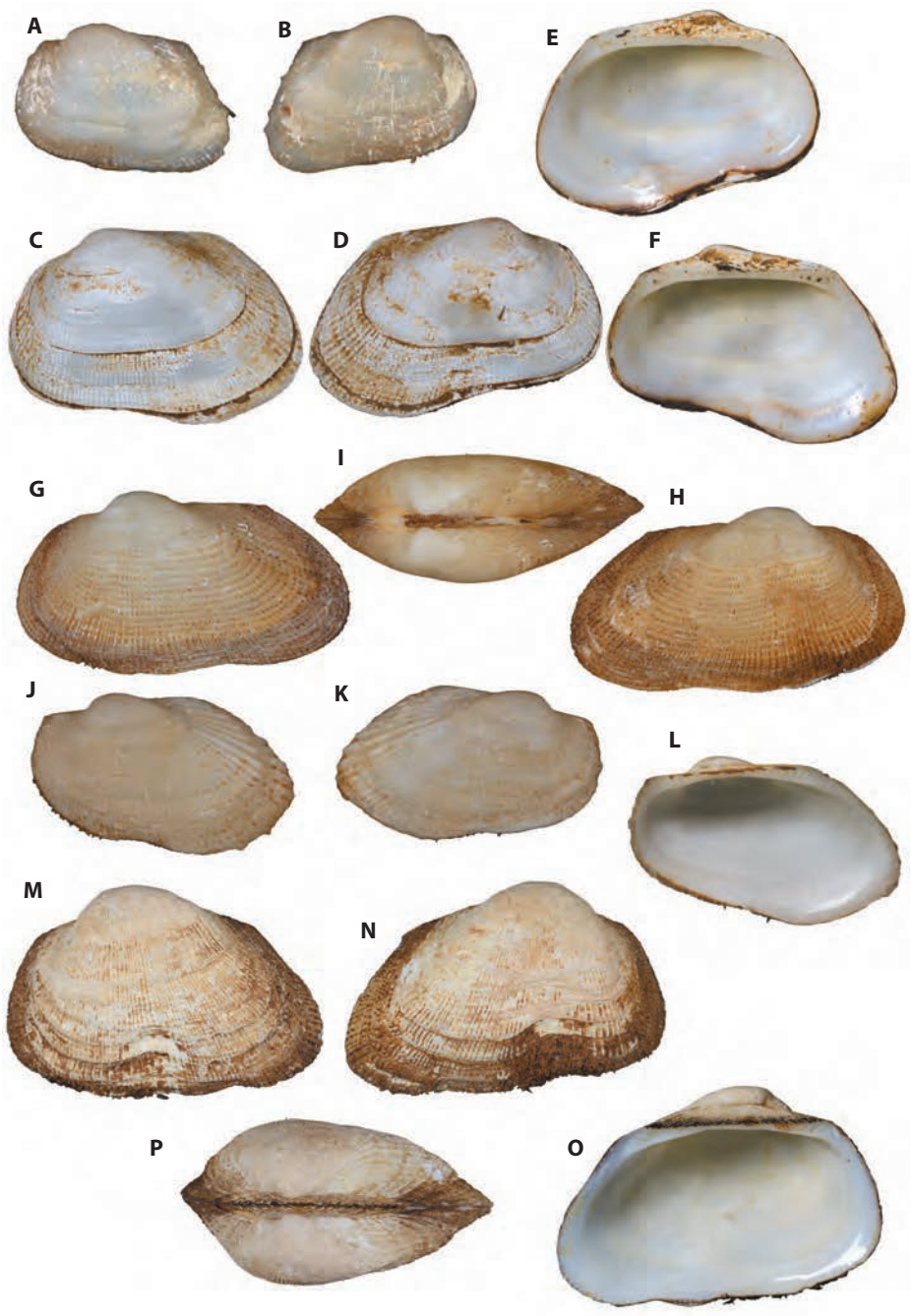
Shell up to 50 mm long, variable in shape and tumidity, often weakly distorted, subrectangular to subtrapezoidal, somewhat elongate, solid, more or less compressed, equivalve, inequilateral, with beaks in the anterior third. Surface with numerous radial ribs and riblets, on the anterior and middle area 50-60 primary riblets, on the posterior area 6-7 large ribs, often with 1-3 secondary riblets. Posterior median riblets bifurcating at an early stage. Commarginal sculpture crossed by radial sculpture, giving the surface a nodulose appearance. Posterior area poorly delimited by a low, weakly angled posterior ridge, more noticeably demarcated by the change in the size of the ribs. Periostracum with a primarily commarginal arrangement of raised lamellae and slightly emergent bristles in the interspaces. Dorsal area narrow to very narrow and deeply inset. Ligament anteriorly extending well beyond the beaks. Chevrons narrow, in very old specimens up to 12. Hinge plate narrow in the middle, with about 45 teeth in total, anterior and posterior set scarcely separated. Lateral teeth laminar or chevron-shaped, becoming strongly oblique. Outside and inside of shell white, periostracum brown.



Distribution. Guinea (Conakry area) southward to southern Angola (Moçâmedes, Namibe province); Cape Verde Islands (rare); São Tomé, Ilha do Principe, Annobon.

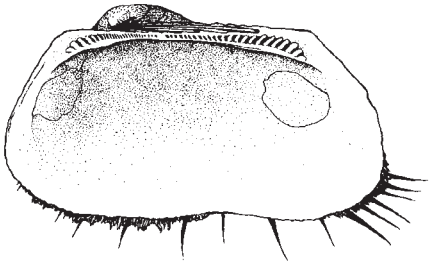
Biotope. Byssally attached to the undersides of rocks, stones and other hard objects, on rocky bottoms, from low tide level to about 40 m, locally common.

Remarks. This species had been cited under the names: *B. helblingii* (Bruguière, 1789) = *B. candida* (Helbling, 1779) which refer to a Caribbean species. *Barbatia stigmosa* (Dunker, 1853) is a synonym. Another similar Indo-Pacific species is *B. foliata* (Forsskål, 1775) = *B. nivea* (Röding, 1798), however, Oliver & Cosel (1993a) found the Caribbean *B. candida* being more closely related.



2.8. *Barbatia complanata* (Bruguière, 1789). **A**-**B**, Ilha do Sal, Cape Verde Islands (9.9 mm). **C**-**F**, Mondoleh Island, Ambas Bay, off Victoria (now Limbe), Cameroon (35.5 mm). **G**-**I**, Annobon, 1°25.2'S, 5°36'E (39.1 mm). **J**-**L**, Annobon, 1°24'S, 5°37.5'E (20.3 mm). **M**-**P**, Praia do Cesar, Lucira, S-Angola (44.2 mm).

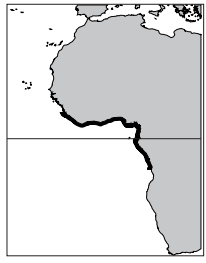
Barbatia gabonensis Oliver & Cosel, 1993



2.9. Off Mayumba, Gabon (27.7 mm without barbs).

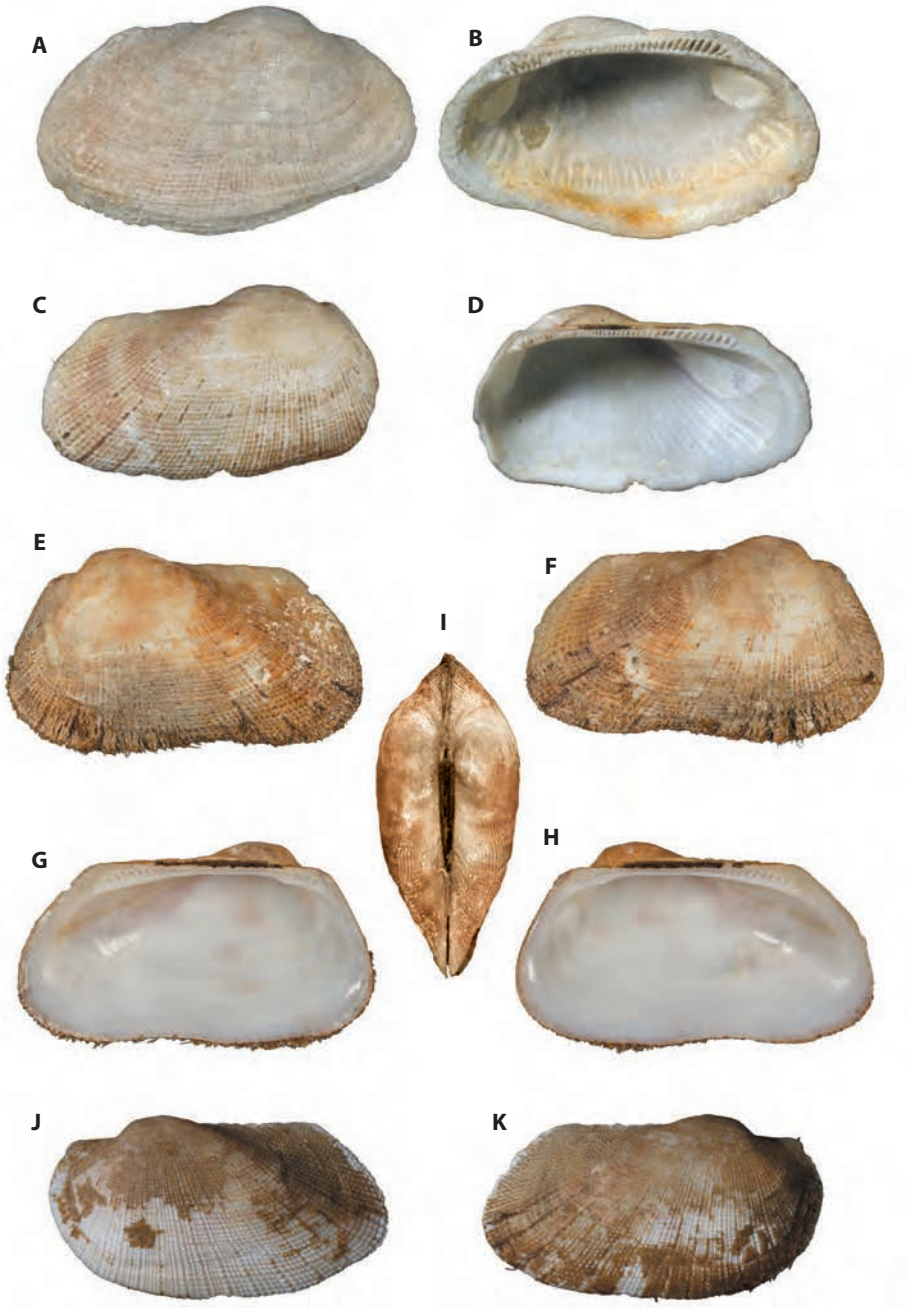
Shell up to 30 mm long, rather uniform, roughly rectangular with nearly parallel dorsal and ventral margins, not very thick, rather compressed, equivalve, inequilateral, with beaks well in front of the vertical midline. Posterior angle smoothly rounded, posterior area indistinct. Surface with about 90-110 fine, nodulose, radial riblets and 13-18 pairs of larger riblets with distinct radial grooves bordered by each pair. Periostracum mostly lamellar except for long, somewhat tubular, dark brown bristles arising from the radial grooves. Dorsal area very narrow, umbos close together. Ligament absent anteriorly, extending from between the beaks towards the posterior end. Chevrons narrow, up to 7 in fully grown specimens. Hinge plate rather broad, with an anterior set of up to 10 teeth and a posterior set of up to 16 teeth, separation indistinct. Teeth serrated, straight or slightly chevron-shaped, becoming slightly oblique towards the ends of the hinge plate. Outside and inside white, occasionally with faint tinges of brown or brownish pink. Periostracum straw coloured.

Distribution. Known only from Côte d'Ivoire to northern Angola (Luanda).



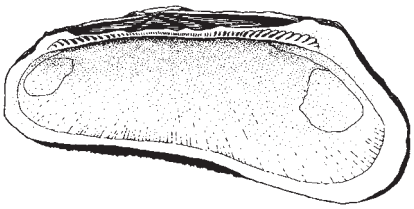
Biotope. Byssally attached to hard objects on soft bottom, well offshore, 90-100 m, rare.

Remarks. Apart from the entirely different biotope, this species is distinguished from *B. complanata* by the series of distinct radial grooves which bear the characteristic, long periostracal bristles. Close Indian Ocean species are *B. sculpturata* Turton, 1932 from South Africa and *B. perinesa* Oliver & Chesney, 1994 from the Northern Indian Ocean (Oman to Pakistan).



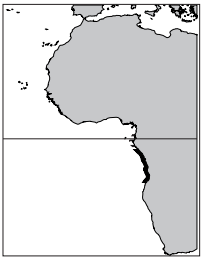
2.10. ***Barbatia gabonensis*** **Oliver & Cosel, 1993**. **A-B**, Ghana, 4°37'N, 0°50'W, 90-100 m (26.1 mm). **C-D**, same locality (23.3 mm). **E-I**, Mayumba, Gabon, 3°25'S, 9°56'E, 100 m (holotype, 27.7 mm, photo Manuel Caballer/ Recolnat). **J-K**, off Pointe-Noire, Congo (21.6 mm).

Barbatia legumen (Lamy, 1907)



2.11. Corimba, Luanda prov., Angola, low tide (39.6 mm).

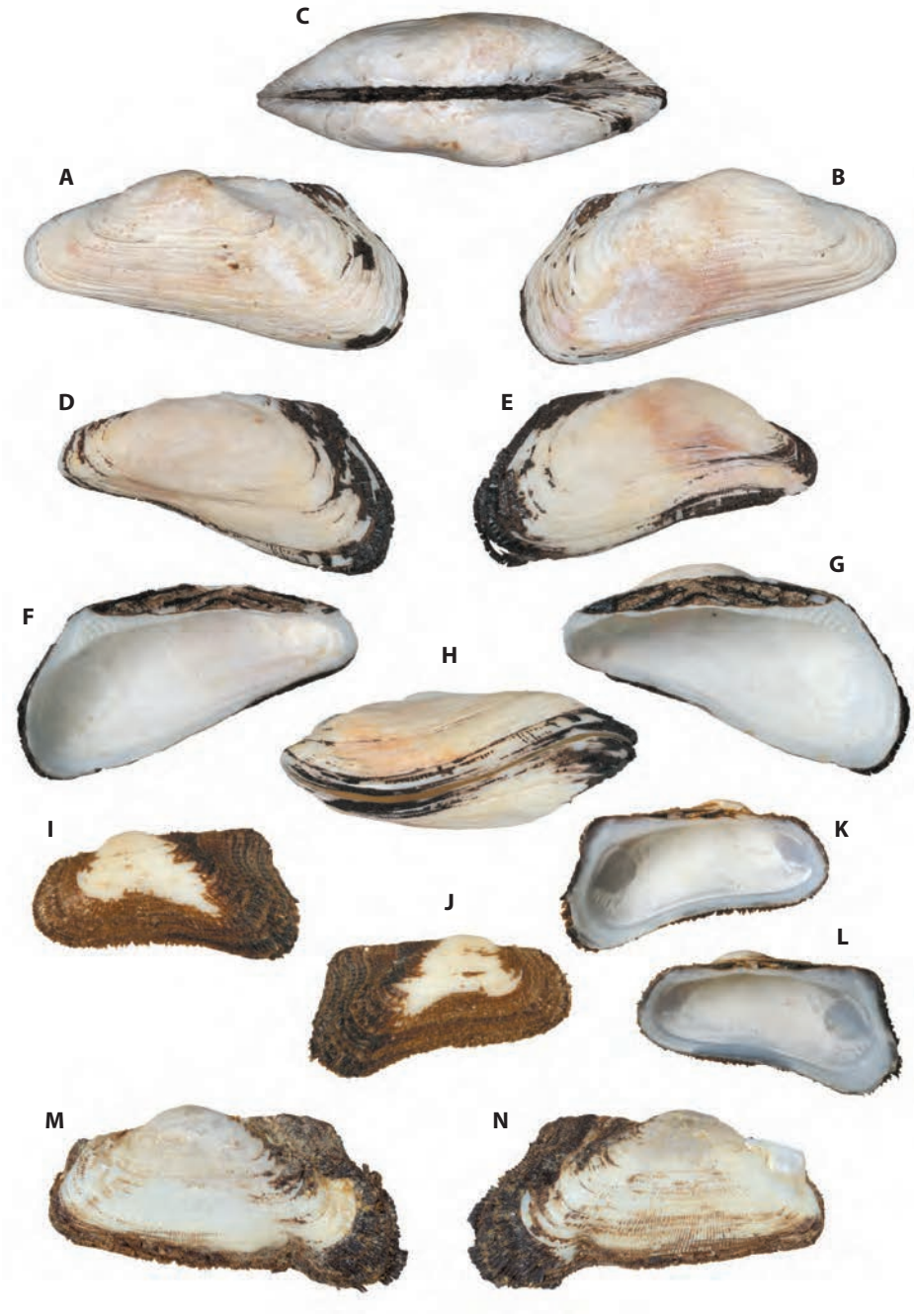
Shell up to 45 mm long, somewhat variable, nearly mytiliform, often arched and faintly to markedly twisted, with narrow anterior part and broad posterior part, elongate, solid, compressed, equivalve, inequilateral with beaks in the anterior third. Posterior angle broad, rounded and forming the greater part of the posterior half of the shell. Surface with numerous radial riblets which are often worn and are best preserved on the middle part of the valves. Periostracum consisting of thick, commarginal, lamellar layers with scarcely emergent bristles. Younger specimens with broad bristles on the posterior angle. Dorsal area very narrow and deeply inset, umbos rather close together. Ligament almost entirely lamellar, extending over the whole dorsal area; chevrons very strong, up to 5 in adult specimens. Hinge plate rather broad, with in total up to 50 teeth which are finely serrated, finely chevron-shaped and becoming oblique at both ends of the plate. Median teeth usually worn, giving the appearance of distinct and well separated anterior and posterior sets. Outside white to cream, inside white, in juveniles somewhat bluish. Periostracum dark brown.



Distribution. Equatorial Guinea, Gabon and Congo (Pointe-Indienne and Baie de Pointe-Noire) to Angola (Benguela). No recent findings in Gabon and Equatorial Guinea.

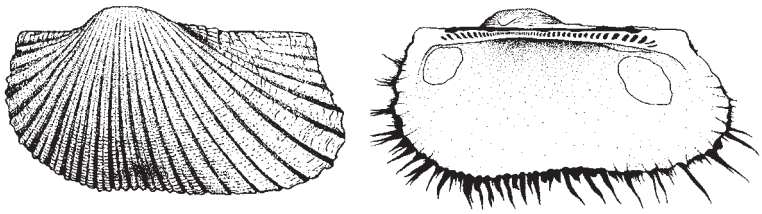
Biotope. Byssally attached to rocks and stones, mostly on the undersides, also on secondary hard substrate on soft bottoms, from low tide mark to 1-2 m, locally not uncommon.

Remarks. This species is very close to *B. obliquata* (Wood, 1828) from South Africa, southern Madagascar and the Indian Ocean, which has a longer posterior part and the ligament is restricted to behind the beaks, the valves are tinged with brownish, in contrast to the white valves of *B. legumen*. Another close species is *B. virescens* (Reeve, 1844) from the Western Pacific, which is shorter with more pronounced sculpture and a more spicate periostracum.



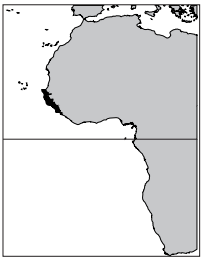
2.12. *Barbatia legumen* (Lamy, 1907). **A**-**C**, Baie de Pointe-Noire, Congo (Brazzaville), littoral (53.6 mm). **D**-**H**, same locality (34.7 mm). **I**-**L**, Ambrizete, N-Angola (17.1 mm). **M**-**N**, Santo Antonio, Benguela, S-Angola, rocks on shore (30.0 mm).

Mesocibota allocostata (Oliver & Cosel, 1993)



2.13. Off mouth of Rio Geba, Guinea-Bissau, 11°57.5'N, 16°27'W, 7 m (lv devoid of periostracum, 28.5 mm; rv, 27.9 mm without barbs).

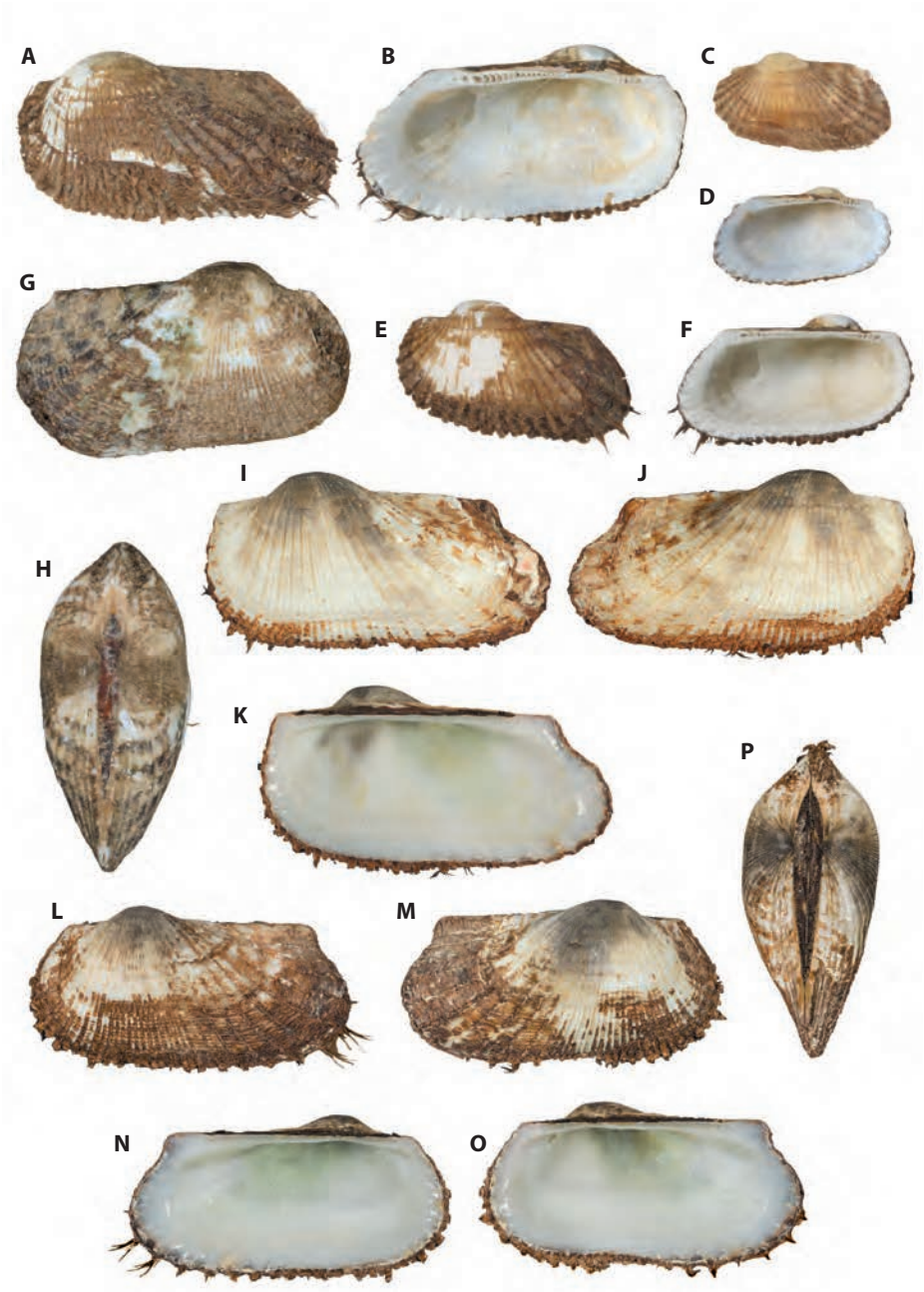
Shell up to 35 mm long, somewhat variable in outline and tumidity, subrectangular, somewhat elongate, rather thin but solid, inflated on the anterior umbonal region, equivalve, inequilateral, with the beaks at the anterior third. Posterior angle rounded and becoming obsolete. Surface with 26-28 radial ribs of which the anterior ones are simple and irregularly nodulose, the median ones deeply bifurcate and nodulose and the posterior 10-12 ribs broad, flat and more or less smooth. Periostracum consisting of dark brown bristles arising from the rib interspaces, becoming very long over the posterior angle, short and fragile on the rest of the shell. Dorsal area narrow, nearly flat, umbos well separated; ligament in young specimens behind the beaks only, in adult specimens also in front of the beaks, with up to 3 chevrons in fully grown specimens. Hinge plate narrow, with up to 50 small, weakly serrated and more or less straight teeth which in the middle are vertical and become slightly oblique towards the ends. Indistinct separation of the two teeth sets. Outside of shell white, umbos often grey, posterior area occasionally with brown blotches. Periostracum dark brown. Inside white with greenish or greyish green under the umbos.



Distribution. So far only known from Senegal (southern Casamance) to the Guinea-Sierra Leone border (9°N).

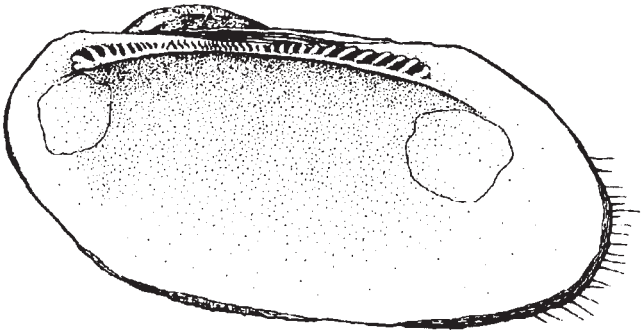
Biotope. Byssally attached to rocks and stones, mostly on the undersides, from low tide level to shallow water, or more offshore on oyster beds, between oysters, on pebbles and on shells of large gastropods, down to about 20 m, locally not uncommon to abundant. The species is confined to murky, sediment-laden waters with estuarine influence and seasonal salinity changes; it is mostly found together with *Crassostrea tulipa*, *Anomia ephippium* and the snails *Turritella gemmata* Reeve, 1849 and *Stramonita haemastoma* (Linnaeus, 1767).

Remarks. This species is very close to the Indo-Pacific *Mesocibota bistrigata* (Dunker, 1866), but is smaller, with less developed marginal crenulations and minor differences in the sculpture.



2.14. ***Mesocibota allocostata*** **(Oliver & Cosel, 1993)**. **A**-**B**, Ziguinchor, Casamance River, Senegal, 3-5 m (lv, 19.5 mm). **C**-**D**, same locality (14.5 mm). **E**-**F**, same locality (10.8 mm) **G**-**H**, Essoukoudiak Bôlon, S-Casamance, 5-6 m, coarse sand (21.4 mm). **I**-**K**, Guinea-Bissau, mouth of Rio Geba, 11°57.5'N, 16°27'W, 7 m (paratype, 31.1 mm, photo Manuel Caballer/Recolnat). **L**-**P**, same locality (holotype, 28.4 mm, photo Manuel Caballer/Recolnat).

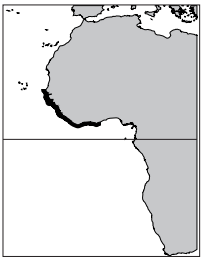
Calloarca ionthados (Oliver & Cosel, 1993)



2.15. S of Grand Bassam, Côte d'Ivoire, 200 m (rv, 20.6 mm, holotype).

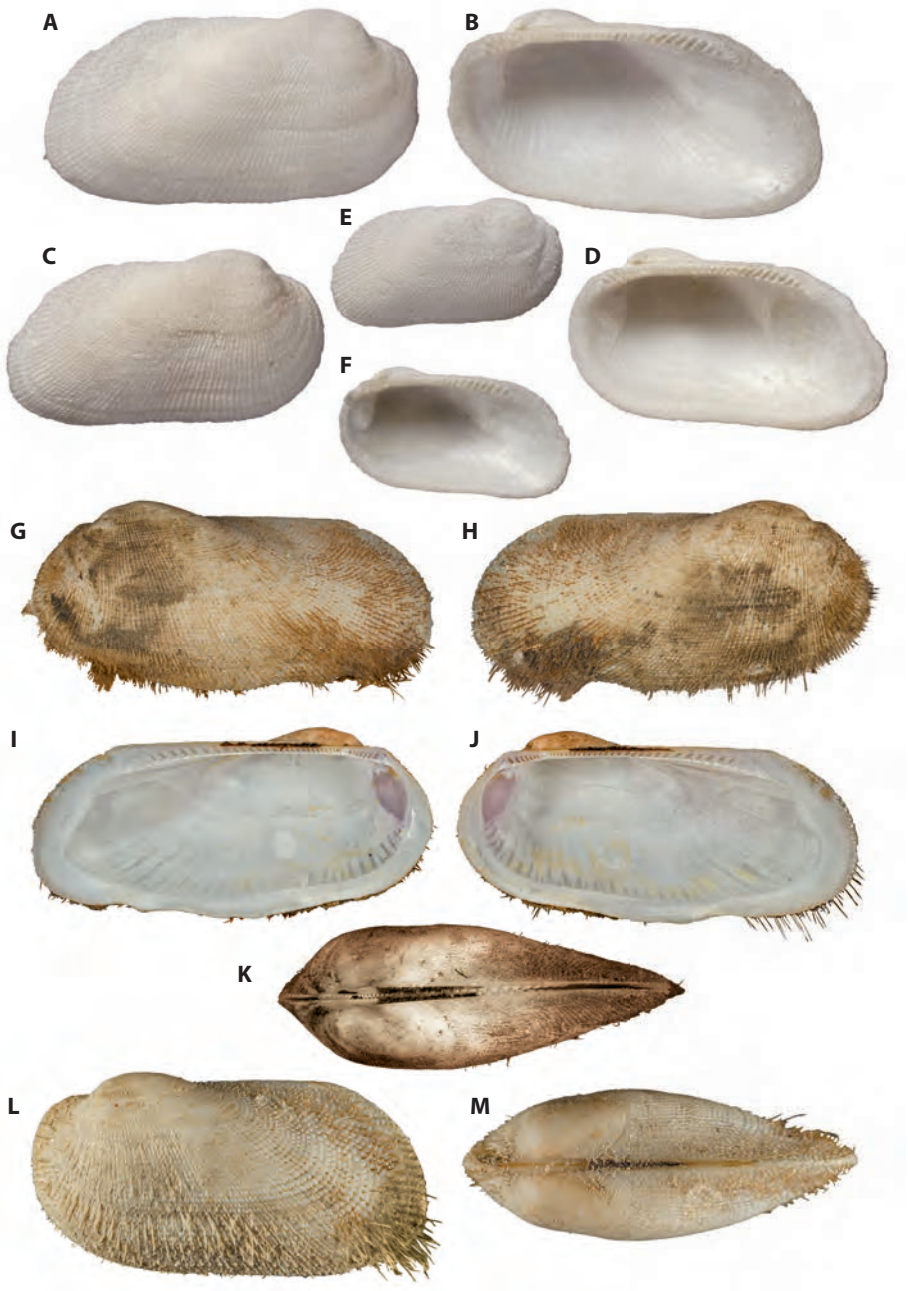
Shell up to 21 mm long, elongate-rectangular with more or less parallel dorsal and ventral margins, very fragile, somewhat compressed, equivalve, inequilateral with beaks in the anterior fifth. Posterior angle rounded but distinct. Surface with 88-96 very fine, weakly nodulose, radial riblets, becoming even finer anteriorly. Periostracum consisting of long, very fine bristles which are longest on the posterior angle and most erect on the posterior slope. Dorsal area very narrow, umbos not far away from each other. Ligament only on the posterior part; chevrons narrow, not more than 4 in adult specimens. Hinge plate long and narrow, with an anterior set of up to 9 teeth and a posterior set of up to 31 teeth, all small, more or less straight and finely serrated. Lateral teeth slightly oblique. Outside and inside uniform white.

Distribution. Only known from Senegal (Dakar) to Ghana.



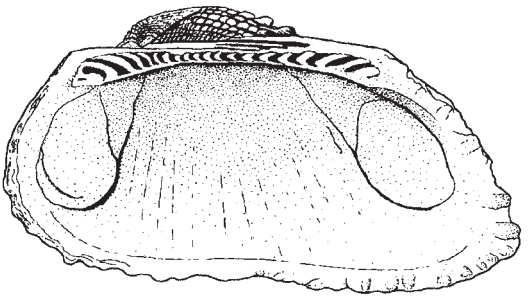
Biotope. Byssally attached to hard objects, most probably on soft bottom, well offshore from about 100 to 200 m, rare.

Remarks. This species is most closely related to the Indo-Pacific *C. tenella* (Reeve, 1844), with which it shares the fragile shell, the posterior ligament, the fine sculpture and the spicate periostracum.



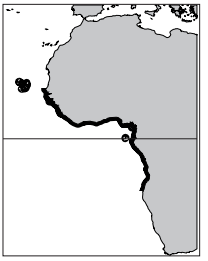
2.16. ***Calloarca ionthados*** **(Oliver & Cosel, 1993)**. **A-B**, off Gorée, Senegal, 80 m (rv, 15.4 mm). **C-D**, same locality (13.2 mm). **E-F**, same locality (9.8 mm). **G-K**, Grand Bassam, Côte d'Ivoire, 200 m (holotype, 20.6 mm, photo Manuel Caballer/Recolnat). **L-M**, Cape Three Points, Ghana, 4°43.5'N, 2°45.5'W, 100 m (paratype, 11.1 mm, photo Manuel Caballer/Recolnat).

Acar olivercoseli Huber, 2010



2.17. São Tomé (rv, 18.2 mm).

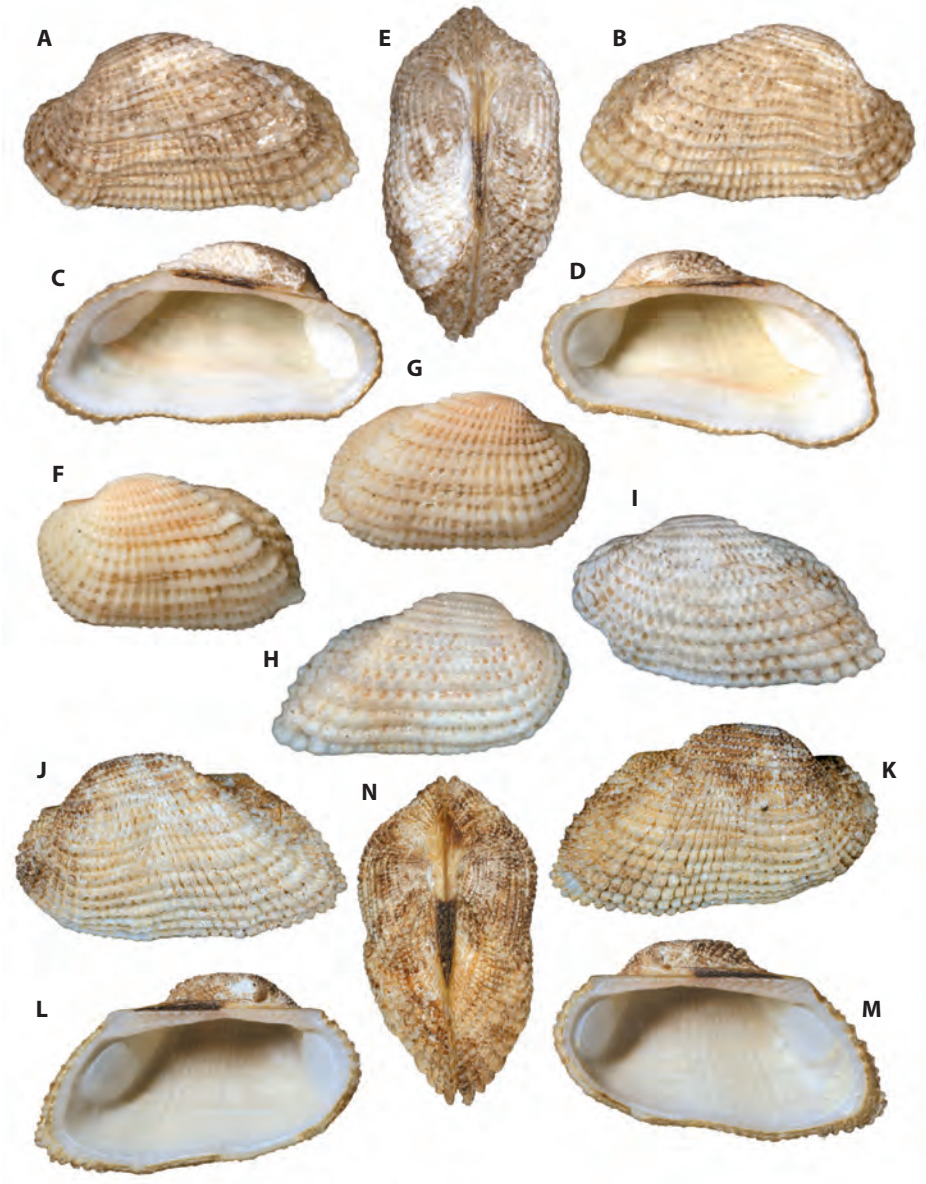
Shell up to 26 mm long, variable in shape and tumidity and often distorted, especially in very old specimens, subrectangular to subtrapezoidal, oblong, solid, slightly inflated to very inflated, equivalve, inequilateral with beaks in the anterior fourth. Posterior angle keeled. Surface with up to 30 rather broad commarginal ridges, crossed by 25-35 radial ribs which divide during growth to form up to 50 in very old specimens. Periostracum very thin, normally entirely eroded. Dorsal area usually very narrow, in very old specimens becoming wider. Ligament restricted to well behind the beaks, chevrons very narrow, up to 8 in average specimens but up to 20 in very old and extremely tumid ones. Hinge plate rather narrow, with an anterior set of up to 10 teeth and a posterior set of up to 15 teeth, all strong and coarsely serrated, anterior teeth laminar, posterior teeth chevron-shaped, marginal teeth becoming very oblique. Outside dirty cream to orange, inside white, in most specimens from the islands off tropical West Africa and occasionally in Angolan specimens tinged with pale orange-pink.



Distribution. Eastern Atlantic: Senegal (Dakar, rare) to Southern Angola (Praia Amelia, Namibe province), Cape Verde Islands, São Tomé, Principe, Annobon.

Biotope. Byssally attached to the undersides of rocks and stones which are embedded in coarse sediment where water still can circulate, and in crevices, from low tide level to several metres, in clear water, common on the Cape Verde Islands and in Angola, uncommon to rare on the remaining coast.

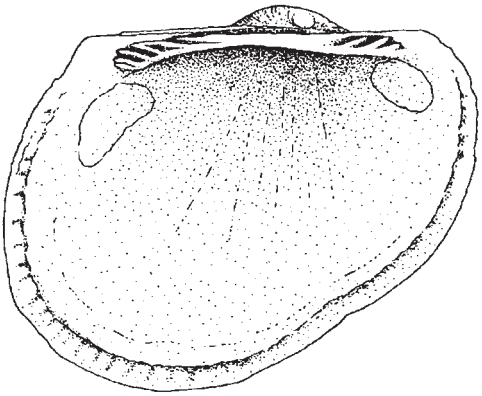
Remarks. This species is very close to the Mediterranean *A. clathrata* (Defrance, 1816), the Caribbean *A. domingensis* (Lamarck, 1819) and the Panamic-Pacific *A. gradata* (Broderip & G.B. Sowerby I, 1829). Records of *Acar clathrata* from West Africa refer to the present species. They are mainly distinguished by the coarseness of the sculpture and the degree to which the radial and the commarginal elements fuse into either nodules or fluted lamellae. *Acar clathrata* is smaller than the other species and has predominant fluted commarginal lamellae. Huber (2010a: 130, 2010b: 4, fig. 1) separated the West African population so far identified with the Indo-Pacific *Acar plicata* (Dillwyn, 1817) as a new species *Acar olivercoseli* Huber, 2010. In comparing it with the Indo-West Pacific populations, he stated a "more regular, less lamellar posterior sculpture", a "narrower and more elongate … shape" and a "significantly smaller" size. Specific rank remains



2.18. *Acar olivercoseli* Huber, 2010. **A**-**E**, Baia Matiota, São Vicente, Cape Verde Islands (18.5 mm). **F**-**G**, same locality (12.8 mm). **H**-**I**, Loango, Congo (16.0 mm). **J**-**N**, Baia das Pipas, S Angola, shore, under rocks (26.1 mm).

uncertain until DNA characters are studied. *Acar plicata* is found from East Africa to the Red Sea and widely throughout the Indo-West Pacific. This species was misidentified as the Panamic *Acar gradata* (Broderip & Sowerby, 1829) by Locard (1898), cited from the shore of São Vicente (Cape Verde Islands).

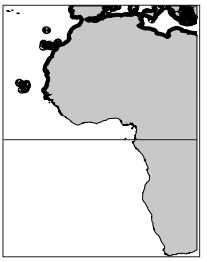
Bathyarca pectunculoides (Scacchi, 1835)



2.19. SW of Gorée, Senegal, 150-250 m (lv, 4.0 mm).

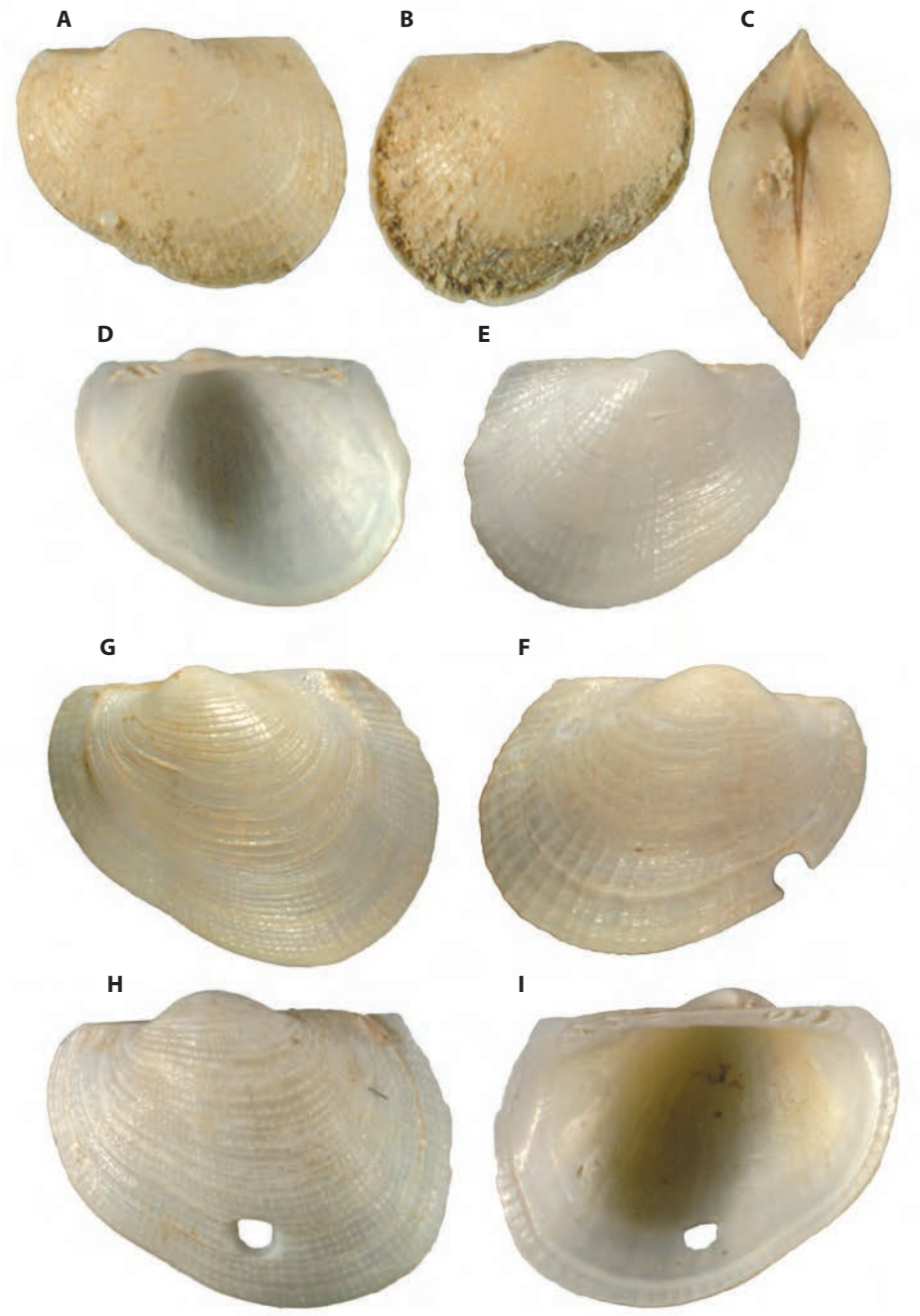
Shell small, up to 6 mm long, somewhat oval, posteriorly expanded, rather thin, not very inflated, inequivalve, right valve slightly smaller than left valve, inequilateral, with beaks in front of the vertical midline. Posterior angle rapidly becoming obsolete with growth. Surface with weak, subcancellate sculpture. Periostracum weakly haired. Dorsal area narrow, ligament only behind the beaks, with few chevrons in adult specimens. Beaks rather close together. Hinge plate narrow, with an anterior set of up to 5 teeth and a posterior set of up to 8 teeth, all small and straight, lateral teeth becoming strongly oblique. Umbonal separation well marked. Valves entirely whitish to yellowish.

Distribution. Eastern Atlantic: Norway (70°N) to Senegal (Dakar region), previous records from Angola are unconfirmed; Azores, Madeira, Canary Islands; Mediterranean. Western Atlantic: Greenland to Bermuda.



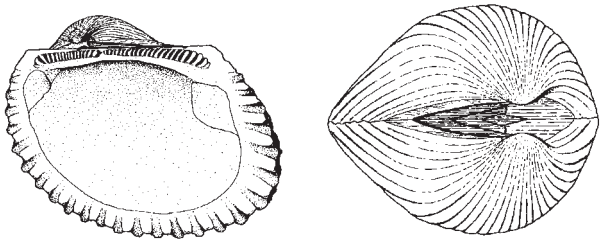
Biotope. Byssally attached to secondary hard substrate such as stones, dead shells, coral pieces etc. in soft sediment areas, but also on hard bottom, from 200 to 500 m, in the northern part of its range also much shallower, 70 m in the Mediterranean and from 2 m downward in Scandinavia.

Remarks. This is the type species of the genus *Bathyarca*. Several authors, *e.g.* Oliver & Cosel (1993a) have incorrectly used the name *Bathyarca grenophia* (Risso, 1826) for this species, however, the lectotype of *Arca grenophia* in MNHN has finally been identified as *B. philippiana* (Nyst, 1848) and the name *B. pectunculoides* restored by an ICZN Opinion (see Salas 1996).



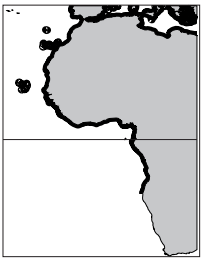
2.20. ***Bathyarca pectunculoides*** **(Scacchi, 1835)**. **A**-**C**, Dakar, Senegal, N of Cap Vert peninsula, 205-230 m (2.6 mm). **D**-**E**, Baie de Gorée, Senegal, 170-200 m (3.0 mm). **F**, same locality (3.5 mm). **G**-**I**, SW of Gorée, Senegal, 150-250 m (4.1 mm).

Anadara gibbosa (Reeve, 1844)



2.21. Cameroon, 2°39'N, 9'40'E, 60-65 m, anteriorly constricted morph (23.5 mm).

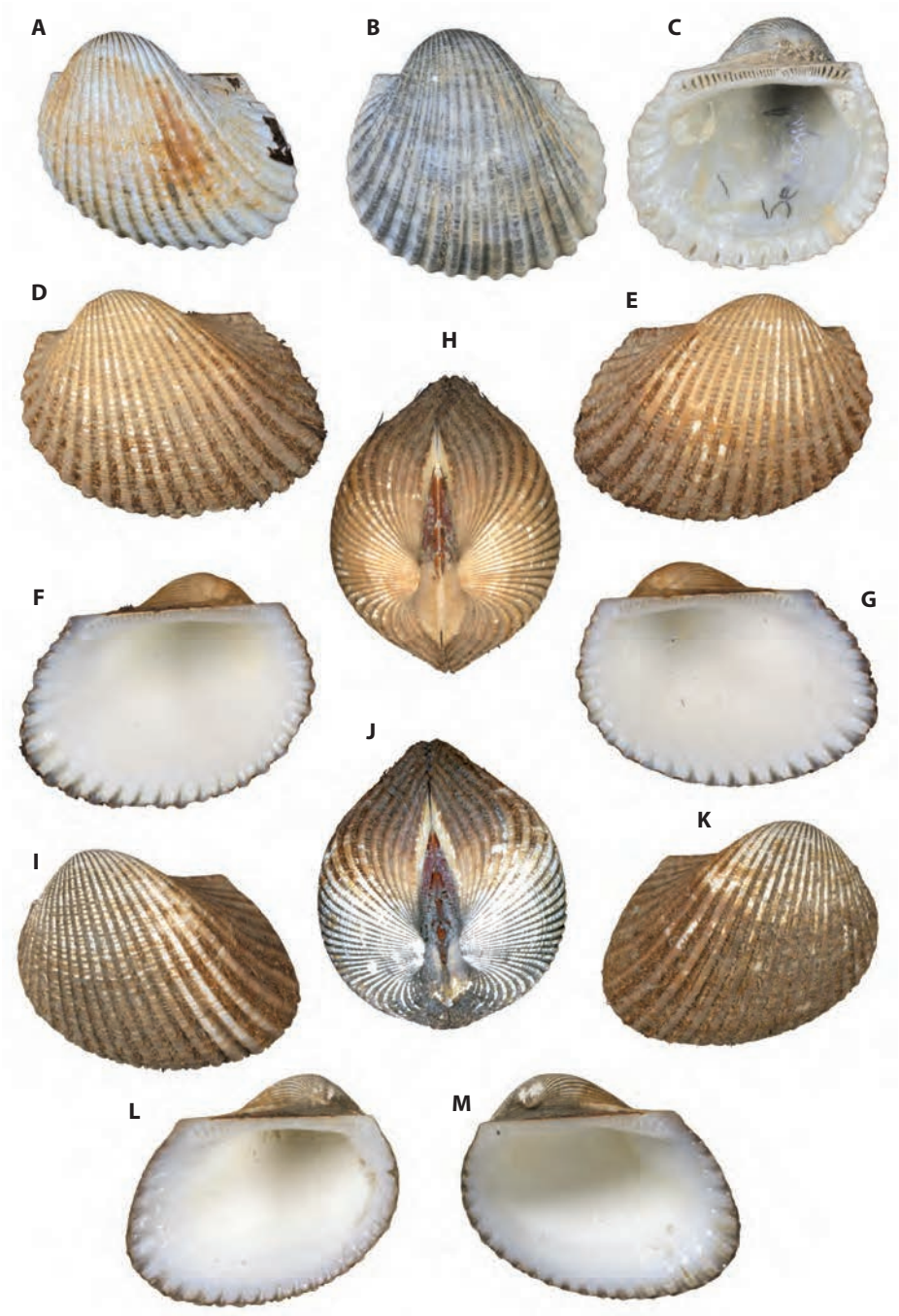
Shell up to 55 mm long, extremely variable in size, outline and tumidity, oblong-subrectangular to suboval or oval, usually longer than high but some only slightly so, rather thick and solid, inflated to very inflated, slightly inequivalve in adults, left valve a little larger. Beaks on the anterior fourth or anterior fifth of the shell. Surface with 24-28 rather narrow, high radial ribs bearing small, closely spaced nodules, on the right valve much weaker than on the left valve. Interspaces mostly as wide as ribs. Periostracum with rather short and fragile bristles in the interspaces, triangular and sharply pointed anteriorly and in the middle part of the shell, linear and very long and narrow on the posterior angle. Dorsal area rather broad. Ligament in very young specimens only behind the beaks, developing also between and in front of the beaks with age, with up to 6 chevrons in fully grown specimens. Hinge plate with an anterior set of up to 23 teeth and a posterior set of up to 30 teeth, all laminar. Umbos only slightly separated. Valves entirely white. Periostracum rusty brown.



Distribution. Portugal (Setubal) southward to southern Angola (Moçâmedes, Namibe province); Madeira, Cape Verde Islands; throughout the Mediterranean.

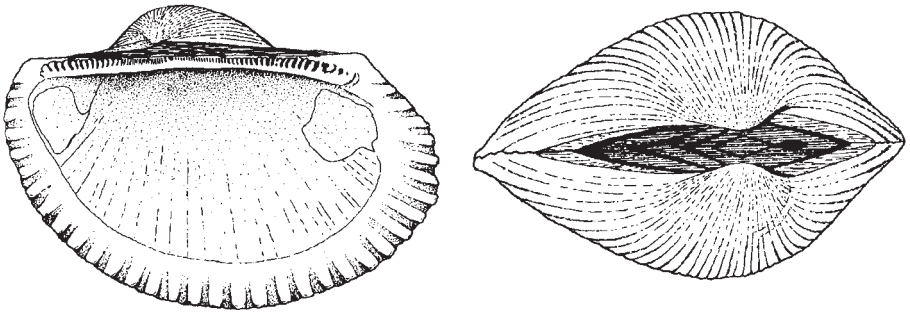
Biotope. In mud and sandy mud, perhaps also in fine muddy sand, offshore from 50 to 200 m, uncommon.

Remarks. Several different forms of this variable species can be distinguished: 1) a small, obliquely-oval, anteriorly not flaring, globose form mostly from West Africa; 2) a larger, very inflated, apparently only subfossil form from West Africa, mostly Senegal; 3) a large, oblong-subrectangular form, mostly from the Mediterranean and rare in West Africa; and 4) a small, oval form mostly from Atlantic Morocco. As these forms overlap in their distribution, and intergrades are not uncommon over the total geographic range of the species, they are all considered to be variants of *A. gibbosa* until additional material and DNA analysis allow a more detailed study. The species was for a long time known as *A. diluvii* (Lamarck, 1819) or *A. polii* (Mayer, 1868). *Arca diluvii* Lamarck, 1819 is a Miocene fossil and is easily distinguished by the more numerous ribs (up to 33) and the beaks which are situated closer to the vertical midline. *Arca polii* finally resulted being a junior synonym of *Arca gibbosa* Reeve, 1844, a name unearthed only recently by Huber (2010) (see also Cosel *et al.* 2014: 72). Other synonyms are *Arca sphaerica* Kobelt, 1891 and *Arca talismani* Locard, 1898.



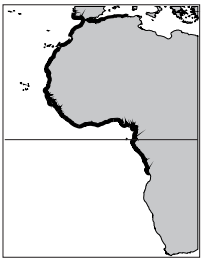
2.22. ***Anadara gibbosa*** **(Reeve, 1844)**. **A**, Dakar, Senegal, 14°50′N, 17°29′W, 150 m (29.2 mm). **B-C**, same locality (31.0 mm). **D-H**, Côte d›Ivoire, 5°01′N, 5°17′W, 40 m (24.0 mm). **I-M**, Cameroon, 2°51′N, 9°41′E, 80 m (25.0 mm).

Anadara corbuloides (Monterosato, 1881)



2.23. Ponta das Lagostas, Luanda prov., Angola, 30-50 m (66 mm).

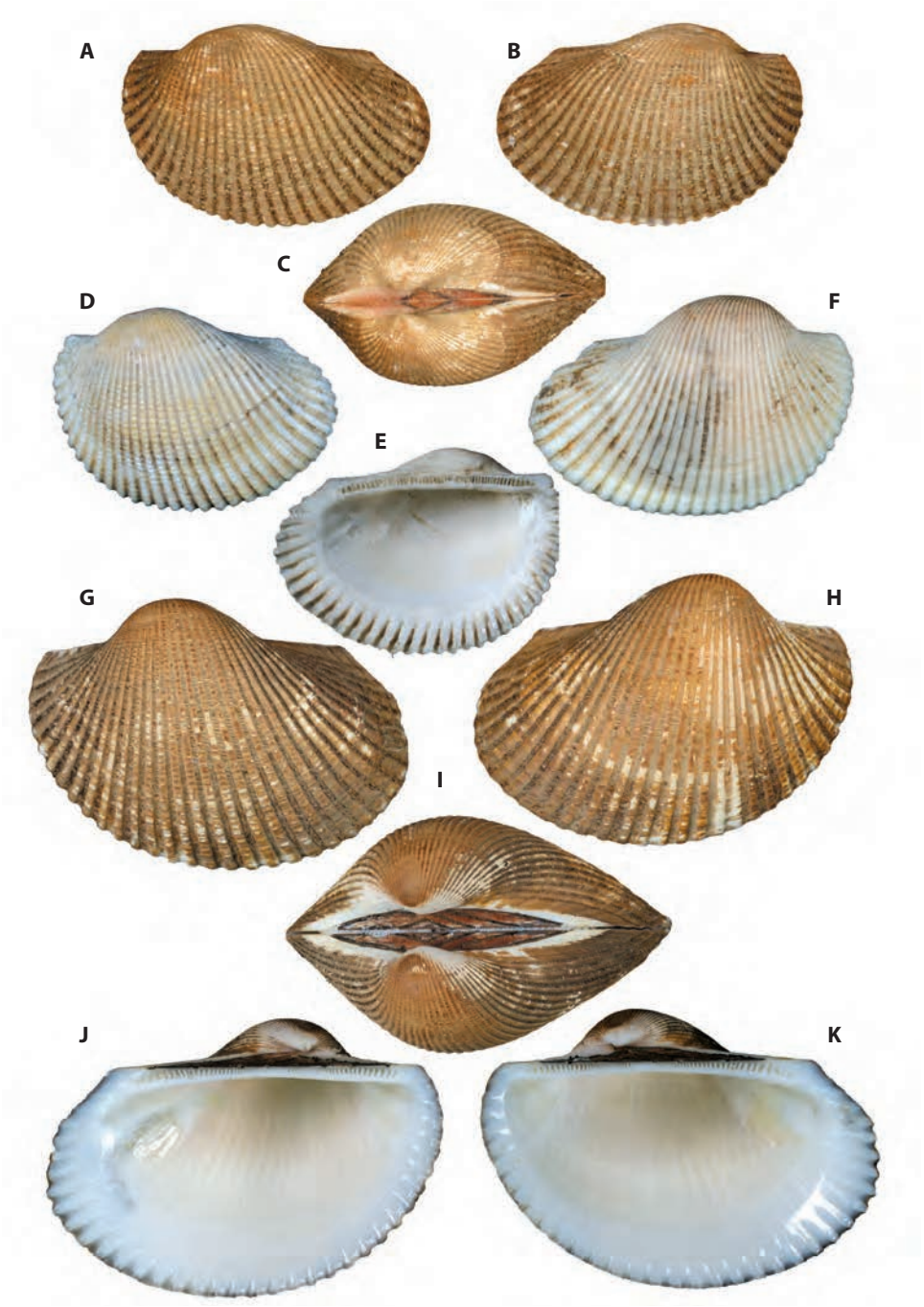
Shell up to 70 mm long, not very variable, typically subelliptical with well rounded ventral margin, thick and solid, very inflated, slightly inequivalve, especially in juvenile specimens, with left valve larger than right valve. Beaks well in front of the vertical midline. Surface with 30-35 strong radial ribs. Right valve with the anterior ribs bearing weak nodules, on the left valve anterior and middle ribs with small, transverse nodules. Interspaces on the anterior and middle part as broad as the ribs, on the posterior part narrower. Periostracum rather thin, with rigid, spicate bristles pointing towards the umbo in the interspaces. Dorsal area normally rather narrow but sometimes becoming wide in very old specimens. Ligament in very young specimens only behind the beaks, later covering most of the dorsal area, with up to 5 chevrons, leaving narrow ligament-free areas anteriorly and posteriorly. Hinge plate rather narrow with an anterior set of up to 37 teeth and a posterior set up to 39 teeth, all small and more or less laminar. Umbos only slightly separated. Valves entirely white. Periostracum rusty brown to olive brown.



Distribution. Ibero-Moroccan Gulf southward to northern Angola (Luanda); Mediterranean sea only along the North African coast. Not common anywhere.

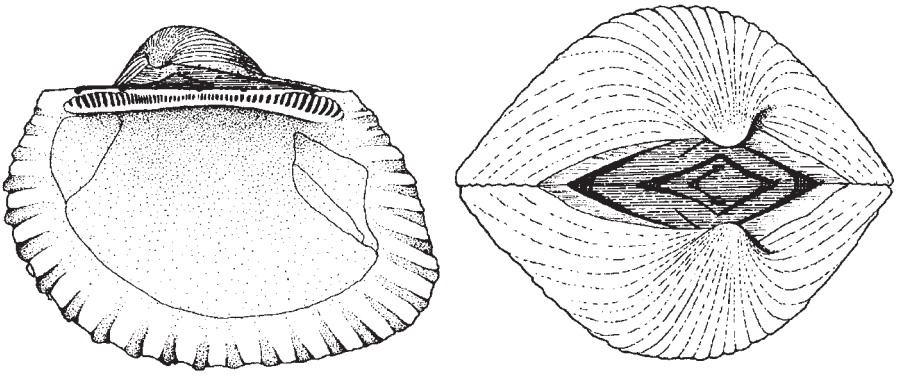
Biotope. In mud or fine, muddy sand, well offshore from 30 to 60 m, occasionally deeper, not common.

Remarks. This species with its typical outline cannot be mistaken for any other species from the area. There are two similar species in the Panamic-Pacific faunal province: *A. mazatlanica* (Hertlein & Strong, 1943), and *A. biangulata* (G.B. Sowerby I, 1833). *Anadara corbuloides* is occasionally taken in trawls as by-catch.



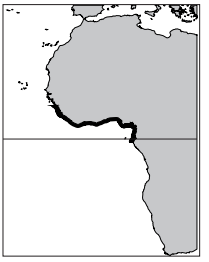
2.24. *Anadara corbuloides* **(Monterosato, 1881)**. **A-C**, Mauritania, 17°42'N, 16°16'W, 54 m (30.0 mm). **D-E**, Liberia, 4°34.5'N, 8°31'W, 64 m (lv, 32.1 mm). **F**, Cameroon, between Wouri estuary and Cap Nachtigal, 3°43'N, 9°13'E, 32-35 m (rv, 54.1 mm). **G-K**, Ponta das Lagostas, Luanda prov., N-Angola, 30-50 m (69.8 mm).

Anadara eborensis Oliver & Cosel, 1993



2.25. Grand Bassam, Côte d'Ivoire, 5°07'N, 3°22'W, 20 m (29.6 mm).

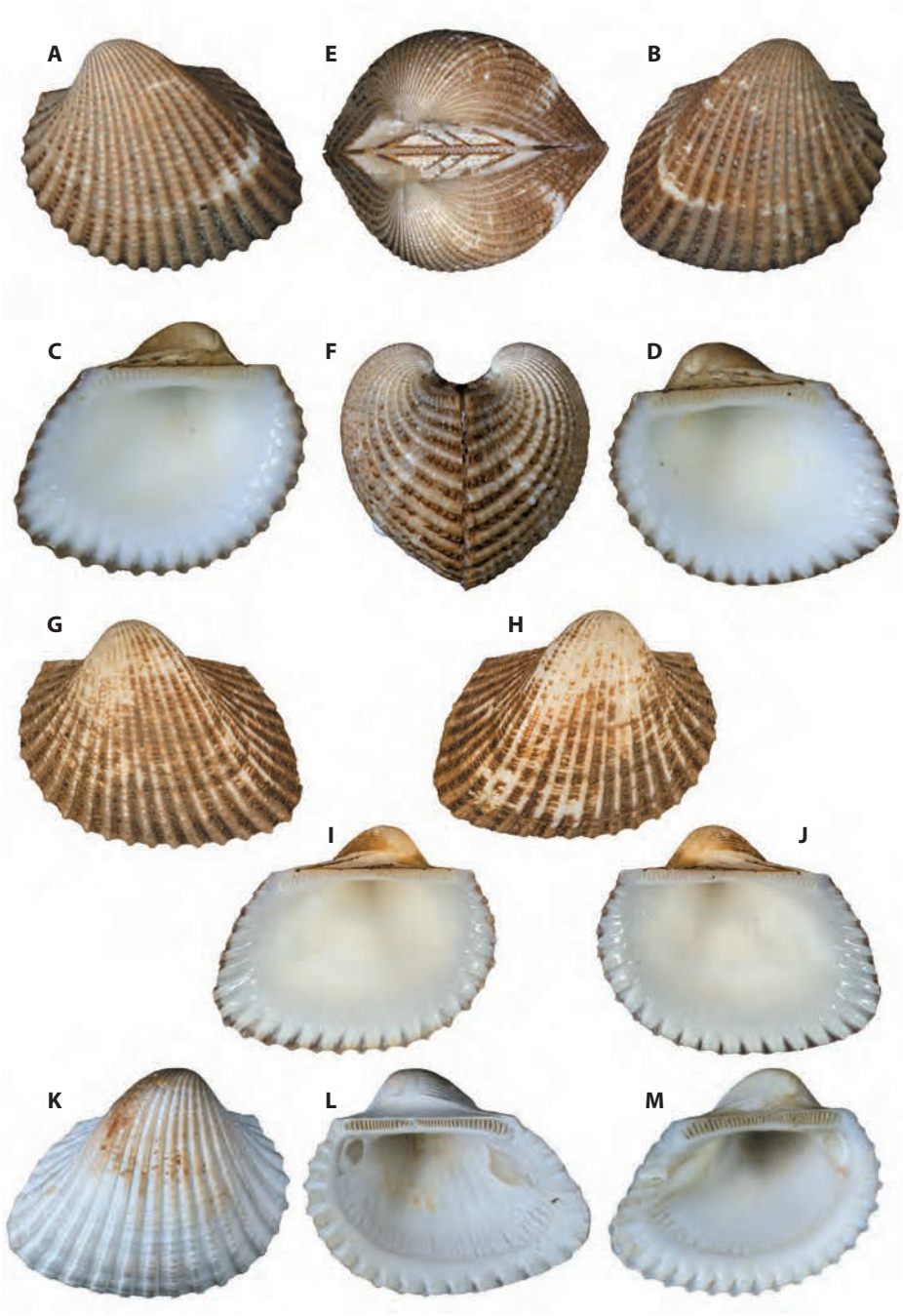
Shell up to 32 mm long, somewhat variable, subquadrate, a little longer than high, thick and solid, very inflated, slightly inequivalve, left valve a little larger than right valve. Beaks in front of the vertical midline. Surface with 24-27 (usually 25) strong radial ribs with narrow tops, on the left valve bearing small nodules, on the right valve almost smooth except a few anterior ribs. Interspaces wider than ribs with a semi-circled profile. Periostracum brown with short, erect bristles arising from the interspaces. Dorsal area broad, umbos widely separated. Ligament in young specimens with a single posterior chevron, in half- and fully grown specimens also with anterior chevrons, with up to 5 growth points on the hinge line. Hinge plate rather broad, with an anterior set of up to 24 teeth and a posterior set of up to 27 teeth, all narrow, laminar and vertical. Slight umbonal separation. Valves entirely white. Periostracum brown with slightly darker bristles



Distribution. Guinea (9°40'N) southward to Gabon (Port-Gentil).

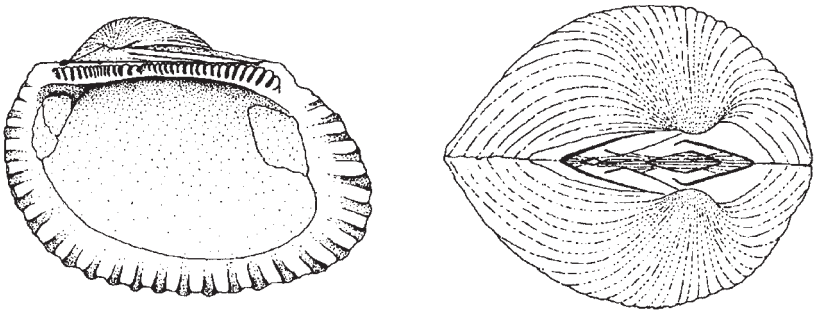
Biotope. In sandy mud or fine, muddy sand, from 18 to about 60 m, occasionally shallower, rare.

Remarks. This species is characterized by its quadrangular, rather thick and heavy shell. The only species which can be compared with it is *Anadara reinharti* (H.N. Lowe, 1935), from the Panamic Pacific faunal province. However, the latter species is considerably larger, its posterior margin is more rounded and the ribs are as wide as or wider than the interspaces. Empty valves have been found on a beach in Port-Gentil, Gabon, which may indicate a shallower occurrence in this area, where other normally offshore species are also encountered in only a few metres.



2.26. ***Anadara eborensis*** **Oliver & Cosel, 1993**. **A-F**, W of Tannah Is., Guinea, 9°12'N, 13°46.8'W, 28 m (18.3 mm). **G-J**, Grand Bassam, Côte d'Ivoire, 5°07'N, 3°22'W, 20 m (holotype, 31.4 mm, photo Manuel Caballer/Recolnat). **K-L**, Cap Lopez, Gabon, on beach (27.6 mm). **M**, same locality (28.0 mm).

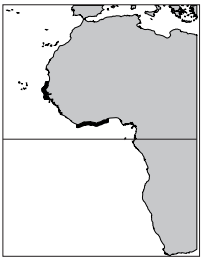
Anadara subglobosa (Kobelt, 1889)



2.27. Mauritania, 17°30'N, 16°15'W, 41 m (17.3 mm).

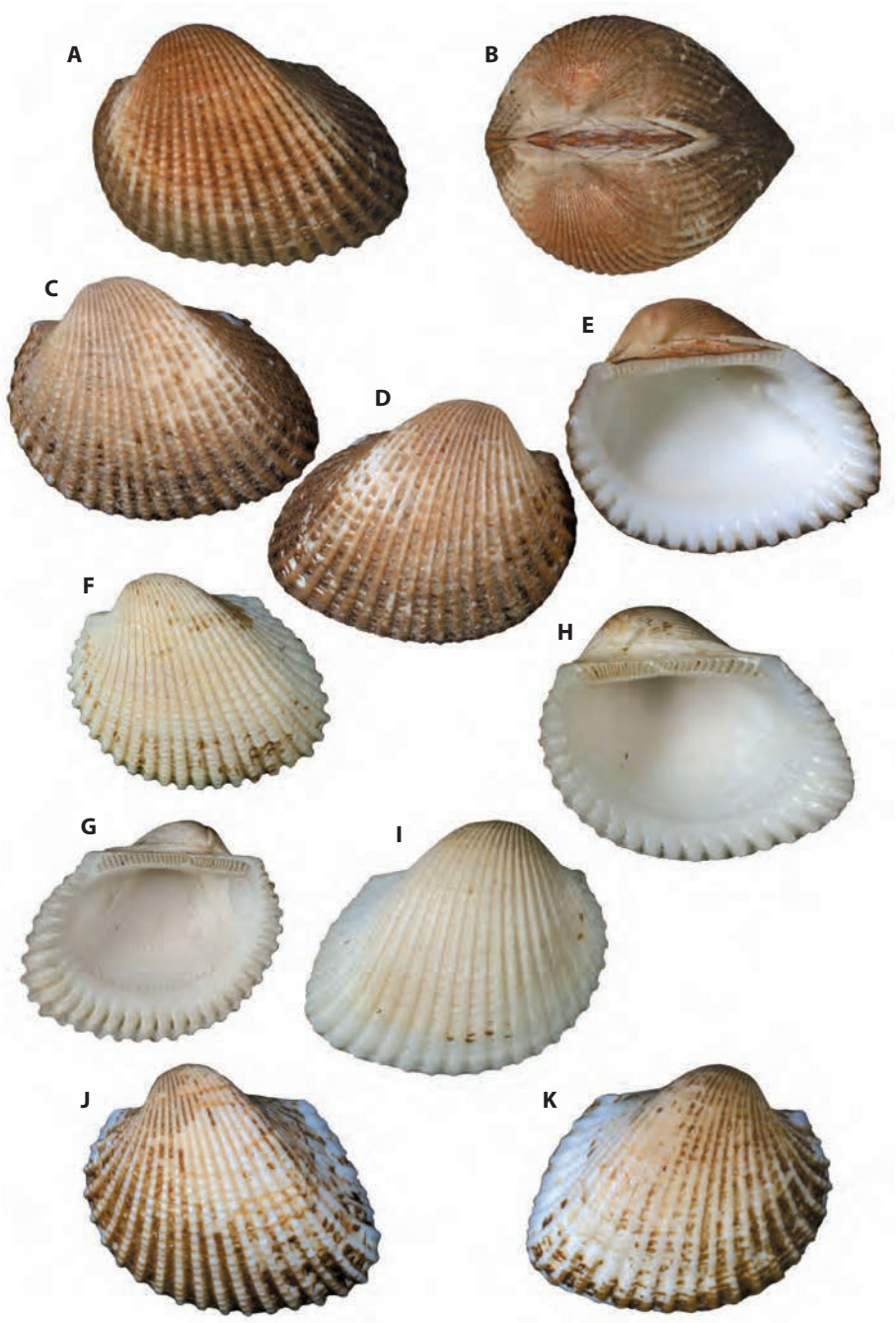
Shell up to 19 mm long, not very variable, rectangular-oblique, thick and solid, inflated to strongly inflated, slightly inequivalve in juveniles, adults more or less equivalve. Fully grown specimens always distinctly longer than high. Beaks well in front of the vertical margin. Surface with 28-31 narrow and rather flat-topped radial ribs bearing rather long, sparse nodules on the left valve; those on the right valve more or less smooth except for weak nodules on the anterior ribs. Interspaces broader than ribs. Periostracum with a few bristles in the interspaces, those on the anterior and middle part thorn-like and curled up dorsally, those on the posterior angle longer and narrower. Dorsal area rather wide, especially in front of the beaks. Ligament in very young specimens only behind the beaks, in older specimens also in front of them, with only 2-3 chevrons and with small ligament-free areas. Hinge plate rather broad, with an anterior set of up to 18 teeth and a posterior set of up to 24 teeth, all laminar and mostly vertical. Umbonal separation indistinct. Valves entirely white. Periostracum generally rusty brown.

Distribution. Mauritania (17°30'N) to Senegal (Casamance, Abéné); Côte d'Ivoire to Ghana. No record from both typical tropical regions.



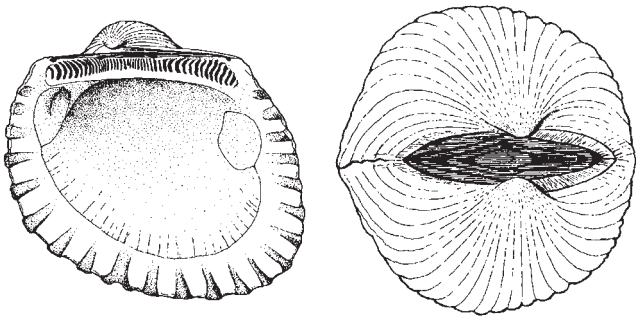
Biotope. In sandy mud, fine, muddy sand and fine sand, offshore from about 17 to 200 m, not common.

Remarks. This species is very close to *A. eborensis*, especially in shape and sculpture of the radial ribs; however, it is distinguished by its more rectangular rather than quadrate outline, and it is also smaller, has less prominent umbos and bears 28-31 instead of 24-27 ribs. No intermediates between the two species have been found.



2.28. ***Anadara subglobosa*** **(Kobelt, 1889)**. **A**-**B**, Mauritania, 17°30'N, 16°15'W, 41 m (18.6 mm). **C**-**E**, Gorée, Senegal (18.5 mm). **F**-**G**, Côte d'Ivoire, 4°25.5'N, 5°57.5'W (16.1 mm). **H**-**I**, same locality (18.9 mm). **J**-**K**, Abidjan area, Côte d'Ivoire (18.3 mm).

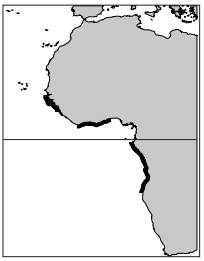
Anadara senegalensis (Gmelin, 1791)



2.29. Abidjan, Côte d'Ivoire, 20 m (22.2 mm).

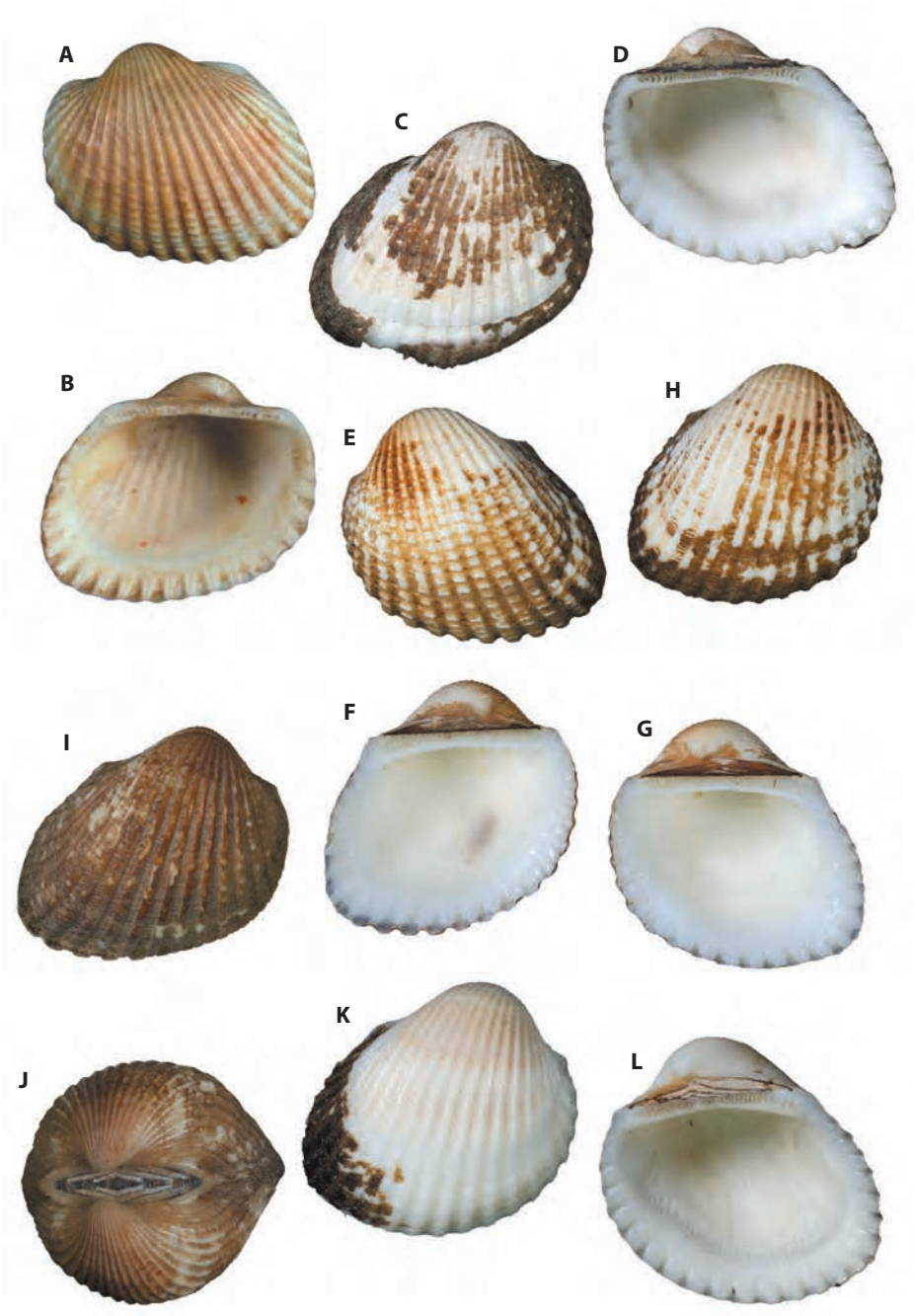
Shell up to 24 mm long, extremely variable in outline and tumidity, rhomboidal-oval, varying from noticeably longer than high to as high as long, rather thin to thick and solid, very inflated, slightly inequivalve, left valve larger than right valve. Beaks in front of the vertical midline. Surface with 23-24 strong radial ribs, the anterior 15-16 on the left valve strongly nodulose, the anterior 6-10 on the right valve more weakly nodulose. Interspaces narrower than the ribs. Periostracum with long, erect bristles arising from the interspaces. Dorsal area rather narrow, with slight umbonal separation. Ligament in younger specimens only behind the beaks, in fully grown specimens also in front of the beaks, up to 4 widely spaced chevrons. Anterior ligament-free area slightly larger then posterior ligament-free area. Hinge plate broad with an anterior set of 22 teeth and a posterior set of up to 20 teeth, all laminar and more or less vertical. Umbos only slightly separated. Valves entirely white. Periostracum rusty brown with black bristles.

Distribution. Senegal (Casamance) to Guinea (Conakry); Côte d'Ivoire to Togo; Gabon (Port-Gentil) to southern Angola (Moçâmedes, Namibe province). Not recorded from the typical tropical zones.



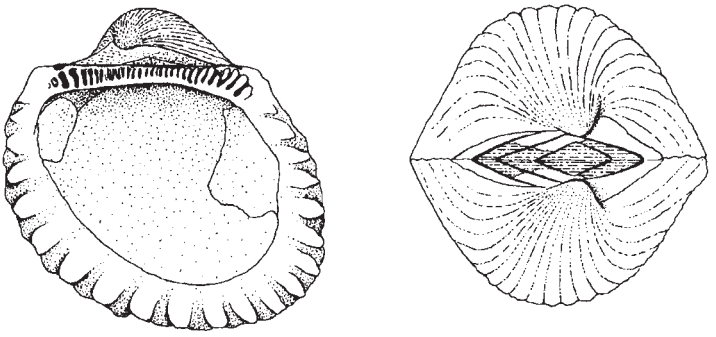
Biotope. In sandy mud and fine, quite muddy sand, from 1 to 15 m, locally common to abundant. It occurs together with *Stenocista gambiensis*, *Jolya letourneuxi*, *Lissochlamys exotica*, *Scissodesma micronitida*, *Pitar longior* and the gastropod *Turritella ungulina* (Linnaeus, 1758).

Remarks. This species has often been cited as *A. subglobosa,* but the latter is more elongate and more inequilateral and has less nodulose ribs. *A. senegalensis* has 23-24 ribs, whereas *A. subglobosa* has 28-31 ribs. A close Caribbean species is *A. chemnitzii* (Philippi, 1851). *Anadara senegalensis* is the most common *Anadara* in the regions with at least feeble seasonal upwelling influence. Empty valves are regularly found on many beaches and often form the major component of the drift line; live specimens might be cast ashore after storms. This is "Le Robet" of Adanson (1757).



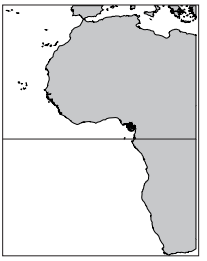
2.30. ***Anadara senegalensis*** **(Gmelin, 1791)**. **A**-**B**, Cap Skirring, Casamance, 12°22.5'N, 17°03'W, 20 m (23.7 mm). **C**-**D**, Senegal (lectotype, 20.5 mm, photo Delphine Brabant/Recolnat), Adanson coll. **E**-**H**, off Abidjan, Côte d'Ivoire (22.3 mm). **I**-**J**, same locality (24.7 mm). **K**-**L**, Pointe-Noire, Congo, Plage Raffinerie (21.1 mm).

Anadara camerunensis Oliver & Cosel, 1993



2.31. Between Victoria (now Limbe) and Bota, Cameroon, 8-10 m (13.3 mm).

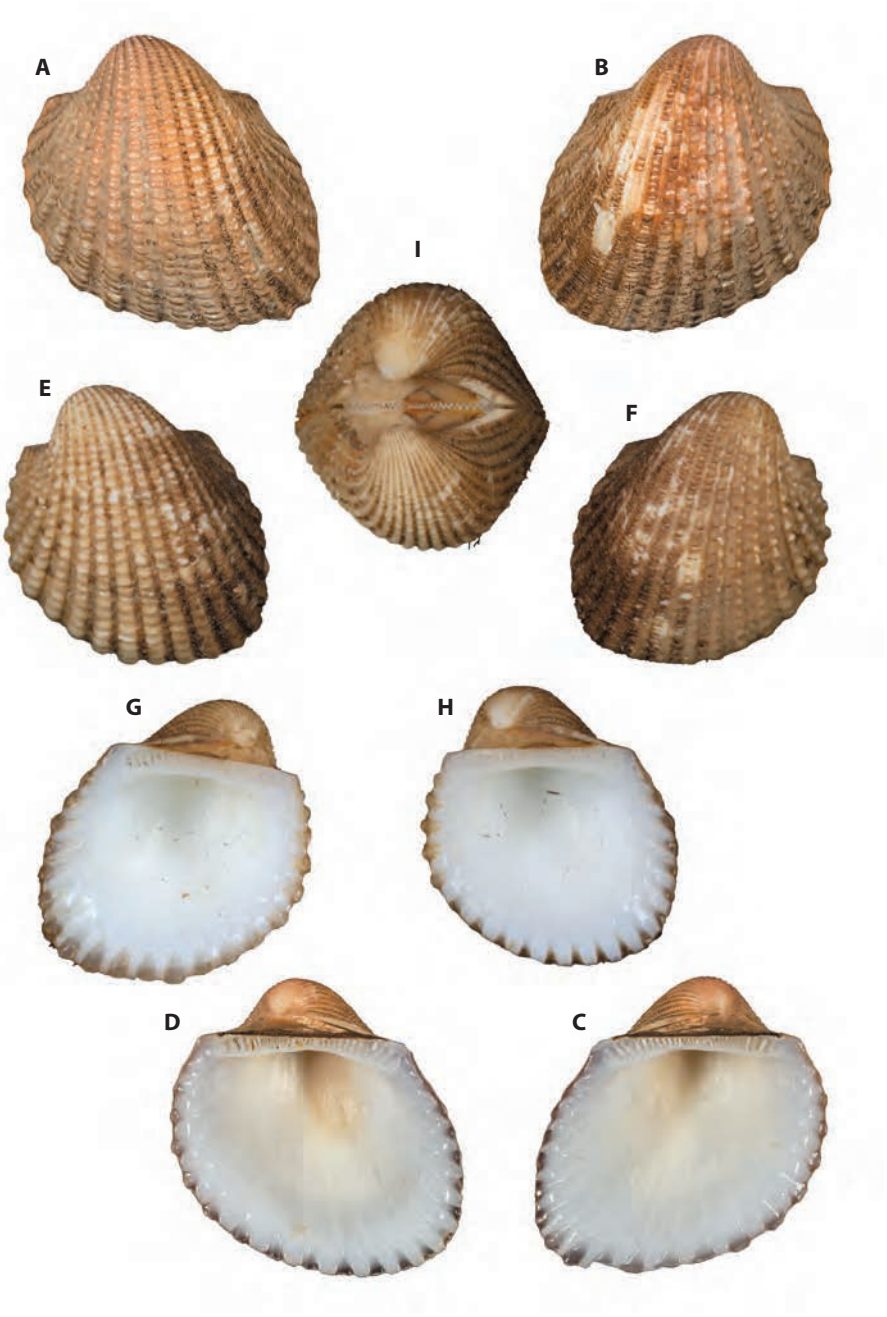
Shell up to 15 mm long and 16.5 mm high, not very variable, obliquely oval, subrhomboidal, always higher than long, rather thick and solid, very inflated, slightly inequivalve, left valve larger than right valve. Beaks well in front of the vertical midline. Surface with 21-22 strong radial ribs, the anterior 13-14 on the left valve and the anterior 9-11 ones on the right valve bearing strong, transverse, close-set nodules. Interspaces nearly as broad as ribs. Periostracum with erect bristles in the interspaces, which on the posterior area form very long, rigid hairs but are elsewhere much shorter and thicker. Dorsal area wider in front of the beaks than behind, with moderate umbonal separation. Ligament in younger specimens only behind the beaks, in fully grown specimens on both sides, up to 3 widely spaced chevrons. Anterior ligament-free area broader and slightly longer than posterior ligament-free area. Hinge plate rather broad with an anterior set and a posterior set each of up to 17 teeth, all laminar and more or less vertical. Indistinct umbonal separation. Valves entirely white. Periostracum dark rusty brown with black hairs.



Distribution. To date, only known from Cameroon off the Wouri estuary and Bota but most probably inhabits the whole southern typical tropical region.

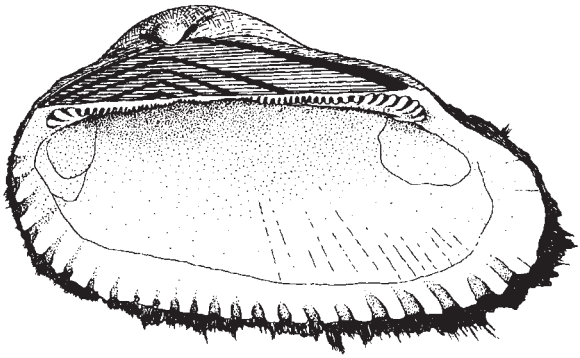
Biotope. *In fine* muddy sand, 5-25 m, not common.

Remarks. This species is very close to the high, short form of *A. senegalensis*, but is smaller and always higher than long, whereas the height of *A. senegalensis* only occasionally exceed its length. *A. camerunensis* is more oblique than *A. senegalensis*, and has a more tapering postero-ventral margin and 21-22 ribs instead of 23-24 as in *A. senegalensis*. The very long, rigid, black bristles on the posterior area also characterise this species.



2.32. ***Anadara camerunensis*** **Oliver & Cosel, 1993**. **A-D**, between Victoria (now Limbe) and Bota, Cameroon, 5-6 m (holotype, 14.7 mm, photo Manuel Caballer/Recolnat). **E-I**, between Wouri estuary and Cap Nachtigal, Cameroon, 3°44'N, 9°11'E, 24 m (11.3 mm).

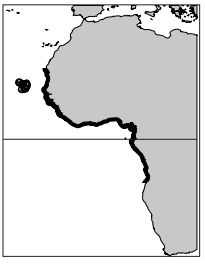
Anadara geissei (Dunker, 1891)



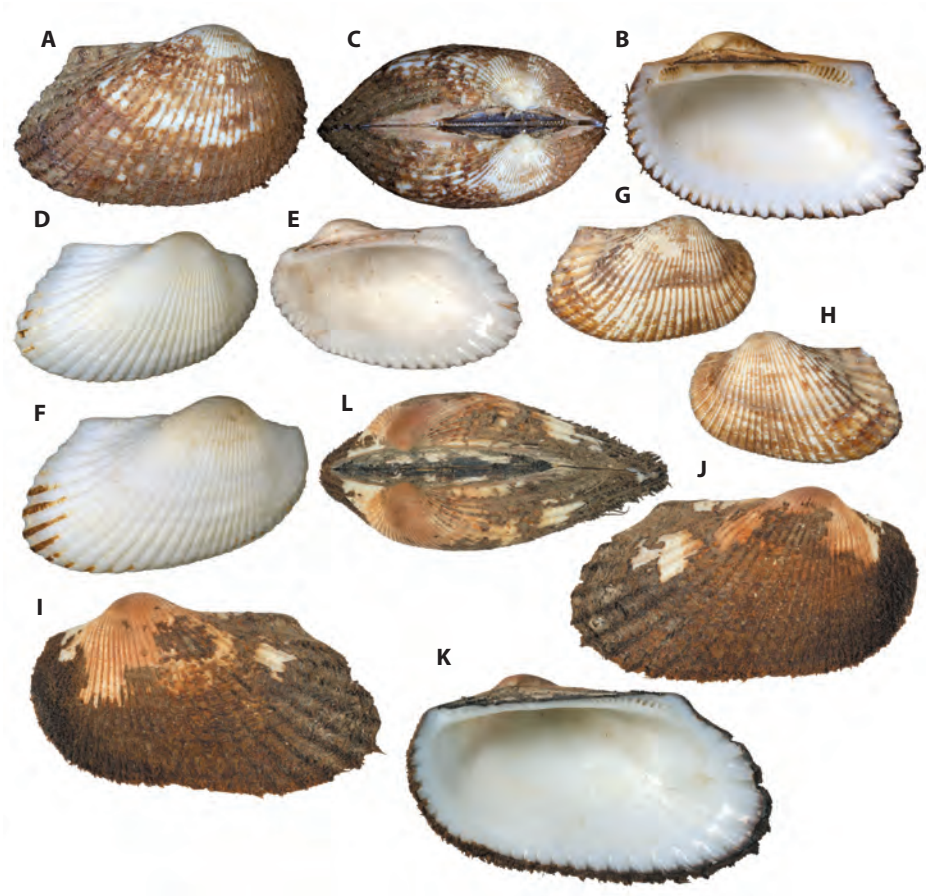
2.33. Baia da Corimba, Luanda prov., Angola, 8-10 m (69 mm).

Shell up to 75 mm long, quite variable in outline and tumidity, oblong-subrectangular, distinctly longer than high, thick and solid, more or less inflated, slightly inequivalve when young, fully grown specimens equivalve and tending to gape antero-ventrally. Beaks on the anterior third of the valves. Surface with 29-32 radial ribs, the anterior 18 becoming progressively bifurcate, the posterior ribs broader and more flat. Interspaces narrower than ribs. Periostracum in adult specimens thick, strong and deep brown, consisting of appressed laminae with bristles developing from the interspaces and the bifurcate interspaces on the anterior ribs. Bristles short, lanceolate and soft on the anterior and middle part and coarse, long, rigid and semi-erect on the posterior part. Dorsal area long and rather narrow, in very large specimens occasionally broader. Ligament in very young specimens only behind the beaks, from 6 mm onward gradually appearing also on the anterior part, with up to 4-5 chevrons in fully grown specimens, where the ligament-free areas are very narrow. Hinge plate rather narrow with an anterior set of up to 30 teeth and a posterior one with up to 35 teeth, the lateral ones slightly oblique. Indistinct umbonal separation. Valves white, occasionally with light brown on the umbonal part. Periostracum dark brown. Juvenile specimens with a distinct maculate pattern over the posterior area formed by differential thickening of the periostracum.

Distribution. Mauritania (Cap Blanc) to southern Angola (Benguela); Cape Verde Islands.



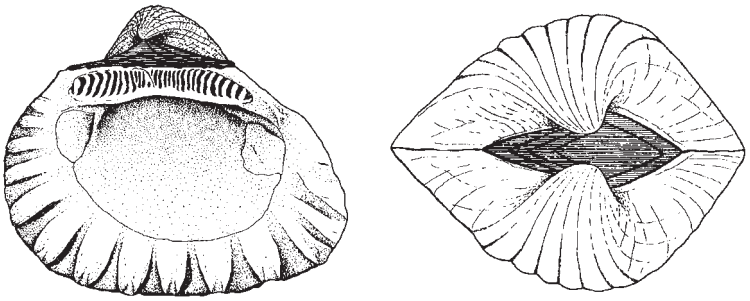
Biotope. Semi-infaunal on fine and mixed sand with calcareous algae and shell debris, often with gravel or pebbles, from about 3 to 35 m, locally common. The juveniles are byssally attached to hard objects, adults live half-buried and in dense populations, byssally attached one to the other. The species often shares its biotope with *Arca bouvieri*, *Chama crenulata*, *Cardiocardita tankervillii* and *Venus declivis*.



2.34. *Anadara geissei* (Dunker, 1891). **A**-**C**, W of Ile Tannah, Guinea, 9°12'N, 14°16.3'W, 33 m (37.5 mm). **D**-**E**, Port-Gentil, Gabon, "Anguille" drilling site, 0°55'S, 8°40.8'E. (45.1 mm). **F**, same locality (52.1 mm). **G**-**H**, Cacuaco, N-Angola, 5-10 m (26.0 mm). **I**-**L**, Corimba, N-Angola, 10-20 m (72.0 mm).

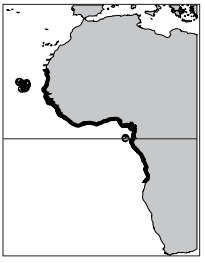
Remarks. This species is most similar to the Panamic-Pacific *A. formosa* (G. B. Sowerby I, 1833), which large specimens from Angola particularly resemble. Specimens from Cape Verde Islands may be rather close in shape to the Caribbean *A. notabilis* (Röding, 1798), under which name our species had occasionally been cited; however, that species lacks the bifid anterior ribs and is more inflated. An even more similar Caribbean species with bifid anterior ribs is *A. secticostata* (Reeve, 1844). This is *Arca setigera* Dunker, 1853 (*non* Reeve, 1844), *Arca dunkeri* Kobelt, 1891 and "L'Anadara" of Adanson. On the grounds that juveniles are byssally attached, Huber (2010) moved this species to the genus *Mosambicarca* Lutaenko, 1994, which differs from *Anadara* in having a definite byssal gape like *Arca*. This is not followed, as there is no real byssal gape in this species, which is most likely related the abovementioned species of *Anadara*. Moreover, Huber (2010) used for this species the specific name *hians* Reeve, 1844, which had remained hitherto unused and qualifies for the status of "*nomen oblitum*".

Senilia senilis (Linnaeus, 1758)



2.35. Ponta do Mussulo, Luanda prov., Angola (59 mm).

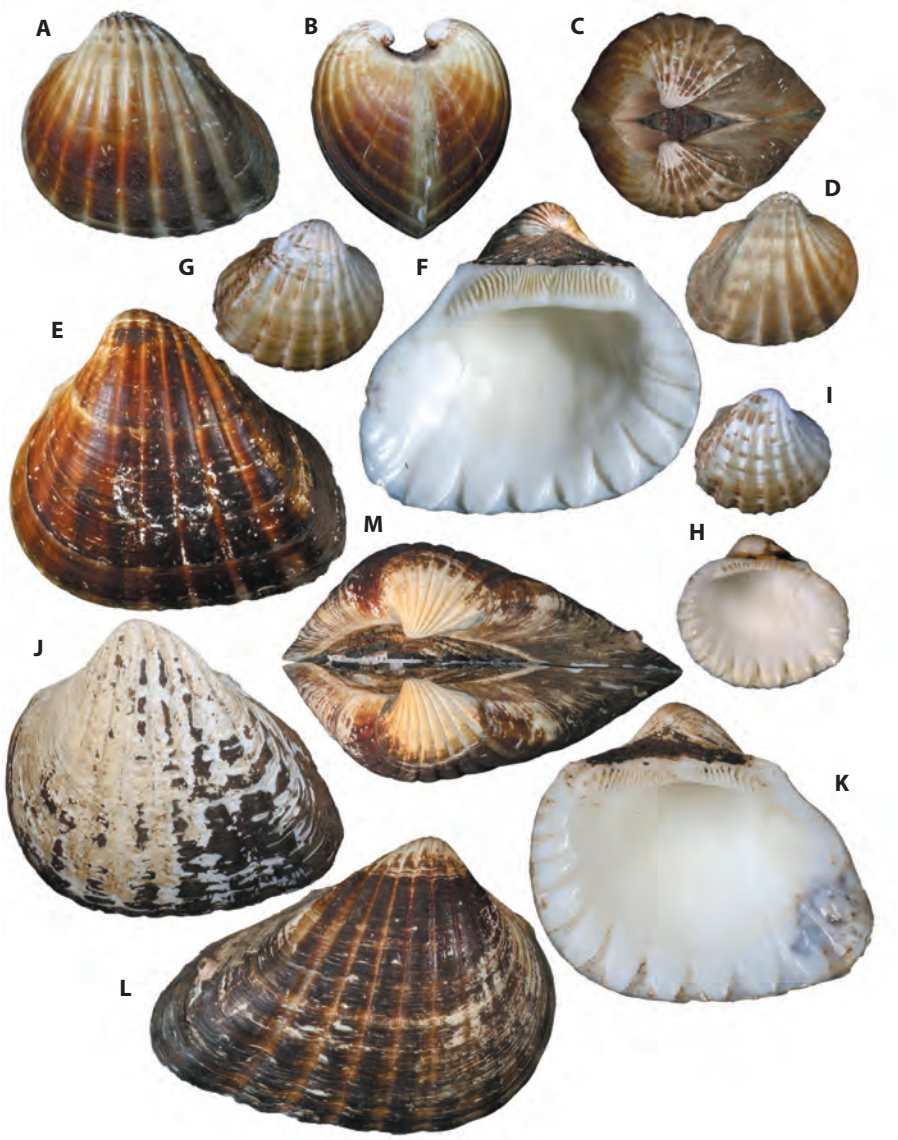
Shell 50-100 mm, rarely larger, to 135 mm, quite variable in outline, subrhomboidal-triangular, anteriorly broad, posteriorly tapering, very thick to extremely heavy, inflated to very inflated, equivalve at all sizes. Beaks well in front of the vertical midline, pointing forward. Surface with 13-15 smooth, broad ribs, mostly flattened, but occasionally narrower and more rounded; interspaces very narrow. Periostracum smooth and sometimes glossy, rather thin but strong, persistent. Dorsal area rather short, rhomboidal with its anterior part broader than the posterior part. Ligament with up to 8 strong chevrons. Anterior ligament-free area very narrow, no posterior ligament-free area. Hinge plate very broad, with an anterior set of up to 15 teeth and a posterior set of up to 16 teeth, all long and often more or less distorted, the lateral ones sometimes slightly chevron-shaped. Umbonal separation more or less broad. Valves entirely white. Periostracum olive green to dark brown or black.



Distribution. West Sahara (Rio de Oro) and Mauritania (subfossil, Quaternary); Senegal (St. Louis) southward to northern Angola (Luanda); São Tomé. There are also recent records of live specimens from Banc d'Arguin (Mauritania) (Wolff *et al*. 1987) and from Cape Verde Islands (Cosel 1982). Subfossil (Quaternary) valves are reported from the Mediterranean at Marseilles (Paulus & Mars 1941-1942).

Biotope. *In fine* sand with low silt portion or fine clean sand in estuaries, creeks or lagoons with regular tidal influence and more or less drastic seasonal salinity changes, often near mangroves but not within them, from the lower intertidal zone to about 2 m, locally abundant. It is often found together with *Tagelus adansonii*, *Dosinia isocardia* and occasionally *Mactrotoma compressa*.

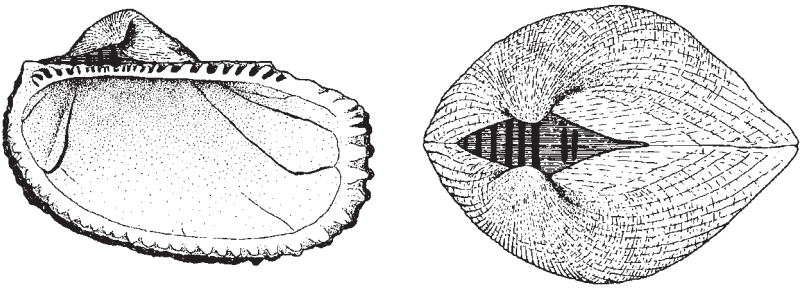
Remarks. This species is marketed and consumed in many parts of tropical West Africa. Important natural concentrations and kitchen-middens consisting of subrecent shells are found in Mauritania, northern Senegal and northern Angola. At least in the North of Senegal, the shells served (or still serve) for chalk burning or even in the construction of road pavements and as ballast for railway lines (Joire 1947). In Senegal, it is known as "khor" or "khory", and in the Luanda area it is called "mabanga" and is used as bait for fishing lines. This is *Arca subnitens* Recluz, 1851 (described



2.36. *Senilia senilis* (Linnaeus, 1758). A-C, Katakalous Bôlon, Casamance, Senegal, 3-4 m (22.1 mm). D, same locality (11.4 mm). E-F, mouth of the Gambia River, Gambia (76.1 mm). G-H, Ponta Oquedelrey, Saõ Tomé, 5 m (10 mm). I, same locality (8.5 mm). J-K, Man o'War Bay, Victoria (now Limbe), Cameroon (80.0 mm). L-M, Cacuaco, N-Angola (97.7 mm).

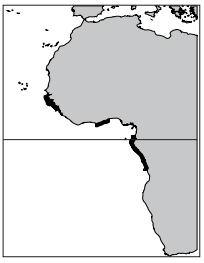
from a juvenile specimen) and "Le Fagan" of Adanson. The genus has recently been found in the Lower Miocene (Burdigalian) of the Aquitanian Basin and thus is presumed to be present already in the Oligocene (Lozouet & Gourgues 1995). For details on anatomy, biology, ecology and reproduction, see Yoloye (1975, 1976), Yankson (1982), Wolff *et al*. (1987), Zabi & Le Loeuff (1992), and Debenay *et al*. (1994, and references therein).

Sheldonella minutalis Oliver & Cosel, 1993



2.37. Cabo Ledo, Luanda prov., Angola, 10-40 m (6.3 mm).

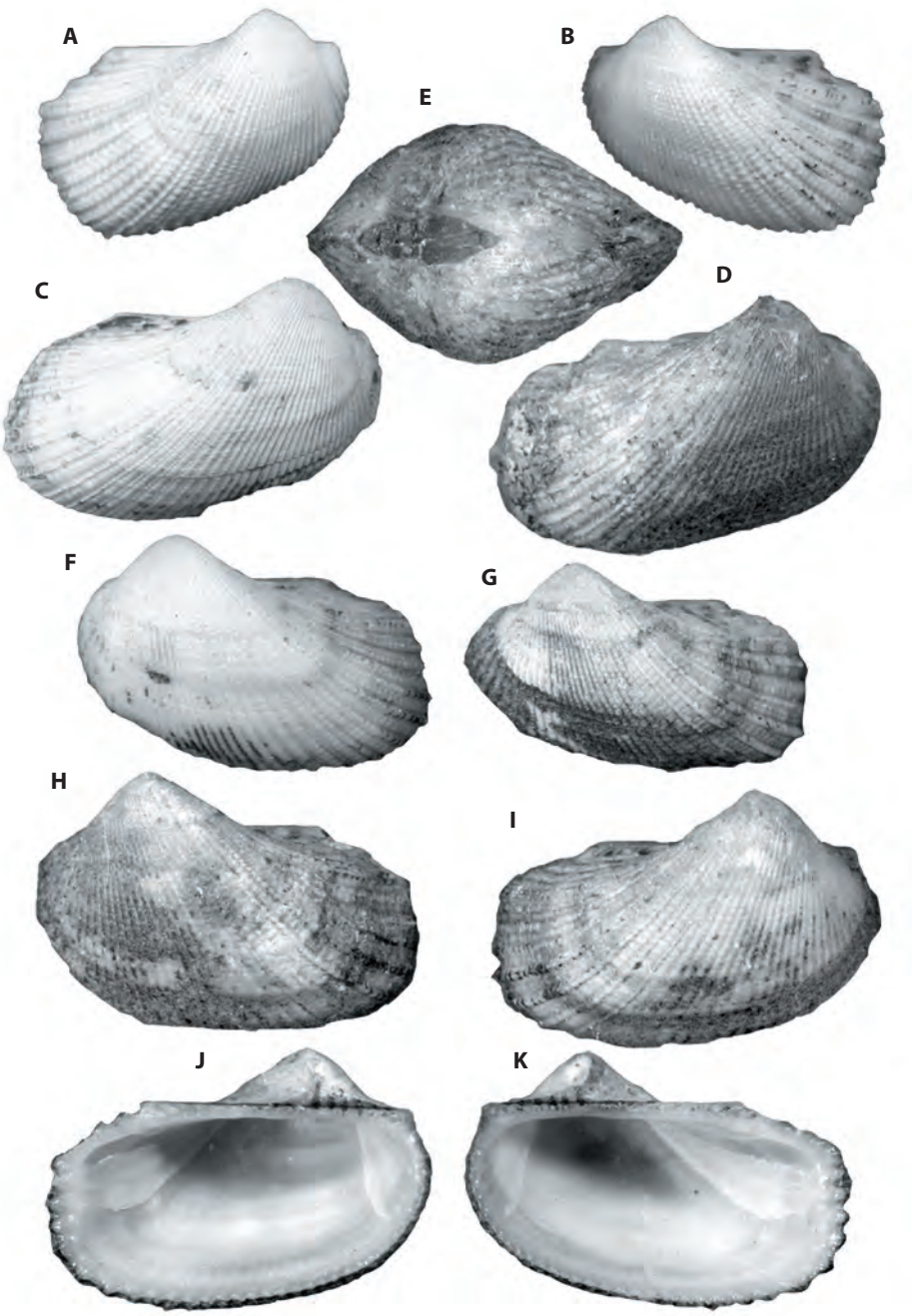
Shell very small, up to 8.5 mm long, elongate, modioliform-arciform, thin but strong, very inflated, equivalve, beaks about at the end of the first third of the valves. Anterior margin rounded but not angled with ventral margin, ventral margin gently convex, posterior margin biangulate, at the posterior end of the dorsal area margin initially inclined at about 25° but beyond the secondary dorsal ridge increasing to at least 90° to the horizontal midline. Surface with narrow primary riblets and early developing secondary riblets, about 36-39, which form the dominant sculpture. Primary ribs anteriorly weakening into raised threads, in the middle of the valves becoming obsolete but on the posterior area remaining prominent, nodulose and higher and narrower than secondary ribs. Posterior area with a secondary ridge dorsal to the posterior angle. Periostracum spicate from primary ribs but lamellar from secondary riblets. Ligament on the anterior part of the dorsal area, symmetrical about the beaks. Hinge plate narrow, with anterior and posterior sets each of up to 15 teeth, all small and straight, posterior teeth becoming progressively oblique. Valves white, old shells often becoming orange to brown. Periostracum straw-coloured to rusty brown with dark brown bristles.



Distribution. Guinea-Bissau (Bissagos) to Guinea (Conakry area); Ghana (material in the private collection of P. Ryall); Gabon (Cap Esterias) to northern Angola (Cabo Ledo); no records between.

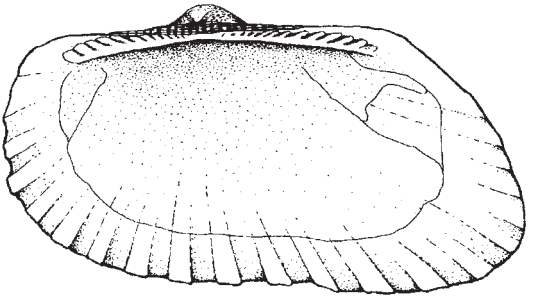
Biotope. On muddy sand and fine sand with shell debris, byssally attached to secondary hard substrate such as shells, worm-tube agglomerations etc., also on algal mats on mud, 3-40 m, rare.

Remarks. This species is most similar to the Caribbean *S. bisulcata* (Lamarck, 1819), but the latter is larger and has fewer, wider and more strongly sculptured dominant riblets. The South African and Indo-Pacific *S. lateralis* (Reeve, 1844) is larger and more rounded posteriorly. *S. minutalis* seems to have two distribution gaps along the West African coast; it seems to prefer slight seasonal upwelling.



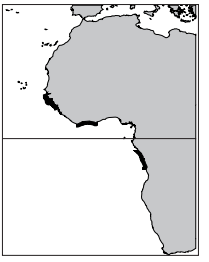
2.38. ***Sheldonella minutalis*** **Oliver & Cosel, 1993**. **A**, W of Rio Morébaya, Guinea, 9°24'N, 13°45'W, 17 m (4.6 mm). **B**, same locality (4.7 mm). **C**, Cap Esterias - Pointe Idolo, Gabon (11.0 mm). **D-E**, Pointe-Noire, Congo, Plage Orstom, 5-7 m (paratype, 6.7 mm). **F**, Ambrizete, N-Angola (8.0 mm). **G**, Cabo Ledo, N-Angola, 10-40 m (8.7 mm). **H-K**, same locality (holotype, 8.4 mm).

Stenocista gambiensis (Reeve, 1844)



2.39. Gambia (29.5 mm).

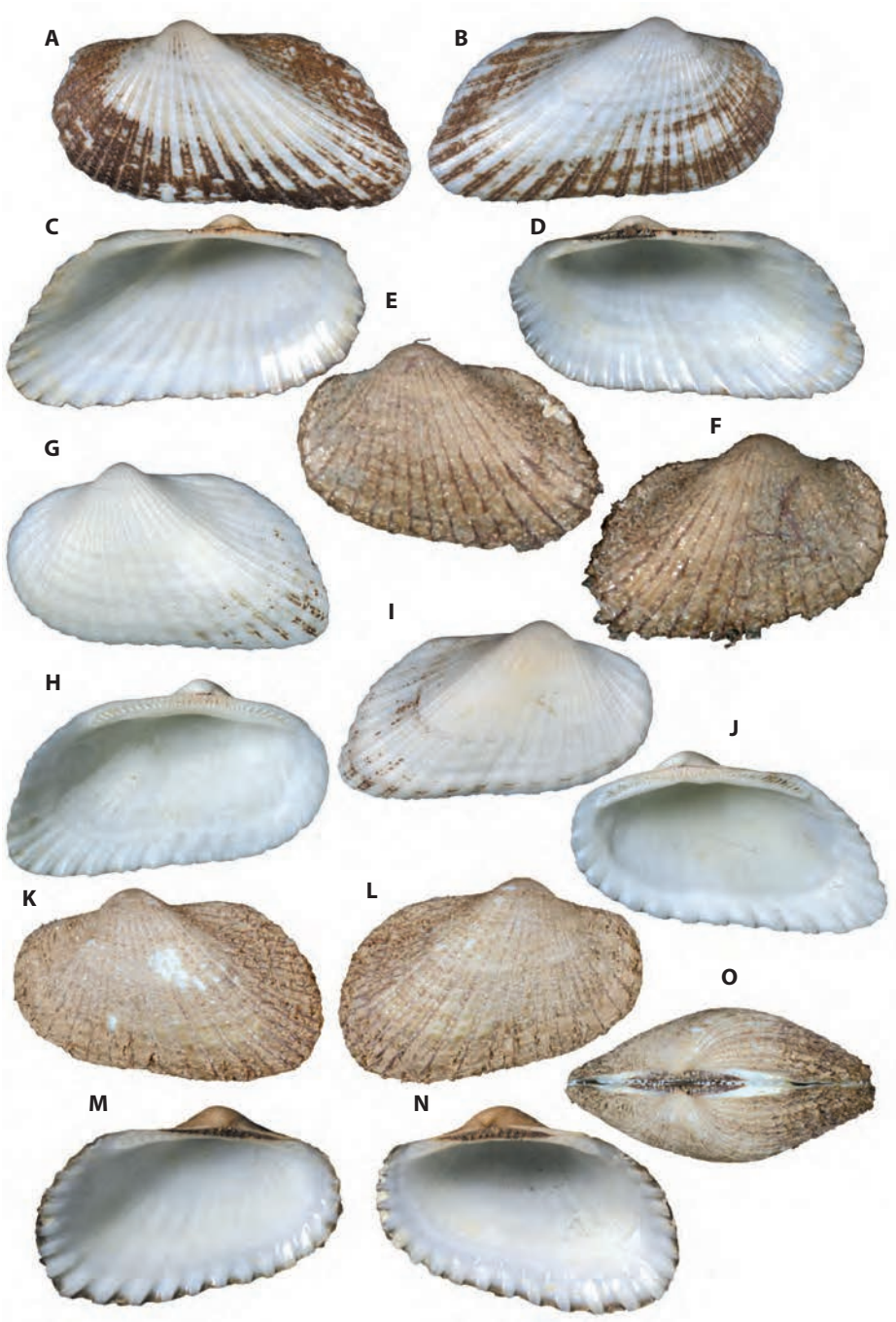
Shell up to 36 mm long, not very variable, subrectangular to oblong, posteriorly slightly broader, rather thin but solid, compressed, equivalve, nearly equilateral with beaks just in front of the vertical midline. Surface with numerous radial ribs and riblets, of which the primary ribs remain weak to nearly obsolete whereas the secondary sculpture develops rapidly to form 23-26 low, broad ribs. Posterior angle low and rounded. Periostracum lamellar over major ribs and with long, blunt bristles arising from the primary interspaces and shorter bristles arising from the carinae of the major ribs. Dorsal area narrow, wholly covered by the ligament with numerous, closely spaced chevrons. Hinge plate narrow, with an anterior set of up to 16 teeth and a posterior set of up to 21 teeth, all small and straight, vertical in the middle and becoming oblique towards the ends of the plate. Valves entirely white. Periostracum dark brown.



Distribution. Gambia and Senegal (Casamance) southward to Guinea (9°42'N); Côte d'Ivoire; Congo (Brazzaville) to northern Angola (Luanda).

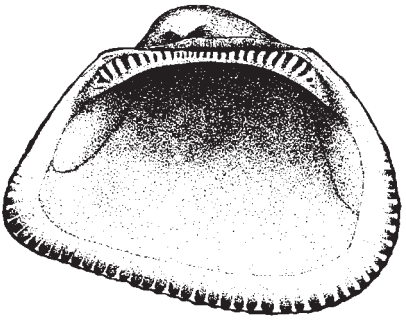
Biotope. In sandy mud or fine, muddy sand, from 2 to about 20 m, only locally found, not common. The species has been found living together with *Lembulus montagui*, *Anadara senegalensis*, *Cardiocardita lacunosa*, *Scissodesma micronitida* and *Pitar cor*.

Remarks. Like the preceding species, *S. gambiensis* has an affinity to seasonal upwelling which explains its absence from the typical tropical regions. The specimens from Côte d'Ivoire are all exceptionally small (about 3 mm) and rather inflated. They might represent juveniles but perhaps also another species. More material, fieldwork and DNA study are necessary. Empty valves are occasionally washed up on certain beaches. This is the type species of the genus *Stenocista*.



2.40. ***Stenocista gambiensis*** **(Reeve, 1844)**. **A**-**D**, Gambia (28.2 mm). **E**-**F**, Cap Skirring, Casamance, 3-5 m (11.0 mm). **G**-**H**, S of Cap Skirring, Casamance, beach drift (27.3 mm). **I**-**J**, same locality (28.1 mm). **K**-**O**, Baie de Pointe-Noire, Congo, Orstom beach, 5-7 m (15.2 mm).

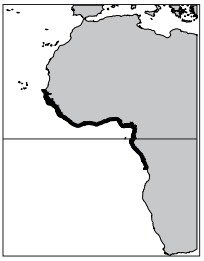
Congetia congoensis (Thiele, 1931)



2.41. Côte d'Ivoire (lv, 7.9 mm).

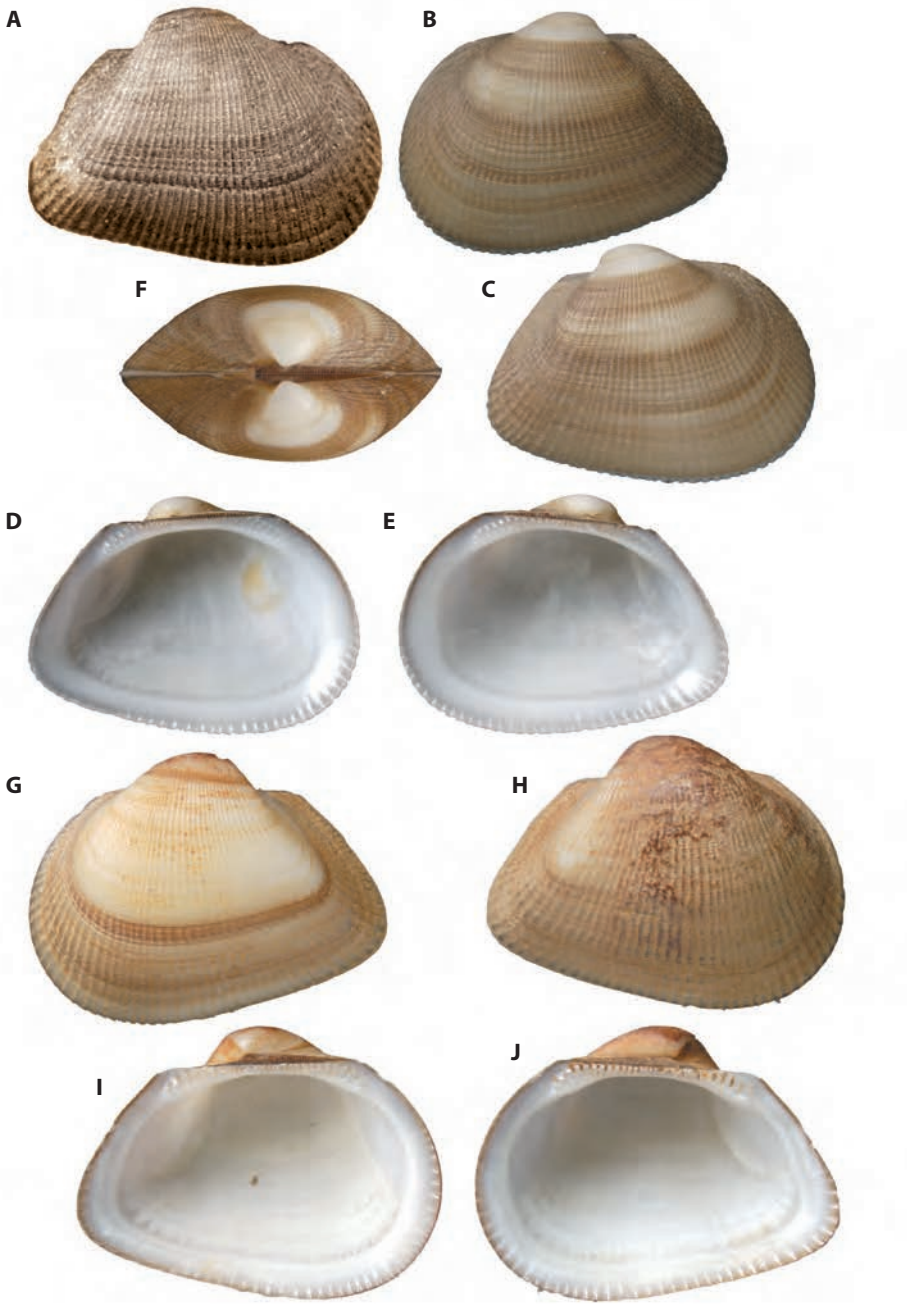
Shell up to 15 mm long, rather uniform, subrhomboidal, anteriorly broader than posteriorly, solid, inflated, equivalve, inequilateral with beaks slightly behind the vertical midline. Surface with about 60 low, rather indistinct radial riblets or raised lines. Posterior angle prominent and rather sharp. Periostracum thick with dense commarginal lines, on the posterior part raised into narrow lamellae. Dorsal area narrow, umbos close together. Ligament in young specimens only in front of the umbos, in adult specimens also behind them. Hinge plate narrow in the middle, broadening at both ends, with an uninterrupted set of up to 18 teeth anteriorly and up to 12 teeth posteriorly, all small and laminar, vertical in the middle of the hinge, becoming rather oblique at both ends. Valves entirely white. Periostracum pale brown; surface often coated with a black or rust coloured deposit.

Distribution. Senegal (Dakar) to northern Angola (Luanda).



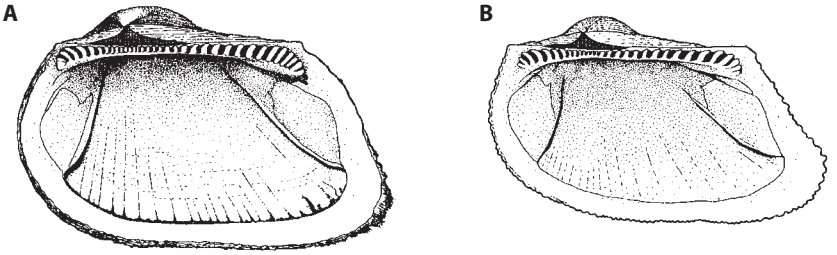
Biotope. In mud, muddy sand and fine sand, from 5 to about 80 m, locally not uncommon. Shallow water populations are mostly confined to sheltered, more or less muddy bays.

Remarks. This species is the only West African noetiid with an initially prosodetic ligament and therefore cannot be confounded with any other West African species of the group. A very close Indo-Pacific species is *Congetia chesneyi* (Oliver & Chesney, 1994), endemic to the north-western part of the Arabian Gulf (see Oliver & Chesney 1994).



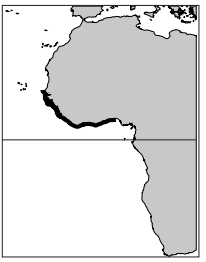
2.42. ***Congetia congoensis*** **(Thiele, 1931)**. **A**, W of Rio Morébaya, Guinea, 9°24′ N, 13°51′W, 15 m (10.2 mm). **B**-**F**, Conkouati, Congo (Brazzaville), 4°00′S, 10°59′E, 17-19 m (9.3 mm). **G**-**J**, Baie de Pointe-Noire, Congo, Orstom beach, 5-6 m (12.2 mm).

Striarca lactea scoliosa Oliver & Cosel, 1993



2.43. A, Mauritania (rv, 12.7 mm). B, Gulf of Guinea (rv, 10.7 mm).

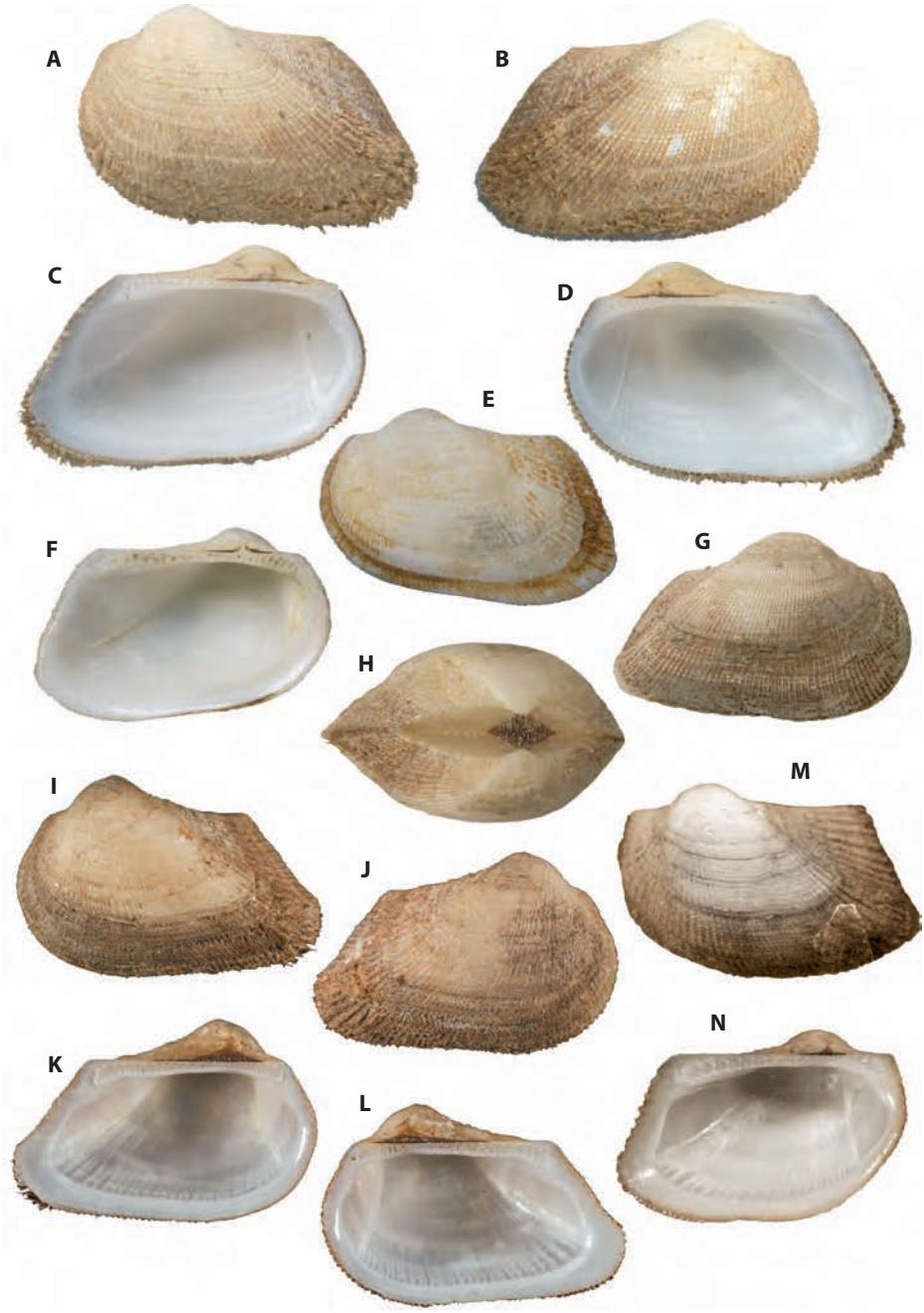
Shell up to 13 mm long, subquadrate, oblong, solid, very inflated, equivalve, inequilateral, beaks well in front of the vertical midline. Posterior margin obliquely truncate, straight. Anterior margin rounded. Surface with numerous radial riblets, initially 35-45, rapidly developing interstitial riblets over the antero-median and anterior areas. Anterior riblets narrow with equally sized interspaces, postero-median riblets more closely spaced, evenly nodulose; posterior riblets widely spaced, narrow and similar to anterior riblets, more irregularly nodulose. Anterior and median riblets nodulose, posterior riblets more irregularly nodulose. Posterior angle distinct, carinate in all growth stages. Periostracum consisting of fine bristles on the riblets and lamellae in the interspaces; strong bristles on the riblets on the posterior angle. Dorsal area rather wide, in adult specimens nearly entirely covered by the ligament. Hinge plate narrow, with in total up to 35 teeth forming a continuous series under the umbos, in the middle vertical and towards the sides slightly angled. Valves entirely white. Periostracum rust brown.



Distribution. The nominal subspecies *S. lactea lactea* (Linnaeus, 1758) is distributed from the English Channel southward to Morocco and the Canaries, and throughout the Mediterranean and Black Sea (not in Azov Sea). Intermediate forms between *S. lactea lactea* and *S. lactea scoliosa* (see next entry) are found off Mauritania (18°N) and the Cape Verde Islands. Typical representatives of the subspecies are found from Senegal (Dakar) south- and eastward to Nigeria (4°E).

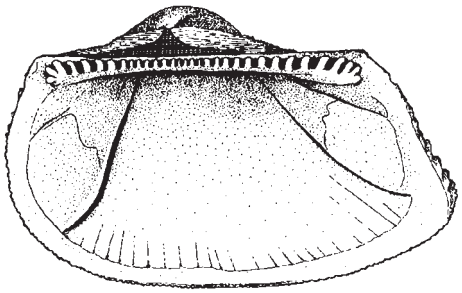
Biotope. The nominal subspecies is found in Europe intertidally or mostly in shallow water, byssally attached under rocks. Conversely, *S. lactea scoliosa* lives subtidally from 35 to 200 m, byssally attached to small stones or other hard objects lying on sandy or muddy bottoms, rather common, and has never been found close to shore from Senegal to Cameroon.

Remarks. *Striarca lactea scoliosa* differs from *S. lactea lactea* by its smaller size and distinctly more inequilateral, oblique shape (Oliver & Cosel 1993b), with more anteriorly situated beaks and a carinate posterior angle even in the adult specimens. In *S. lactea lactea* the posterior angle becomes rounded on adult specimens. A similar pattern of regional variation is present in the Indo-Pacific *Striarca symmetrica* (Reeve, 1844) complex.



2.44. *Striarca lactea scoliosa* Oliver & Cosel, 1993. **A**-**D**, Mauritania, 18°30'N, 16°50'W, 240 m (11.1 mm). **E**-**F**, Baie de Gorée, Senegal, 80 m (10.1 mm). **G**-**H**, Palm Beach, Abidjan, Côte d'Ivoire 10-15 m (9.3 mm). **I**-**L**, Lagos, Nigeria, 6°02'N, 4°16'E, 100 m (holotype, 9.7 mm, photo Manuel Caballer/Recolnat). **M**-**N**, same locality (paratype, 7.8 mm).

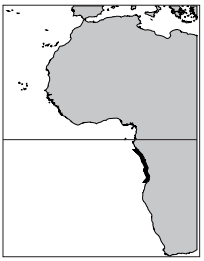
Striarca lactea epetrima Oliver & Cosel, 1993



2.45. Angola (10.8 mm).

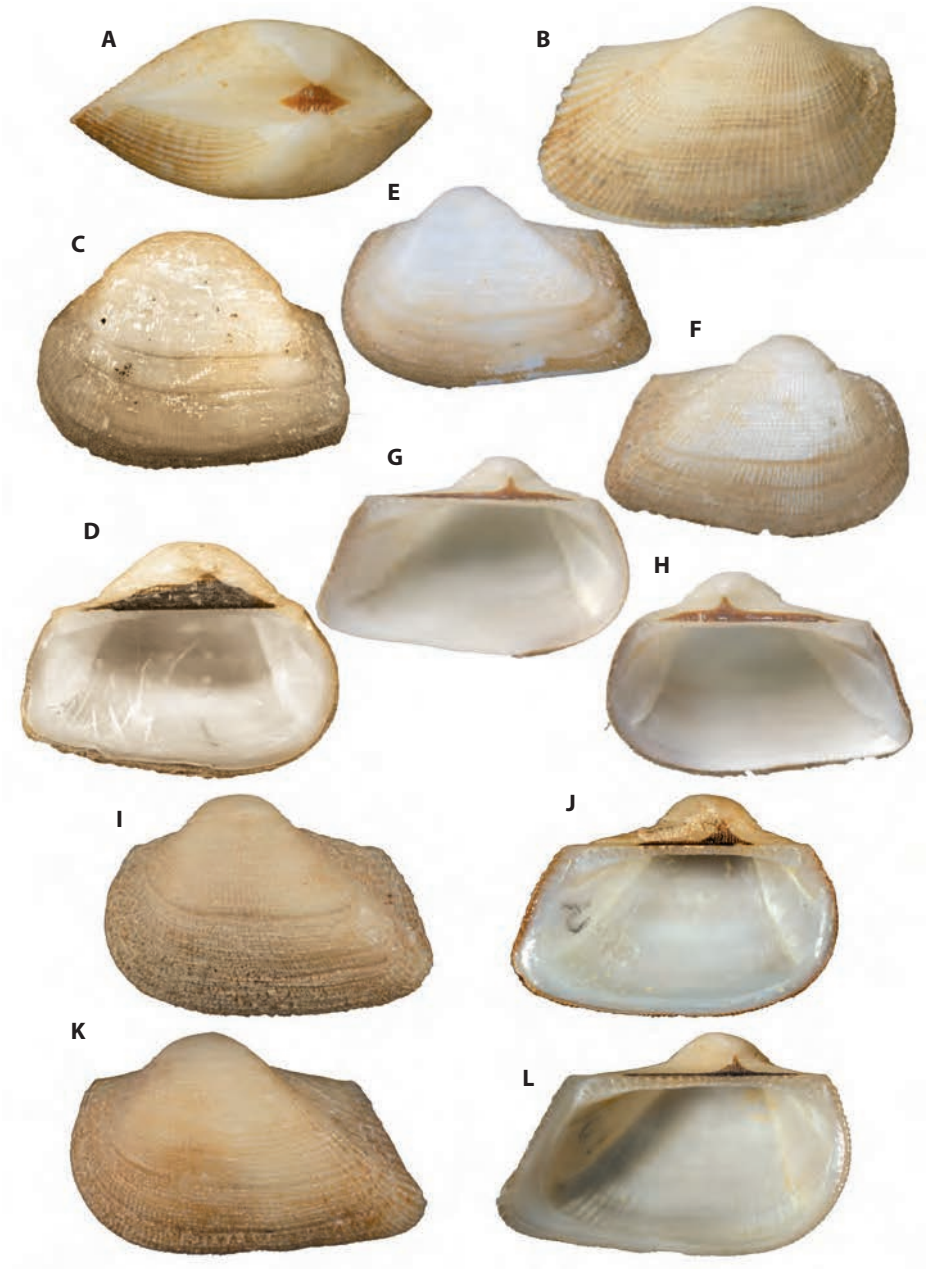
Shell up to 13.5 mm long, subquadrate, oblong, solid, rather inflated, equivalve, inequilateral, beaks somewhat in front of the vertical midline. Surface with numerous radial riblets which rapidly develop interstitial riblets over the antero-median and anterior areas, twice as dense as in the nominal subspecies. Anterior riblets narrow with evenly sized interspaces, postero-median riblets more closely spaced, posterior riblets widely spaced, narrow and similar to the anterior riblets, regularly nodulose. Anterior and median riblets nodulose, bearing closely packed regular beads. Posterior angle distinct, in juveniles and subadults carinate, only in the largest adults becoming rounded. Dorsal area rather wide, in adult specimens nearly entirely covered by the ligament. Periostracum consisting of fine bristles on the riblets which are strong on the riblets on the posterior angle. Lamellar periostracum in the interspaces. Valves entirely white. Periostracum straw coloured.

Distribution. Congo Brazzaville (Pointe-Noire) to southern Angola (Moçâmedes, Namibe province).



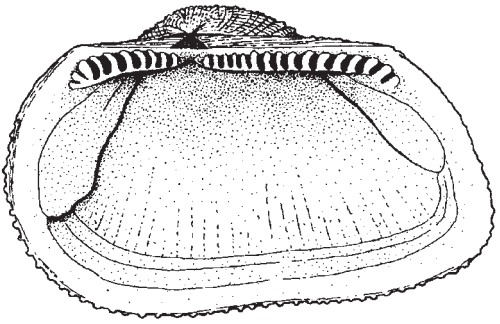
Biotope. On hard substrate, from the intertidal zone to about 40 m, locally not uncommon. The intertidal populations observed in Angola were found byssally attached to the undersides of rocks which are partly embedded in coarse sand or silty gravel. Offshore populations are byssally attached to small stones and other hard objects on soft bottom.

Remarks. This subspecies resembles European specimens in the trapezoidal outline, not so markedly oblique as *S. lactea scoliosa*. It differs from *S. lactea lactea* mainly in the denser sculpture of ribs in the median part. Only in Angola is the subspecies found on the shore where it occurs together with *Arcopsis afra* (see next entry) and *Acar olivercoseli*. The South African *S. gibba* (Krauss, 1848) is larger and much more robust, with a convex, not straight postero-dorsal margin.



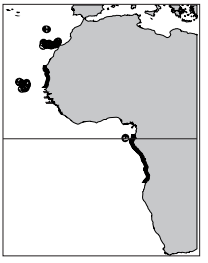
2.46. ***Striarca lactea epetrima*** **Oliver & Cosel, 1993**. **A**-**B**, Ilha de Luanda, N-Angola, 40-60 m (8.1 mm). **C**-**D**, Praia Etambar, Corimba, N-Angola, shallow water (11.6 mm). **E**-**H**, Caotinha, Benguela prov., S-Angola (8.3 mm). **I**-**J**, Baia das Limagens, Benguela prov., S-Angola, 0-2 m (syntype, 9.2 mm, photo Manuel Caballer/Recolnat). **K**-**L**, same locality (syntype, 9.5 mm).

Arcopsis afra (Gmelin, 1791)



2.47. Praia Etambar, Corimba, Luanda prov., Angola (rv, 12.3 mm).

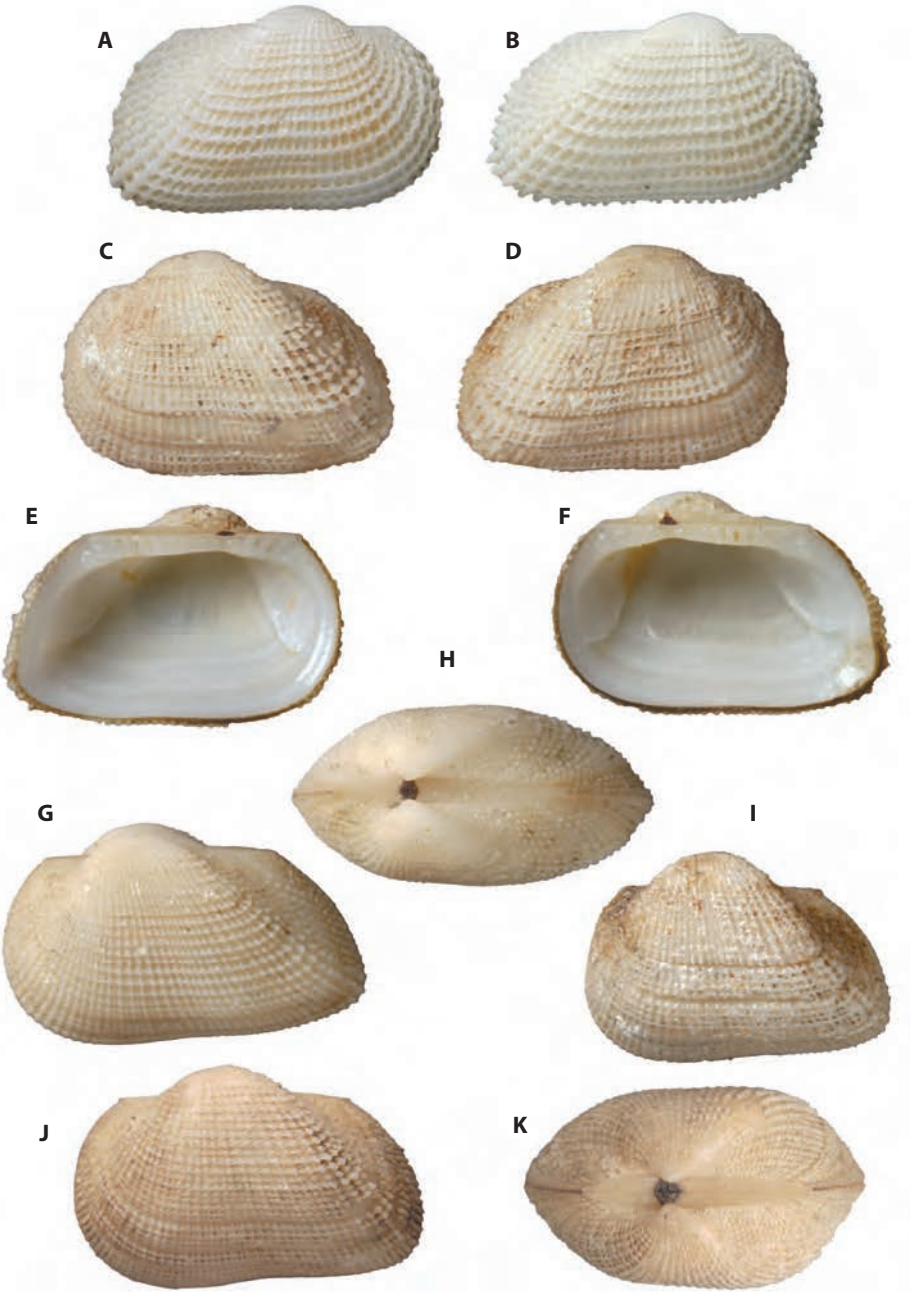
Shell up to 13 mm long, subquadrate, oblong, solid, inflated, equivalve, inequilateral, with beaks behind the anterior third. Surface with strong radial riblets, about 25 in young specimens and, by adding secondary and tertiary riblets in the interspaces, up to 90 in very large specimens. Riblets crossed by commarginal ridges resulting in a nodulose sculpture. Posterior angle well developed, carinate in young specimens, sharply angled in adults. Dorsal area rather narrow, flat, with a small ligament only between the beaks. Periostracum pale straw coloured, consisting of very weak lamellae and short bristles, persistent on the marginal part only. Hinge plate with an anterior set of up to 11 teeth and a posterior set of up to 18 teeth, all minutely serrated and more or less straight, in the middle vertical and on the sides slightly oblique. Valves entirely white.



Distribution. Mauritania (Cap Blanc) to Senegal (Ouaran, Petite Côte) and perhaps Guinea; Gabon (Cap Esterias) to southern Angola (Moçâmedes, Namibe province); Madeira, Canary Islands; Cape Verde Islands; São Tomé, Ilha do Principe.

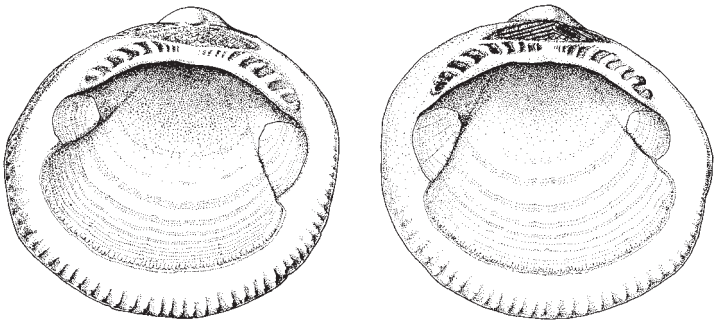
Biotope. Byssally attached to the undersides of rocks and stones, from low tide level to about 40 m, common. Seems to prefer clear water with full salinity but may occasionally also be found in more murky water.

Remarks. This species is close to the Caribbean *A. adamsi* (Dall, 1886), but that species has a more dense sculpture with about twice as many riblets at any equivalent size. Coarsely sculptured specimens are superficially similar to small *Acar olivercoseli*, but are readily distinguished by their short ligament situated just between the umbos (long and posterior to the umbos in *Acar*).



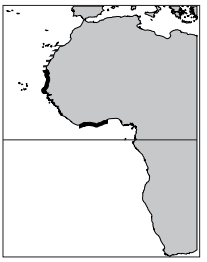
2.48. *Arcopsis afra* (Gmelin, 1791). **A**, Mauritania, 20°20'N, 16°22'W, 10 m (8.5 mm). **B**, same locality (8.4 mm). **C**-**F**, Baia Matiota, São Vicente, Cape Verde Islands, under rocks (8.6 mm). **G**-**H**, Cap Esterias, 1-1.5 m (11.8 mm). **I**, same locality (10.0 mm). **J**-**K**, Praia São Tiago, Bengo prov., N-Angola, 1-2 m (13.1 mm).

Glycymeris scripta (Born, 1778)



2.49. M'Bour, Petite Côte, Senegal, 30-50 m (59.4 mm).

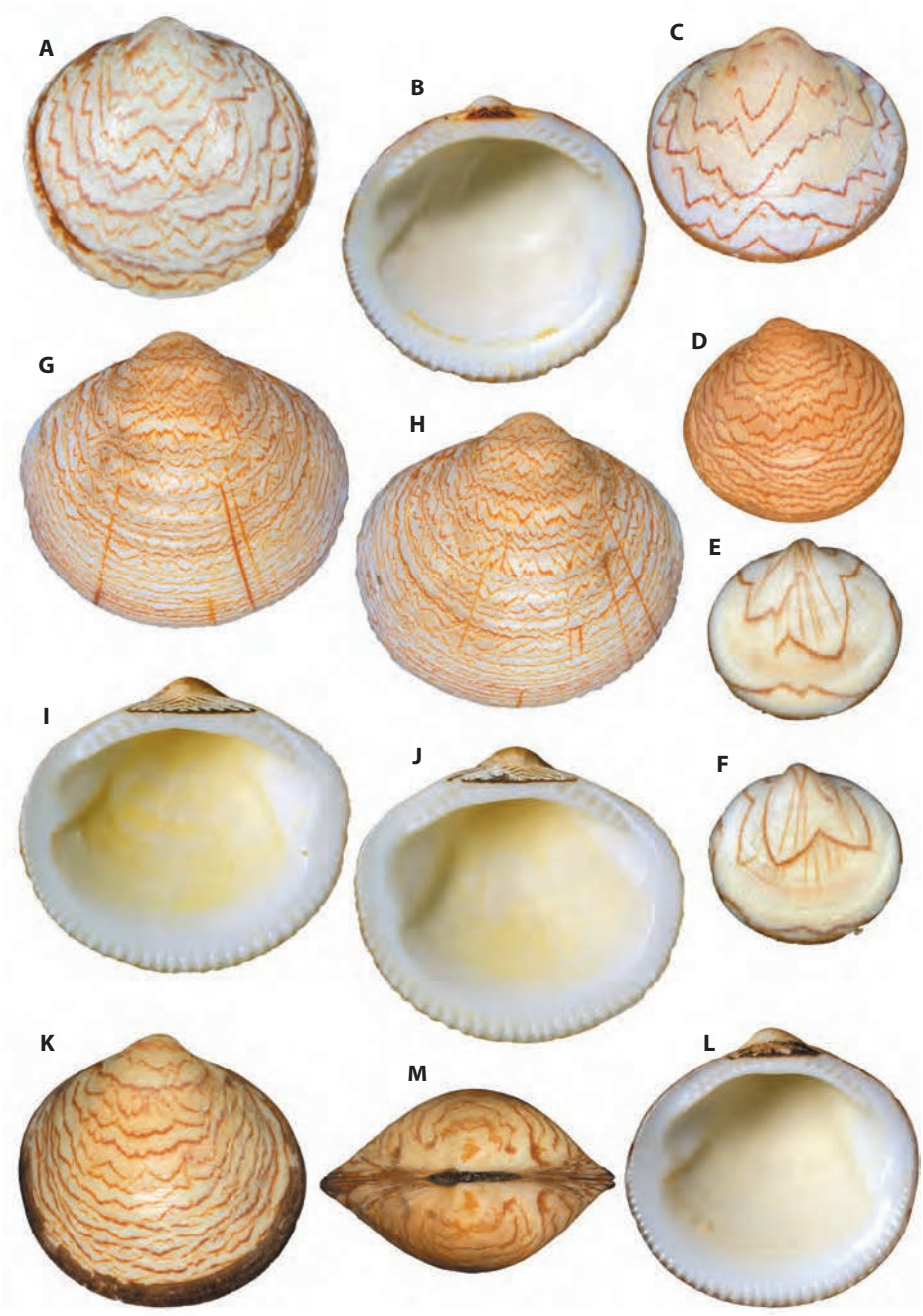
Shell up to 67 mm long, somewhat variable in outline, almost circular, slightly longer than high, thick and solid, rather inflated, nearly equilateral with the beaks on or just in front of the vertical midline. Surface with rather fine, irregular growth lines and occasionally also coarser growth stages. There are also extremely fine, dense, more or less regularly spaced radial striae, only visible under a lens. Dorsal area very narrow, deeply inset, beaks close together, the dorsal cavity filled with the ligament. Ligamental area smooth, inequilateral, ligament bearing 4-5 chevrons in adult specimens. Periostracum brownish, rather thick and delicately velvety, mostly eroded and persistent only near the margins. Hinge plate broad with 9-12 anterior and 9-11 posterior teeth, most of them thick, especially the distal ones. Inner margin dentate, adductor scars on platforms, the anterior one slightly larger than the posterior one. Outside whitish cream, frequently tending to light yellowish or light brownish pink, with earlier parts occasionally somewhat darker coloured. Pattern consisting of close-set to widely spaced, continuous or interrupted, irregular, reddish brown to dark brown zigzag lines. Occasionally shells are monochromatic without pattern. Inside white, sometimes with brownish zones or occasionally with brownish commarginal lines.



Distribution. Mauritania (Cap Blanc) southward to Senegal (Petite Côte); Côte d'Ivoire (Abidjan region) to Ghana (Tema and Accra, material in the private coll. of P. Ryall). Bellon-Humbert (1974) reported the species from the extreme South of Morocco (Tarfaya). Not found in Casamance and Guinea.

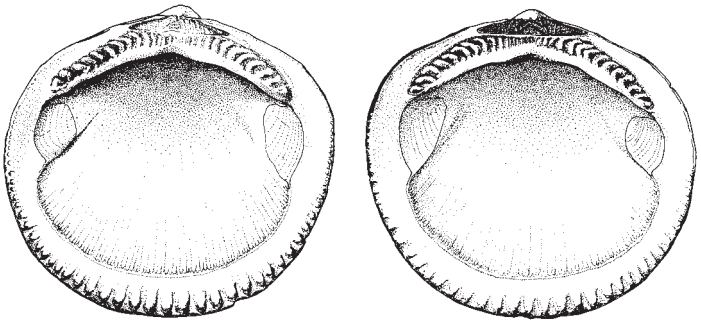
Biotope. *In fine* and mixed sand, from about 7 to 50 m, rather common.

Remarks. *Glycymeris scripta* has a disjunct distribution and is restricted to the northern zone of more or less long intermittent upwelling and the upwelling zone at Côte d'Ivoire and Ghana, there it seems to be rare. Specimens and empty valves are occasionally taken in trawls. This is "Le Vovan" of Adanson.



2.50. ***Glycymeris scripta*** **(Born, 1778).** **A-B**, Port-Etienne (now Nouadhibou), Mauritania, 20°20'N, 16°22'W (36.1 mm). **C**, same locality (lv, 31.2 mm). **D**, same locality (rv, 26.5 mm). **E-F**, Mauritania, 19°54'N, 17°03'W, 7 m (juvenile, 15.9 mm). **G-J**, M'Bour, Petite Côte, Sénégal, 30-50 m (67.3 mm). **K-M**, off Abidjan, Côte d'Ivoire (34.2 mm).

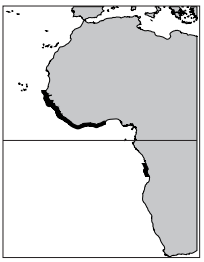
Glycymeris stellata (Bruguière, 1789)



2.51. M'Bour, Senegal, 10-20 m (50.4 mm).

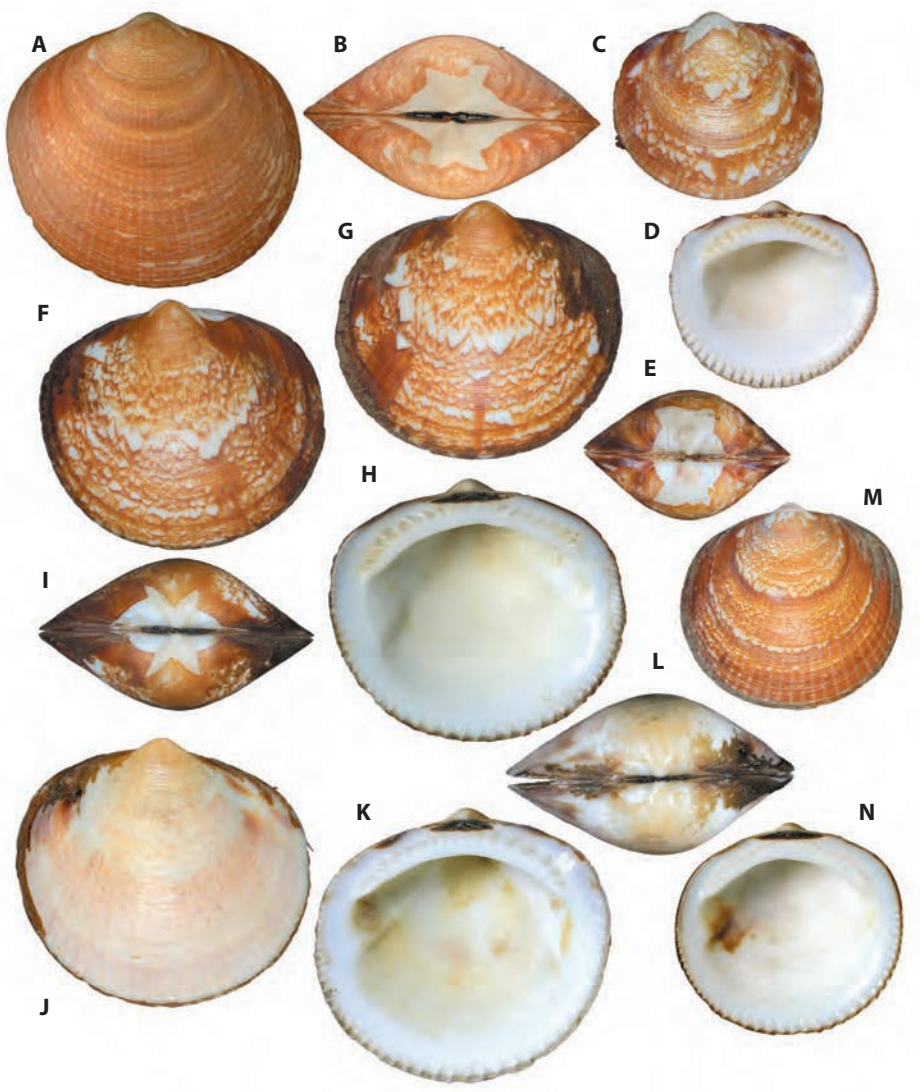
Shell up to 65 mm long, little variable in outline and tumidity, colour and teeth number, nearly circular, slightly longer than high, rather thick and solid, somewhat compressed, about equilateral. Surface with narrow, slightly irregular commarginal waves or folds, especially on half-grown specimens and the dorsal (earlier) half of adult specimens. On the lower half of fully grown specimens sculpture transforming to more irregular growth lines and a few coarser growth stages mostly near the ventral margin. Radial sculpture consisting of extremely fine, dense, more or less regularly spaced radial striae, only visible under a lens. Juvenile specimens without any radial sculpture. Dorsal area very narrow, deeply inset, beaks close together. Ligament with 4-7 chevrons in adult specimens, ligamental area smooth. Periostracum brown, rather thick, somewhat pilose, persistent only near the margins. Hinge plate very broad with 12-16 anterior and 12-16 posterior teeth, varying from nearly laminar and narrow to rather thick, some being bifid. Inner margin dentate, anterior adductor scar slightly larger than posterior scar, both on platforms. Outside whitish cream, frequently tending to light yellowish or light brownish pink with dense brownish or reddish zigzag or tent markings; towards the margins zigzag lines becoming very close-set, nearly touching to merging, resulting in appearing uniform reddish brown. Umbonal region generally with a whitish or light coloured zone with sharp zigzag limit, reminding an irregular star on a complete shell viewed from dorsally. Inside white, often tinged with orange or reddish brown, mainly on the posterior side.

Distribution. Senegal (Gorée area) southward to Côte d'Ivoire and Ghana; Southern Gabon to northern Angola (Luanda, rare and only juveniles found). Not N of Senegal and no records from Bénin to northern Gabon.



Biotope. *In fine*, mixed and rather coarse sand, from about 10 to about 45 m and perhaps deeper, rather common in the north, uncommon to rare south of Guinea.

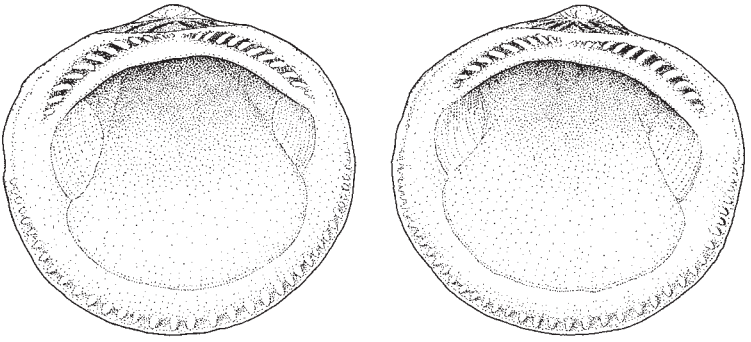
Remarks. This species is distinguished from *G. scripta* by its less tumid valves, the less sloping antero- and postero-dorsal margin, and the orthogyrous umbo with equilateral ligamental area in young and fully grown specimens, whereas in *G. scripta* the juveniles have



2.52. *Glycymeris stellata* (Bruguière, 1789). **A-B**, M'Bour, Petite Côte, Sénégal, 10-20 m (51.5 mm). **C-E**, Holotype of *G. vovan*, MNHN (27.1 mm). **F-I**, W of Rio Yomboya, Guinea, 10°27'N, 15°37.5'W, 39 m (41.1 mm). **J-L**, same locality, specimen with pale, uniform colour pattern (lv, 40.4 mm). **M-N**, off Sierra Leone River (38.6 mm).

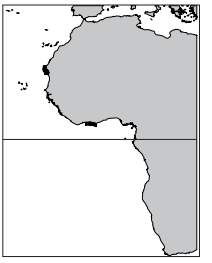
orthogyrous umbos with inequilateral ligamental area. Juvenile shells of *G. stellata* are smooth, of *G. scripta* sculptured with radial striae. The periostracum of *G. stellata* is slightly more leafy than in *G. scripta* and the hinge plate somewhat broader. *Pectunculus vovan* Lamy, 1912, under which name this species was known since a long time, is a synonym (for details, see Huber 2010). Lamy (1912) did not have access to Adanson's specimens and wrongly identified this species as being "Le Vovan", which was actually *G. scripta*. Specimens and empty valves are occasionally taken in trawls.

Glycymeris rafaelmesai Nolf & Swinnen, 2013



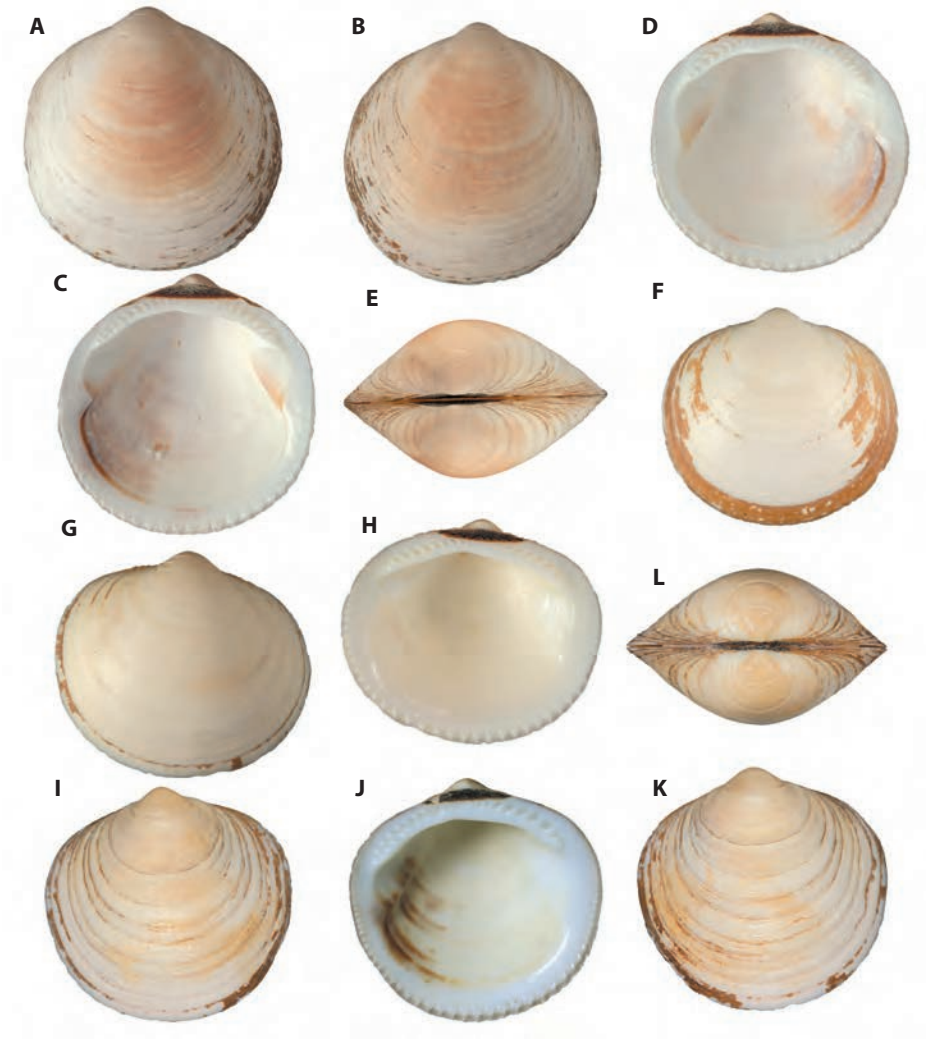
2.53. Banc d'Arguin, Mauritania, 20°20'N, 16°22'W, 10 m (35.0 mm).

Shell up to 65 mm long, rather variable in outline, less variable in tumidity, almost circular, slightly higher than long, as long as high to a bit longer than high, thick and solid, inflated, nearly equilateral with more or less prominent beaks almost on the vertical midline. In juvenile shells (up to 20 mm) beaks nearly not opisthogyrous but almost appearing orthogyrous. Surface with rather dense growth lines, visible as more or less irregular commarginal waves or folds. There are also numerous coarser growth stages. Radial sculpture consisting of very weak, distantly spaced shallow grooves which correspond to the interspaces of the internal non-sculpturous ribs, only visible under a lens, often only on the posterior slope. Dorsal area very narrow, deeply inset, beaks close together. Ligament with 4-7 chevrons in adult specimens. Ligamental area almost smooth but in fully grown specimens chevrons may be reflected on its surface as very shallow waves. Periostracum brown, rather thick, leafy, mostly eroded and persistent only near the margins. Hinge plate broad with 12-16 anterior and 12-15 posterior teeth, all rather narrow and laminar to quite thick. Inner margin dentate. Anterior adductor scar slightly larger than posterior scar both on platform-shaped buttresses. Outside uniform whitish cream to light yellowish or light brownish pink. A star-like pattern on the umbonal region may occasionally be present but generally is very faint. Inside white, sometimes with brownish zones or lines postero-ventrally.



Distribution. Known from the permanent upwelling zone along NW-Africa from Canary Islands (Lanzarote, *fide* Nolf & Swinnen, 2013), West Sahara (La Güera, Nolf & Swinnen 2013); Mauritania (Cap Blanc; NW of Nouakchott; Baie du Lévrier; Banc d'Arguin). Also known from a single specimen collected at Côte d'Ivoire (Abidjan region). Furthermore, Nolf & Swinnen (2013) reported the species from Dakar, Senegal, although we never have found it there. Another isolated record by these authors comes from Northern Angola (Moita Seca, 75 m), which may indicate a bipolar distribution on the West African coast.

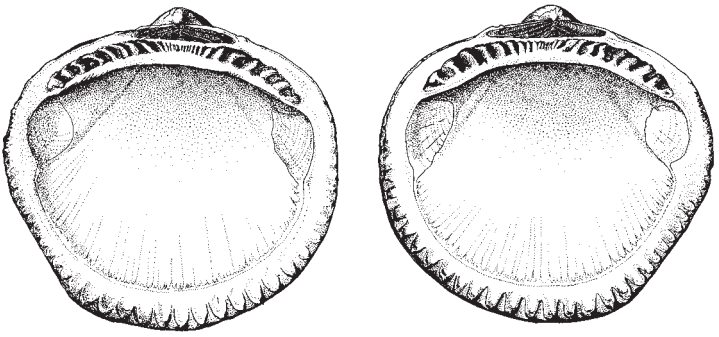
Biotope. In mixed and perhaps also coarse sand, from about 10 to 40 m, occasionally deeper, to 85 m, locally rather common.



2.54. *Glycymeris rafaelmesai* Nolf & Swinnen, 2013. **A-E**, SE of Nouadhibou, Mauritania (57.4 mm). **F**, same locality (rv, 35.2 mm). **G-H**, Mauritania, 20°20'N, 16°22'W, 10 m (lv, 52.7 mm). **I-L**, off Abidjan, Côte d'Ivoire (43.4 mm).

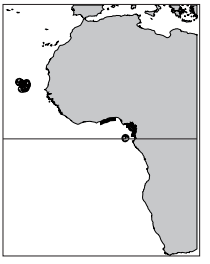
Remarks. This species is the closest to *G. stellata*, it has, however, a more tumid shell, a slightly narrower hinge plate in fully grown specimens, an often more downward sloping anterior and posterior margins and a usually monochromatic outside. *G. rafaelmesai* entirely lacks the extremely fine and dense radial grooves of *G. stellata*; it is smooth except rather few widely spaced shallow grooves usually restricted to the posterior slope. The periostracum is thus not hairy but distinctly leafy. Apart from the typical pattern, *G. scripta* is distinguished by its opisthogyrous umbos and dense radial striae. Specimens and empty valves are occasionally taken in trawls.

Glycymeris formosa (Reeve, 1843)



2.55. Ilha do Principe, ex coll. Rang (40.6 mm).

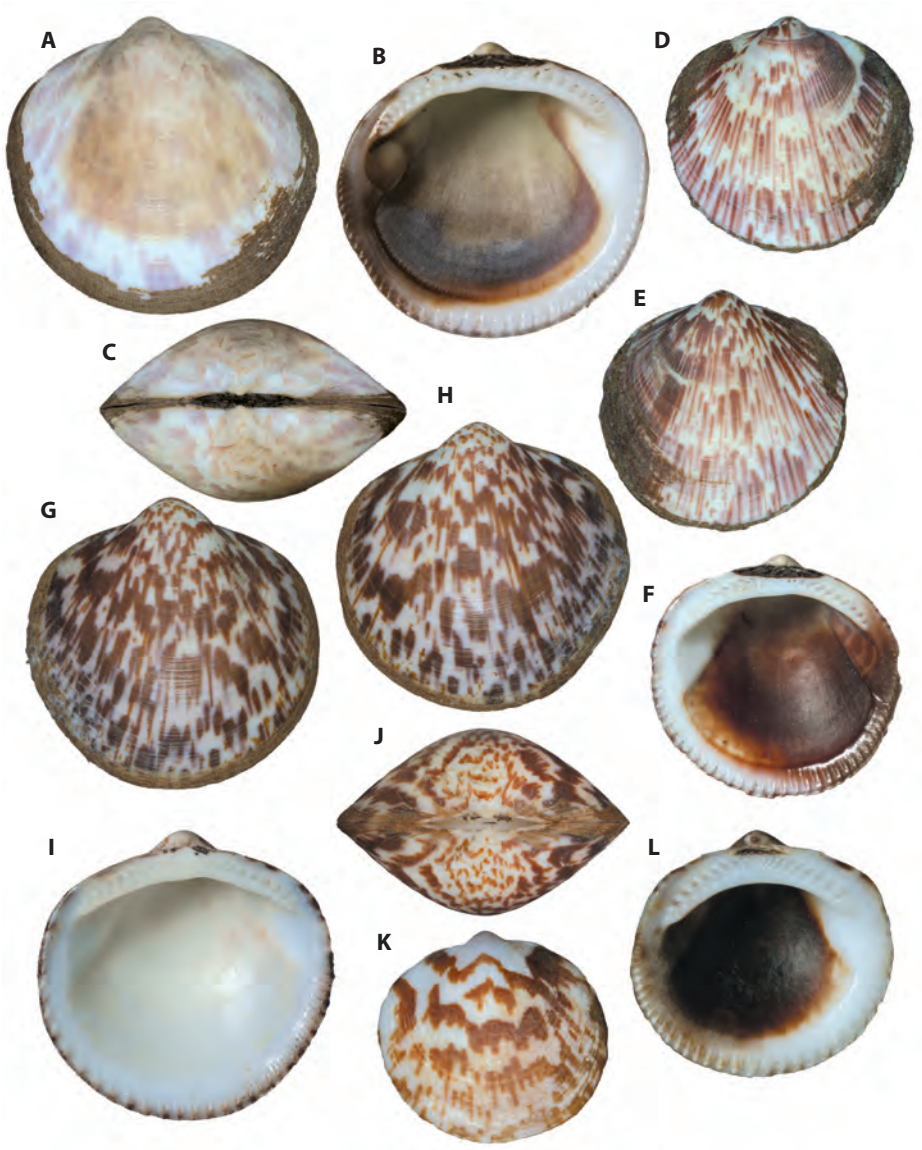
Shell up to 61 mm long, somewhat variable in outline and tumidity, nearly circular, thick and solid, compressed to slightly inflated, with beaks almost in the vertical midline or slightly behind it. Postero-ventral margin in fully grown specimens oblique and less rounded. Surface with rather dense, very shallow irregular commarginal waves or folds, irregular growth lines and often very faint, punctuated, densely spaced radial grooves on the anterior or both slopes. Dorsal area very narrow, deeply inset. Beaks close together, the dorsal cavity filled by the ligament. Adult specimens with about 3-4 chevrons, ligamental area smooth. Periostracum dark brown, rather thick, hairy and velvety, usually persistent only near the margins. Hinge plate well arched and in smaller specimens occasionally very broad, with 7-12 anterior and 9-12 posterior teeth, all more or less oblique and straight to somewhat chevron-shaped. Inner margin dentate, adductor scars on platforms, the posterior one more sharply marked than the anterior one. Outside whitish to cream, occasionally in the middle light brownish, with dark reddish brown to purplish radial streaks, drops or dashes, often in isolated groups, sometimes merged together to broad zigzags and mostly with running and not sharp outlines. A star-like white zone on the umbonal region might occasionally be present. Inside white with a more or less vast dark purplish brown zone on the posterior part, which often occupies nearly the whole interior except the anterior muscle scar platform and the anterior half of the hinge plate.



Distribution. Cape Verde Islands, São Tomé, Ilha do Principe, Annobon; on the continental coast only known from a few samples from Ghana (E of Takoradi), Cameroon (Victoria/Limbe area southward) and Gabon.

Biotope. On mixed and coarse sand, also with calcareous algae and shell debris, from 2 m to about 50 m, common on the islands, rare on the continental shelf.

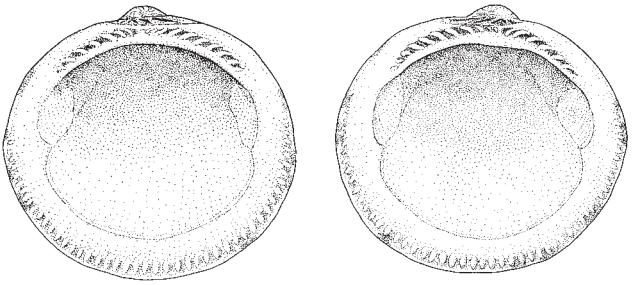
Remarks. This species is distinguished from the other West African *Glycymeris* by the radial colour pattern with the typical running outlines, the largely dark interior and the unevenly rounded posterior margin in large specimens. This insular species seems to reach the continent only at Ghana and between Cameroon and Gabon. The variety "*tumida*" described



2.56. *Glycymeris formosa* (Reeve, 1843). **A**-**C**, Baia Matiota, São Vicente, Cape Verde Islands (lv and dorsal view, 52.1 mm). **D**-**F**, same locality (40.1 mm). **G**-**J**, Praia Grande, Ilha do Principe (49.4 mm). **K**, Ile Banié, Gabon (lv, 25.8 mm). **L**, same locality (lv, 29.5 mm).

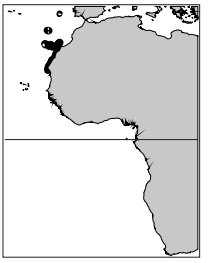
by Dautzenberg & Fischer (1906) and figured also by Bernard (1984) is somewhat smaller and slightly more globose; it falls entirely into the variability of the species. Empty shells and valves are regularly cast ashore on island beaches.

Glycymeris vanhengstumi Goud & Gulden, 2009



2.57. Banc d'Arguin, 20º20'N, 16º22'W, 10 m (36 mm).

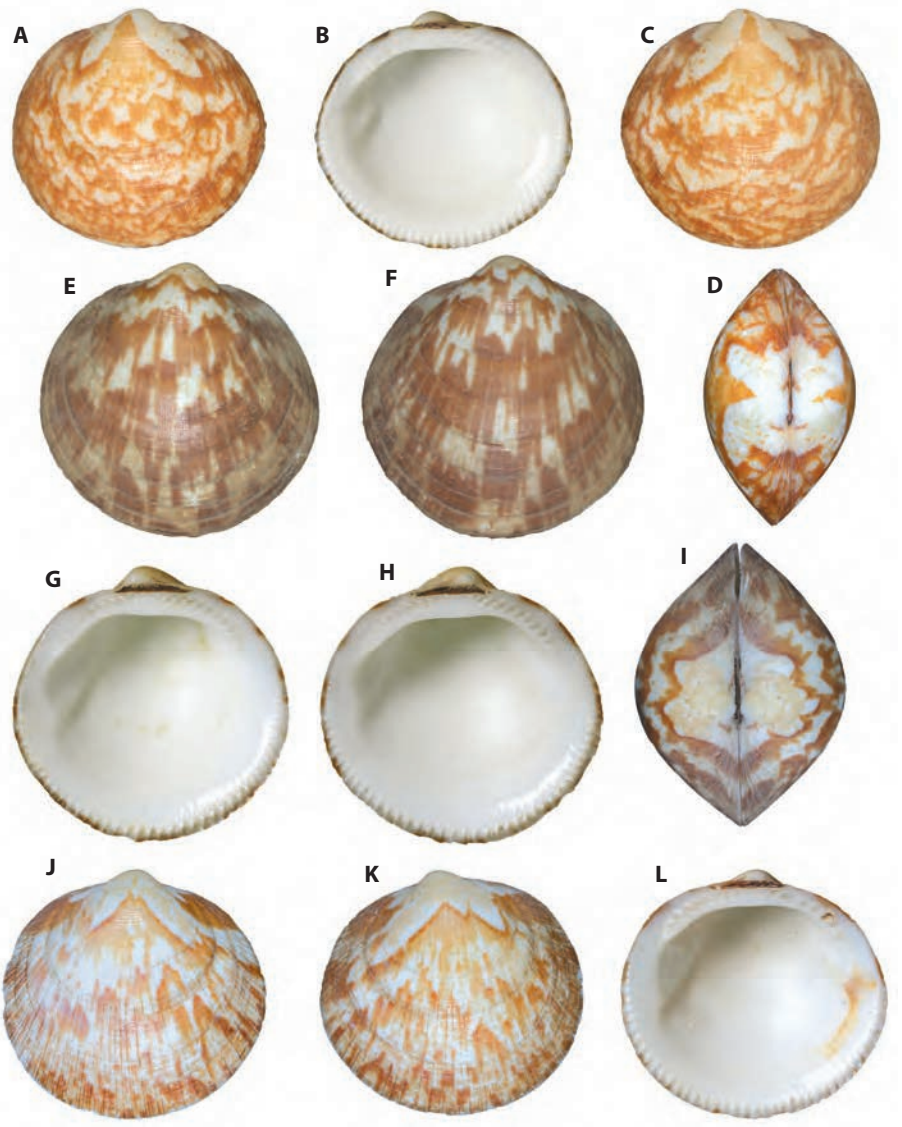
Shell up to 38 mm long and 40 mm high (rarely larger, to 52 mm), rather variable in outline, nearly circular but in fully grown specimens often with more or less oblique postero-ventral margin, as long as high, slightly longer than high (small specimens) or higher than long, thick and solid, well inflated, more or less equilateral. Beaks more or less markedly opisthogyrous. Surface with coarser growth stages and fine, regular, rather dense, shallow commarginal waves becoming slightly more irregular towards the ventral margin. Radial sculpture of irregularly but not densely spaced fine and sharp grooves where in course of growth more and more secondary grooves intercalate. Dorsal area more or less deeply inset. Beaks close together but not touching each other. Ligament narrow, with 2-3 chevrons in smaller specimens and broader, with up to 6 chevrons in very old specimens. Chevrons reflected on the surface as shallow waves. Periostracum thin and straw-coloured to brown, only close to the margins with weak bristles. Hinge plate markedly curved on both sides and nearly straight under the ligament, rather narrow to moderately broad, with 11-15 anterior and 9-12 posterior teeth, rather narrow and close-set, some of them slightly bifid. Inner margin dentate, adductor scars on more or less marked platforms. Outside whitish cream, with mostly radially arranged brown streaks, drops or dashes, middle brown to rather dark brown or dark reddish brown, isolated or merged to high, narrow zigzags or broader zones, with more or less running contours. Occasionally valves nearly monochromatic, brown or with larger brown zones. A star-like whitish zone is frequently present on the umbos. Inside white.



Distribution. From Gorringe Bank off Portugal (about 37°N) to West Sahara (24°N), Canary Islands, Madeira and Selvagens.

Biotope. On sand, often with calcareous algae and shell agglomerations, from about 50 m to 250 m and deeper, common on the seamounts.

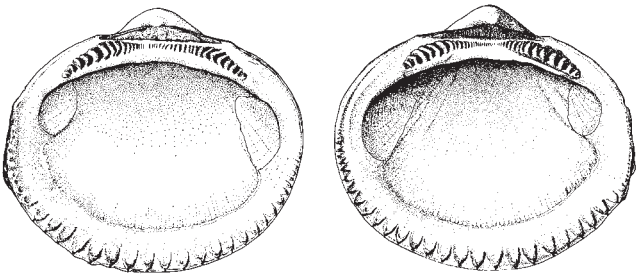
Remarks. This form hitherto considered as *G. pilosa* (Linnaeus, 1767) was recently described as *Glycymeris vanhengstumi* by Goud & Gulden (2009) but it is still not demonstrated that it is not merely a geographic subspecies of *G. glycymeris* (Linnaeus, 1758) or *G. pilosa*. From the Mediterranean coast and shelf specimens of *G. pilosa* (which may reach 70 mm and more), this form is distinguished by being smaller and more tumid, and the more vivid colour of the outer surface, not obscured by the periostracum. The outline is also different, with a less convex and more oblique postero-ventral margin, more



2.58. *Glycymeris vanhengstumi* Goud and Gulden 2009. **A-D**, Banc de la Malouine, off West Sahara, 25°38'N, 14°55'W (21.7 mm). **E-I**, off West Sahara, 24°00'N, 16°48'W (29.4 mm). **J-L**, West Sahara fishing grounds (25.5 mm).

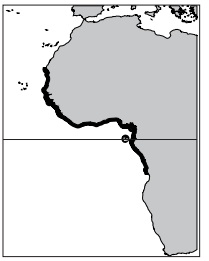
angled posterior margin and the maximum diameter situated along the midline (not below as in *G. pilosa*). However, the early postembryonal part of the valves and the rather strongly opisthogyrous umbos are indistinguishable and this would suggest to consider both forms conspecific. Intermediates occur. The only other West African glycymerid with blurry outlines in the colour pattern is *G. formosa* which is much larger with more orthogyrous umbos and a more reddish brown to purplish pattern. Due to its occurrence in rather deep water, this species is never found on the beach.

Glycymeris concentrica (Dunker, 1853)



2.59. Punta de Mussulo, Luanda, Angola, on beach (45.8 mm).

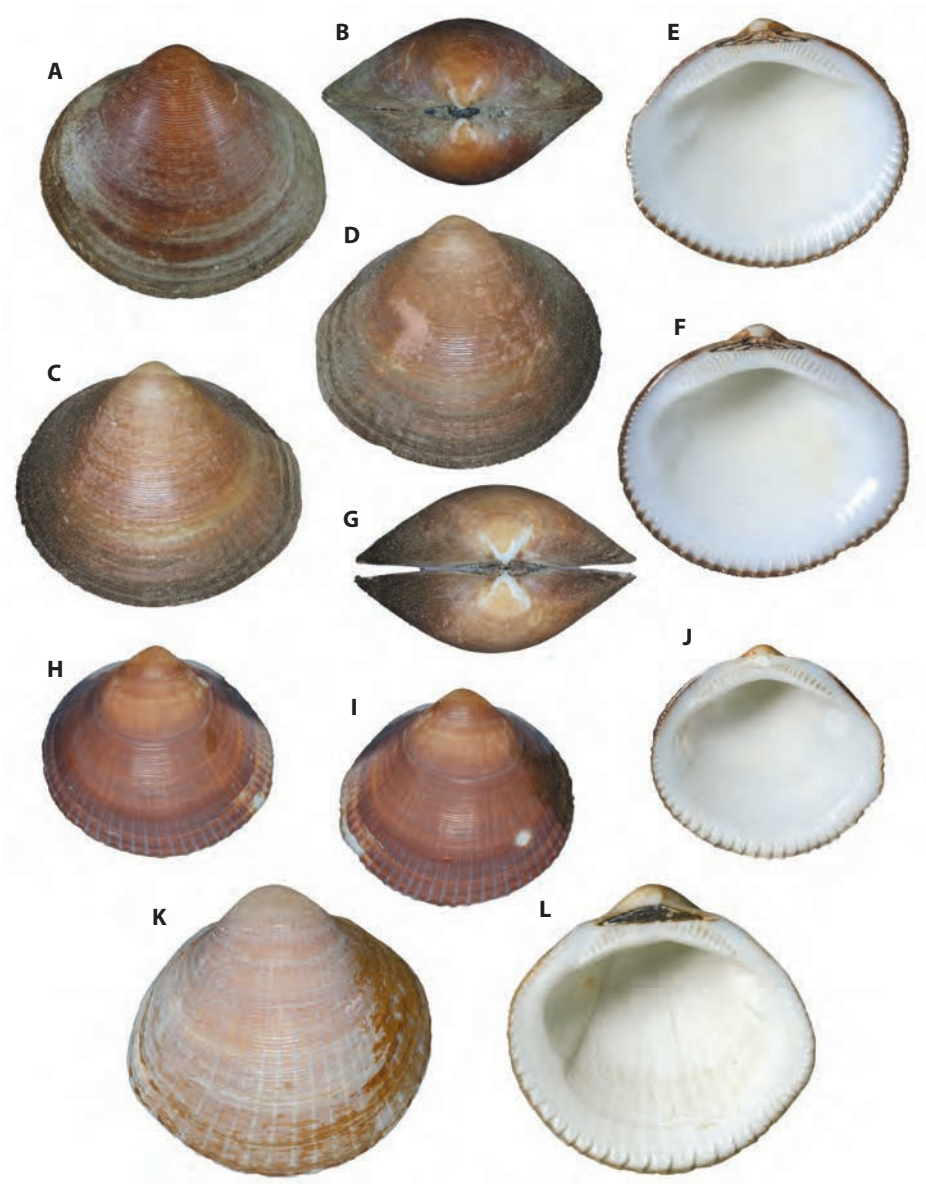
Shell up to 50 mm long, somewhat variable in size and outline, slightly longer than high, with broadly rounded anterior margin and more narrowly rounded posterior margin, thick and solid, inflated, weakly inequilateral. Beaks slightly opisthogyrous, situated just in front of the vertical midline. Surface with very close-set, fine but well marked and regular commarginal grooves, towards the ventral margin becoming still denser and slightly irregular. There are also extremely fine, dense, more or less regularly spaced radial striae, only visible under a lens. Beaks close together; dorsal area narrow and deeply inset, covered by a thick ligament, with up to 3-5 chevrons in fully grown specimens. Chevrons reflected in grooves on the ligamental area. Periostracum generally persistent on the entire valve, brown, on the umbonal half smooth with a glossy appearance, on the marginal half thicker and velvety, especially on the anterior slope. Hinge plate broad, well arched, with 12-17 anterior and 13-16 posterior teeth, all close-set, more or less laminar and straight to slightly arched or chevron-shaped. Inner margin dentate. Anterior adductor scar slightly larger than posterior scar, both on platforms. Outside reddish brown, occasionally with a lighter ray on the posterior slope; umbonal part often pale brown to cream. Juveniles occasionally creamish with reddish brown mottles or bands, rarely also half-grown or adult specimens. Inside white, under the beaks often tinged with orange, pinkish or light brownish.



Distribution. Mauritania (Cap Blanc) to northern Angola (Luanda); São Tomé, Ilha do Principe.

Biotope. In fine sand, from shallow water (2-4 m) to about 30 m and perhaps deeper, common in Mauritania and Senegal, uncommon on the remaining part of the coast.

Remarks. This species is distinguished from the other West African species by its smaller size, the more inequilateral shell and the more laminar and closer-set teeth. The lamellar layer (chevrons) of the ligament is situated directly on the ligamental area and in ligamental grooves, whereas in the other species the chevrons are completely imbedded in the fibrous layer and thus result in a smooth ligamental area. *Glycymeris concentrica* is close to the Mediterranean *G. nummaria* (Linnaeus, 1758) with which it shares the grooves on the ligamental

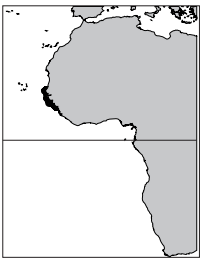


2.60. *Glycymeris concentrica* (Dunker, 1853). **A**-**B**, Casamance, Senegal, 13°05.6'N, 17°02.4'W, 19 m (37.0 mm). **C**-**G**, W of Baie de Sangarea, Guinea, 9°42'N, 15°21'W, 30 m (35.6 mm). **H**-**J**, Takoradi, Ghana (34.6 mm). **K**-**L**, Ponta do Mussulo, N-Angola (rv, 35.1 mm).

area and the glossy-looking periostracum. The hinge plate of *G. concentrica* is broader and the teeth more numerous and much closer-set, the shell is less tumid and less oblique. *Glycymeris cor* (Lamarck, 1805) from the Lower Miocene of the Aquitaine Basin is similar and may be an ancestor. Specimens and empty shells are occasionally taken by fishermen, valves are found on the drift line of some beaches.

Limopsis pyrenoides Oliver & Cosel, 1995

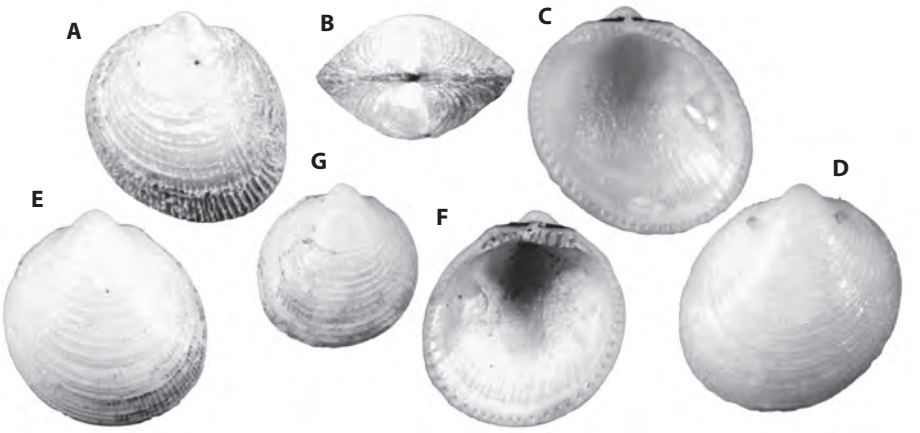
Shell small, up to 4.5 mm long and 5 mm high, equivalve, somewhat inequilateral, slightly compressed, ovate and slightly oblique, higher than long. Posterior margin weakly curved to almost straight, ventral margin rounded and curving continuously into the rounded anterior margin. Dorsal margin very short, dorsal area narrow, beaks not widely separated. Surface in well preserved specimens with widely spaced but narrow commarginal ridges which are finely interrupted by the insertion marks of the periostracal bristles. These are rapidly eroded in larger specimens and on dead valves. Periostracum rust brown, with a primarily commarginal arrangement of short, semierect, pointed bristles. Inner margin finely crenulate, crenulations weaker on the posterior margin and absent at the posterior ventral junction. Hinge prominent, hinge plate with an anterior set of up to 6 vertical teeth and a posterior set of up to 5 more oblique teeth, the edentulous gap between the sets narrow. Valves entirely white.



Distribution. Known only from Senegal (Dakar region) and Guinea (9°30'N).

Biotope. Unknown but presumed to live in fine muddy sand. It has been dredged between 80 and 230 m. Uncommon to rare.

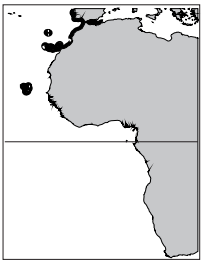
Remarks. This species has some features in common with *L. cristata* Jeffreys, 1876, *e.g.* the crenulated margin and the form of the periostracum. However, the bathyal *L. cristata* is less tumid and has longer bristles. A very close species is *L. friedbergi* Glibert & van de Poel, 1965, a fossil from the Pleistocene of Sicily which occurs as Recent around the Canary Islands and in the Ibero-Moroccan Gulf (see Salas 1996). The two species might finally result conspecific. Several old and poorly preserved valves of a second *Limopsis*, *L.* cf. *minuta* (Philippi, 1836), have been dredged sympatrically in Baie de Gorée.



2.61. *Limopsis pyrenoides* Oliver & Cosel, 1994. **A**-**B**, Baie de Gorée, Senegal, 14°51.5'N, 17°30'W, 170-200 m (holotype, 3.1 mm, photo Manuel Caballer/Recolnat). **C**-**D**, same locality (paratype, 5.2 mm). **E**-**F**, same locality (paratype, 4.2 mm). **G**, same locality (paratype, 3.8 mm).

Limopsis aurita (Brocchi, 1814)

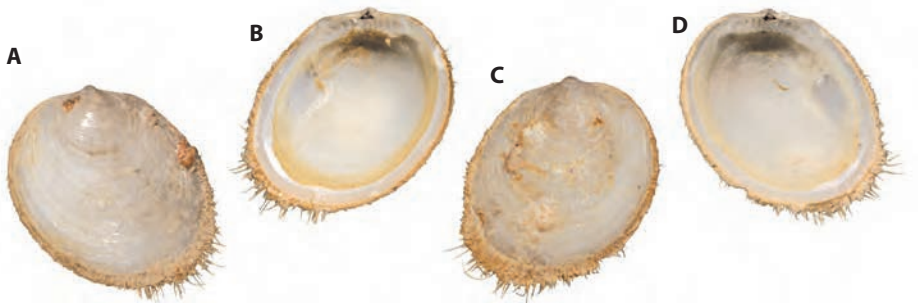
Shell small, up to 15 mm high, higher than long, equivalve, inequilateral, compressed, ovate and definitely oblique with the posterior part more produced. Posterior margin weakly curved, ventral margin rounded and curving continuously into the rounded anterior margin. Dorsal margin short, dorsal area narrow with beaks not widely separated. Surface with widely spaced, low and irregular commarginal ridges and, on the posterior third, of ill-defined radial threads interrupted by the commarginal ridges. Periostracum brown, forming long periostracal bristles almost parallel to the surface and projecting well beyond the ventral margin; these bristles are loosely arranged along radial rows. Inner margin bevelled and absolutely smooth, with the two broad flat surfaces of each valve in contact when the shell is closed. Hinge plate with an anterior set of up to 7-8 vertical teeth and a posterior set of up to 7-9 more oblique teeth, the edentulous gap between the sets narrow. Ligament in a small triangular pit situated just below the beaks. Valves entirely white.



Distribution. From Norway to Morocco, Azores, Canary Islands (Oliver & Allen 1980b), Madeira (Segers *et al.* 2009) and Cape Verde Islands (Locard 1898); Mediterranean in the Alboran Sea and with scanty records in the Tyrrhenian Sea. The species is also recorded from the Western Atlantic from Newfoundland to the Caribbean and Brazil, and but DNA analysis would be needed to ascertain if those populations are really conspecific.

Biotope. on offshore muddy gravels in 200-600 m (Oliver & Allen 1980b), attached to sediment particles by a single byssus thread, locally abundant when the appropriate habitat is present.

Remarks. This species is distinguished from all other European limopsids by the smooth, sharply beveled edge of the valves, whereas all others have crenulations at least on the postero-ventral margin. The outline is quite variable but no essential differences can be seen with Pliocene specimens. For details on anatomy and observations on living specimens, see Oliver & Allen (1980b). This is the type species of the genus *Limopsis*.



2.62. *Limopsis aurita* (Brocchi, 1814). A-D, Cape Verde Islands, 16°52'N, 25°10'W, 400-580 m (12.5 mm ht without barbs).

Superfamily MYTILOIDEA

Family MYTILIDAE
Subfamily Mytilinae
- Genus ***Mytilus*** Linnaeus, 1758 – 1 species
- Genus ***Perna*** Philipsson, 1788 – 1 species
- Genus *Semimytilus* Soot-Ryen, 1955 – 1 species (not treated)

Subfamily Brachydontinae
- Genus ***Brachidontes*** Swainson, 1840 – 2 species

Subfamily Arcuatulinae
- Genus ***Arcuatula*** Jousseaume in Lamy, 1919 – 1 species

Subfamily Musculinae
- Genus ***Musculus*** Röding, 1798 – 2 species
- Genus ***Gregariella*** Monterosato, 1883 – 4 species

Subfamily Crenellinae
- Genus ***Solamen*** Iredale, 1924 – 1 species
- Genus ***Rhomboidella*** Monterosato, 1884 – 1 species

Subfamily Lithophaginae
- Genus ***Lithophaga*** Röding, 1798 – 1 species
- Genus ***Leiosolenus*** Carpenter, 1857 – 2 species

Subfamily Modiolinae
- Genus ***Modiolus*** Lamarck, 1799 – 6 species
- Genus ***Jolya*** Bourguignat, 1877 – 1 species
- Genus ***Lioberus*** Dall, 1898 – 1 species
- Genus ***Amygdalum*** Megerle von Mühlfeld, 1811 – 1 species

Subfamily Bathymodiolinae
- Genus *Bathymodiolus* Kenk & Wilson, 1985 – 2 species (not treated)

Subfamily Dacrydiinae
- Genus *Dacrydium* Torell, 1859 – 3 species (not treated)

Superfamily Mytiloidea

This superfamily contains the sole family Mytilidae, and together with the extinct Paleozoic superfamily Modiolopsoidea conforms the Order Mytilida. Members of this group include the well known mussels and typically have a very inequilateral shell, with the umbos situated at the anterior end ("mytiliform" as in genus *Mytilus*) or close to it ("modioliform" as in genus *Modiolus*).

Family MYTILIDAE

Shells very small to exceptionally large (up to 370 mm), equivalve, inequilateral, short-oval to very elongate, with terminal or subterminal beaks and mostly with a more or less narrow anterior margin and broadly rounded posterior margin. Valves thin and fragile to rather thick and solid, generally inflated. Surface smooth and with growth lines only or with variable radial sculpture, often divided into three areas, the anterior and posterior area being sculptured and the middle area smooth. Exterior covered by a conspicuous, light yellowish brown to dark bluish black periostracum; surface often with more or less long hairs or bristles, mainly on the posterior part, or with calcareous incrustations. The hairs and bristles are byssal bristles, they are not part of the periostracum, but are produced by the foot and the glands associated with it, and not by the mantle edge (for details see Ockelmann 1983). Hinge without teeth or with small teeth anterior to the ligament or on both sides of it, occasionally with minute crenulations (dysodont teeth) along the hinge line. Ligament very long and situated wholly behind the beaks (opisthodetic), on a long, calcified, ligamental ridge. Interior sometimes nacreous, always with smooth internal shell margin. Adductor scars very unequal, anterior scar very small or absent, posterior scar large and merged with the scars of the posterior pedal and byssal retractor muscles.

Mussels are inhabitants of marine and brackish water habitats and occasionally even fresh water. Most live attached to hard substrate by means of a strong byssus, although some inhabit soft bottoms and use the byssus for building a nest-like structure to which mud is often glued. Other species bore into coral, shells, limestone or soft rock. Some are solitary but many intertidal or shallow water species are gregarious and may occur in masses, structuring the habitat. A short introduction to the family (with a survey of the Panamic-Pacific species) was given by Soot-Ryen (1955); for general information on ecology, physiology, larval biology and mytiliculture, see Bayne (1976) and Gosling (1992).

There are currently 413 accepted species worldwide, 26 of these live on the West African coast and five more in deep water off West Africa.

Attempts to group the mytilid genera as subfamilies or even as separate families (*e.g.* Morton 2015) are not fully consistent and lack the support of extensive molecular data. Some groups are nevertheless recognizable and Huber (2010) listed ten subfamilies, according to which the genera are here arranged.

Genus *Mytilus* Linnaeus, 1758. Shells medium sized to large (over 100 mm), wedge-shaped to subtriangular, with pointed anterior margin and broadly rounded posterior margin. Beaks terminal. Anterior tip with few small, tooth-like crenulations. Surface smooth or with radial sculpture. Anterior adductor scar very small, posterior adductor muscle scar fused with the posterior pedal and byssal retractor scars.

Genus *Perna* Philipsson, 1788. Shells medium-sized to large (over 100 mm), mytiliform, elongate to very elongate, with markedly pointed anterior margin and rounded posterior margin. Beaks terminal. Surface smooth, with growth lines. Anterior adductor scar absent in adult specimens, posterior muscle scars differing from *Mytilus* in that the posterior pedal retractor scar is clearly separated from the fused posterior adductor and byssal retractor scars. Hinge with 1-2 small teeth under the beaks.

Genus *Brachidontes* Swainson, 1840. Shells small to medium-sized, mytiliform, with more or less pointed anterior margin, rounded posterior margin and subterminal to terminal beaks. Surface generally with more or less prominent, irregular, partly bifurcating, radial ribs. Margin with small teeth anterior to and behind the ligament.

Genus *Arcuatula* Jousseaume *in* Lamy, 1919. Shells rather small to medium-sized, modioliform, thin, elongate, with more or less narrowly rounded anterior margin and rounded posterior margin. Beaks somewhat subterminal. Surface with commarginal growth lines and with indistinct radial lines anteriorly and posteriorly. Anterior adductor scar rather large, anterior byssus retractor scar rounded and under the beaks. Posterior muscle scars united. Ligament long, resilifer narrow and often pitted. The configuration of periostracum and radial sculpture is very similar to *Musculus*, but contrary to the latter the radial sculpture is extremely blurred.

Genus *Musculus* Röding, 1798. Shells mostly small, broadly modioliform, oval, with rounded anterior margin and more or less broadly rounded posterior margin, thin and inflated to very inflated. Beaks subterminal. Surface divided into three oblique areas: anterior part with radial striae or riblets, middle part smooth or with commarginal growth lines, postero-dorsal part with fine, radial ribs. Anterior adductor scar small, posterior scars fused. Small teeth anterior to and behind the ligament. The most commonly used synonym is *Modiolaria* Beck, 1838.

Genus *Gregariella* Monterosato, 1883. Shells small to medium-sized, modioliform, elongate, with rounded anterior and posterior margin, inflated. Beaks subterminal, with rounded keel running to the postero-ventral corner. Surface of the anterior and posterior part with radial striae, middle part with commarginal striae or smooth. Posterior part of valves with long hairs or bristles. Anterior adductor scar small. Hinge line often with fine, equal teeth anterior to and behind the ligament. Inner margin crenulate.

Genus *Solamen* Iredale, 1924. Shells small, rounded to oval, with terminal, more or less rounded beaks and rounded posterior margin, very inflated. Surface with radial, bifurcating ribs. Inner ventral shell margin finely crenulate. Hinge margin without definite crenulations (unlike *Crenella* Brown, 1827) and with a very strong ligament situated below the postero-dorsal margin, so deeply sunken that it is internal.

Genus *Rhomboidella* Monterosato, 1884. Shells small, modioliform, thin, elongate, rounded anterior margin and rounded posterior margin. Beaks subterminal. Surface with radial ribs which are diverging and bifurcating. Ligament short, resilifer narrow and often pitted. Large smooth protoconch.

Genus *Lithophaga* Röding, 1798. Shells small to rather large, cylindrical, straight, elongate to very elongate, posteriorly slightly tapering, with rounded anterior and posterior margin, thin, very inflated. Beaks terminal to slightly subterminal. Periostracum strong, with characteristic antimarginal striae embedded. Hinge without teeth. All the species bore in hard or soft rock, coral, shells and other calcareous substrate. *Lithodomus* Cuvier, 1816 is a synonym. For more information on the group, see Kleemann (1983). *Lithophaga s. str.* includes the species without posterior calcareous incrustations.

Genus *Leiosolenus* Carpenter, 1857. Like *Lithophaga* in outline but posterior part of the valves with calcareous incrustations, and periostracum without antimarginal striae. The Panamic type species *Leiosolenus spatiosus* Carpenter, 1857 actually has very slight incrustations. There is no consensus on whether the species with elaborate incrustations on the posterior part of the shell should be treated as generically distinct, and several of them were placed in *Lithophaga* by Coan & Valentich-Scott (2012).

Genus *Modiolus* Lamarck, 1799. Shells small to large, oval-trigonal, more or less elongate, with narrowly rounded anterior margin and broadly rounded posterior margin. Beaks subterminal and rounded. Surface with growth lines only, on the posterior part frequently with hairs or bristles which are species-characteristic and which are important diagnostic characters in otherwise "look-alike" species. Muscle impressions indistinct, anterior adductor scar small. Hinge without teeth. Inner margin of valves smooth. Siphons weakly developed, extensible only very little beyond the shell margin (Wilson pers. comm.). A synonym is *Modiola* Lamarck, 1801. The identification of certain West African *Modiolus* is extremely difficult and, apart from the form of the bristles and the general shell shape, possible only by means of the protoconch and the soft anatomy. After the detailed descriptions of three West African species by Ockelmann (1983), the problems of this group remain far from being solved. A thorough taxonomic revision of all eastern Atlantic species is greatly needed.

Genus *Jolya* Bourguignat, 1877. Shells medium-sized to large (over 100 mm), thin and fragile, elongate to elongate-triangular or somewhat cylindrical, with subterminal umbos. Postero-dorsal corner strongly angulate, dorsal margin straight, anterior margin narrowly to more broadly convex, ventral margin slightly convex, postero-ventral margin wing-like prolonged. Surface smooth, with thin and polished periostracum. No adventitious setae on the periostracum like in *Modiolus*. Siphons thick and muscular, extensible well beyond the shell margin (Wilson pers. comm.).

Genus *Lioberus* Dall, 1898. Shells small to medium sized (over 40 mm), more or less elongate, with rounded anterior and posterior margins. Beaks subterminal and inflated. Surface with growth lines only, without any radial sculpture. Muscle impressions indistinct, anterior adductor scar only slightly smaller. Hinge without teeth. Inner margin of valves smooth. Periostracum very glossy on the anterior part, covered on the posterior part by a characteristic velvety mat without definite bristles. Siphons well developed, extensible beyond the shell margin.

Genus *Amygdalum* Megerle von Mühlfeld, 1811. Shells small to medium-sized, modioliform, more or less elongate, with narrowly rounded anterior margin and broadly rounded posterior margin, thin to very thin, not very tumid, with subterminal beaks. Surface smooth and glossy. No hinge teeth. Oliver (2001) discussed the systematic position of the genus, concluding that it shares traits

with both the Modiolinae and the Crenellinae and that its relationships remain unresolved. The large deep-water mussels of the subfamily Bathymodiolinae from cold seep biotopes and the minute are only listed herein, they are treated in detail elsewhere (Cosel 2002; Olu-Le Roy *et al.* 2007). Some species are adapted to house chemosynthetic bacteria and reach exceptionally large sizes and densities on deep-sea hydrothermal vents. The minute deep-water species of the subfamily Dacrydiinae were treated by Salas & Gofas (1997).

Species treated (25)

Mytilus galloprovincialis Lamarck, 1819; *Perna perna* (Linnaeus, 1758); *Brachidontes puniceus* (Gmelin, 1791); *Brachidontes niger* (Gmelin, 1791); *Musculus subpictus* (Cantraine, 1835); *Musculus costulatus* (Risso, 1826); *Gregariella multistriata* (E.A. Smith, 1872); *Gregariella petagnae* (Scacchi, 1832); *Gregariella semigranata* (Reeve, 1858); *Gregariella vignoni* (Petit, 1862); *Arcuatula elegans* (Gray, 1828); *Solamen dollfusi* (Dautzenberg, 1910); *Rhomboidella canariensis* (Odhner, 1931); *Lithophaga lithophaga* (Linnaeus, 1758); *Leiosolenus aristatus* (Dillwyn, 1817); *Leiosolenus carmenae* (Cosel, 1995); *Modiolus barbatus* (Linnaeus, 1758); *Modiolus pseudobarbatus* Ockelmann, 1983; *Modiolus verdensis* Cosel, 1995; *Modiolus nicklesi* Ockelmann, 1983; *Modiolus lulat* Dautzenberg, 1891; *Modiolus martorelli* (Hidalgo, 1877); *Jolya letourneuxi* Bourguignat, 1877; *Lioberus agglutinans* (Cantraine, 1835); *Amygdalum politum* (Verrill & Smith, 1880).

Other species reported from the area (6)

Semimytilus algosus (Gould, 1850). Southernmost Angola and Namibia, intertidal (Kensley & Penrith 1970); also Peru and Chile.

Bathymodiolus aff. *boomerang* Cosel & Olu, 1998. Regab pockmark, 8 km N of Congo Canyon, 3170 m; off Nigeria (Cosel, unpublished).

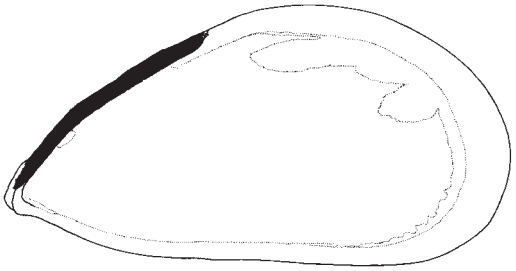
Bathymodiolus (*s.l.*) *mauritanicus* Cosel, 2002. Cold seeps off Morocco and Mauritania, 900-1200 m; off Nigeria (Cosel 2002).

Dacrydium ockelmanni Mattson & Warén, 1977. Iceland, Faeroe, Norway to Bay of Biscay; off Mauritania, 1733-1762 m (Salas & Gofas 1997).

Dacrydium angulare Ockelmann, 1983. Off Mauritania, 3119-4570 m (Salas & Gofas 1997), Namibia, 1849-3136 m.

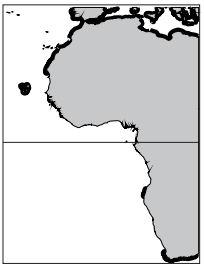
Dacrydium cf. *speculum* Poutiers, 1989. Off Mauritania, 4580 m (Salas & Gofas 1997), Indian Ocean.

Mytilus galloprovincialis Lamarck, 1819



3.1. Port-Etienne (now Nouadhibou), Mauritania (68 mm).

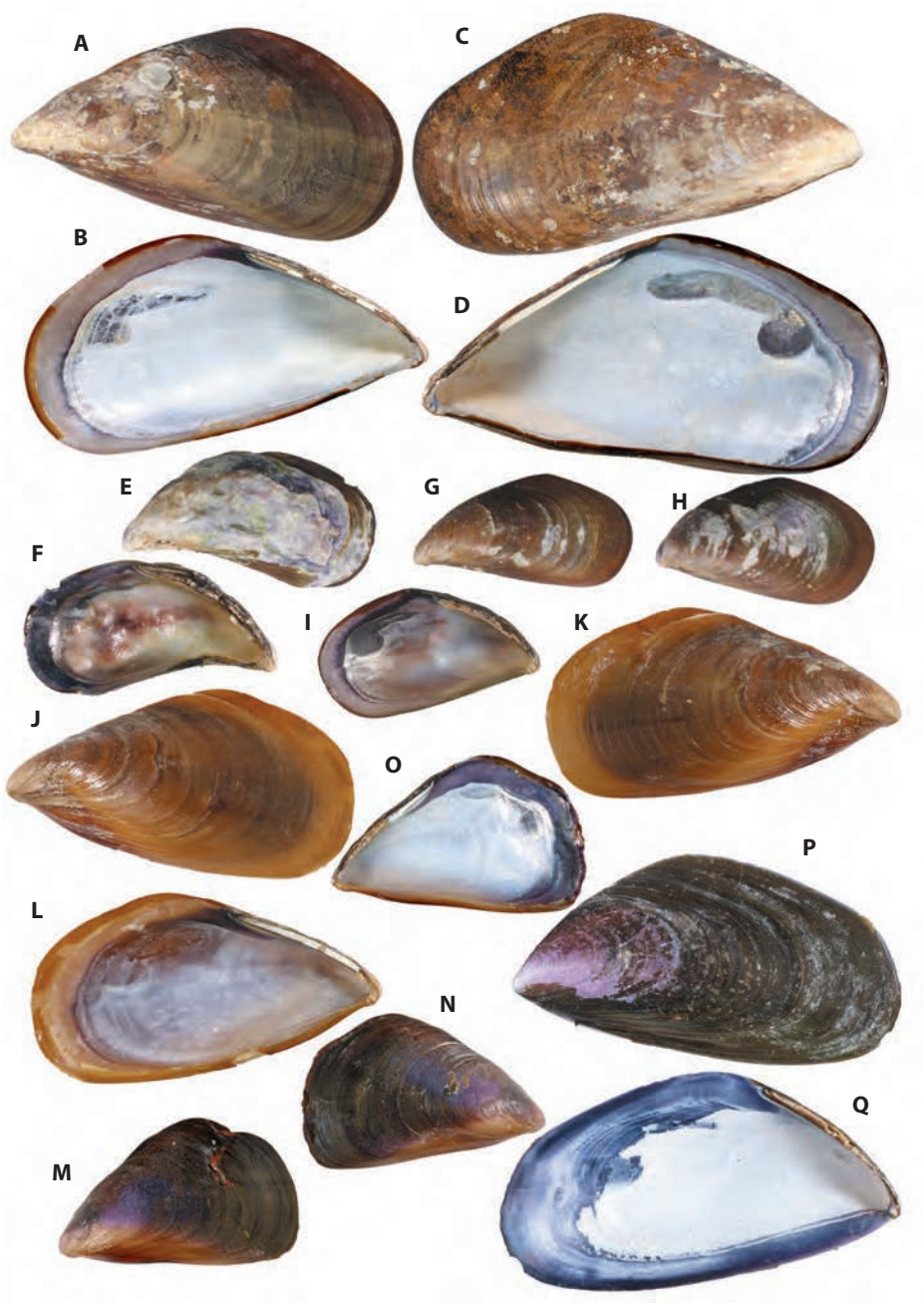
Shell up to 80 mm long, somewhat variable in shape, subtriangular, mytiliform, with pointed and often hooked anterior end and broadly rounded posterior margin, thin to quite solid, rather inflated. Ventral margin straight to slightly convex. Antero-dorsal (ligamental) margin from the beaks to the highest point of the valve weakly convex behind the beaks, otherwise nearly straight. Beaks pointed and terminal. Surface with fine, irregular growth lines. Ligament long, occupying about two thirds of the antero-dorsal margin. Anterior adductor scar very small, posterior adductor scar united with the posterior foot and byssal retractor muscle scars. Inner margin smooth. Periostracum light brown to dark brown, olive or nearly black. Outside irregularly purple to dark blue or brownish. Inside bluish white, nacreous, with dark blue rim.



Distribution. Eastern Atlantic: Shetlands, NE Scotland, Yorkshire, W-Ireland, SW-England, W-France southward to Mauritania (Cap Blanc); Mediterranean. An isolated population is found in southernmost Angola (Baia dos Tigres, possibly introduced), and there is a record from Cape Verde Islands (Lopes pers. comm. 2010), also perhaps introduced. The species is otherwise introduced in South Africa and California (Gosling 1992).

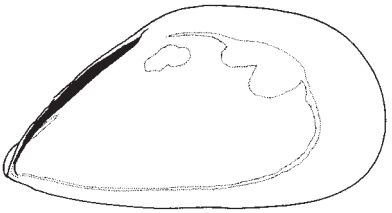
Biotope. On rocky bottom, but also on man-made structures such as wharves, piers, dams and others, within the intertidal zone and just below, on open coasts with heavy surf and also on sheltered places, often in masses.

Remarks. This is a cold temperate species which does not pass beyond the area of permanent upwelling either in the north or in the south. As far south as Cap Blanc, *M. galloprovincialis* still grows to about 75 mm, but on the bay side of the peninsula (Nouadhibou) specimens remain smaller (20-50 mm). *M. galloprovincialis* is one of the two principal edible mussels of Europe; if the Cap Blanc population proves to have a similar density and reproduction rate, it might also be commercially exploited. This species had often been mistaken for the very similar Northern European *M. edulis* Linnaeus, 1758, which does not occur in West Africa. For details of distribution of both species, see Gosling 1992.



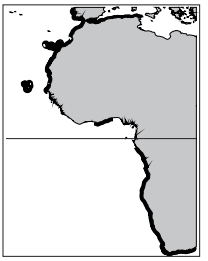
3.2. *Mytilus galloprovincialis* Lamarck, 1819. **A**-**B**, Nouadhibou, Mauritania (75.6 mm). **C**-**D**, same locality (86.7 mm). **E**-**F**, Nouadhibou, Mauritania very encrusted specimen (23.5 mm). **G**, same locality (20.6 mm). **H**-**I**, same locality (20.4 mm). **J**-**L**, Baia dos Tigres, S-Angola (40.1 mm). **M**-**O**, same locality (30.3 mm). **P**-**Q**, Walfishbay, Namibia (72.1 mm).

Perna perna (Linnaeus, 1758)



3.3. Pointe-Noire, Congo (38.7 mm).

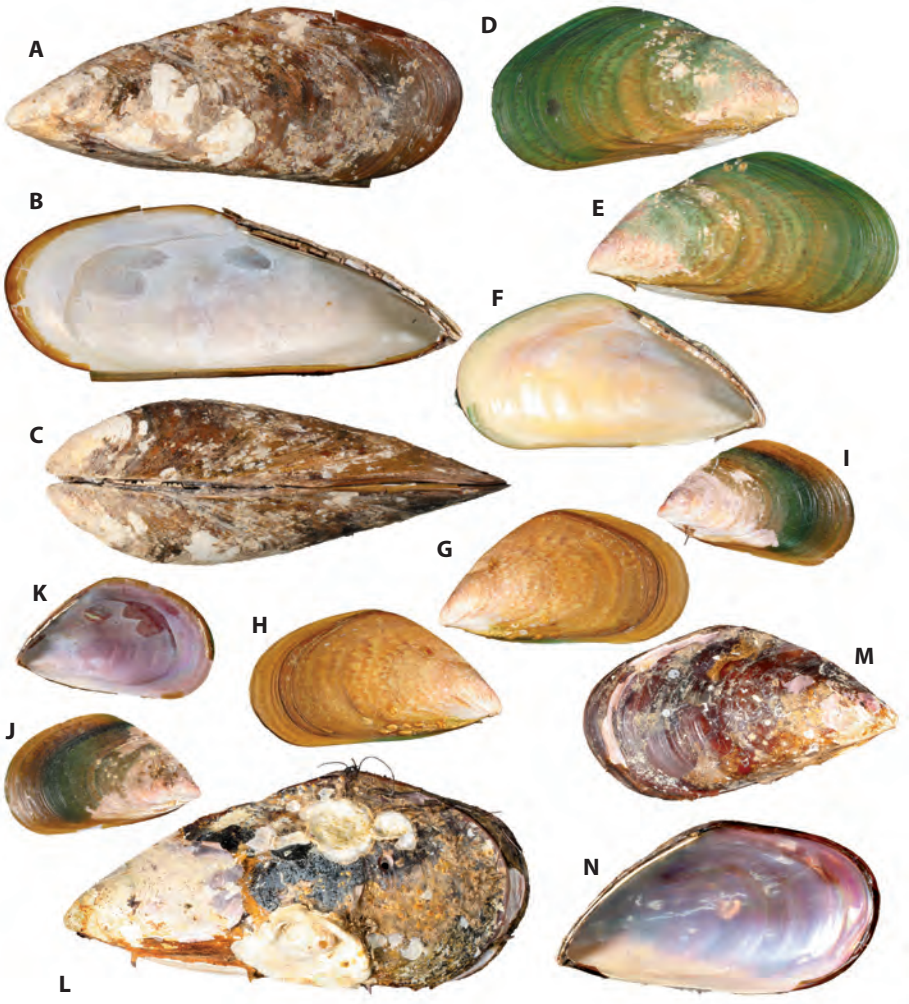
Shell up to 160 mm long, quite variable in shape and size, more or less elongate, mytiliform, with sharply pointed anterior margin and rounded posterior margin, rather solid, more or less inflated. Ventral margin usually in its anterior third slightly convex, more posteriorly straight or somewhat concave, occasionally convex in its entire length. Antero-dorsal margin convex to nearly straight, often no sharp bend between this and the postero-dorsal margin. Beaks well pointed, terminal and often slightly hooked. Surface smooth, with irregular growth lines and stages. Ligament extending onto nearly the whole length of the antero-dorsal margin. Hinge with 1-2 small teeth under the beaks, no teeth behind the ligament. Inner margins of valves smooth. Posterior byssal retractor scar united with posterior adductor scar, posterior pedal retractor scar typically widely separate from them; no anterior adductor scar. Periostracum light brown to dark brown, in some populations partly or wholly bright green, in dried, fully grown specimens often peeling off together with the outermost shell layer. Outside often whitish with brownish zigzag markings in younger and half-grown specimens and brownish white to reddish brown in adult specimens. Inside beautifully nacreous, whitish to light brownish or violet.



Distribution. Eastern Atlantic: Southern Portugal (just north of Cabo São Vicente) to Senegal (N-Casamance); Côte d'Ivoire (Abidjan and eastwards) and Ghana (Nicklès 1955); Congo Republic (Pointe-Noire) to southern Angola (Baia dos Tigres) and further southward along Namibia and around the Cape to southern Mozambique; Mediterranean only in the Alboran Sea, along the North African coast eastward to southwestern Sicily and northwestern Tunisia. Canary Islands mostly in Lanzarote and Fuerteventura (Hernández *et al.* 2011); recently recorded also from Cape Verde Islands. Western Atlantic: eastern Venezuela (eastern shore of the Gulf of Cariaco eastward to Carupano); southern Brazil and Uruguay (not recorded northward of Recife). Records from Argentine and from the West coast of Madagascar are very doubtful.

Biotope. On rocks and other hard substrate, on open, more or less surf-beaten coasts, from low tide level to about 5 m, locally common to abundant and occasionally forming banks. In Mauritania it was found together with *Mytilus galloprovincialis* in mixed populations.

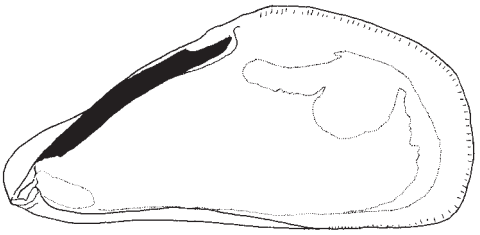
Remarks. This commercially exploited mussel needs at least a seasonal influence of cooler water (upwelling in the tropical zones) and cannot stand permanent tropical conditions. It also avoids salinity reductions. This was shown by an unsuccessful attempt to introduce specimens from a cultivation site in Mochima, Gulf of Cariaco, eastern Venezuela (where upwelling exists) to Colombia (Cartagena



3.4. *Perna perna* (Linnaeus, 1758). A-C, Nouadhibou, Mauritania (123.0 mm). D-F, Baie du Lévrier-Pointe des Maures, Mauritania (53.5 mm). G-H, same locality (34.2 mm). I-K, Pointe-Noire, Congo Brazzaville, Plage Mondaine (35.5 mm). L, same locality (123.5 mm). M-N, same locality (113.5 mm).

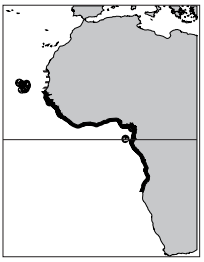
area), an area without any upwelling influence and generally with murky water and higher freshwater influx rate. In West Africa, there is no record between southern Casamance and Côte d'Ivoire and from E of Ghana to Gabon (Port-Gentil), which corresponds to the part with entirely tropical conditions and seasonally more or less reduced salinity and low water transparency. *Perna perna* is consumed at various localities, and Mauritanian specimens could be marketed together with *Mytilus galloprovincialis*. In Baie de Pointe-Noire, rearing experiments were successfully carried out (Cayré 1982), and in Angola, the species is sold as "mexillão". The growth rates in West Africa can be up to 9 mm/year (Cayré 1978). Synonyms are *Mytilus pictus* Born, 1778 and *M. afer* Gmelin, 1791; the species is also known as "*M. africanus* Chemnitz, 1785", an unavailable name. This is "Le Fonet" of Adanson.

Brachidontes puniceus (Gmelin, 1791)



3.5. Dakar, Senegal (26.8 mm).

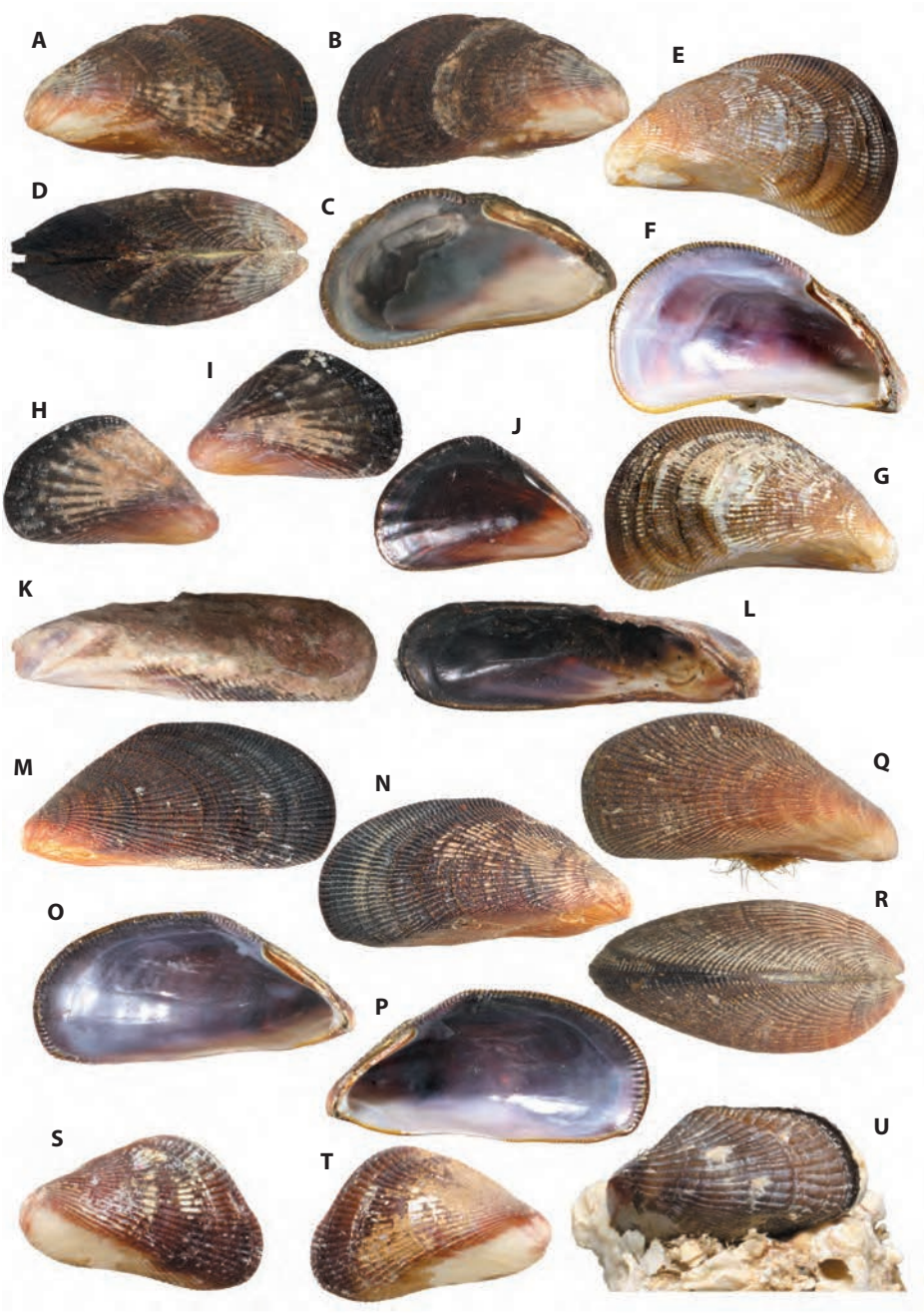
Shell up to 28 mm long, considerably variable in shape and length/ width ratio, mytiliform, somewhat subtriangular, with pointed anterior margin and rounded posterior margin, rather solid, inflated to very inflated. Ventral margin straight to concave, antero-dorsal (ligamental) margin slightly convex, especially just behind the beaks. Beaks more or less pointed, terminal. Surface with irregular, well developed, close-set, radial ribs, which are often bifurcate or even trifurcate. There are also growth lines and coarser growth stages. Ligament long and rather strong, extending along nearly the whole length of the antero-dorsal margin. Hinge generally with two teeth under the beaks. A few equal teeth behind the ligament. Inner margin of the valves finely crenulate. Posterior muscle impressions rather large and united. Periostracum thick and light brown to dark brown. Outside on the ventral side whitish, dorsal part pinkish blue, dark violet or brownish. Inside white, dorsally brownish pink to dark violet.



Distribution. Senegal (north coast of Cape Vert Peninsula) to southern Angola (Moçâmedes, Namibe province); Cape Verde Islands; Islands in the Gulf of Guinea; Quaternary of Mauritania (Coulombel 1980).

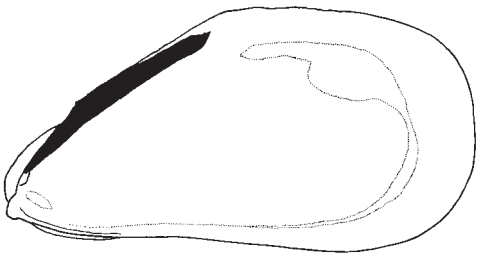
Biotope. On rocky shores, mostly on open and rather surf-beaten coasts, by preference on intertidal rock platforms, but also subtidally, common.

Remarks. Synonyms are *Mytilus senegalensis* Lamarck, 1818 and *Mytilus charpentieri* Dunker, 1853. This is "L'Aber" of Adanson. The anatomy was described by Morton (2012) based on specimens from the Cape Verde Islands. The Red Sea *Brachidontes pharaonis* (P. Fischer, 1870) is extremely similar, to the point that specimens cannot be positively identified from morphology if their origin is not known.



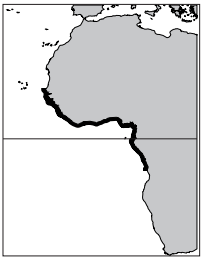
3.6. *Brachidontes puniceus* (Gmelin, 1791). A-D, Rufisque, Senegal (13.5 mm). E-G, Freetown, Sierra Leone (19.5 mm). H-J, Tamara, Iles de Los, Guinea (7.0 mm). K-L, same locality (17.7 mm). M-P, Praia Emilia, São Tomé (20.7 mm). Q-R, same locality (19.2 mm). S-T, Santa Maria, Benguela prov., S-Angola (9.5 mm). U, Praia do Cesar, Lucira, S- Angola (18.5 mm).

Brachidontes niger (Gmelin, 1791)



3.7. Kribi, Cameroon, intertidal rocks (18.9 mm).

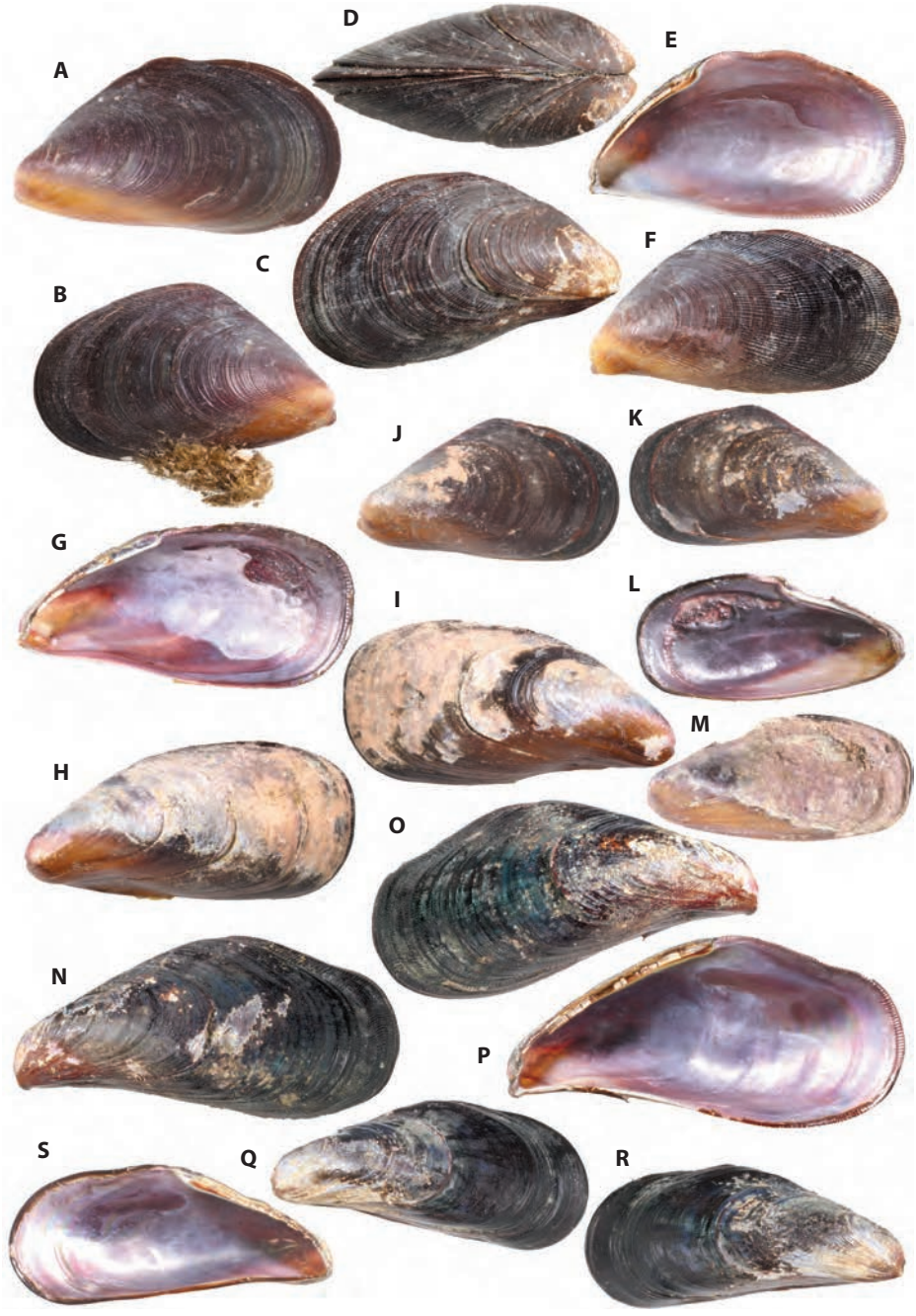
Shell up to 35 mm long, quite variable in shape, length/width ratio and sculpture, mytiliform, with pointed anterior margin and rounded posterior margin, thin but rather solid, inflated. Ventral margin slightly concave to nearly straight, antero-dorsal margin slightly convex to nearly straight. Beaks somewhat rounded and slightly subterminal. Surface smooth, with irregular growth lines only, or with fine, dense, irregular, radial ribs which rarely bifurcate near the margins. There exist all kinds of intergrades between the ribbed and the smooth form, the latter often bearing short ribs or indications of ribs near the margins. Ligament extending for more than two thirds of the antero-dorsal margin. Hinge with a few small denticulations anterior to and behind the ligament. Inner margin of the valves very finely crenulated or smooth. Posterior muscle impressions large and united. Periostracum rather thick, glossy and dark brown to black. Outside bluish lilac, often lighter to whitish on the beaks and along the ventral margin close to it. Inside dark brownish violet to deep violet.



Distribution. Senegal (Joal, Petite Côte) to northern Angola (Luanda province); Ilha do Principe.

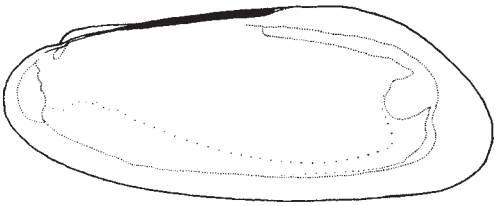
Biotope. On rocks, but also on mangrove roots, oysters and other hard objects, in calm water, mostly in semi-sheltered bays, lagoons and inlets, from the lower intertidal zone to about 5 m, locally common. Tolerates salinity changes within certain limits.

Remarks. This species is easily recognized by its predominantly deep violet colouration and is distinguished from *B. puniceus* by its larger, thinner and less tumid shell with finer or obsolete radial striae. Its variability, especially the presence or absence of sculpture, have led to several synonyms: *Mytilus tenuistriatus* Dunker, 1853; *M. atropurpureus* Dunker, 1857; *M. laevis* Dautzenberg, 1912 and most probably also *M. substriatus* Philippi, 1847. This is "Le Dotel" of Adanson. *Brachidontes tenuistriatus* (Dunker, 1853) was recognized by Huber (2010: 118) as a third separate W-African species, but this could only be ascertained by DNA sequence analysis. Huber (2015: 364) noted that the latter name is preoccupied by *Mytilus tenuistriatus* Münster, 1837 and gave the replacement name *Brachidontes dunkeri* Huber, 2015.



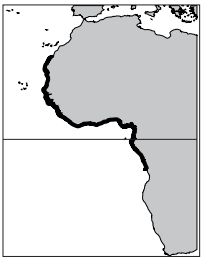
3.8. *Brachidontes niger* (Gmelin, 1791). **A**, Katakalous Bôlon, Casamance, Senegal, dredged, 3-4 m (17.7 mm). **B**, same locality (16.1 mm). **C**-**D**, Diogue, Casamance, Senegal (23.3 mm). **E**-**F**, same locality (29.0 mm). **G**-**I**, Kribi, S-Cameroon, intertidal hard substrate (21.0 mm). **J**-**K**, same locality (18.3 mm). **L**-**M**, same locality (16.2 mm). **N**-**P**, Cacuaco, Bengo prov., N-Angola, on shipwreck (32.0 mm). **Q**-**S**, same locality (26.7 mm).

Arcuatula elegans (Gray, 1828)



3.9. Port-Etienne (now Nouadhibou), Mauritania (22.5 mm).

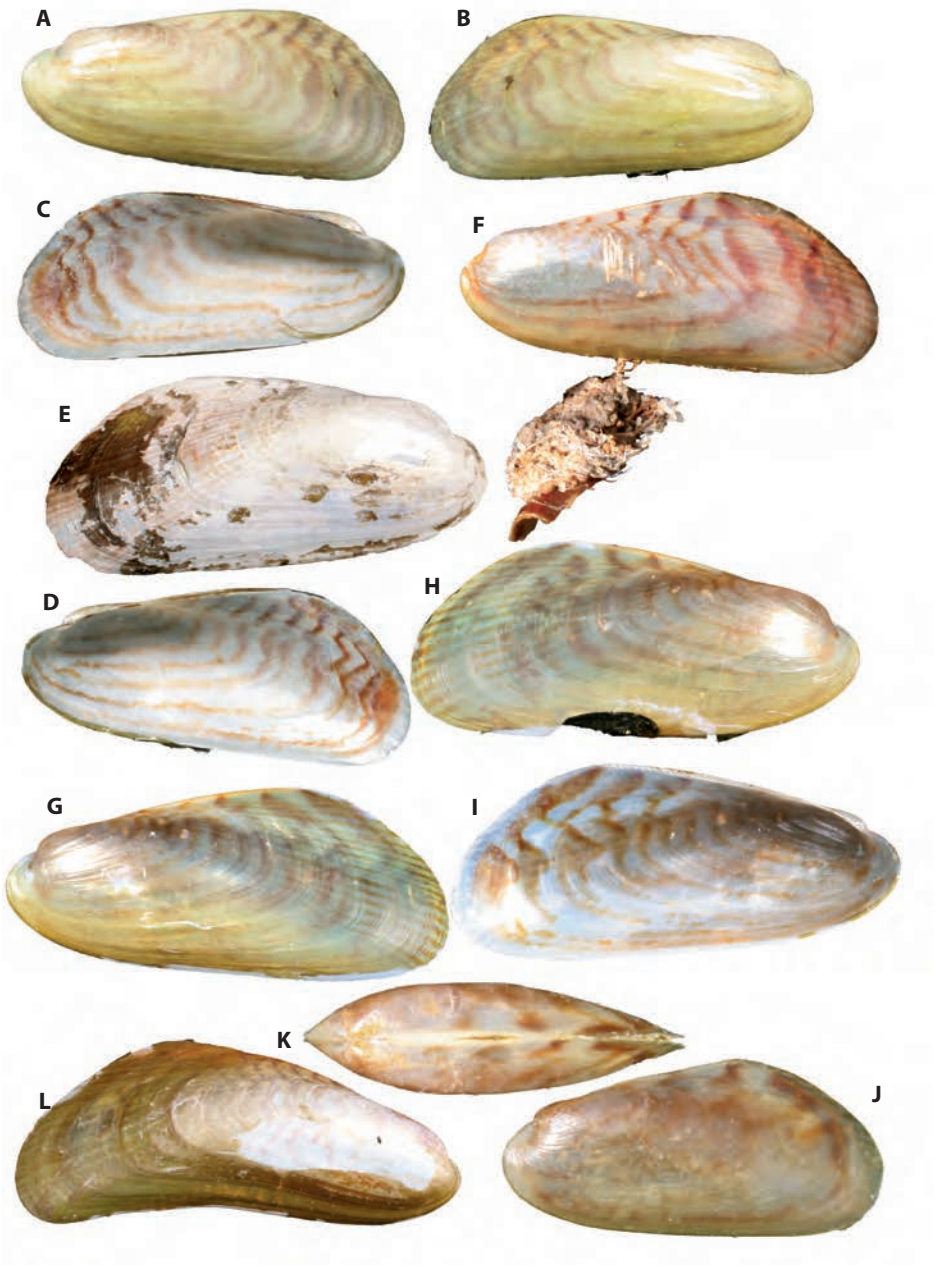
Shell up to 35 mm long, little variable, with rather narrowly rounded anterior and posterior margin, thin and fragile, more or less compressed. Ventral margin almost straight, antero-dorsal (ligamental) margin weakly concave to straight. Umbos broad, not prominent, subterminal. Surface smooth, with irregular growth lines and very faint and mostly obsolete radial striae on the posterior part. Ligament long and very narrow. Inner margin antero-dorsally with very fine, close-set teeth which give the resilifer a pitted appearance and which extend behind the ligament to the bend to the postero-dorsal margin. The teeth can be partly or completely obsolete. Rest of inner margin smooth. Periostracum strong, light green to brownish green. Outside white, with irregular, purplish zigzag lines, mostly on the postero-dorsal part, occasionally on the whole valve, and faint, pale purplish, radial lines on the posterior part. Inside nacreous white, with external colouration showing through.



Distribution. West Sahara (Dakhla, formerly Vila Cisneros) to northern Angola (Luanda).

Biotope. In fine, muddy sand and fine sand, also with shells and gravel, in calm, sheltered bays as well as in lagoons, inlets and creeks such as the "bôlons" of Casamance; in shallow water from 2 to about 6 m, locally not uncommon. The species tolerates salinity changes within certain limits.

Remarks. The West African species had been referred to by Nicklès (1955) as *Modiolus perfragilis* (Dunker, 1857), a close Indo-Pacific species which has a narrower anterior part and a more or less but always visibly concave ventral margin. In old collections, such curved specimens (Fig. 3.10L) obviously belonging to the Indo-Pacific species are often mislabelled "West Africa". Another very similar Indo-Pacific species, *Arcuatula senhousia* (Benson, 1842), is invasive in the Mediterranean Sea. The genus *Mytella*, known only from tropical America, is morphologically quite similar but has the umbos closer to the anterior end and lacks a clear radial sculpture.

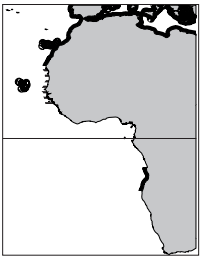


3.10. ***Arcuatula elegans*** **(Gray, 1828)**. **A**-**D**, Baie de l'Etoile, "La Rivière", Mauritania (21.4 mm). **E**, Baie de Cansado, Mauritania (34.4 mm). **F**, Katakalous Bôlon, Casamance, Senegal (15.0 mm). **G**-**I**, Pointe-Noire, Congo Brazzaville, Plage Orstom (17.6 mm). **J**-**K**, Praia Etambar, Corimba, N-Angola (10.3 m). **L**, ***Arcuatula perfragilis*** **(Dunker, 1857),** labelled "Sénégambie" in MNHN coll. Denis but undoubtedly of Indo-Pacific origin (32.3 mm).

Musculus subpictus (Cantraine, 1835)

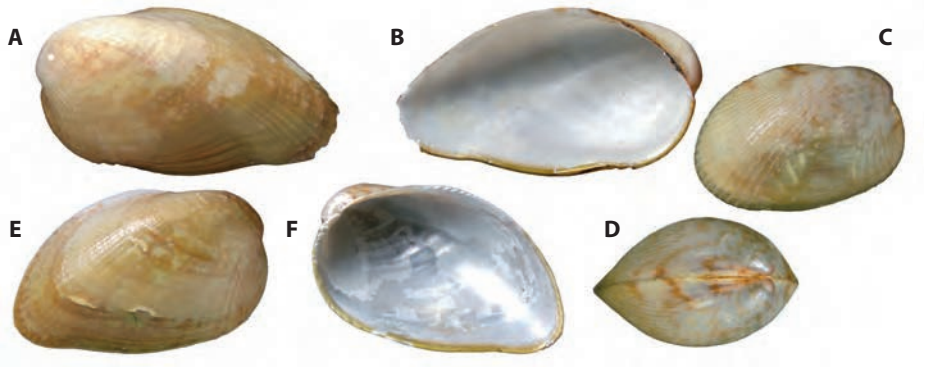
Shell up to 15 mm long, quite variable in outline, rather short, oval to somewhat rhomboidal, with broadly rounded anterior margin and more or less narrowly rounded posterior margin, thin, very inflated. Ventral margin about straight, with a slight convexity along the smooth part of the surface. Dorsal margin strongly convex, with a slight bend between anterior and posterior part. Beaks broad and nearly terminal. Surface with regular, rather broad, radial ribs on the anterior and posterior part, posterior ribs slightly less broad than anterior. Middle part smooth, with growth lines only. Limit between the middle part and the posterior part formed by a depression. Ligament narrow and rather short. Hinge line anterior to and behind the ligament with small, equal teeth which continue as crenulations along the shell margin at the termination of the external radial ribs. Ribs reflected on the interior. Periostracum glossy, thin and yellowish green to greenish. Outside whitish, with irregular, pale reddish brown to reddish or purplish zones, spots or mottles. Inside nacreous whitish, with outside colouration slightly showing through.

Distribution. Northern Norway (70.5°N), Faroe, British Isles to Mauritania (Cap Blanc), probably more southward to Guinea; northern and southern Angola (Luanda to Moçâmedes, Namibe province); Canary Islands, Cape Verde Islands; throughout the Mediterranean.



Biotope. On rocky shores, typically inside the tests (tunica) of compound and simple ascidians, but also on soft bottom with seagrass beds, attached to plants, from low water mark to about 60 m, occasionally deeper; common.

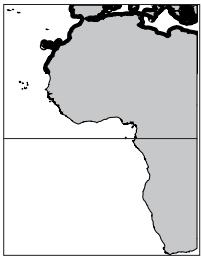
Remarks. All West African specimens, including those from Angola, are here considered as falling within the variability of *M. subpictus*. The Atlantic form has been named *Modiolus marmoratus* Forbes, 1838, which is a synonym. There are no records from South of Guinea to the Congo, which might indicate a disjunct distribution. Morton & Dinesen (2011) placed this species in the genus *Modiolarca* Gray, 1843, whereas Huber (2010) treated *Modiolarca* as a subgenus of *Musculus*. This view is followed here. For details on systematic, biology and morphology of this species, see Morton & Dinesen (2011).



3.11. *Musculus subpictus* (Cantraine, 1835). A-B, São Tiago, Cape Verde Islands, 15-35 m (14.2 mm). C-D, Baia de Corimba, N-Angola, 10-20 m (3.9 mm). E-F, Praia Amelia, Moçâmedes, Namibe prov., S-Angola (12.0 mm).

Musculus costulatus (Risso, 1826)

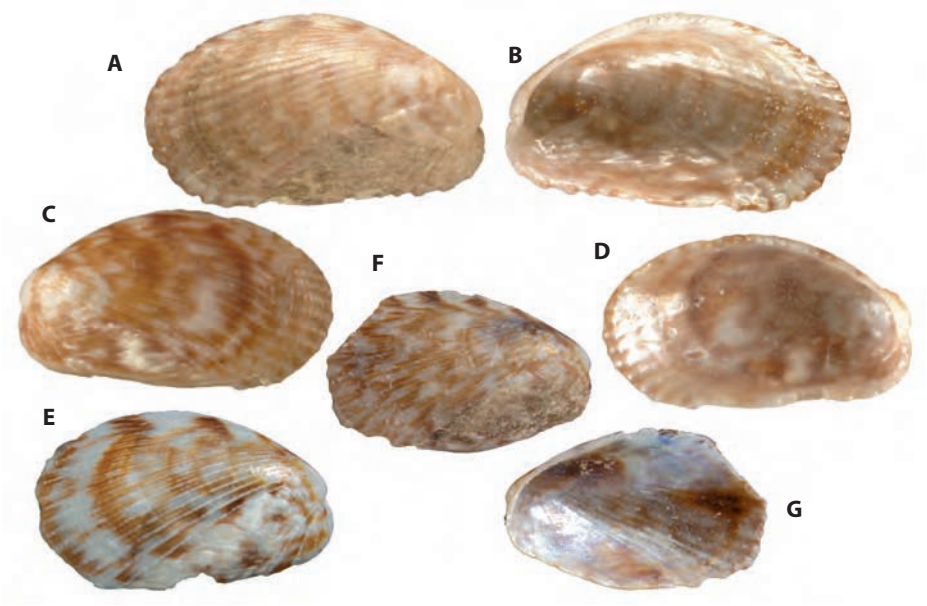
Shell small, up to 8 mm long, slightly variable in outline, oval, elongate, somewhat modioliform, with rather narrowly rounded anterior margin and broadly rounded posterior margin, thin, inflated. Ventral margin in its smooth part slightly convex, dorsal margin well and evenly convex. Umbos broad and not prominent, slightly subterminal. Surface with about 5-7 anterior, very broad, low, radial ribs, a broad area with growth lines and few, fine, irregular, commarginal folds, and a large postero-dorsal part with numerous, regular, close-set, low and flat, radial ribs. Limit between the middle part and the posterior part formed by a broad depression. Ligament short and narrow. Hinge line with few equal teeth anterior to and behind the ligament. Shell margin ventrally smooth, otherwise finely denticulate, corresponding to the radial ribs. Periostracum thin, pale yellowish to green. Outside whitish, with irregular, brownish to purplish brownish zones, blotches, mottles and zigzags. Inside iridescent white, with external pattern often visible in nearly similar intensity as on the outside.



Distribution. British Isles southward to Mauritania (19°18'N); throughout the Mediterranean.

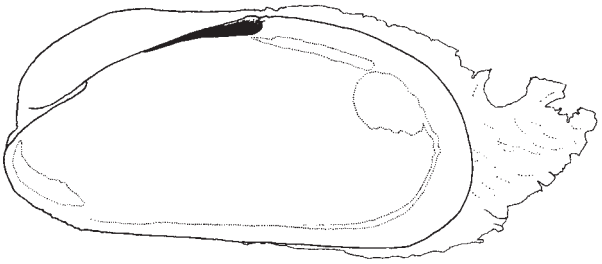
Biotope. On rocky shores in algal tufts on rocks and stones, in crevices or on algae. Unlike the preceding species, it is never associated with ascidians; Not common anywhere.

Remarks. This northern species does not range south of the zone of permanent upwelling.



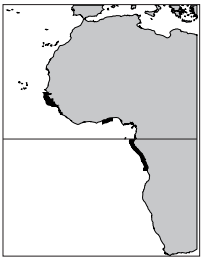
3.12. *Musculus costulatus* (Risso, 1826). **A-B**, Casablanca, Morocco, on beach (7.0 mm). **C-D**, Mauritania, 19°18'N, 16°36'W, 5 m (4.3 mm). **E**, same locality (4.2 mm). **F-G**, Cap Blanc, Mauritania, among rocks (4.2 mm).

Gregariella multistriata (E.A. Smith, 1872)



3.13. Cacuaco, Bengo prov., Angola (44.1 mm).

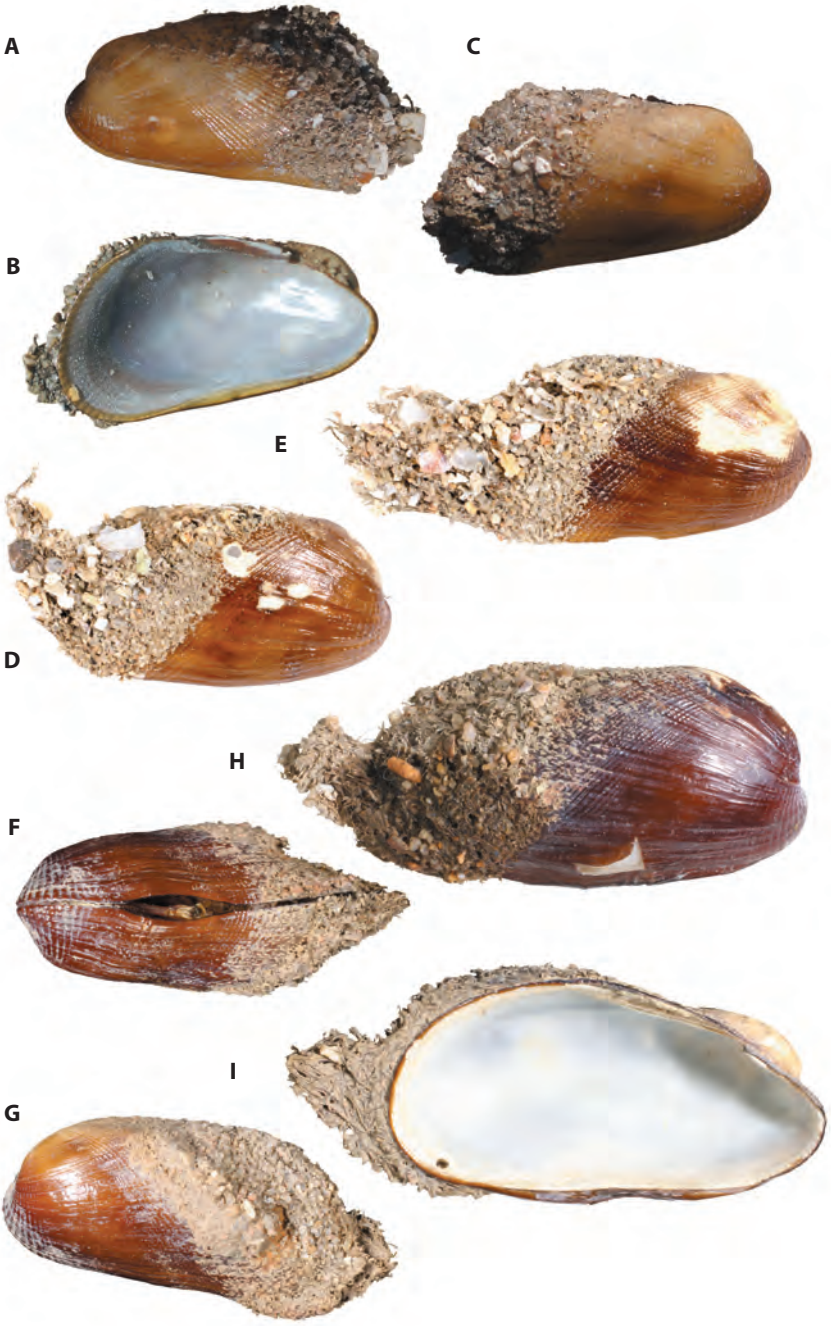
Shell up to 35 mm long, variable in outline, modioliform, elongate, with rounded anterior margin and broadly rounded posterior margin, thin and rather fragile, very inflated. Ventral margin straight to more or less concave, dorsal margin slightly convex at ligament level and more convex behind the ligament. Beaks broad, prominent and subterminal. Surface with very fine, ill-defined, radial striae on the anterior and the posterior part, middle part only with irregular growth lines. Ligament rather short and broad. Hinge line nearly without teeth or with very fine crenulations under the beaks. Inner margin of valves finely crenulate. Posterior adductor scar nearly touching foot and byssal retractor scar but not united with them. Periostracum thick, medium to dark brown, with tendency to peel off in dried specimens. Posterior part of the valves with long, hairy bristles, to which sand grains and mud adhere. Outside whitish or cream to pale brownish. Inside nacreous white to somewhat greyish.



Distribution. Senegal (N-Casamance) to Guinea (10°18'N); Bénin (Ouidah, E.A Smith 1872); Gabon to northern Angola (Luanda).

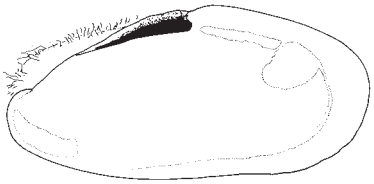
Biotope. Mostly in sandy gravel among stones, but also in mixed sand with mud, shells and shell debris, from about 1 to 35 m, uncommon. The species makes a nest with shell debris and gravel agglutinated together by the byssus.

Remarks. This species somewhat resembles *G. petagnae* (see following entry), but grows considerably larger, is often somewhat curved, and has the beaks more subterminal. There are no ascertained records from the typical tropical regions, and the occurrence of *G. multistriata* there is at least very doubtful. *Modiolaria obermulleri* Fischer-Piette & Nicklès, 1946 is likely a synonym.



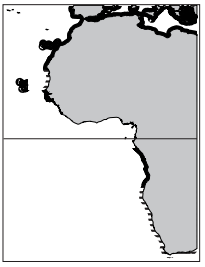
3.14. ***Gregariella multistriata*** (E.A. **Smith, 1872**). **A-C**, Karabane Is., estuary of the Casamance, Senegal (16.0 mm; photo J.L. Delemarre). **D**, 10 km S of Ambrizete, Zaïre prov., N-Angola (16.0 mm). **E**, same locality (16.3 mm). **F-G**, Cacuaco, Bengo prov., N. Angola (33.7 mm). **H-I**, same locality (44.1 mm).

Gregariella petagnae (Scacchi, 1832)



3.15. Baie de l'Etoile, Mauritania, intertidal (13.0 mm).

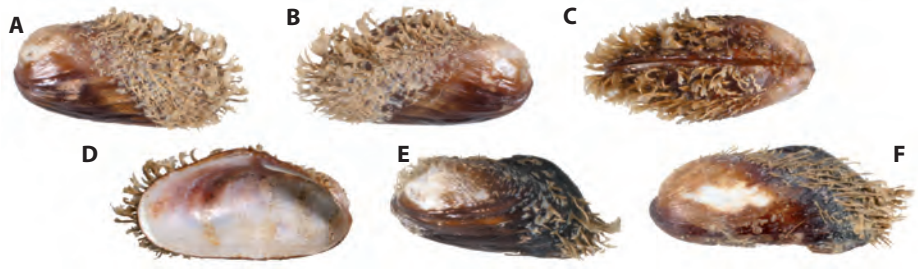
Shell up to 15 mm long (occasionally to 18 mm), variable in outline, modioliform to nearly cylindrical, elongate, with rounded anterior margin and more or less broadly rounded posterior margin, thin and rather fragile, very inflated. Ventral margin straight or very slightly convex, antero-dorsal (ligamental) margin weakly convex, often with rather sharp bend to the postero-dorsal and posterior margin. Beaks broad and subterminal. Surface on anterior and posterior part with radial riblets, middle part smooth, with weak growth lines. Ligament broad and rather long. Hinge line with a few small, equally-sized teeth on both sides of the ligament. Inner margin finely crenulate to ventrally nearly smooth. Periostracum thick, light to dark brown, glossy. Posterior part of the valves with long, simple hairy bristles which at the extremities become leafy. Outside whitish, inside nacreous white.



Distribution. Northern Spain (Asturias) to Mauritania (Cap Blanc) and Guinea-Bissau (Nicklès 1955); northern and southern Angola (Cabo Negro) and further southward to South Africa (Natal) (Kensley & Penrith 1970); Cape Verde Islands; throughout the Mediterranean.

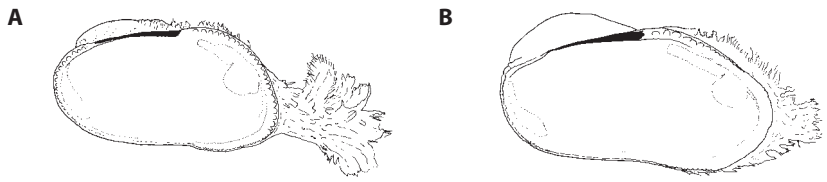
Biotope. On muddy or sandy bottom, with gravel, shells or shell debris, or between stones, from low tide to about 25 m, uncommon.

Remarks. This species has not yet been reported from the tropical zones, where it is replaced by *G. multistriata*. *Gregariella petagnae* has a widely disjunct distribution but the Angolan specimens fall within the variability. This species has sometimes been cited in the literature as *Modiola sulcata* Lamarck, 1819 and *M. opifex* Say, 1825, which are other species (for details see Palazzi 1981). Synonyms are *Modiolus barbatellus* Cantraine, 1835 and *Gregariella simplicifilis* Barnard, 1964.



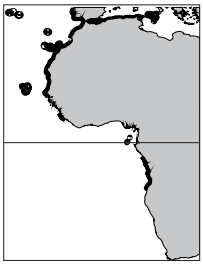
3.16. *Gregariella petagnae* (Scacchi, 1832). A-D, Baie de l'Etoile, Mauritania (8.5 mm). E, Baie Cansado, Mauritania (6.7 mm). F, Cabo Ledo, Bengo prov., N-Angola (8.0 mm).

Gregariella semigranata (Reeve, 1858)



3.17. **A**, SW of Madeleines Is., Senegal (rv, 8.6 mm). **B**, Asilah, Atlantic Morocco, 50-200 m (rv, 9.4 mm).

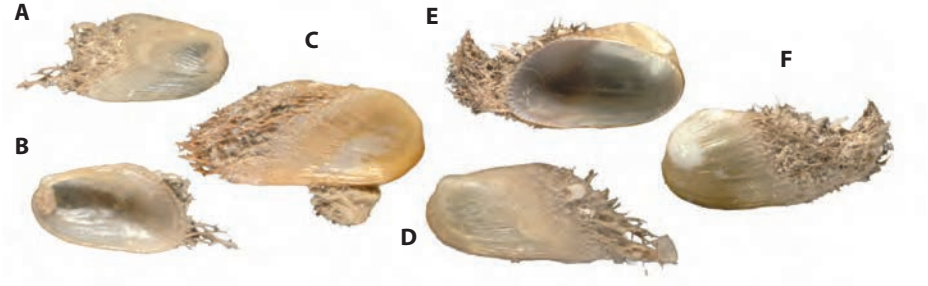
Shell small, up to 8 mm long, very variable in outline and length/width ratio, somewhat mytiliform to nearly cylindrical, more or less elongate, with well rounded anterior and posterior margin, thin, very inflated. Ventral margin straight to slightly concave, antero-dorsal (ligamental) margin weakly convex to nearly straight. Posterior part of valves more or less elongate in comparison with antero-dorsal margin. Beaks broad, somewhat subterminal to nearly terminal. Surface with numerous, fine, close-set, irregular and occasionally bifurcating, commarginal ridges, and on the posterior part fine, dense radial riblets, causing there a somewhat cancellate pattern. Radial ribs on the anterior part only occasionally marked, mostly ill-defined or obsolete. Ligament rather short. Hinge line with a few equally-sized teeth anterior to and behind the ligament, which continue, slightly weaker, as the crenulation along the inner shell margin. Periostracum thin, pale greenish yellow to nearly colourless, on the umbonal region often eroded. Posterior part of the valves with long, hairy and typically branched bristles. In young specimens these hairs may occasionally be absent. Valves entirely whitish.



Distribution. Bay of Biscay to Senegal (northern Casamance); northern and southern Angola (Ambrizete to Lucira); Azores, Canary Islands, São Tomé, Annobon; Western part of the Mediterranean.

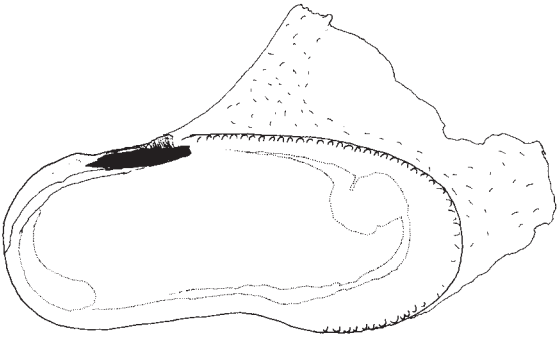
Biotope. On hard substrate under stones as well as on fine and mixed sand with shells and shell debris, from 5 to about 110 m, not common.

Remarks. Although this species has been reported from the islands in the Gulf of Guinea, it is not yet known from between Casamance and northern Angola. *Modiola subclavata* Libassi, 1859 is a synonym. For details, see Palazzi 1981. The anatomy was described in detail by Morton (1995) based on specimens from the Azores.



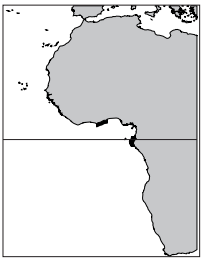
3.18. *Gregariella semigranata* (Reeve, 1858). **A-B**, Banc du Seminole, Dakar region, Senegal, 38 m (2.4 mm). **C**, São Tomé, N of S. Antonio, 5-6 m (6.5 mm). **D**, off Ponta do Mussulo, N.-Angola, 90-100 m (2.6 mm). **E-F**, Baia de Lucira, S-Angola, maerl, 10-20 m (4.6 mm).

Gregariella vignoni (Petit de la Saussaye, 1862)



3.19. Gabon, MNHN old coll. (10.8 mm without aggregated material).

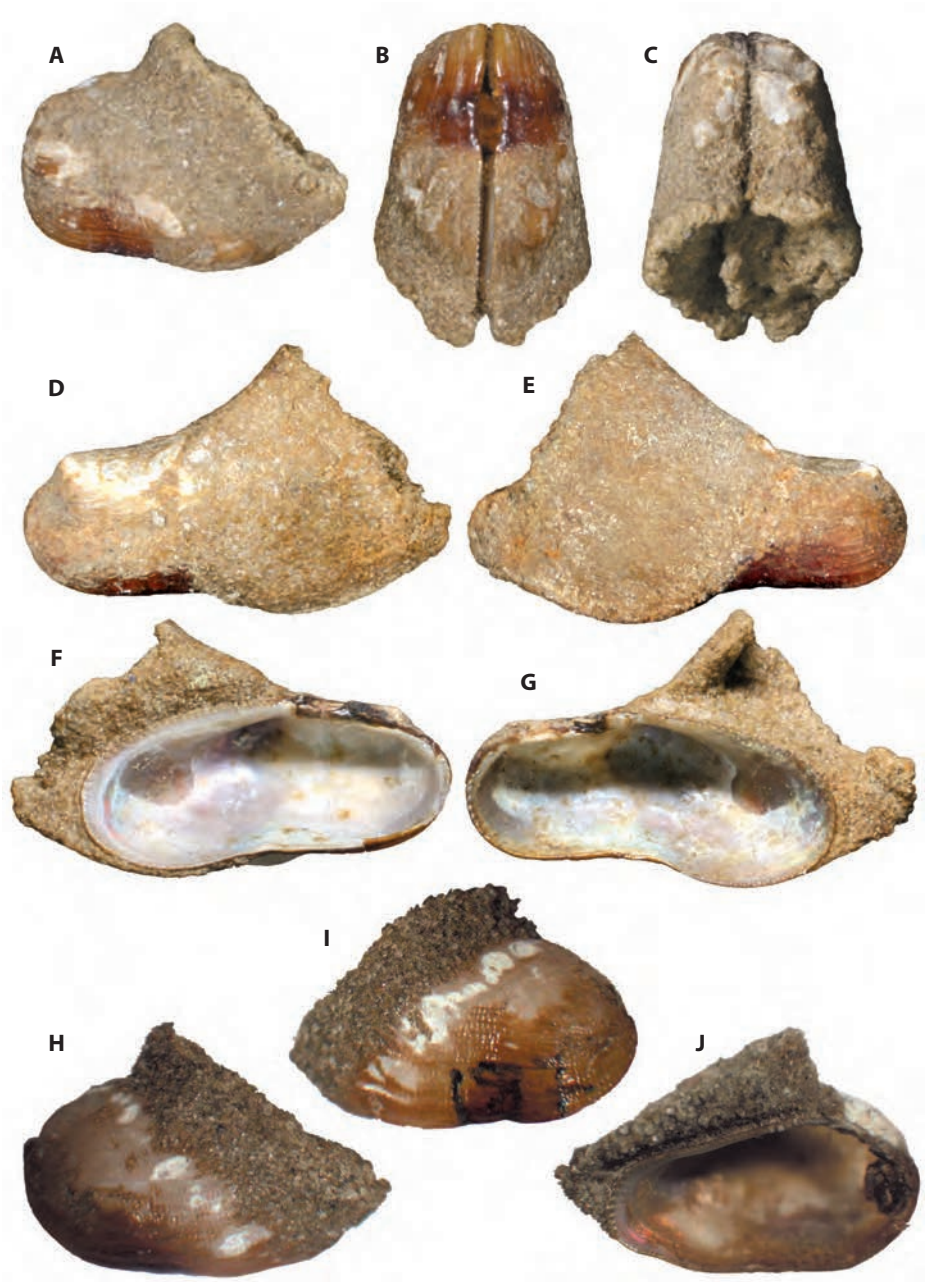
Shell up to 11 mm long, somewhat variable, subcylindrical, elongate, slightly curved, with nearly equally rounded anterior and posterior margin, thin, very inflated. Ventral margin in its middle slightly concave, dorsal margin slightly convex. Beaks small, subterminal, often eroded. Surface on the posterior part of the valves with radial riblets. Middle part smooth, on the anterior part ribs ill-defined or obsolete. There are also fine, irregular, commarginal ridges. Umbonal part of the valves often deeply corroded. Ligament very short and broad. Hinge line with a few teeth anterior to and behind the ligament, passing into the rather strong crenulations of the inner margin all around the shell. Posterior muscle impressions fused. Periostracum thick, dark brown, on the posterior part heavily encrusted with sediment particles. Outside whitish, inside nacreous whitish-violet to reddish brown.



Distribution. To date only recorded from the western part of the Ghana coast (Ampenyi) and from Gabon (exact locality not known).

Biotope. Unknown, most probably in bore-holes in beachrock and other "softer" hard substrate; rare. The species typically uses sand grains for the "nest" and cements them in a peculiar manner to the posterior half of the shell, forming an obliquely cut posterior end.

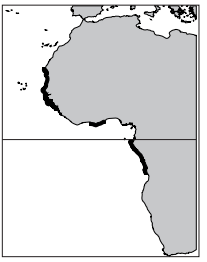
Remarks. This rare species is known from the type lot, one other lot from the same source and a recently collected lot from Ghana (Huber pers. comm.). A very close species with similar sediment cementation is the very variable Caribbean *G. coralliophaga* (Gmelin, 1791) = *G. opifex* (Say, 1825).



3.20. *Gregariella vignoni* (Petit de la Saussaye, 1862). **A**-**C**, Gabon (10.4 mm), coll. Jousseaume. **D**-**G**, same locality (12.0 mm). **H**-**J**, Ampenyi, W. Ghana, among sandstones at 5-10 m, 08.2005, coll. Markus Huber (photo courtesy of M. Huber, 11.0 mm).

Solamen dollfusi (Dautzenberg, 1910)

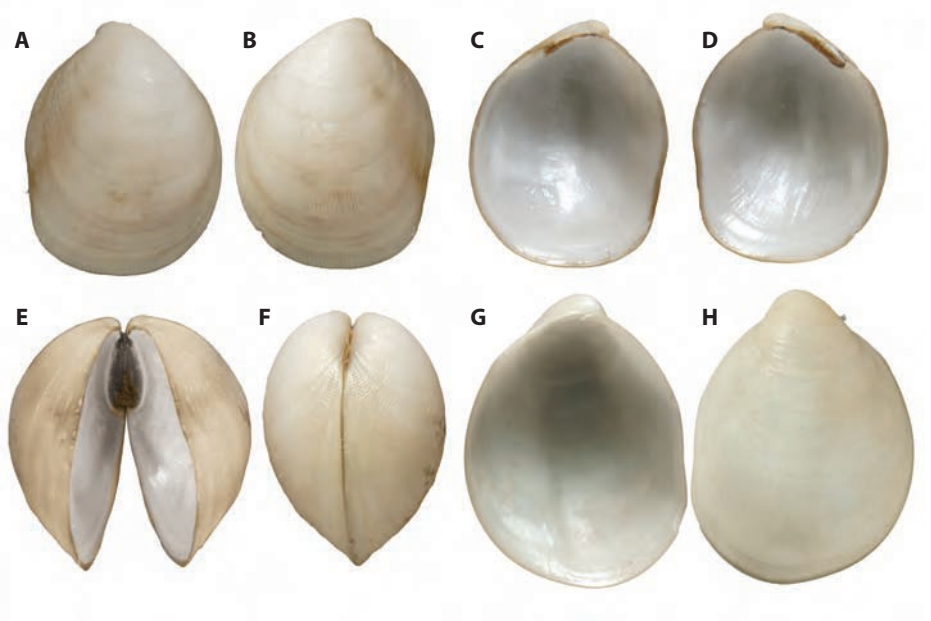
Shell small, up to 10 mm long, somewhat variable in outline, oval, with narrowly rounded anterior margin and broadly rounded posterior margin, thin, very inflated. Antero-dorsal margin slightly convex, antero-ventral margin strongly convex, ventral margin usually straight. Beaks rather small, rounded and terminal. Surface with numerous, very fine, irregular, close-set, radial riblets, which often bifurcate near the margin and which are visible under a lens (x 5-10). There are also irregular growth lines and stages. Ligament rather short and broad. Hinge with very fine denticulations above and behind the ligament. Inner margin of valves finely crenulate. Periostracum thin, pale straw-coloured, greyish yellow or greenish. Outside white, inside nacreous white.



Distribution. Mauritania (Cap Blanc) to Guinea (off Conakry); Côte d'Ivoire (off Grand Bassam); Gabon to northern Angola (Ambrizete to Luanda).

Biotope. On mixed sand, coarse sand and gravel, also with seagrass, from low water mark or shallow water to about 50 m, locally not uncommon.

Remarks. This species seems to be confined to the alternant regions with seasonal upwelling, as there is so far no record from the two typical tropical zones.

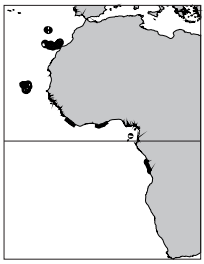


3.21. *Solamen dollfusi* (Dautzenberg, 1910). A-F, Baie de l'Etoile, Mauritania (6.2 mm). G-H, Palmeirinhas, Luanda prov., N-Angola (8.8 mm).

Rhomboidella canariensis (Odhner, 1931)

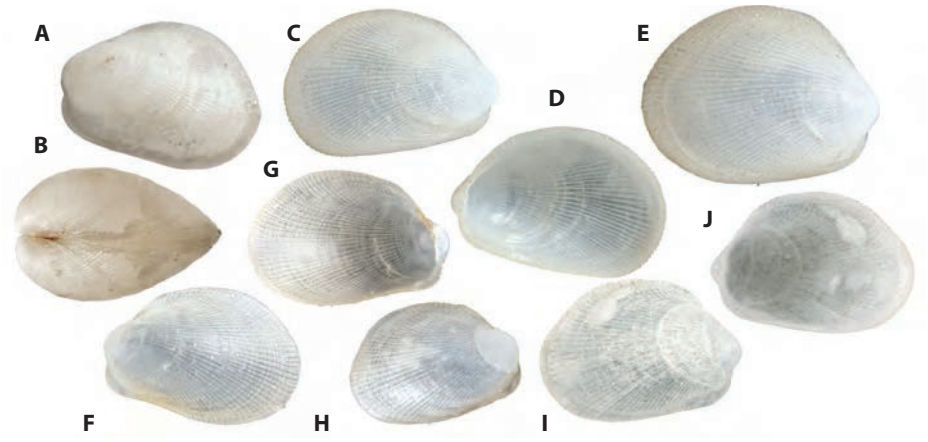
Shell very small, up to 3.5 mm long, slightly variable in outline, oval, with rounded anterior margin and broadly rounded posterior margin, thin, very inflated. Ventral margin straight to somewhat concave, antero-dorsal margin slightly convex. Beaks rather broad and subterminal, with large protoconch and very large nepioconch. Surface with extremely fine, irregular, close-set, bifurcate, radial ribs which become obsolete towards the beaks. Ligament rather short. Hinge with very fine denticulations under the ligament and 1-2 faint teeth under the beaks. Inner margin of the valves very finely crenulate. Periostracum not retained in the examined material. Valves entirely white.

Distribution. Known only from the Canary Islands, Madeira, here cited for the first time from the Cape Verde Islands and from northern Angola (Ambrizete, Ilha de Luanda). This species was also cited from Guinea by Nicklès (1955) as "*Crenella vaillanti* Issel, 1869", which is a larger and more triangular Indo-Pacific species living in the Red Sea.



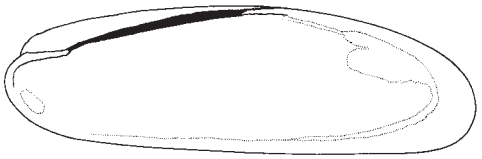
Biotope. Not known, most probably sand with shell debris, from about 10 to 60 m, rare.

Remarks. The European *R. prideaux* (Leach, 1815) has coarser radial ribs and commarginal lamellae, is more rhomboidal in outline and lacks the slightly concave ventral margin typical for large, fully grown *R. canariensis*; both species occur in the Canary Islands. The specimens from Angola and São Tomé are almost identical to *Crenella canariensis* as figured by Odhner (1931) and are here considered conspecific. Ockelmann (1983) described *Rhomboidella obesa* from Guinea and Ghana and stated his species to be "quite distinct" from *R. canariensis* but did not indicate which were the differences. Here, not more than one species could be recognized and the earlier name is used, pending further taxonomic studies.



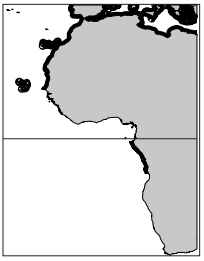
3.22. *Rhomboidella canariensis* (Odhner, 1931). A-B, Palm Mar, Tenerife, Canary Islands (2.9 mm). C-D, Palmeira, Sal, Cape Verde Islands (2.2 mm). E, same locality (3.1 mm). F-G, Esprainha, São Tomé, subtidal rocks (2.0 mm). H, same locality (1.7 mm). I-J, Ambrizete, N.-Angola, 60-80 m (2.1 mm).

Lithophaga lithophaga (Linnaeus, 1758)



3.23. Senegal, MNHN old coll. (31.9 mm).

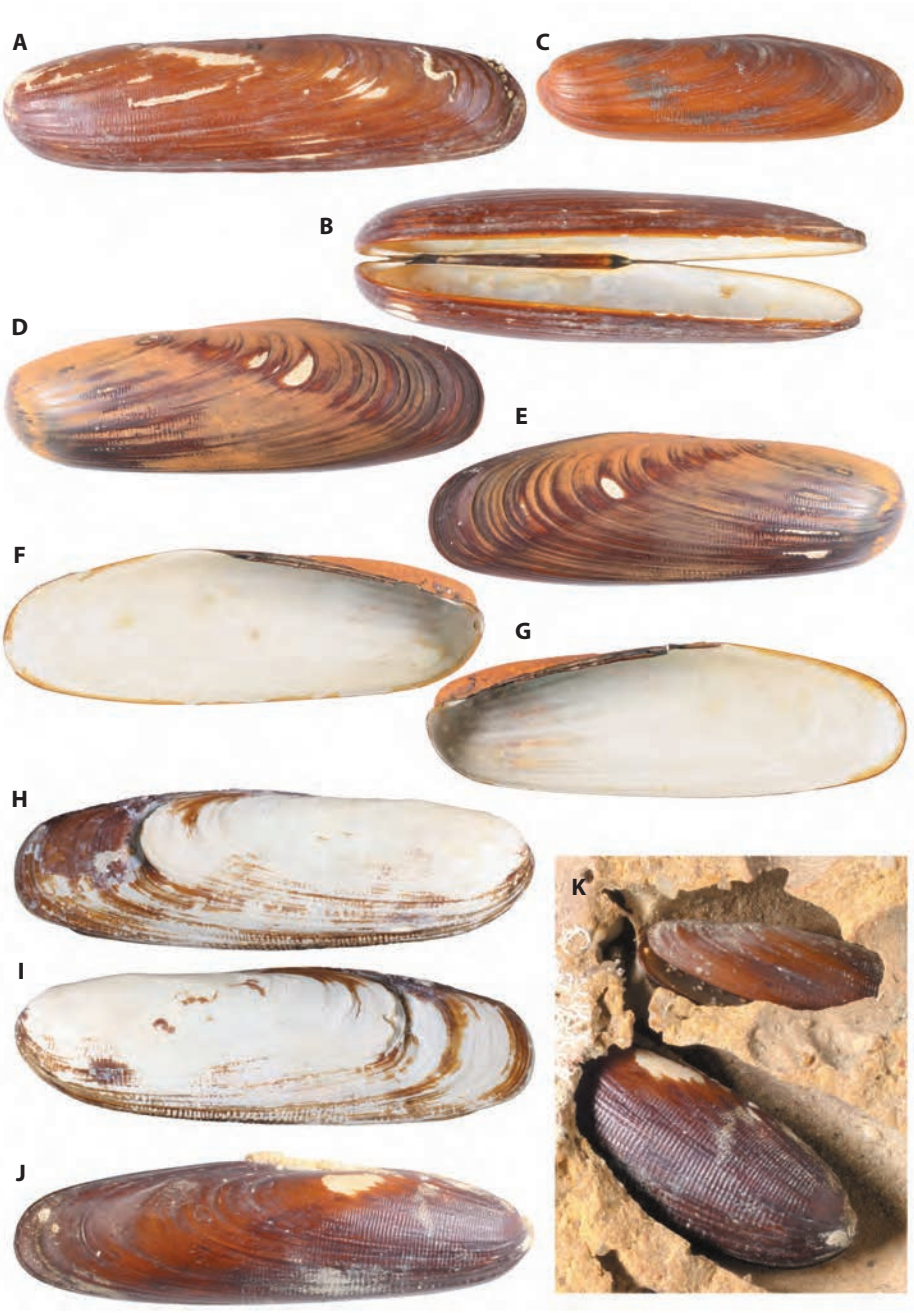
Shell up to 85 mm long, elongate, date-shaped, with obliquely rounded anterior margin and broadly rounded posterior margin, thin, very inflated. Ventral margin very slightly convex, antero- and postero-dorsal margin nearly straight, with a small bend between them. Beaks nearly terminal. Surface with rather coarse growth lines and growth stages and with very fine, irregular, interrupted, vertical striae on the anterior and middle part, occasionally obsolete. Ligament long, extending to about the middle of the valves. Hinge without any teeth. Inner margin smooth. Periostracum strong, appressed, striated towards the ventral side of the shell. Outside cream-white, covered by the more or less dark brown periostracum. Inside nacreous whitish.



Distribution. Strait of Gibraltar to Senegal (Dakar); Gabon (Pt.-Gentil) to northern Angola (Cabo Ledo); throughout the Mediterranean; Cape Verde Islands.

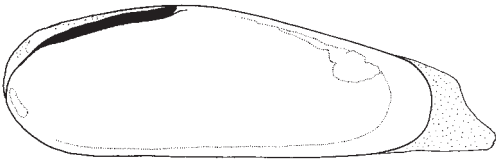
Biotope. Boring in more or less hard calcareous rock, from below low water to about 100 m. Common in the Mediterranean, uncommon to rare in West Africa.

Remarks. The distribution of this species shows a gap which covers most of the three tropical regions. It is edible, but too rare and too difficult to collect to be marketed; moreover, it is now protected in the Mediterranean. This is the type species of the genus *Lithophaga*.



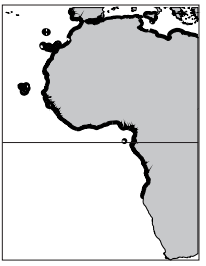
3.24. ***Lithophaga lithophaga*** **(Linnaeus, 1758)**. **A**-**B**, Gorée, Senegal, 15-20 m (71.4 mm). **C**, same locality (45.5 mm). **D**-**G**, Senegal (no precision, old coll. MNHN) (68.0 mm). **H**-**I**, Gorée, Senegal, 15-20 m (59.7 mm). **J**, Cabo Ledo, Bengo prov., N-Angola, (55.6 mm). **K**, same specimen embedded in its boring.

Leiosolenus aristatus (Dillwyn, 1817)



3.25. Palmeirinhas, Luanda prov., Angola, 2-3 m (31.7 mm).

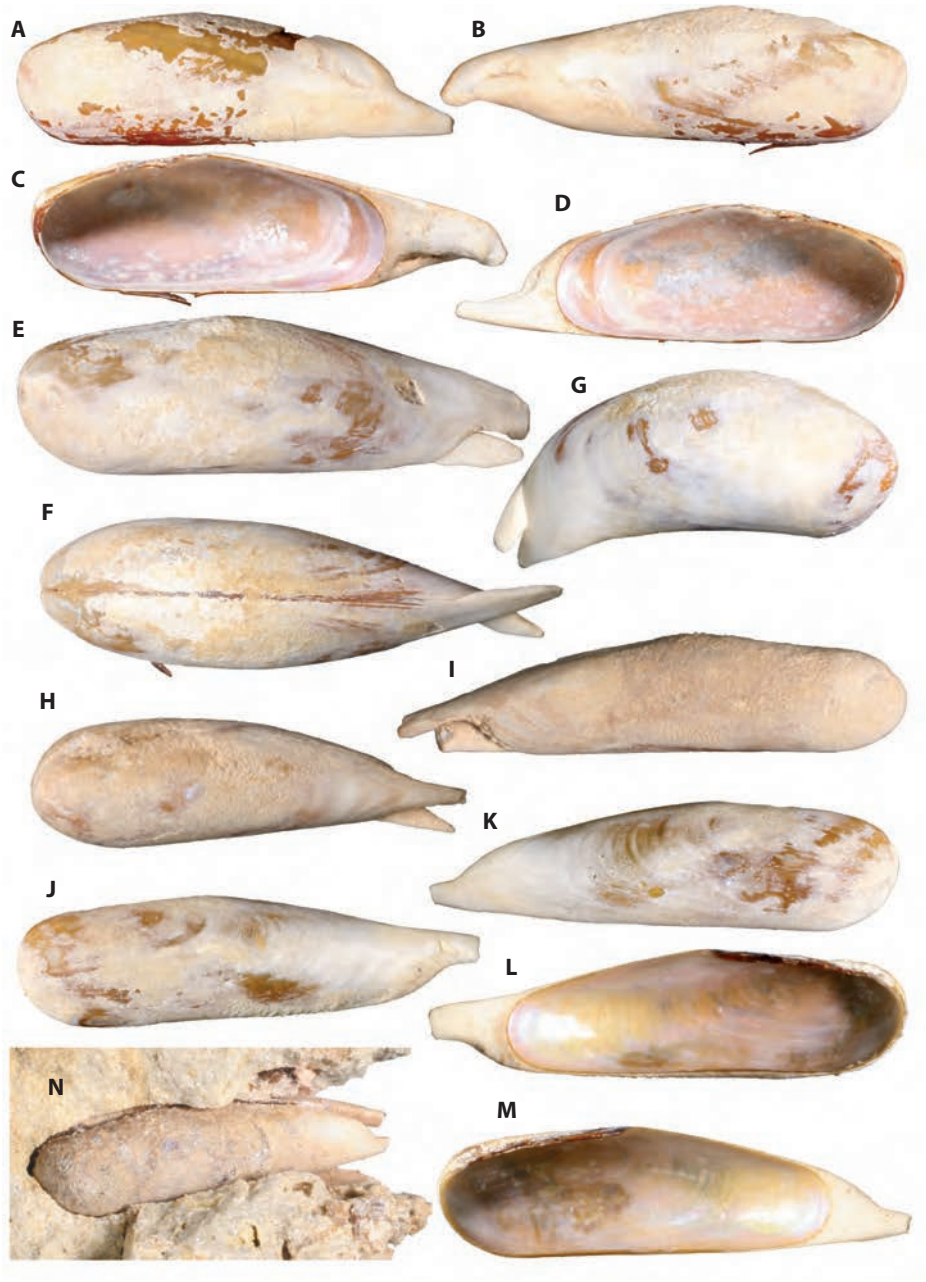
Shell up to 40 mm long (inclusive of incrustations), elongate, date-shaped, with broadly rounded anterior and posterior margin, thin, very inflated. Ventral margin straight, antero-dorsal margin weakly curved to nearly straight, postero-dorsal margin straight, both separated by a slight bend. Umbos terminal. Surface with irregular growth lines and coarser growth stages. Ligament extending to the middle or just anterior to the middle of the valves. No hinge teeth. Inner margin smooth. Periostracum brown, encrusted with a greyish-white, calcareous layer, which projects beyond the posterior margin and ends in a pointed tip. The tips of both valves cross each other when seen dorsally or ventrally. Outside and inside light brownish.



Distribution. Eastern Atlantic: Bay of Biscay (Guéthary, St. Jean de Luz) southward to southern Angola (Moçâmedes, Namibe province); Cape Verde Islands; Islands in the Gulf of Guinea; southern Mediterranean (Morocco and Algeria eastward to Israel). Western Atlantic: North Caroline to Florida, Gulf of Mexico, throughout the Caribbean to Colombia and Venezuela. Also known from the Panamic-Pacific faunal Province.

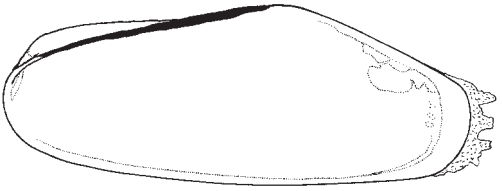
Biotope. Boring in soft rock such as limestone, chalk and sandstone, as well as in coral and shells, from low water mark to about 100 m, common.

Remarks. This widespread species has received many names, among them several based on specimens from America; the synonym frequently used for eastern Atlantic specimens is *L. caudigera* (Lamarck, 1819). For more details, see Kleemann (1983). This is "Le Ropan" of Adanson and the type species of the subgenus *Myoforceps* P. Fischer, 1886.



3.26. ***Leiosolenus aristatus*** **(Dillwyn, 1817)**. **A**-**D**, Praia, São Tiago, Cape Verde Islands (21.5 mm without forceps). **E**-**F**, Santa Maria islet, São Tiago, Cape Verde Islands, 2-3 m (26.5 mm). **G**, Tarrafal, São Tiago, Cape Verde Islands, 0-8 m (20.0 mm). **H**, Djeno, Pointe-Noire, Congo Brazzaville (17.5 mm). **I**, same locality (15.5 mm). **J**-**M**, Buraco, Palmeirinhas, Luanda prov., N-Angola (23.0 mm without forceps). **N**, Chapeu Armado, Namibe prov., S-Angola (18.0 mm), in its boring.

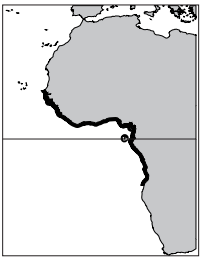
Leiosolenus carmenae (Cosel, 1995)



3.27. Ilha de Luanda, Luanda prov., Angola, 40-60 m (26.3 mm).

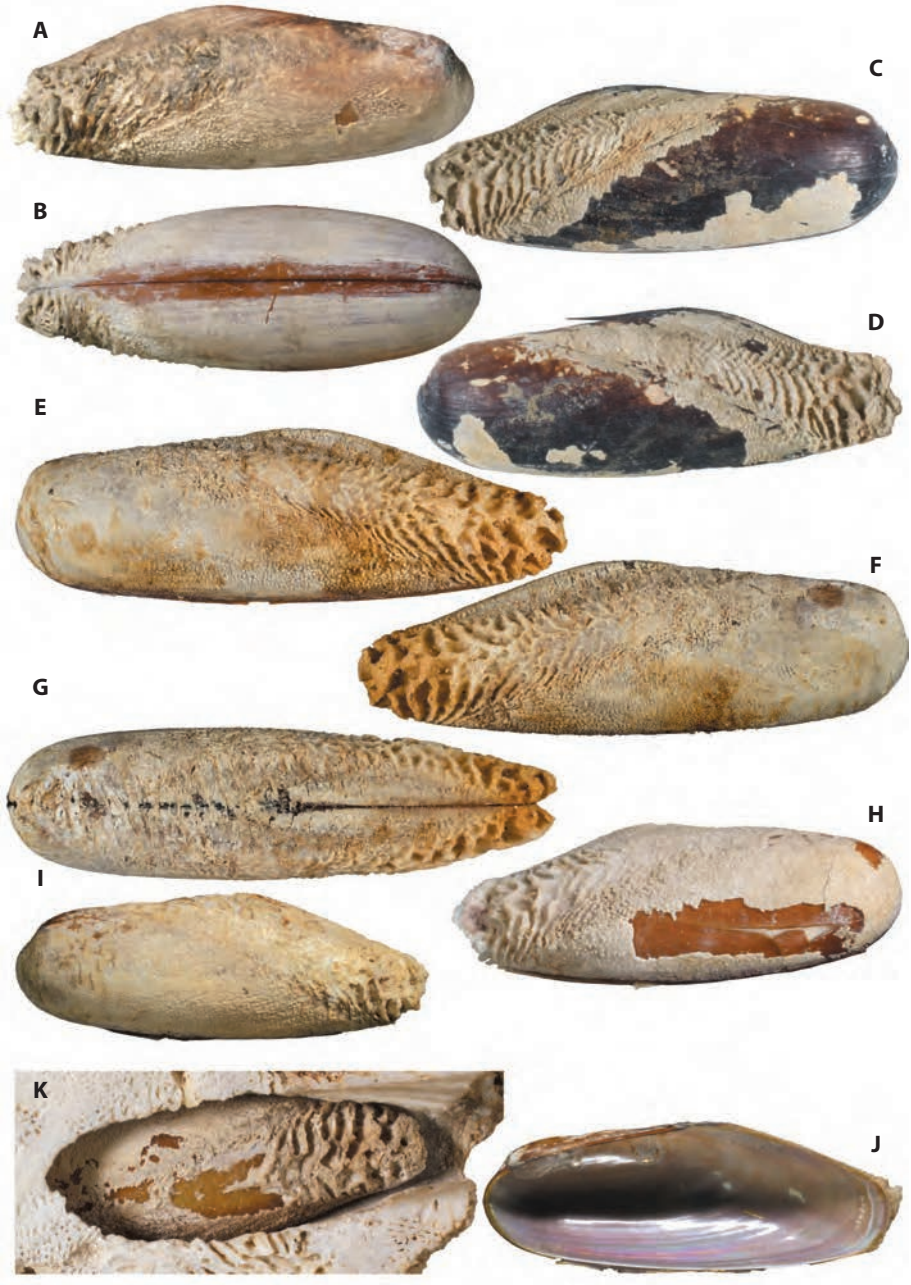
Shell up to 37 mm long, elongate, date-shaped, with broadly rounded anterior margin and more or less narrowly rounded posterior margin, thin, very inflated. Ventral margin slightly and evenly convex, antero-dorsal (ligamental) margin straight, postero-dorsal margin somewhat convex, between them a marked bend. Umbos subterminal. Surface smooth, with growth lines only. Ligament rather long, extending slightly beyond the vertical midline. No hinge teeth. Periostracum strong, brown to dark brown, with strong, light grey calcareous incrustation which, when not eroded, covers the whole shell. A narrow, sharp, more or less marked incision runs from the beaks to the postero-ventral extremity and cuts the incrustation into an antero-ventral part and a postero-dorsal part. Antero-ventral part with a rough, file-like surface. Postero-dorsal part of the valve with a thicker calcareous layer which projects slightly beyond the posterior margin and which, beginning on the posterior third or even more posteriorly, has distinctive, strong, irregular, divaricate wrinkles arranged like a plume. Valves brownish, inside nacreous.

Distribution. Senegal (Petite Côte) to southern Angola (Santa Maria, Benguela); Annobon and probably also São Tomé and Ilha do Principe.



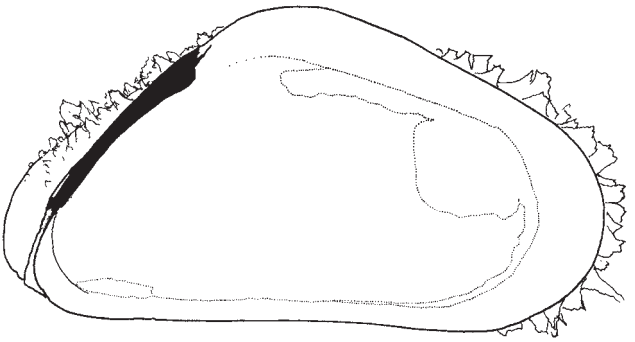
Biotope. Boring in limestone, coral and shells, usually offshore from about 25 to 90 m, uncommon. In southern Angola also found shallower, from 3 m downward, locally common.

Remarks. This species is the closest to *L. plumula* (Hanley, 1844) from tropical West America, but the "plumulate" sculpture on the West African species is shorter than in the Panamic species. The Caribbean *L. bisulcata* (d'Orbigny, 1842) completely lacks the plumulate sculpture, and the oblique incision is broader. A close Indo-Pacific species is *L. divaricalx* (Iredale, 1939). *L. carmenae* belongs to the subgenus *Diberus* Dall, 1898, and this is the sole representative of this subgenus in the eastern Atlantic.



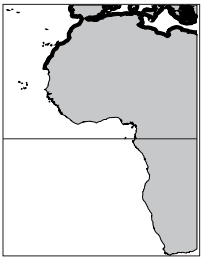
3.28. ***Leiosolenus carmenae*** **(Cosel, 1995)**. **A-B**, off Benin, 55 m (24.6 mm). **C-D**, Côte d'Ivoire, 4°42.5'N, 6°35.5'W, 40 m (32.0 mm). **E-G**, Port-Gentil, Gabon, "Anguille" oilfield, 0°55'S, 8°40.8'E, in incrustations on the piles of an oil rig platform between 8 and 20 m (holotype MNHN, 36.3 mm, photo Manuel Caballer/Recolnat). **H**, Ponta Diogo Vaz, São Tomé, 0-6 m (25.0 mm). **I-J**, Ilha de Luanda, N-Angola, 90 m (34.3 mm). **K**, same specimen *in situ* in its borehole.

Modiolus barbatus (Linnaeus, 1758)



3.29. Baie de l'Etoile, Mauritania, intertidal (31.3 mm).

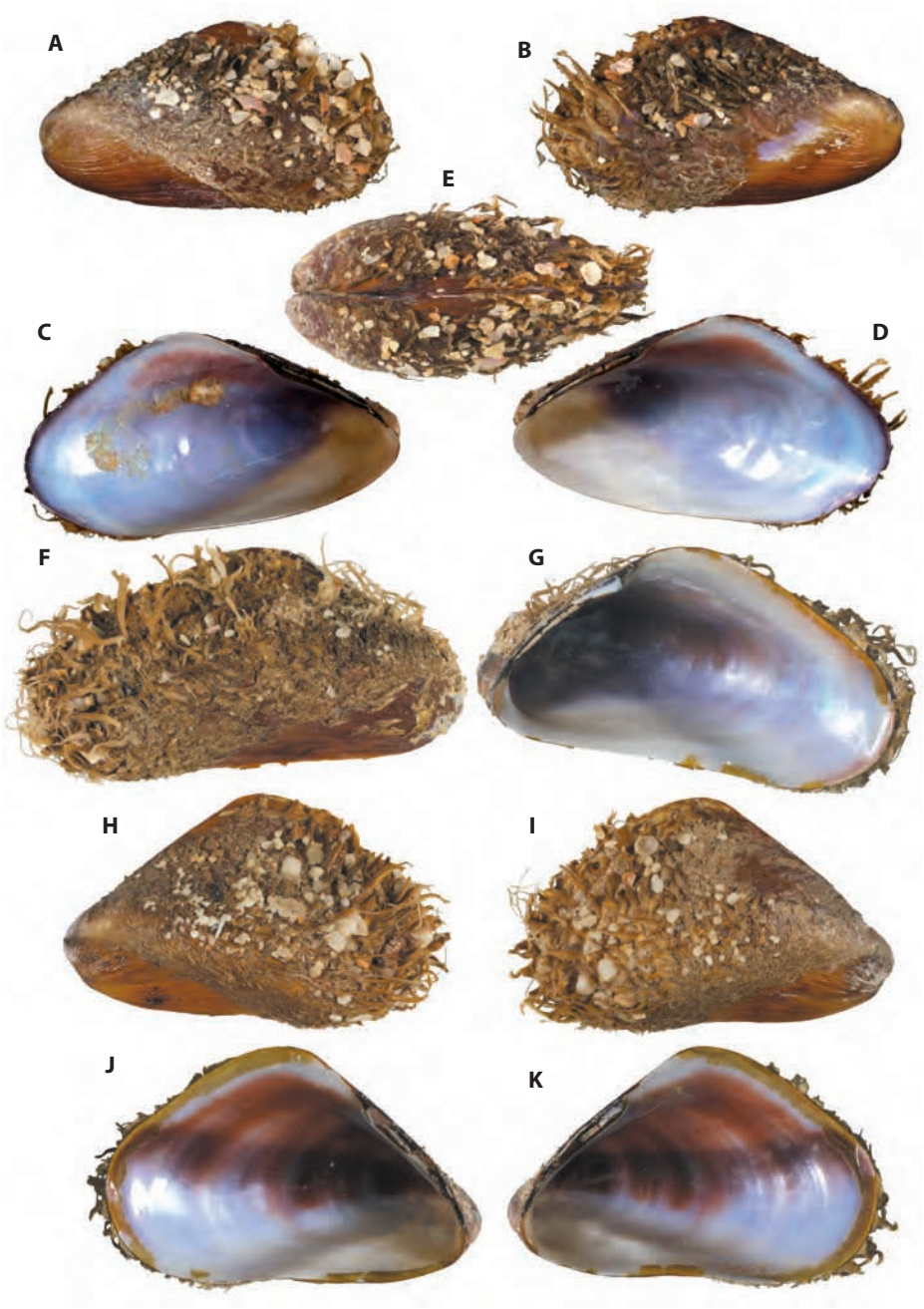
Shell up to 65 mm long (largest West African specimen measured 30 mm), greatly variable in outline, modioliform, with narrowly rounded anterior margin and broadly rounded posterior margin, solid, more or less inflated. Ventral margin straight or with a very weak sinuosity. Antero- and postero-dorsal margin straight to slightly convex, with a rounded angle between them. Umbos slightly subterminal. Surface with irregular growth lines and fine growth folds mostly near the ventral margin. Ligament rather short. Periostracum yellowish to chestnut brown, glossy. Posterior two thirds of the valves covered with long, foliate bristles which have very broad bases and are irregularly serrated on the side facing the ventral shell margin. Outside whitish to purple, yellowish or orange red, inside iridescent white, mostly stained with purple to bluish purple.



Distribution. West coast of England and Ireland and western Channel southward to Mauritania (Cap Blanc); throughout the Mediterranean.

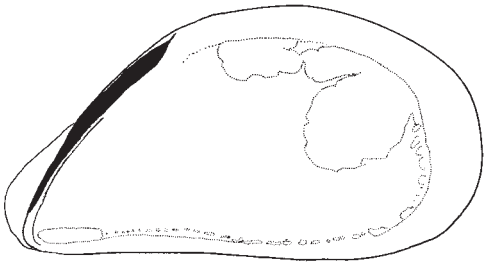
Biotope. Under stones and rocks, also attached to the holdfasts of large seaweed or to hard objects on sandy bottom, from low water mark to about 100 m; common.

Remarks. This is a northern temperate species which is restricted to the influence of permanent upwelling.



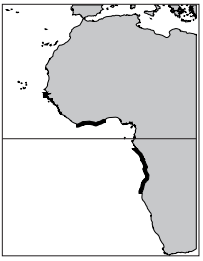
3.30. ***Modiolus barbatus*** **(Linnaeus, 1758)**. **A**-**E**, Pointe des Maures, Mauritania, low tide (24.1 mm). **F**-**G**, Baie de l'Etoile, Mauritania (rv, 29.9 mm). **H**-**K**, same locality (25.7 mm).

Modiolus pseudobarbatus Ockelmann, 1983



3.31. Praia Etambar, Luanda prov., Angola, on beach (17 mm).

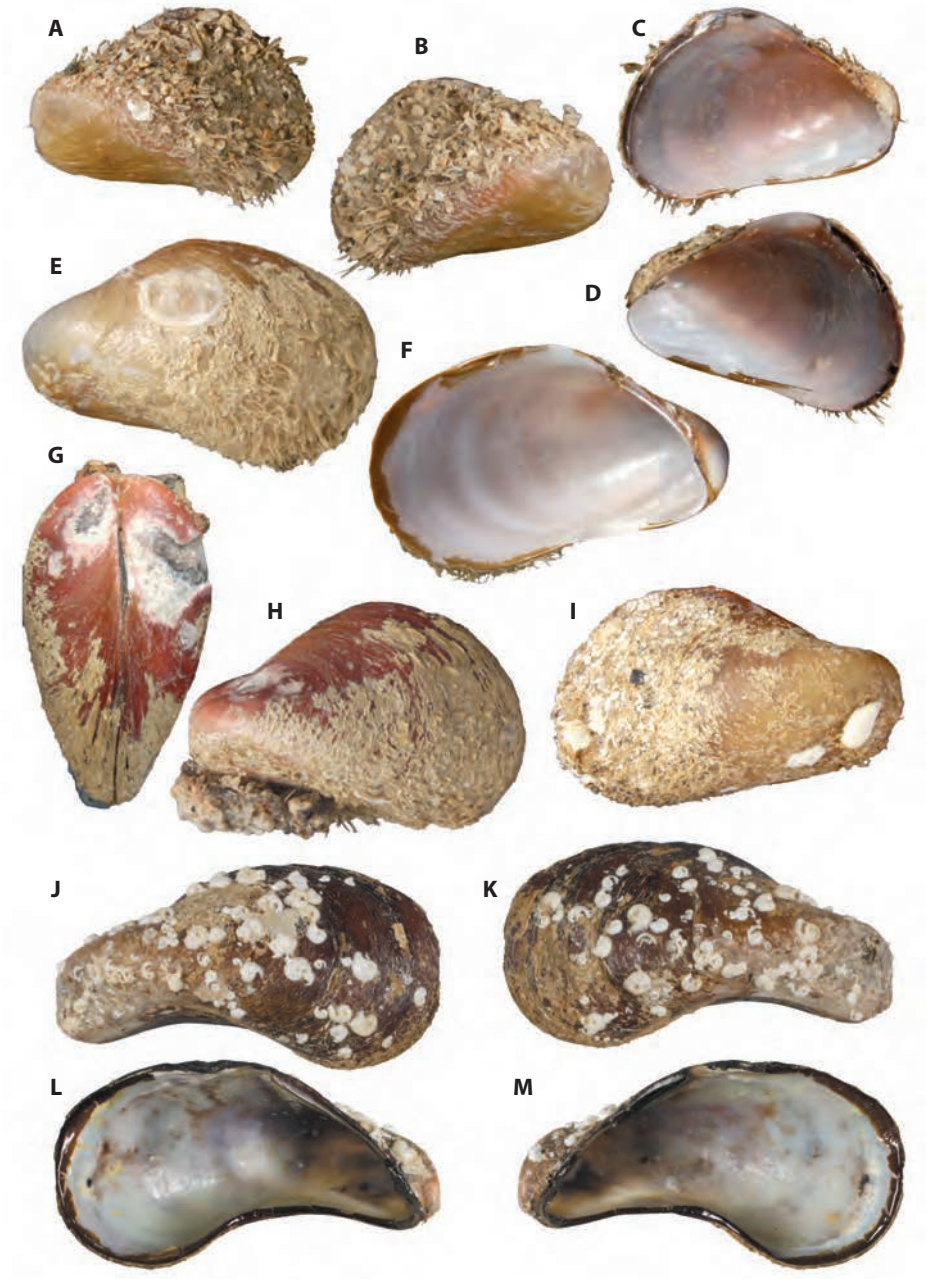
Shell up to 24 mm long, very variable in shape, modioliform, with narrowly rounded anterior margin and more or less broadly rounded posterior margin, solid, very inflated. Ventral margin slightly concave to nearly straight. Antero-dorsal (ligamental) margin slightly convex to nearly straight, postero-dorsal margin convex and gradually passing into the posterior margin. Bend between antero- and postero-dorsal margin rounded to broadly rounded. Umbos rather broad, rounded and prominent, almost terminal. Surface with irregular growth lines and a few folds parallel to the ventral margin, otherwise smooth. Ligament broad and rather long, about 1/3 of shell length. Periostracum pale yellowish brown to dark brown. Bristles long, rather narrowly foliate, unilaterally serrated, with a broadened base, covering the posterior part or nearly the whole valve except the antero-ventral part. Outside whitish, tinged with pink to purple or violet. Inside nacreous whitish with pale pink to purple, violet or nearly uniform dark purplish blue.



Distribution. Gambia (Fajara, one record, Ockelmann 1983); Côte d'Ivoire to Ghana; Congo Brazzaville (Pointe-Noire) to southern Angola (Baia dos Tigres).

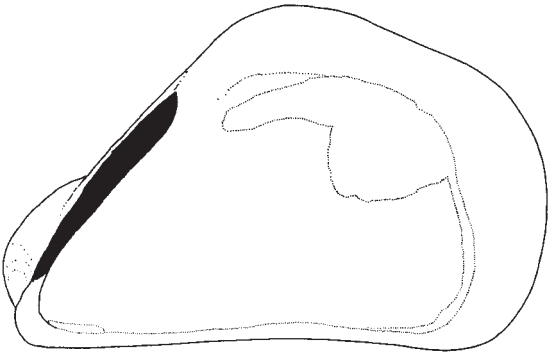
Biotope. On rocky shores on and under rocks, but also attached to hard objects on soft bottom, from low tide mark to about 10 m; locally common.

Remarks. *Modiolus pseudobarbatus* is distinguished from *M. barbatus* by its much smaller size, more inflated shell and the form of the bristles which are narrower, more regularly serrated and have a narrower base. The species is restricted to shallow water and needs seasonal upwelling influence; there are no records from the two typical tropical regions. Huber (2010) contended that this is the same as *M. carvalhoi* Klappenbach, 1966, originally described from Brazil and reported from Praia das Conchas near Moçâmedes by Kensley & Penrith (1970) but this has yet to be proved with genetic data.



3.32. ***Modiolus pseudobarbatus*** **Ockelmann, 1983**. **A-D**, La Niega, Abidjan, Côte d'Ivoire, 5 m, among boulders (7.6 mm). **E-F**, Praia Etambar, Corimba, Luanda prov., N-Angola (13.1 mm). **G-H**, Chapeu Armado, Namibe prov., S-Angola (14.1 mm). **I**, same locality (12.2 mm). **J-M**, Praia Amelia, Namibe prov., S-Angola (24.2 mm).

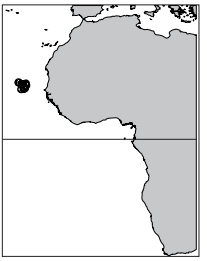
Modiolus verdensis Cosel, 1995



3.33. Ilha São Tiago, Cape Verde Islands, 15°16.6'N, 23°47.7'W, 55-60 m (15.9 mm).

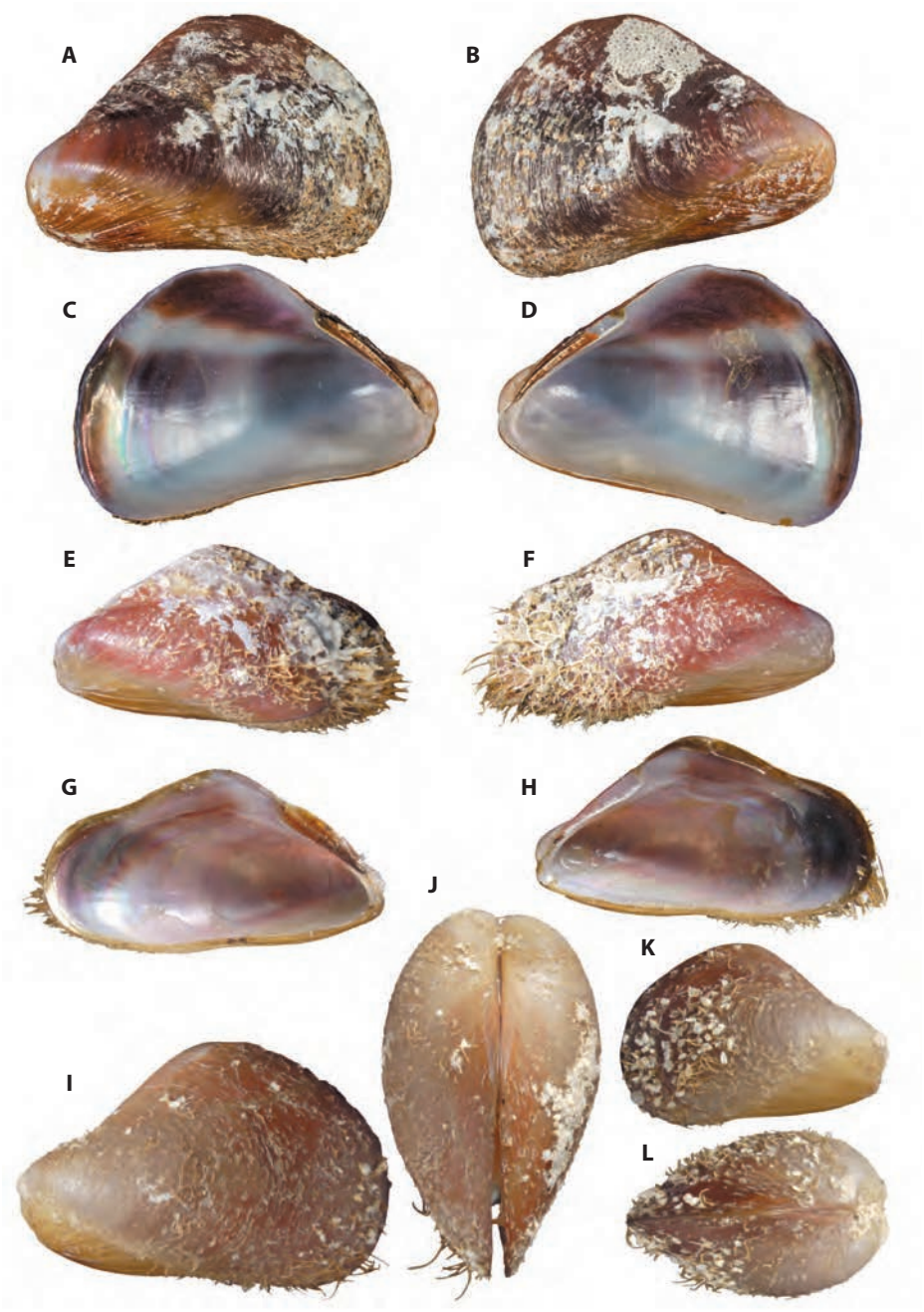
Shell up to 20 mm long, variable in outline, broadly modioliform, with narrowly rounded anterior margin, solid, quite inflated. Ventral margin slightly concave to nearly straight, antero-dorsal (ligamental) margin straight. Postero-dorsal and posterior margin more or less evenly convex, with a rounded angle to the ventral margin. Bend between antero- and postero-dorsal margin rounded to rather sharp. Umbos broad, rather prominent, terminal. Surface with quite coarse, irregular growth lines and growth stages and irregular folds along the ventral margin. Ligament rather broad and short, extending on about two thirds of the antero-dorsal margin. Periostracum rather thin, yellow to brownish. Bristles moderately long to very long, thin and hair-shaped, not serrated, with more or less broad base, mostly rather scattered, occasionally denser near the posterior margin. Outside pale to bright yellow, orange, red to purple or violet, near the ventral margin often whitish. Inside nacreous white, dorsally often purplish to violet.

Distribution. Cape Verde Islands, endemic.



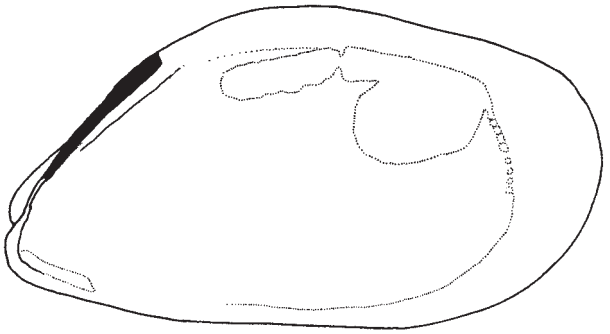
Biotope. On rocky shores on stones and rocks, but also attached to hard objects on soft bottom such as sand with shell debris and calcareous algae, from low water mark to about 10-15 m, occasionally deeper, to 60 m; not uncommon.

Remarks. This species is very close to *M. pseudobarbatus*, and is principally distinguished by the very thin and non-serrated bristles. The valves of *M. verdensis* are broader and slightly less tumid, the posterior margin is not separated from the postero-dorsal margin. The anterior margin shows a lobe-like flare under the umbos which is not observed in *M. pseudobarbatus*. Records of other *Modiolus* species in previous Cape Verde Islands records and faunal lists refer partly to *M. verdensis*.



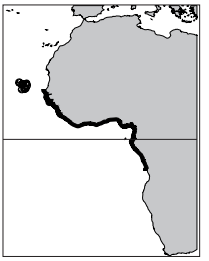
3.34. ***Modiolus verdensis*** **Cosel, 1995**. **A**-**D**, Boavista, between Sal Rei and Ponta do Rife, 2 m (holotype, 15.1 mm, photo Manuel Caballer/Recolnat). **E**-**H**, S. coast of Ilheu Branco, 50 m (10.6 mm, MNCN). **I**-**J**, Parda, Sal (14.0 mm, MNCN). **K**-**L**, same locality (10.1 mm).

Modiolus nicklesi Ockelmann, 1983



3.35. W of Ouendi, Guinea, 9°54.3'N, 15°25'W, 25 m (24.3 mm).

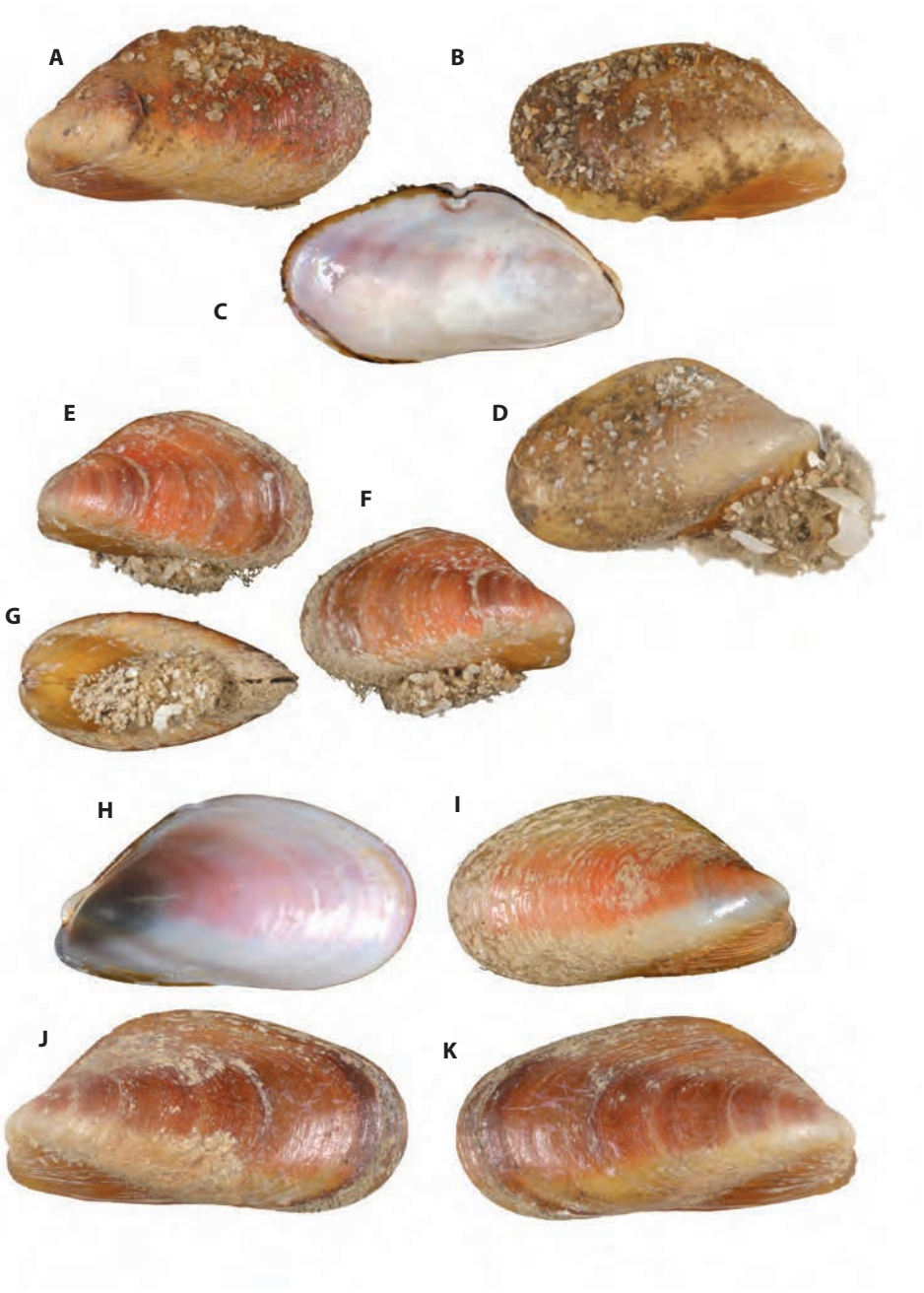
Shell up to 20 mm long (occasionally larger, to 29 mm long), somewhat variable in outline, modioliform, with narrowly rounded anterior margin and broadly rounded posterior margin, thin, moderately inflated. Ventral margin almost straight, often with a slight sinuosity in the middle. Antero-dorsal (ligamental) margin very weakly convex, postero-dorsal margin evenly convex, bend between them rounded, more or less marked. Umbos broad, rather prominent and slightly subterminal. Surface with irregular growth lines and coarser growth stages, along the ventral margin with irregular folds. Ligament narrow and rather short. Periostracum rather thin, pale yellowish to brownish. Bristles thin and narrow, long, more or less serrate on one side. There are also sand grains and small pieces of shells and calcareous algae adhering to the shell. Outside ventrally whitish, in the middle and dorsally reddish to purple. Inside iridescent white, with external colour showing through as pink.



Distribution. Senegal (Dakar) to northern Angola (Luanda); Cape Verde Islands.

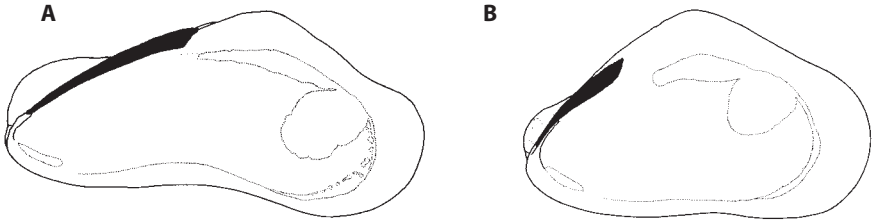
Biotope. On soft bottom such as muddy sand and mixed sand with shells, shell debris or calcareous algae, attached to hard objects, offshore from about 15 to 70 m, mostly between 40 and 55 m; uncommon.

Remarks. This species superficially resembles *M. pseudobarbatus* and *M. verdensis*. From both, it is distinguished by its thinner and less tumid valves with more subterminal umbos, a shorter antero-dorsal margin and a thinner ligament. The bristles are serrate on one side, as in *M. pseudobarbatus*, but still narrower, with less dense serrations, whereas *M. verdensis* has smooth, hair-like bristles. *M. odiolus nicklesi* is an offshore tropical species which may only co-occur with *M. verdensis*.



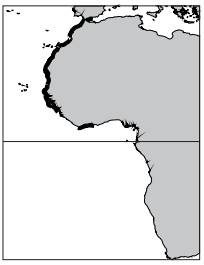
3.36. ***Modiolus nicklesi*** **Ockelmann, 1983**. **A-C**, W of Ouendi, Guinea, 9°54.3'N, 15°25'W, 25 m (24.3 mm). **D**, Liberia, 5°05'N, 3°22'W, 30 m (16.5 mm). **E-G**, Abidjan, Côte d'Ivoire, 25 m, (14.5 mm). **H-I**, Abidjan, Côte d'Ivoire, 44 m (18.0 mm). **J-K**, Jacqueville, Côte d'Ivoire, 50 m (28.4 mm).

Modiolus lulat Dautzenberg, 1891



3.37. **A**, Conakry, Guinea, on beach at low tide (large rv, 77.1 mm). **B**, S of Gorée, Senegal, 32-34 m (small rv identified as *M. thorsoni*, 20.3 mm).

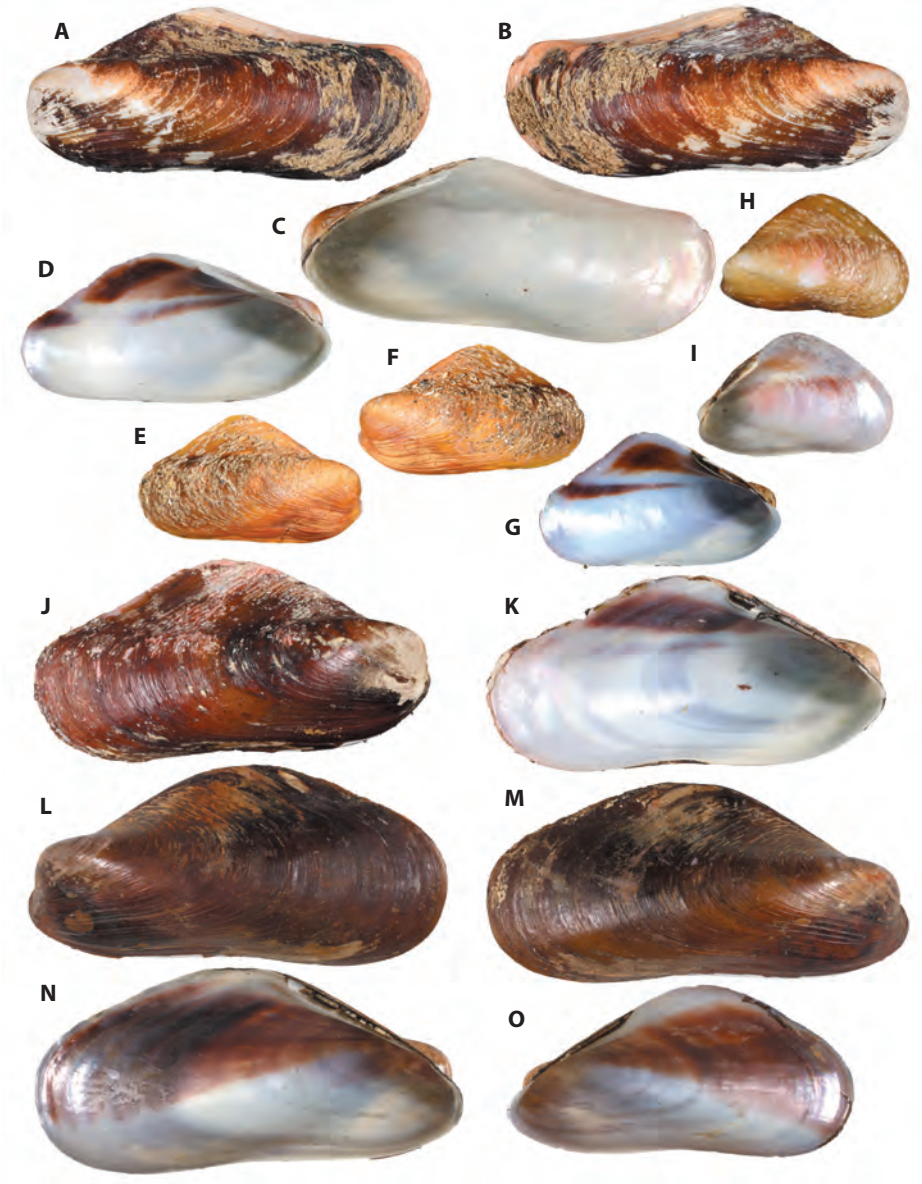
Shell up to 80 mm long, considerably variable in outline, typically modioliform but elongate, with narrowly rounded to broadly angulate anterior margin and rounded posterior margin, rather thick and solid, inflated. Ventral margin anteriorly convex, then slightly to markedly concave. Antero-dorsal (ligamental) margin very weakly curved and somewhat variable in length, postero-dorsal margin well concave to straight, occasionally slightly convex. Bend between antero-dorsal and postero-dorsal margin rather sharp and forming a somewhat wing-like extension. Umbos prominent, rounded, rather broad, nearly subterminal. Surface with dense, irregular, coarse growth lines and growth folds. Ligament rather broad and slightly longer than 1/3 of shell length. Periostracum strong, light yellowish brown to dark brown. Bristles long, broad and somewhat leafy, with slightly irregular margins, bases broad. Outside antero-ventrally dirty whitish, on the rest of the shell reddish with purplish blue. Inside whitish, usually with a sharply delimited purplish area under the dorsal bend and a second ray of the same colour running from the umbo to the antero-dorsal margin.



Distribution. Extreme south-western Mediterranean (Málaga region, see Rueda & Salas 1997) and Morocco to Guinea (Conakry); Côte d'Ivoire. However, Cape Verde Islands records (Guerreiro & Reiner 2000) are based on *Lioberus agglutinans* (Cantraine, 1835).

Biotope. Byssally attached to rocks and other hard objects, on rocky shores and probably also on soft bottoms, from about 1 m to 10 m, not uncommon.

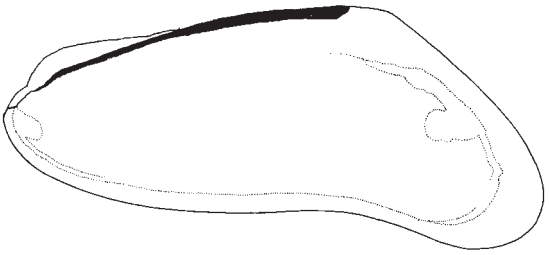
Remarks. This is "Le Lulat" of Adanson. Several species have been confused under the name *M. lulat*, among them most of the previously treated smaller *Modiolus* and, still recently, *M. martorelli* (see next entry). However, *M. lulat* is a distinct species and the largest West African *Modiolus* (*s. str.*). It is characterized by its concave ventral and antero-dorsal margin and the set-off dorsal part with a rather sharp dorsal bend. *Modiolus thorsoni* Ockelmann, 1983 was recognized by Huber (2010) as based on juvenile specimens of this species which are shorter in outline, with a more angular dorsal margin (see Fig. 3.38E-I) but are still diagnosed by the non-serrate bristles and the characteristic dark rays inside. Specimens from Côte d'Ivoire (Fig. 3.38L-O) have a much thinner shell, a continuous dark area inside, and a glossy periostracum and may represent a different, undescribed species. *Modiola nitens* Carpenter *in*



3.38. *Modiolus lulat* Dautzenberg, 1891. **A-C**, Nouadhibou, Mauritania (56.0 mm). **D**, Cap des Biches, Senegal (47.7 mm). **E-G**, same locality (37.1 mm). **H-I**, S of Gorée, Senegal, 32-34 m (11.5 mm), juvenile specimen identified as *M. thorsoni*. **J-K**, Presqu'île du Cap Vert, Senegal (63.9 mm). **L-N**, Côte d'Ivoire (53.7 mm). **O**, same locality (74.0 mm).

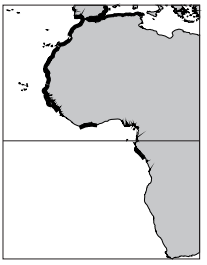
Gould & Carpenter, 1857, described from California, was supposed to be an earlier name for *M. lulat* by Abbott (1981). However, Coan *et al.* (2000) found it to be based on specimens of *Xenostrobus pulex* (Lamarck, 1819), an Australian species.

Modiolus martorelli (Hidalgo, 1877)



3.39. Off Cayar, Senegal, 120 m (73 mm).

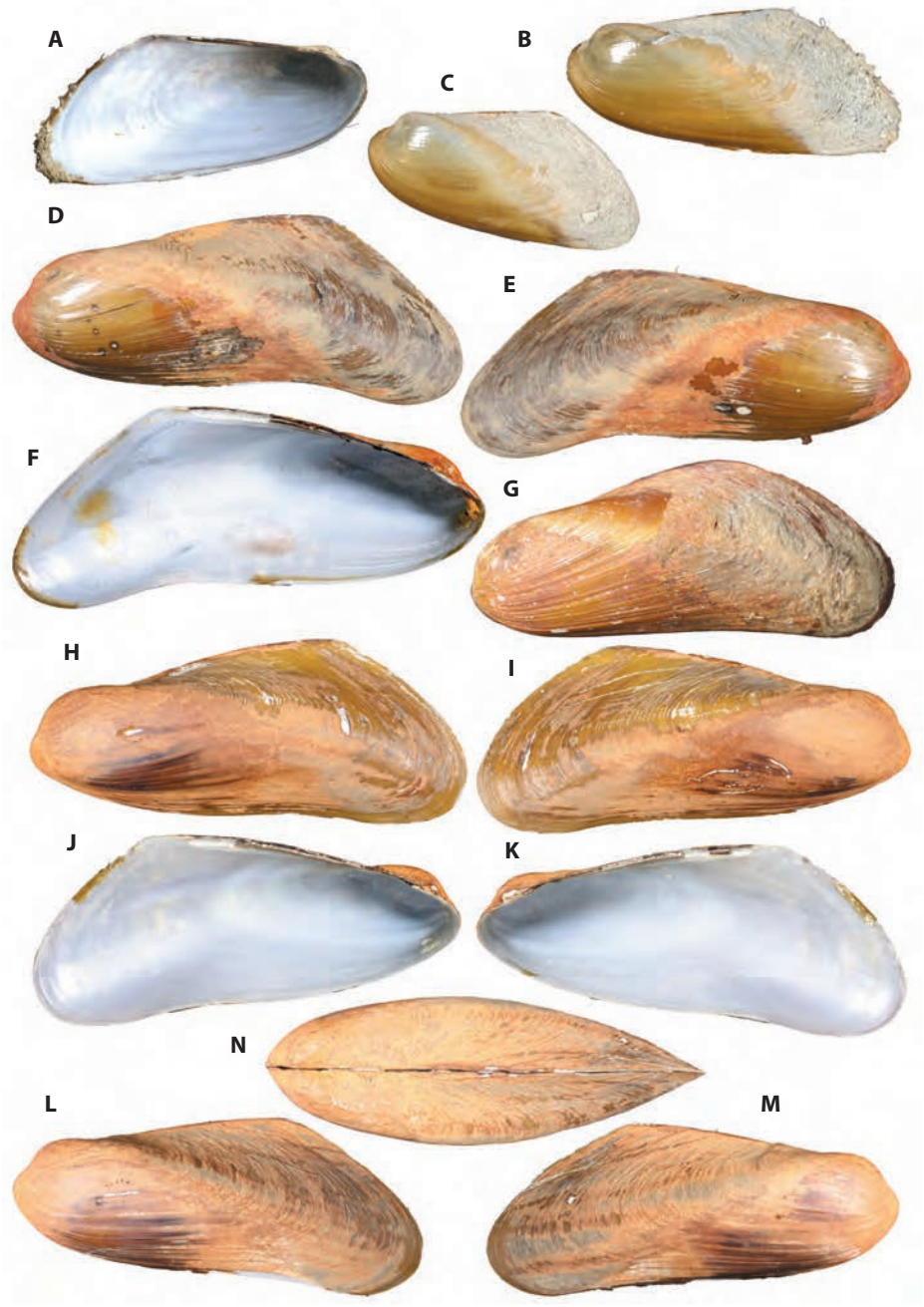
Shell up to 90 mm long, somewhat variable in shape, elongate, modioliform, bean-shaped, with narrowly rounded anterior margin and rather narrowly rounded posterior margin, thin but solid, inflated. Ventral margin in its anterior part convex, in the middle and posterior part slightly to markedly concave. Antero-dorsal (ligamental) margin weakly convex, postero-dorsal margin more or less convex. Bend between antero- and postero-dorsal margin rounded to rather sharp. Umbos more or less broad, subterminal. Surface with dense, irregular growth lines and growth folds. Ligament narrow, extending on about half the shell length. Periostracum strong, light brown to brown, glossy, posterior part with scattered, fine, hair-like bristles, often encrusted with mud. Outside whitish, inside iridescent white to bluish white.



Distribution. Strait of Gibraltar to Sierra Leone; Côte d'Ivoire; Congo Brazzaville (Pointe-Noire region); Western Mediterranean to Western Sicily and Tunisia. No record from the southern (eastern) typical tropical zone (Nigeria to Gabon).

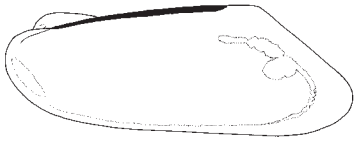
Biotope. In muddy bottom, offshore from 90 to 110 m, in the north also shallower.

Remarks. This outer shelf, mud-living species has repeatedly been confounded with the littoral *M. lulat*. The latter lives exclusively on hard bottoms, is more modioliform with a concave postero-dorsal margin especially in the northern specimen, and has a typical colour pattern with a broad dorsal ray. *Modiolus martorelli* has the postero-dorsal margin always convex, is thinner with very few bristles, and with removed periostracum is nearly colourless. The figure of "Le Lulat" in Adanson (1757) clearly depicts the shallow water species. *Modiolus martorelli* superficially resembles *Jolya letourneuxi* (see next entry), which also inhabits muddy bottom and is also builds a nest, agglutinating sand grains with its byssus. It was placed in *Jolya* by Huber (2010) along with the similar Indo-Pacific species *M. aratus* (Dunker, 1857). Herein, it is retained in *Modiolus* because it lacks the smooth, glossy periostracum, and the sharp postero-dorsal angle characteristic of *Jolya* and has a more elaborate periostracum on the posterior part like other species of *Modiolus*. *M. martorelli* is occasionally taken in trawls.



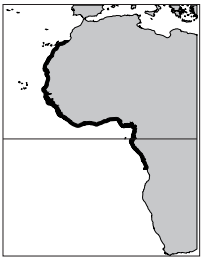
3.40. *Modiolus martorelli* (Hidalgo, 1877). **A**-**B**, Mauritania, 19°42'N, 17°04'W, 126 m (35.5 mm). **C**, same locality (30.4 mm). **D**-**F**, Kayar, Grande Côte, Senegal, 120 m (73 mm). **G**, Abidjan region, Côte d'Ivoire, (86.7 mm). **H**-**K**, off Pointe-Noire, Congo Brazzaville, 5°00'S, 11°36'E (79.4 mm). **L**-**N**, same locality (71.5 mm).

Jolya letourneuxi Bourguignat, 1877



3.41. Abidjan region, Côte d'Ivoire (44.8 mm).

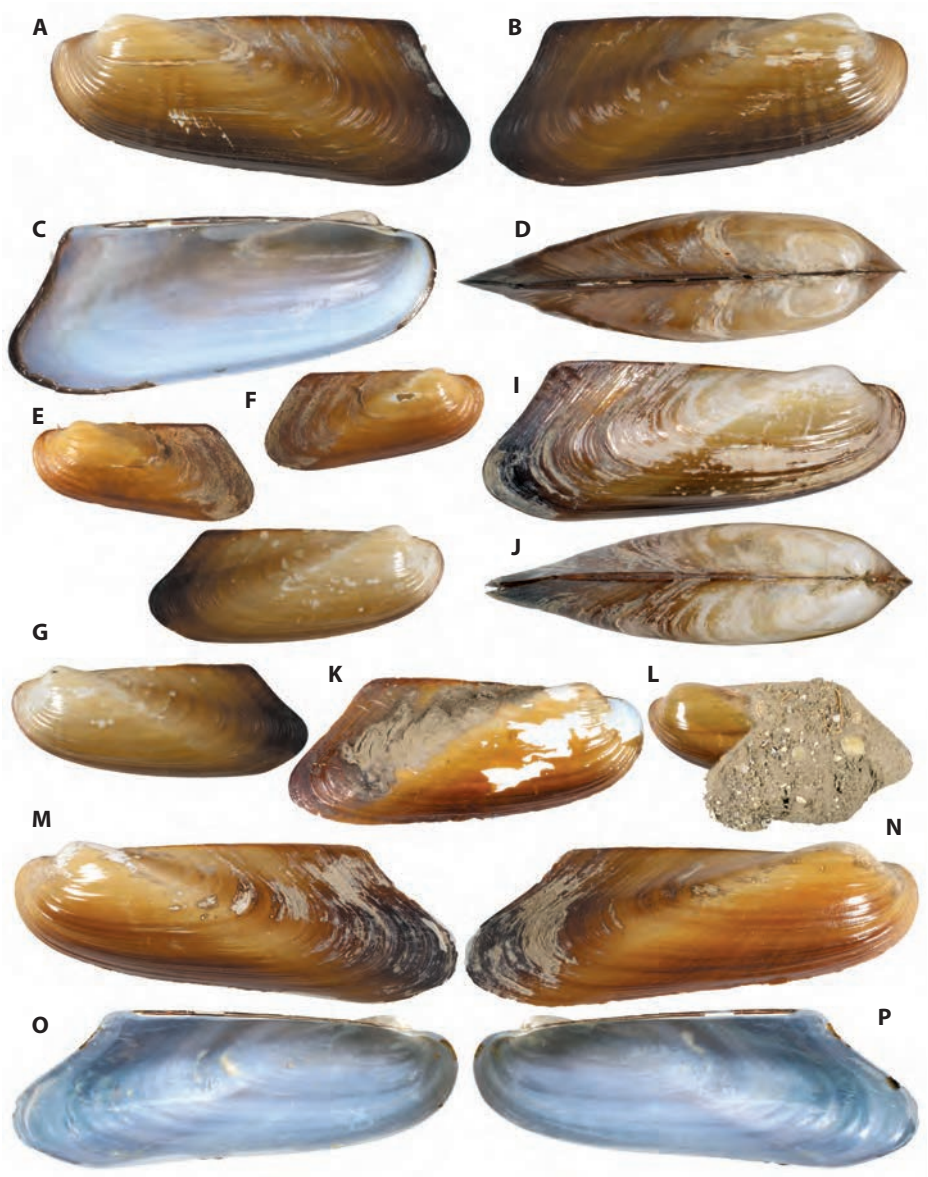
Shell up to 80 mm long, slightly variable in outline, elongate-trapezoidal, with rather broadly rounded anterior margin and quite narrowly rounded and prolonged posterior margin, thin and brittle, moderately inflated. Anterior margin gradually passing into the ventral margin, which anteriorly is convex and in the middle and towards the posterior part nearly straight. Antero-dorsal (ligamental) margin long, slightly convex in its anterior part and straight in its posterior part. Postero-dorsal margin short, straight to markedly concave. Bend between the antero- and postero-dorsal margin sharp. Umbos small, prominent, well subterminal. Surface with irregular, coarse growth lines and anterior of the umbos with pronounced, slightly irregular, commarginal ridges which become obsolete under the umbos. Ligament very narrow, extending nearly on the whole length of the antero-dorsal margin. Periostracum olive brown to brown, thin but persistent, glossy. Posterior part sometimes encrusted with mud. Outside whitish, inside iridescent bluish white.



Distribution. Atlantic Morocco to northern Angola (Luanda). Northernmost records from Agadir (material from collection Lepiney 1936, MNHN; Pasteur-Humbert 1962, material in Institut scientifique, Rabat).

Biotope. In sandy mud and fine, muddy sand, in more or less turbid water, from about 3 to 40 m; locally not uncommon. Builds a nest with byssal threads and sediment which looks like a mud ball, in which only the anterior tip of the shell is visible. In shallow water, the species is often found together with *Lissochlamys exotica* and *Scissodesma micronitida*.

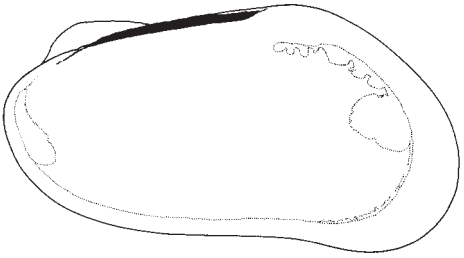
Remarks. This remarkable species was for a long time known as *Modiolus stultorum* (Jousseaume, 1893). However Bourguignat (1877) had described this species 16 years earlier, in his new genus *Jolya* Bourguignat, 1877 with the (erroneous) assumption that it was a freshwater unionid, and with a wrong type locality near the mouth of the Harrash river in Algeria. Haas (1911: 216; pl. 1, figs 1-12) figured the type material, realized that this was a marine mytilid, and first identified it as *Modiola plicata* (Gmelin, 1791) following a misidentification in Reeve (1857: pl. 6, fig. 25). In a follow-up article, Haas (1912: 85) recognized the misidentification and wrote that Bourguignat's species was the same as *Modiola stultorum* (Jousseaume, 1893). This name *stultorum* was given by Jousseaume alluding to the foolishness of previous authors who used wrong names, but himself was not aware of Bourguignat's name which has priority. A close species ranging from the Red Sea eastwards to the Indo-West Pacific, Japan and Australia is *J. elongata* (Swainson, 1821) (B.Wilson pers. comm.). However, it grows twice the size and has the umbos very low and



3.42. *Jolya letourneuxi* Bourguignat, 1877. **A-D**, Casamance, 10-20 m (50.7 mm). **E-F**, same locality (31.4 mm). **G-H**, same locality (41.3 mm). **I-J**, Casamance, 12°22.5'N, 17°03'W, 20 m (52.6 mm). **K**, Ponta das Lagostas, Luanda prov., N-Angola, 20-30 m (57.5 mm). **L**, same locality (42.3 mm with nest). **M-P**, same locality (79.5 mm).

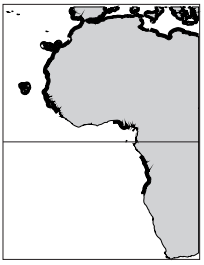
a somewhat more narrowly rounded anterior margin. *Modiola rhomboidea* Reeve, 1857 was originally stated to originate from Gambia, but was treated by Huber (2010: 556) as another Indo-Pacific species of *Jolya*. Large specimens are occasionally taken by shrimptrawlers.

Lioberus agglutinans (Cantraine, 1835)



3.43. Senegal (27.9 mm).

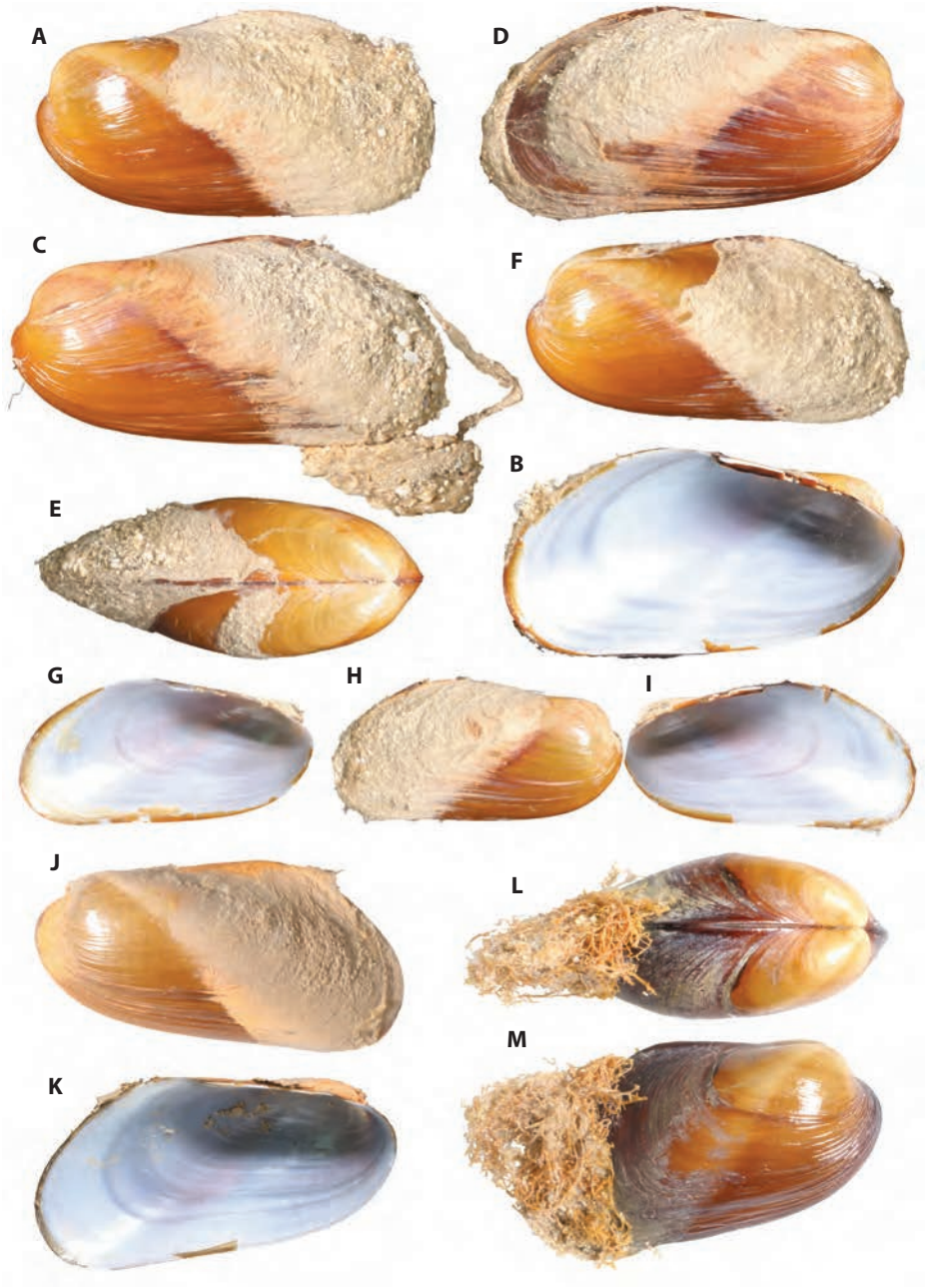
Shell up to 30 mm long (Cape Verde Islands specimens up to 47 mm), variable in shape and length, more or less elongate-oval, with rounded anterior margin and broadly rounded posterior margin, thin and fragile, very inflated. Ventral margin in its anterior part somewhat convex, then straight with a small posterior sinuosity, which is sometimes obsolete or missing. Antero-dorsal margin straight, occasionally slightly convex, postero-dorsal margin convex. Bend between antero- and postero-dorsal margin rounded. Umbos broad, subterminal. Surface with irregular growth lines and a faint depression running from the umbos to the sinuosity in the ventral margin. Occasionally coarser commarginal ridges near the anterior margin. Ligament narrow and rather short. Periostracum strong, brown to dark brown, valves behind the dorso-ventral depression often firmly encrusted with mud and sand grains, sometimes with gravel or small shell fragments. Outside whitish, inside nacreous white.



Distribution. Strait of Gibraltar to Guinea (9°23'N); Nigeria (Niger delta, Nicklès 1955); Congo Brazzaville (Loango; Pointe-Noire) to southern Angola (Santo Antonio, Benguela); Cape Verde Islands; Mediterranean.

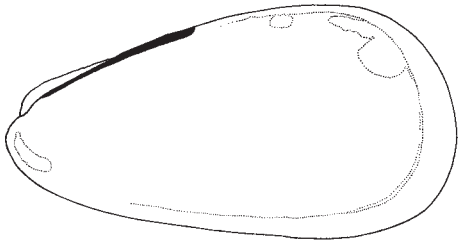
Biotope. In muddy sand, fine sand or mixed sand, also with shells and shell debris or gravel, from about 3 to 60 m, occasionally deeper, in calm bays, inlets and creeks (*e.g.* the Casamance river and the "bôlons") as well as offshore; not common anywhere. The species seems to tolerate salinity changes in certain limits. Builds a nest with byssus threads, sediment and shell fragments, which covers the shell entirely.

Remarks. This species is characterized by its rather short-oval, stout and tumid shell. The posterior part is typically heavily encrusted with sediment. Specimens from the Cape Verde Islands are larger and somewhat more elongate, but otherwise not distinguishable from continental shelf specimens. This is *Modiola vestita* Philippi, 1844; *M. abscondita* Aradas, 1847 and possibly *Modiolus nigeriensis* Nicklès, 1955.



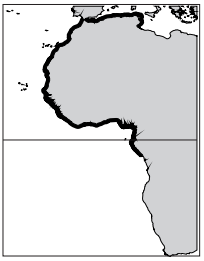
3.44. ***Lioberus agglutinans*** **(Cantraine, 1835)**. **A**-**B**, São Tiago, Baia de Tarrafal, Cape Verde Islands, 15°16.5'N, 23°47.5'W, 40-45 m (32.6 mm). **C**, same locality (38.0 mm). **D**, same locality (36.7 mm). **E**, same locality (33.3 mm). **F**, same locality (32.6 mm). **G**-**I**, same locality (28.0 mm). **J**-**K**, off Pointe Noire, Congo (27.5 mm). **L**-**M**, Cabo Ledo, Luanda prov. Angola, 10-40 m (28 mm).

Amygdalum politum (Verrill & Smith, 1880)



3.45. off Pointe-Noire, Congo Brazzaville, 300 m (38.9 mm).

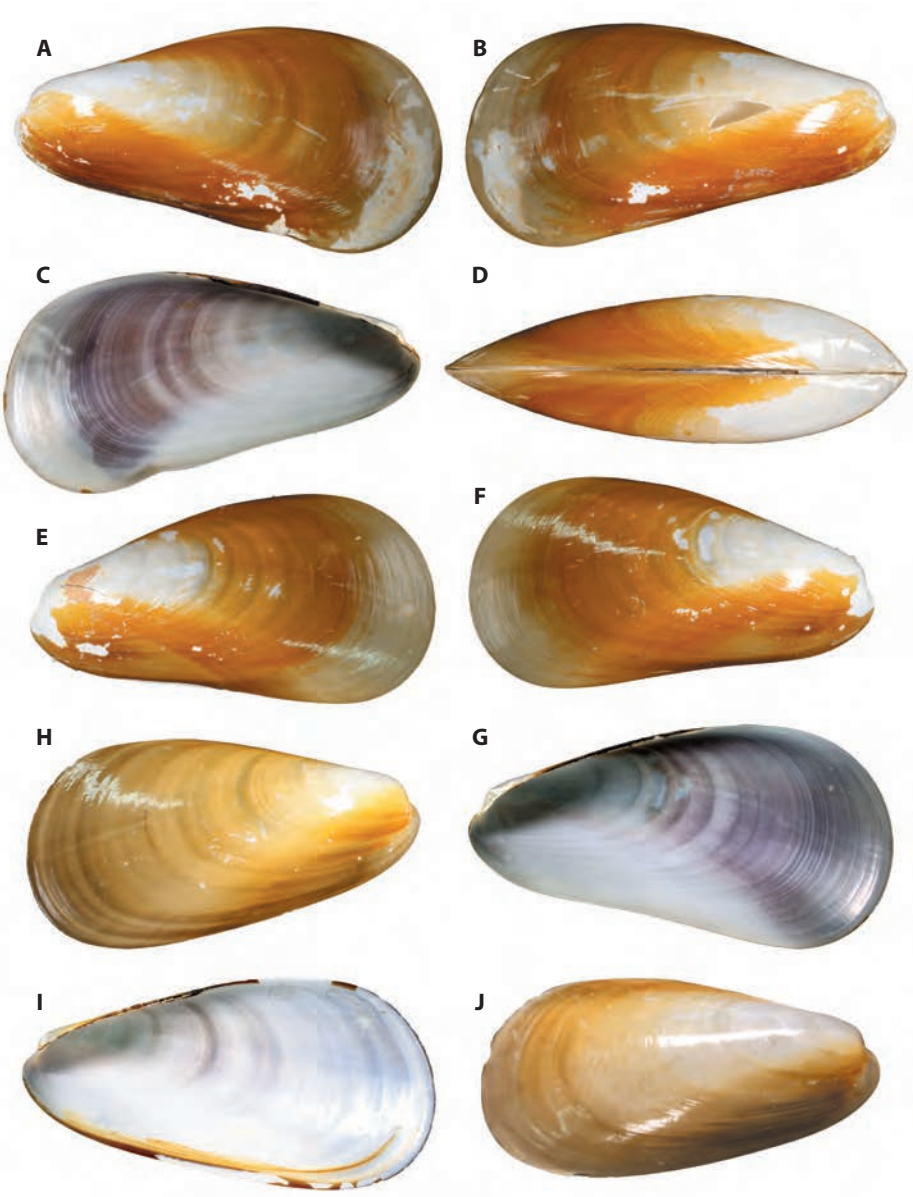
Shell up to 57 mm long, modioliform-trigonal, with narrowly rounded anterior margin and broadly rounded posterior margin, thin and fragile, rather compressed. Ventral margin weakly concave to slightly convex, antero-dorsal margin very faintly convex, nearly straight, with hardly visible bend to the postero-dorsal margin. Umbos rather broad, not prominent, subterminal. Surface smooth, with fine growth lines only. Ligament narrow, extending along the whole length of the antero-dorsal margin. Periostracum thin, glossy, on the umbos and adjacent dorsal part nearly colourless, ventrally and posteriorly rich golden brownish, pale olive near the margins. Valves entirely whitish, interior nacreous.



Distribution. Eastern Atlantic: southern Portugal to N- Angola (7°18'S); south-western Mediterranean from Sicily and Naples to Tarragona and the Alboran Sea. Western Atlantic: New England States southward to the Lesser Antilles and Colombia.

Biotope. In muddy bottom, offshore from 300 to 1000 m, not common. Builds a nest with byssus and mud, which covers the shell completely.

Remarks. This continental slope species is occasionally taken by trawlers working at these depths. This is *Mytilus luteus* Jeffreys, 1880 (*nomen nudum*).



3.46. *Amygdalum politum* (Verrill & Smith, 1880). **A-D**, off Port-Gentil, Gabon, 1°55'N, 9°32'E, 400 m (49.3 mm). **E-G**, same locality (46.7 mm). **H-I**, off Pointe-Noire, Congo Brazzaville, 300 m (34.6 mm). **J**, off Ambrizete, N-Angola, 7°14.42'S, 12°04.60'E, 360-357 m (28.0 mm).

Superfamily PINNOIDEA

Family PINNIDAE
- Genus ***Pinna*** Linnaeus, 1758 – 1 species
- Genus ***Atrina*** Gray, 1842 – 3 species (2 treated)

Superfamily PTERIOIDEA

Family PTERIIDAE
- Genus ***Pteria*** Scopoli, 1777 – 2 species
- Genus ***Isognomon*** Lightfoot, 1786 – 2 species

Family MALLEIDAE
- Genus *Malleus* Lamarck, 1799 – 1 species (not treated)

Superfamilies Pinnoidea and Pterioidea

Superfamily PINNOIDEA

The superfamily Pinnoidea includes the sole family Pinnidae, the "pen shells" which are among the largest bivalves, found in shallow tropical and temperate marine environments worldwide.

Family PINNIDAE

Shells medium-sized to very large (up to over one metre), equivalve or occasionally distorted, very inequilateral, with beaks at the anterior end and broad, rounded or truncated posterior margin. Valves thin to rather heavy, compressed. Surface smooth or with more or less irregular radial sculpture, ribs often bearing short to long scales. Hinge toothless, ligament narrow, rather short to very long, subinternal and non-elastic. Anterior adductor scar small, posterior adductor scar large and situated under the end of the ligament. Anterior part of inside nacreous in front of the posterior adductor scar. Periostracum generally eroded and not visible. – There are 58 species known worldwide, four on the West African coast. The species are mostly soft bottom dwellers and live vertically buried in the sediment, with the anterior (pointed) end plugged into the sediment and the broad posterior end sticking out or flush with the bottom surface. Strong byssus threads fix the bivalve to gravel, stones, shells or other hard objects in the sediment. Occasionally, small specimens may be found on hard substrate with the anterior end plugged between stones or in crevices. The valves are somewhat flexible and can be closed completely by the animal, but in dried specimens they are always gaping at the posterior margin and become brittle when kept dry. In some Indo-Pacific regions, species of Pinnidae are consumed, and shells are used in the shellcraft industry. In former times, the byssus threads of the Mediterranean *Pinna nobilis* Linnaeus, 1758, were used for making gloves and other fabric. The family was recently revised by Schultz & Huber (2013) but molecular work (Lemer *et al.* 2014) indicated that cryptic species are still to be discovered worldwide.

Genus *Pinna* Linnaeus, 1758. Shells large to very large, equivalve, more or less elongate, ham-shaped or wedge-shaped, with pointed anterior end and broad, rounded to truncated posterior margin, thin to rather solid. Surface mostly with irregular radial ribs which often bear scales, but occasionally smooth, with growth lines only. Valves with a keel in the middle, in some species visible only in juveniles. Nacreous zone in the interior divided by a deep, non-nacreous, median sulcus.

Genus *Atrina* Gray, 1842. Shells large, equivalve, rather short and broad to more elongate, ham-shaped or wedge-shaped, with pointed anterior end and well rounded to truncated posterior margin, thin to rather solid, more or less compressed. Surface with irregular radial ribs bearing scales, occasionally smooth with growth lines only. No keel in the middle. Nacreous zone in the interior not divided, posterior adductor scar at the posterior margin of this zone or completely enclosed by it.
In the subgenus *Atrina s. str.*, the posterior adductor scar is situated on the edge of the nacreous zone but not surrounded by it; in subgenus *Servatrina* Iredale, 1939 it is below the edge of the nacreous zone and completely surrounded by it.

Species treated (3)
Pinna rudis Linnaeus, 1758; *Atrina (Atrina) fragilis* (Pennant, 1777); *Atrina (Servatrina) chautardi* (Nicklès, 1953).

Other species reported in the area (1)
Atrina (Servatrina) pini Schultz & Huber, 2013. Senegal, 200 m (Schultz & Huber 2013).

Superfamily PTERIOIDEA

This group of exclusively epifaunal bivalves includes three extant (Pteriidae, Malleidae and Pulvinitidae) and several extinct, mostly Paleozoic, families.

Family PTERIIDAE

Shells small to large (over 300 mm), inequivalve with left valve generally more inflated than right valve, inequilateral, rounded to oval, more or less high or irregular. Dorsal margin straight, with or without wing-like projections on both sides. Beaks mostly well in front of the vertical midline. Right valve with small byssal notch on the anterior margin close to the hinge line. Surface smooth or with commarginal lamellae marking growth stages. Hinge edentulous or with poorly defined tooth-like structures. Ligament external, sunken along most of the hinge line, or (genus *Isognomon*) split into a series of small pits distributed along the hinge line. Interior typically nacreous except on the area bordering the shell margin, mostly with one adductor scar in adults. Periostracum strongly developed, commonly forming foliated projections. The mainly tropical Pteriidae are largely used in the nacre industry and are the main source for pearls. The number of worldwide species is estimated at 72 (including those formerly separated as Isognomonidae), among them four West African species.

Genus *Pteria* Scopoli, 1777. Shells small to rather large, oblique-oval, with more or less long, wing-like projections of the hinge margin, thin and fragile to rather thick and solid, more or less inflated. Surface smooth or with thin and very fragile, commarginal lamellae. Hinge often with 1-2 teeth under the umbo and a posterior lamina. *Avicula* Bruguière, 1792 is the most frequently used synonym.

Genus *Isognomon* Lightfoot, 1786. Shells small to rather large, generally higher than long, irregularly rounded, oval or more or less high-elongate, thin to rather solid, lamellate, compressed to extremely compressed, with small byssal notch and irregular growth lamellae. Beaks situated at the anterior end of the hinge margin. Hinge with numerous, regular, vertical ligamental pits. The most commonly cited synonyms are *Perna* Bruguière, 1789 (not *Perna* Philipsson, 1788, which is a valid mytilid genus) and *Pedalion* Dillwyn, 1817.

Species treated (4)

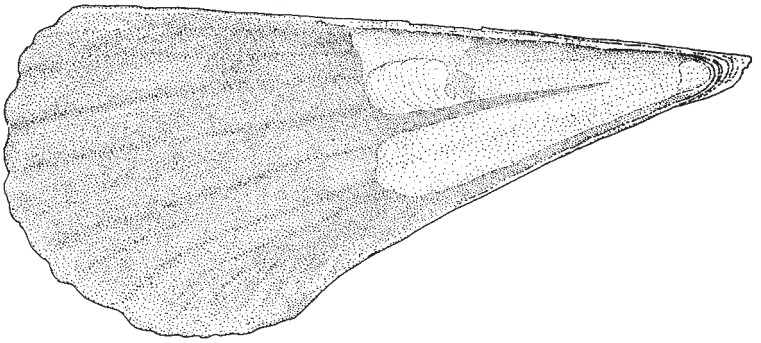
Pteria hirundo (Linnaeus, 1758); *Pteria atlantica* (Lamarck, 1819)*; Isognomon dunkeri* (P. Fischer, 1881); *Isognomon nucleus* (Lamarck, 1819).

Other species reported in the area (1)

Family Malleidae

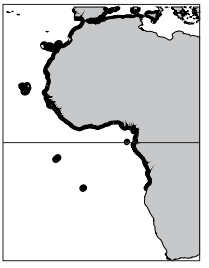
Malleus candeanus (d'Orbigny, 1853). Ghana, 5-10 m, collected 2005 (2 spm., Huber 2010: 605), also S-Florida to Brazil.

Pinna rudis Linnaeus, 1758



4.1. Alboran Island, 35º56.4'N, 3º01.9'W, 2-6 m (lv, 355 mm).

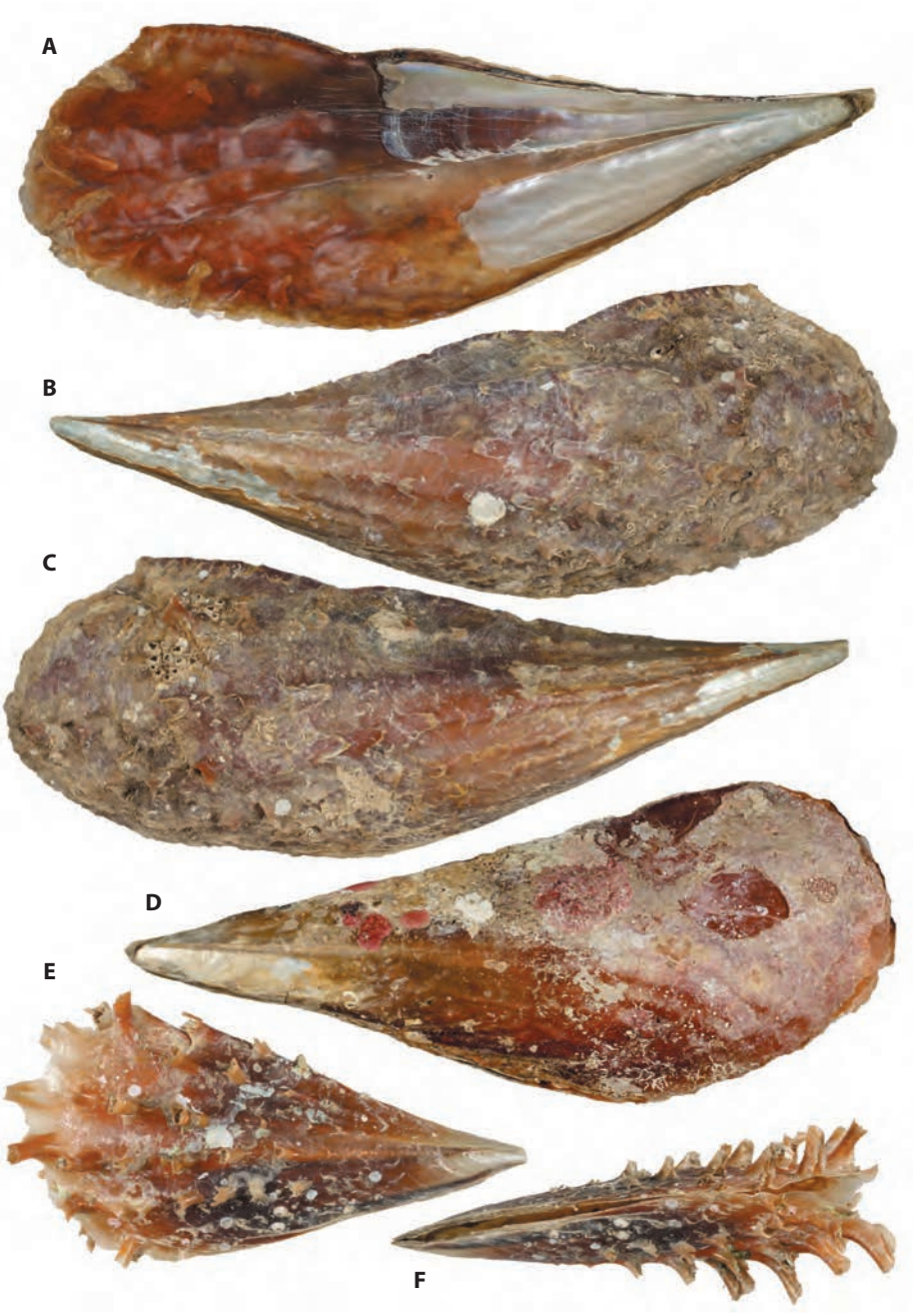
Shell very large, up to 540 mm long, variable in outline and length, somewhat ham-shaped to elongate. Young specimens thin-shelled, fully grown specimens quite heavy and solid. Dorsal margin slightly concave to straight, ventral margin anteriorly more or less concave, posteriorly convex and passing into the more or less rounded posterior margin. Surface with 6-10, occasionally up to 20 irregular radial ribs bearing rather few, long, strong, fluted to tubular spines on the posterior part of the valves. Middle keel visible in younger specimens. Ligament narrow and extending a bit more than half the length of the dorsal margin. Nacreous area divided in two lobes, ventral lobe smaller than dorsal lobe. Outside and inside pale flesh red to reddish brown.



Distribution. Eastern Atlantic: Alboran Sea, Mediterranean along the North African coast and as far north as the Tyrrhenian Sea (Oliverio 1998); Strait of Gibraltar southward to southern Angola (Moçâmedes, Namibe province); Azores, Madeira, Canary Islands, Cape Verde Islands, Islands in the Gulf of Guinea; Ascension Island, St. Helena. Western Atlantic: Eastern Caribbean from Puerto Rico to Trinidad.

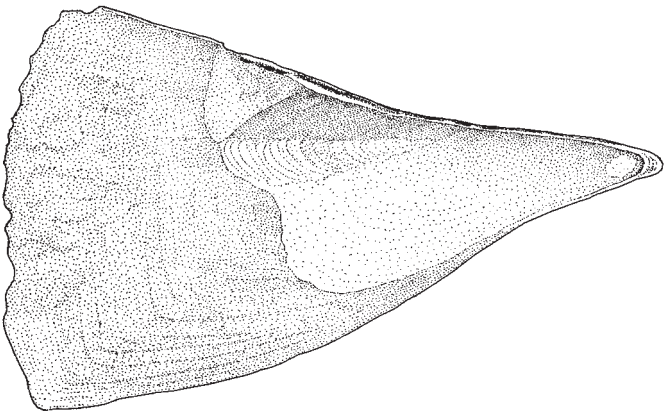
Biotope. In mixed sand with calcareous algae, shells, shell debris and coral, but also on hard bottom between stones and coral pieces, from extreme low tide mark to about 10 m and deeper. In the Caribbean only definitely subtidal, from 10 to 30 m. Common around the islands and at certain West African coastal localities, in the Mediterranean and the Caribbean always uncommon to rare.

Remarks. This species is distinguished from the Mediterranean-endemic *P. nobilis* Linnaeus, 1758 by its smaller size, the more variable and occasionally somewhat distorted shape and the less numerous and much coarser ribs and spines. The common Caribbean *P. carnea* Gmelin, 1791 is smaller, lighter and not so intensely coloured, with finer ribs and spines. The most used synonyms are *P. pernula* Röding, 1798 and *P. varicosa* Lamarck, 1819.



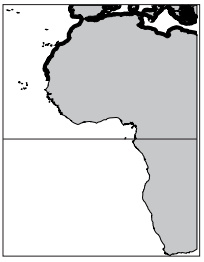
4.2. ***Pinna rudis*** **Linnaeus, 1758**. **A-C**, Pointe-Noire, Congo Brazzaville, Plage Mondaine (390 mm). **D**, Praia das Conchas, Ilha de São Tomé, rocks 0-2 m (208 mm). **E-F**, Futungo, Baia do Mussulo, Luanda prov., N-Angola (160 mm).

Atrina (*Atrina*) *fragilis* (Pennant, 1777)



4.3. Off Mauritania, 17°52'N, 16°36'W, 205 m (lv, 198 mm).

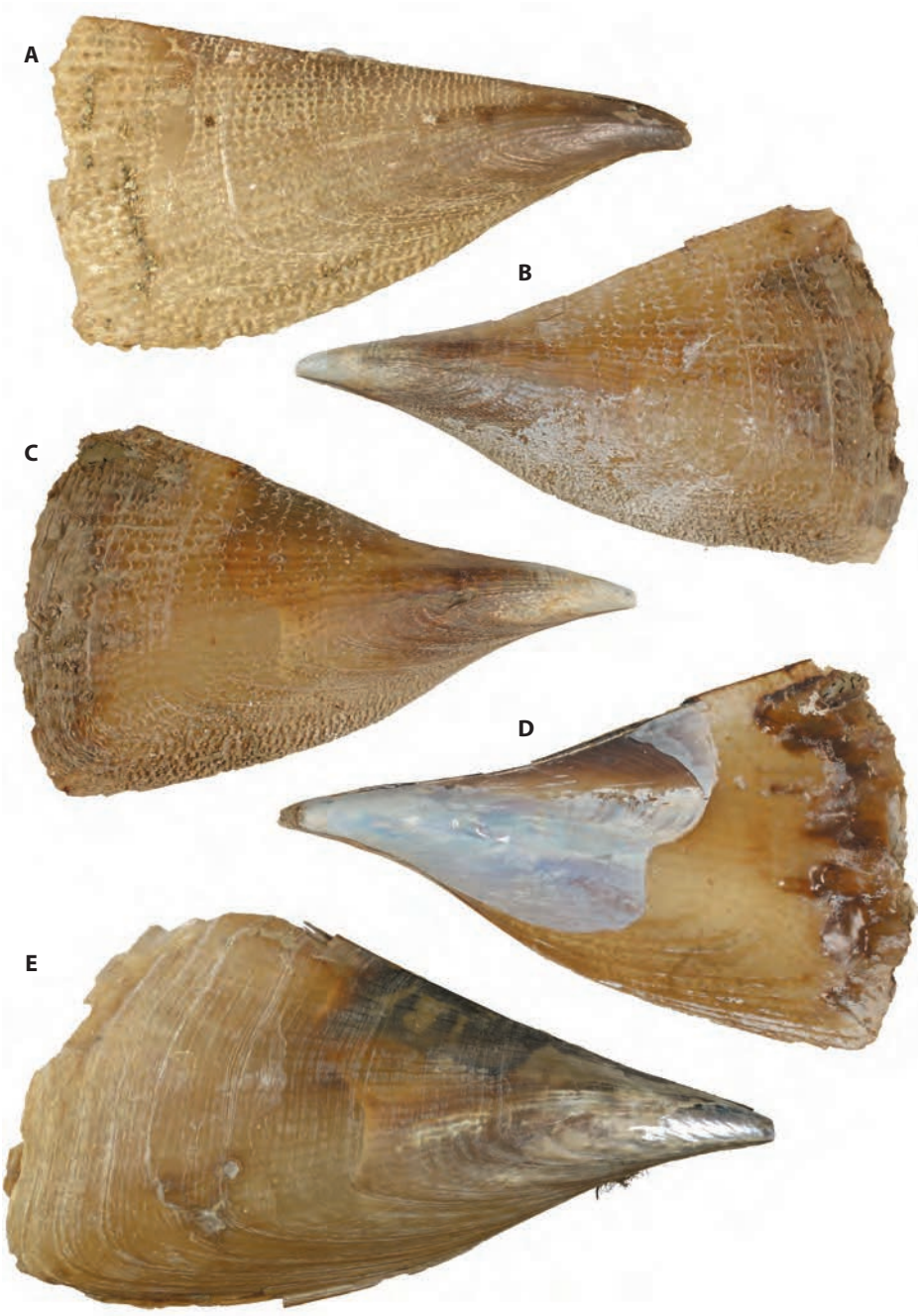
Shell up to 300 mm long, quite variable in length/width ratio and sculpture, triangular-wedge-shaped to fan-shaped, rather thin and fragile. Dorsal margin straight to slightly concave, ventral margin concave in the anterior part and more or less convex to straight in the posterior part. Posterior margin truncated and slightly convex. Surface often with more than 30 low, irregular radial ribs bearing short, scaly spines, but frequently nearly smooth, with irregular growth lines and faint, radial ribs, best visible on the earlier part of the valves. Ligament narrow, extending over two thirds of the dorsal margin. Nacreous area entire, with the posterior adductor scar at its posterior margin. Valves brown to tan, anterior part sometimes darker brown.



Distribution. North Sea, British Isles southward to Mauritania (17°52'N); throughout the Mediterranean.

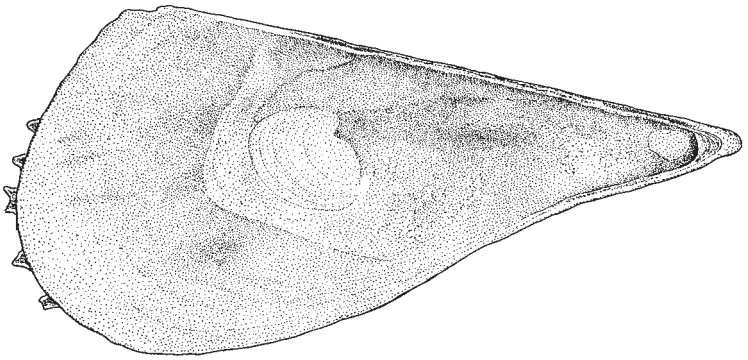
Biotope. In mud, sandy mud or mud with gravel, offshore from about 90 to 600 m, in the Mediterranean also shallower, off Mauritania not found shallower than 200 m; not common.

Remarks. This is a northern temperate species which does not penetrate into the tropical zone proper; it is occasionally taken in trawls. The species has been sometimes mistaken for *Pinna pectinata* Linnaeus, 1767, which is an Indo-Pacific *Atrina* belonging to the subgenus *Servatrina*.



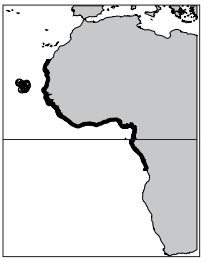
4.4. ***Atrina (Atrina) fragilis*** **(Pennant, 1777).** **A**, off Mauritania, 20°17′N, 17°90′W, 450 m (104 mm). **B**-**D**, off Mauritania, 17°52′N, 16°36′W, 205 m (198 mm). **E**, off Mauritania, 20°16′N, 17°40′W, 280 m (222 mm).

Atrina (*Servatrina*) *chautardi* (Nicklès, 1953)



4.5. Casamance, 10-20 m (lv, 173 mm).

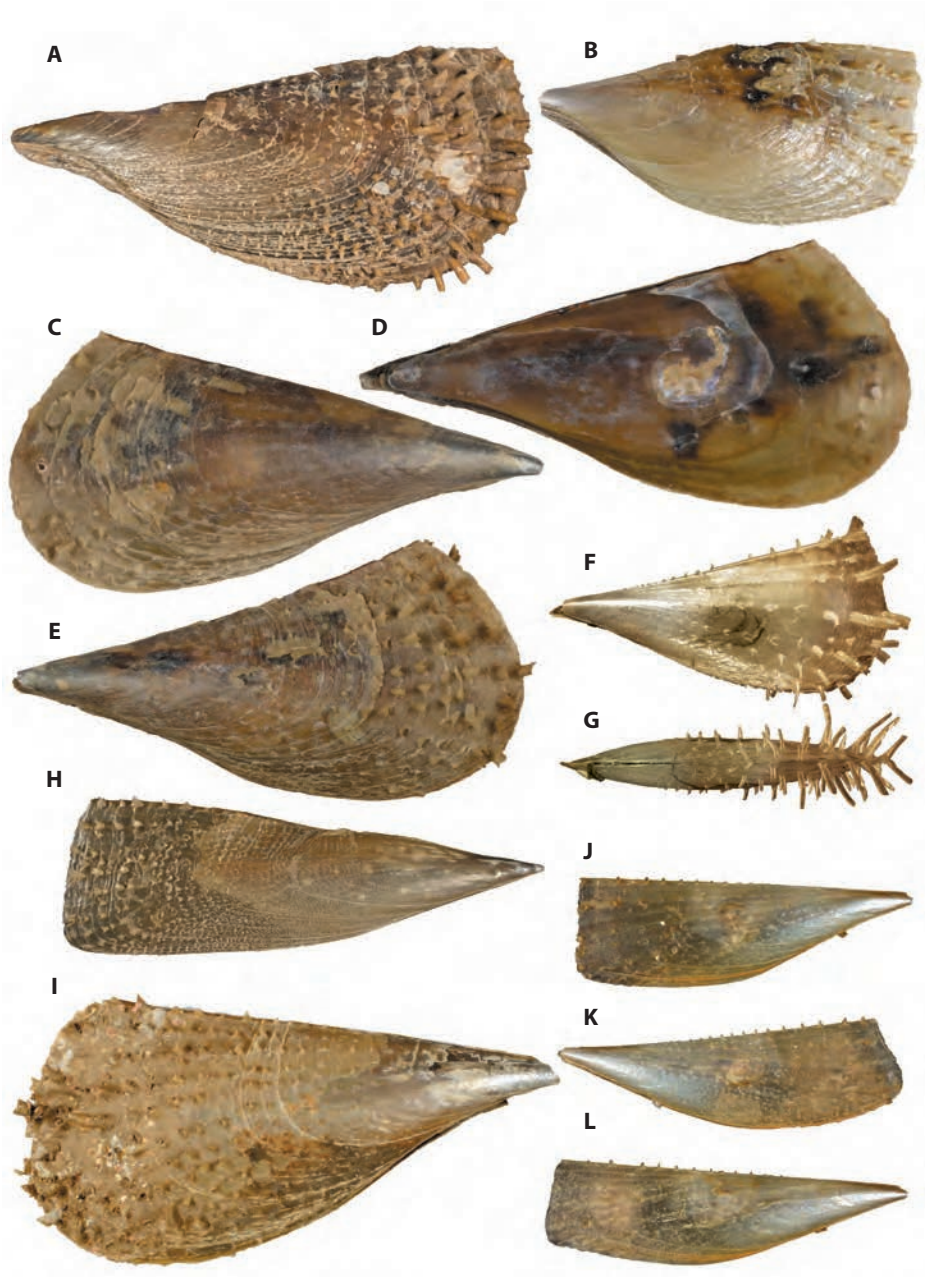
Shell up to 220 mm long, quite variable in outline and sculpture, elongate, ham-shaped, thin and rather fragile. Dorsal margin straight to weakly concave, ventral margin gently S-shaped and passing without angle into the more or less convex posterior margin. Surface with about 12-20 or more irregular, low radial ribs bearing rather long, scaly spines. The 8-10 ribs next to the dorsal margin are well defined whereas the more ventral ones are smaller and ill-defined. Occasionally ribs obsolete, but scales present. Ligament narrow, extending on about two thirds of the dorsal margin or slightly less. Nacreous area entire, posterior adductor scar well enclosed. Valves horn-coloured to dark, somewhat greenish-brown.



Distribution. West Sahara (Rio de Oro, 22°30'N) to northern Angola (Luanda); Cape Verde Islands (Guerreiro & Reiner 2000).

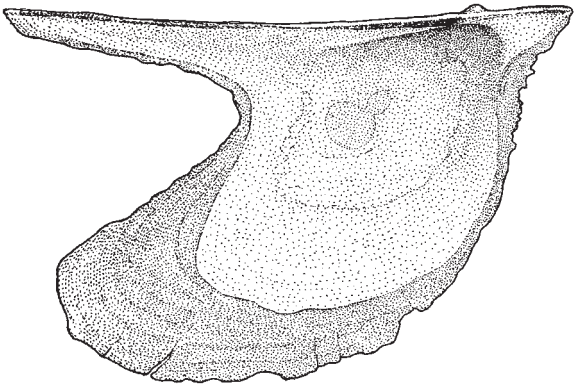
Biotope. In fine muddy sand, fine sand and mixed sand, from about 4 m to offshore (40-60 m); locally common to abundant. Off Guinea, a field with a population density of about 1800 young specimens (40-60 mm long) per square metre was encountered during the Sedigui survey. These beds of juveniles without adult specimens are mostly found on fine sandy-muddy bottom, such specimens are often quite narrow with long scales.

Remarks. This species is occasionally taken as a by-catch by shrimpers; empty shells are not uncommon on beaches. The insufficient knowledge of the West African marine mollusc fauna in comparison with other regions is underlined by the fact that this large species was described only in 1953, after it had been cited as "*Pinna* cf. *ramulosa* Reeve, 1858" which in fact is most probably the Caribbean *A. seminuda* (Lamarck, 1819). This is "L'Apan" of Adanson. An additional species, *Atrina* (*Servatrina*) *pini* Schultz & Huber, 2013 was recently described from *ca.* 100 m depth in the Cayar canyon off Dakar, Senegal. It was stated to reach 210 mm in length and to have a sculpture of over 30 densely set ribs with low spines.



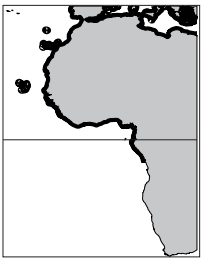
4.6. *Atrina (Servatrina) chautardi* (Nicklès, 1953). **A**, Port-Etienne (now Nouadhibou), Mauritania (holotype, lv, 170 mm, photo Manuel Caballer/Recolnat). **B**, Dakar-Hann, Senegal, beach drift (120 mm). **C-D**, Casamance, 10-20 m (rv, 173 mm). **E**, same locality (168 mm). **F**, W of Baie de Sangarea, Guinea, 9°42'N, 12°29'W, 25 m (55.0 mm). **G**, same locality (53.4 mm). **H**, Ile aux Pigeons, Port-Gentil, Gabon (103 mm). **I**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (130 mm). **J-L**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 5 m (50.3, 50.2 and 52.5 mm).

Pteria hirundo (Linnaeus, 1758)



4.7. Côte d'Ivoire, 4°43'N, 5°54'W, 100 m (lv, 78.7 mm).

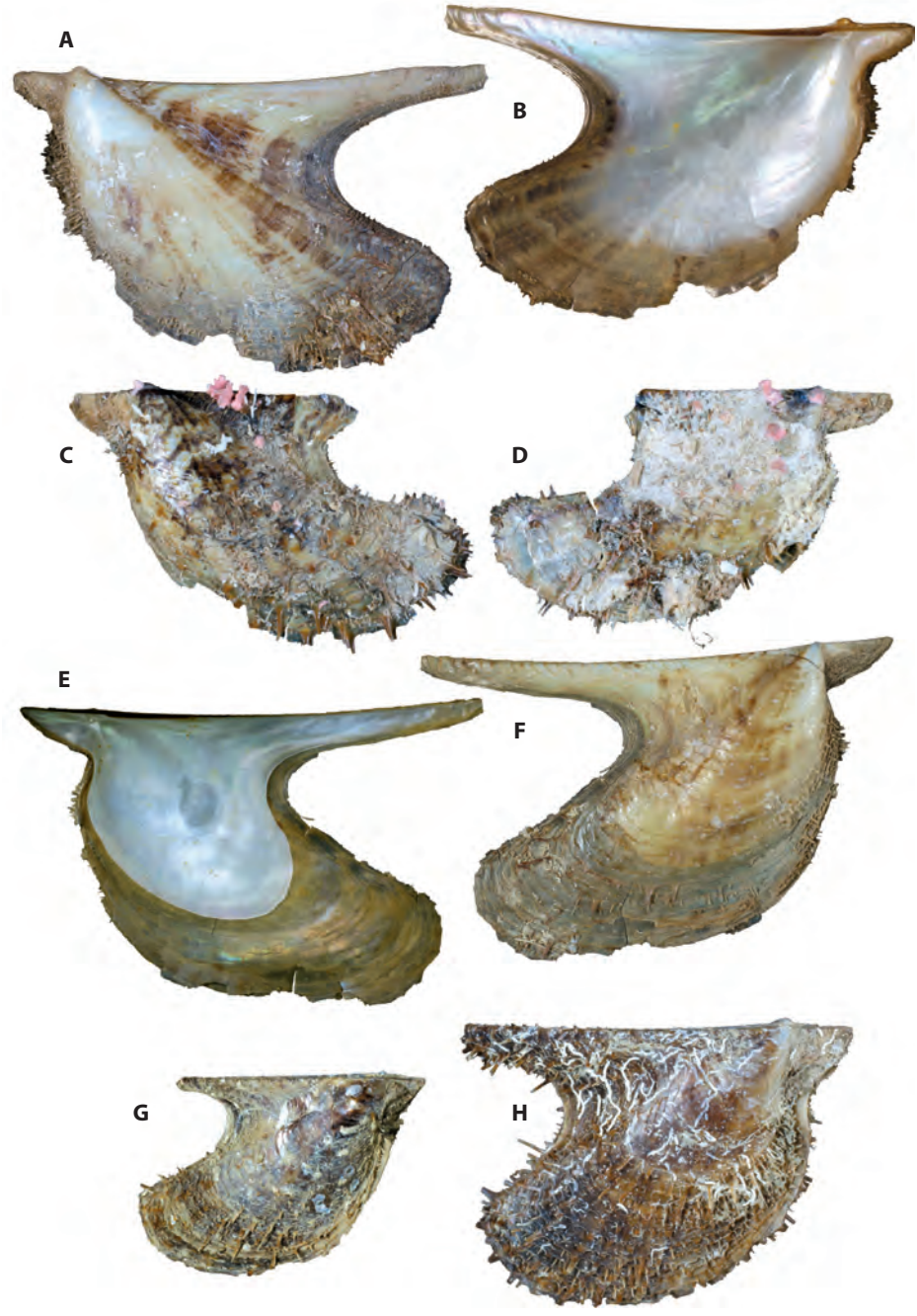
Shell up to 100 mm long (wings included) and up to 70 mm high, oval, very oblique, quite thin and brittle, very fragile at the margins, rather compressed, left valve slightly more tumid than right valve. Anterior projections of the hinge line short, posterior wing varying from short to rather long. Byssal notch small. Beaks at the anterior margin of the disk. Surface with fine, very fragile, commarginal lamellae bearing weak, spine-like scales and eroded on the earlier part of the valves, leaving only fine, irregular lines. Hinge line with a very small, knoblike tooth just under the umbos in the left valve and a corresponding pit in the right valve. Outside greyish brown to beige, often with irregular, brownish purple rays. Inside nacreous, with outside colouration showing through.



Distribution. Irish Sea and extreme south-western England (Cornwall) southward to northern Angola (Moita Seca, Zaïre province); Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

Biotope. Byssally attached to hard objects on muddy and sandy bottoms, also on gorgonians, offshore from about 50 to 200 m, in the Mediterranean also shallower. Common in Europe, uncommon in West Africa.

Remarks. This is the type species of the genus *Pteria*. A synonym is *Avicula tarentina* Lamarck, 1819.

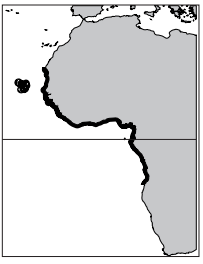


4.8. ***Pteria hirundo*** **(Linnaeus, 1758)**. **A-B**, St. Louis, Sénégal, 100-200 m (78.9 mm). **C-D**, Porto dos Ferreiros, Brava, Cape Verde Islands, 55-65 m (47.4 mm). **E-F**, Côte d'Ivoire, 4°43'N, 5°54'W, 100 m (78.7 mm). **G**, Abidjan region, Côte d'Ivoire, 5°01.5'N, 3°23.5'W, 70 m (29.0 mm). **H**, Ghana, 4°36'N, 2°07.5'W, 70 m (41.5 mm).

Pteria atlantica (Lamarck, 1819)

4.9. Dakar, Senegal (lv, 73.6 mm).

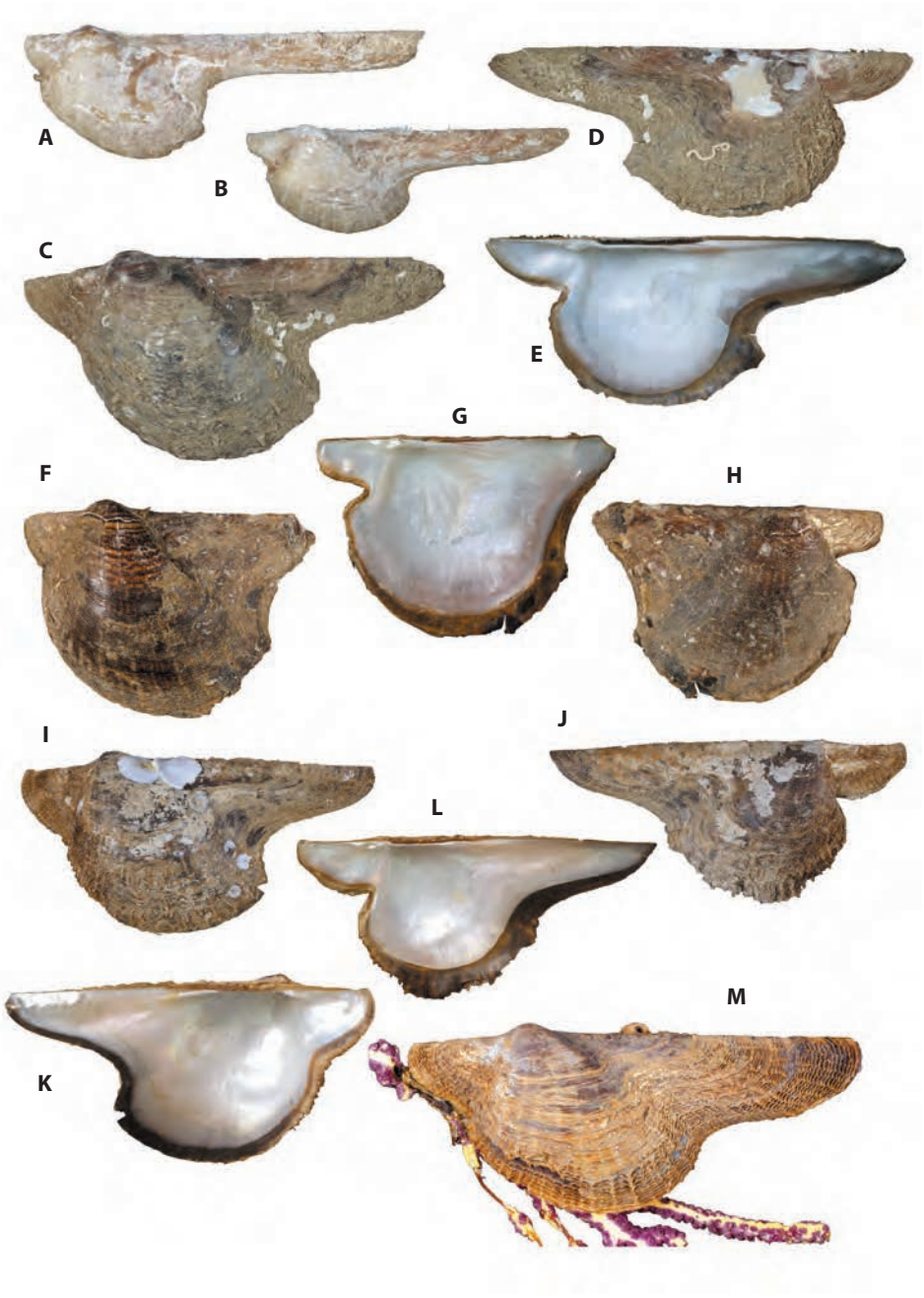
Shell up to 130 mm long (wings included) and up to 60 mm high, oval, but only very slightly oblique, thin but rather solid, fragile only at the margins. Left valve very inflated, right valve moderately inflated. Anterior wings short, posterior wings short to very long and often more or less twisted. In young specimens wings dominant, disk quite small. Byssal notch small, beaks at the anterior margin of the disk. Surface with fine, dense, very fragile, commarginal lamellae bearing weak, spine-like scales which are arranged radially, giving the impression of a radial sculpture. Lamellae often worn away on the earlier part of the valves. Hinge line of the left valve with a small, rather prominent, horizontal tooth under the beaks and a longer, posterior ridge nearly parallel to the margin. Right valve with a slightly broadened hinge margin under the beaks, serving as socket or support for the left valve tooth and a strong, horizontal, posterior ridge just under the margin. Outside brown to pinkish black, often with light brownish to greyish rays. Inside nacreous, with exterior colouration showing through on the marginal parts.



Distribution. Mauritania (Cap Blanc) to southern Angola (Cuio, Benguela); Cape Verde Islands; São Tomé.

Biotope. On muddy and sandy bottom byssally attached to hard objects, mostly on gorgonians, from 10 to 400 m, common.

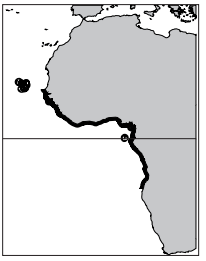
Remarks. This species is easily distinguished from *P. hirundo* by its more inflated and more solid shell, the considerably less oblique outline, the much longer and often twisted posterior wings, the more prominent hinge teeth and the darker colour. This is "Le Chanon" of Adanson. A close Caribbean species is *P. colymbus* (Röding, 1798), which has a more oblique outline. Huber (2010) united *P. colymbus* and *P. atlantica* as one variable amphiatlantic species but this view should first be demonstrated by genetic data and is not followed here.



4.10. ***Pteria atlantica*** **(Lamarck, 1819)**. **A**-**B**, Mauritania, 19°06'N, 18°28'W, 18 m (38.0 and 31.0 mm). **C**-**E**, off Dakar, Senegal (73.6 mm). **F**-**H**, Cameroon, 2°21.5'N, 9°36'E, 70-75 m (64.1 mm). **I**-**L**, Ile aux Pigeons, Port-Gentil, Gabon, 0°40.5'S, 8°45.3'E, mangroves (62.2 mm). **M**, Cacuaco, Bengo prov., N-Angola, 1-2 m (37.5 mm).

Isognomon dunkeri (P. Fischer, 1881)

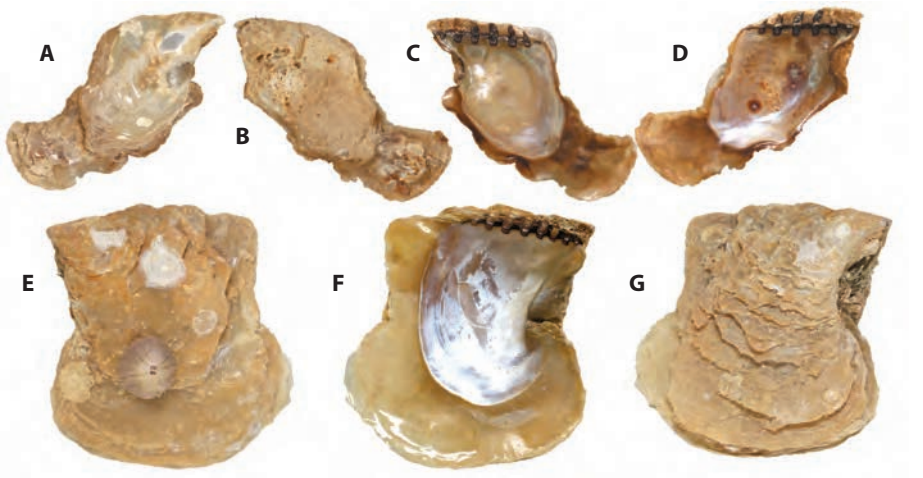
Shell up to 80 mm high, very irregular in shape, higher than long, rounded-oval to very elongate, adult specimens rather solid in the middle and towards the umbos, becoming very thin towards the margins. Shell compressed and often more or less bent to the right side, according to the substrate to which it is attached. Left valve generally more tumid than right valve. Byssal notch just in front of the hinge line, larger in right valve than in left valve. Valves lamellate, surface with rough, irregular growth lamellae. A weak radial sculpture may rarely be present in juvenile specimens. Hinge line with about 4-8 long ligamental grooves. Interior with a nacreous area which in the left valve is slightly to considerably larger than in the right valve. Non nacreous area broad and prolonged ventrally. Valves clear horn-coloured, rarely with purplish brown rays or dots.



Distribution. Senegal (Dakar) to southern Angola (Moçâmedes); Cape Verde Islands; São Tomé, Ilha do Principe, Annobon.

Biotope. On rocky coasts byssally attached to the undersides of rocks and stones, as well as in fissures and crevices, from the lower intertidal zone to about 2-3 m, common.

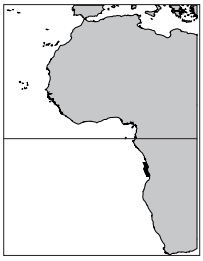
Remarks. This species has been misidentified as *Isognomon isognomum* (*auct*. *non* Linnaeus, 1758), *Isognomon perna* (*auct*. *non* Linnaeus, 1767), *Isognomon vulsella* (*auct*. *non* Lamarck, 1819), and by Nicklès (1955) as *Pedalion anomioides* (*non* Reeve, 1858, an eastern Pacific species). The first name explicitly given to the West African species, by Fischer (1881), is *Perna dunkeri*; it refers to the excellent figure in Dunker (1853: pl. 8, fig. 7-10), hence his name has to be employed for this species. A close species is *I. bicolor* (C.B. Adams, 1845) from the Caribbean, which inhabits the same type of biotope.



4.11. *Isognomon dunkeri* (P. Fischer, 1881). **A-D**, Porto Praia, São Tiago, Cape Verde Islands (28.8 mm). **E-G**, Praia Amelia, Moçâmedes, Namibe prov., S-Angola, low tide (32.2 mm).

Isognomon nucleus (Lamarck, 1819)

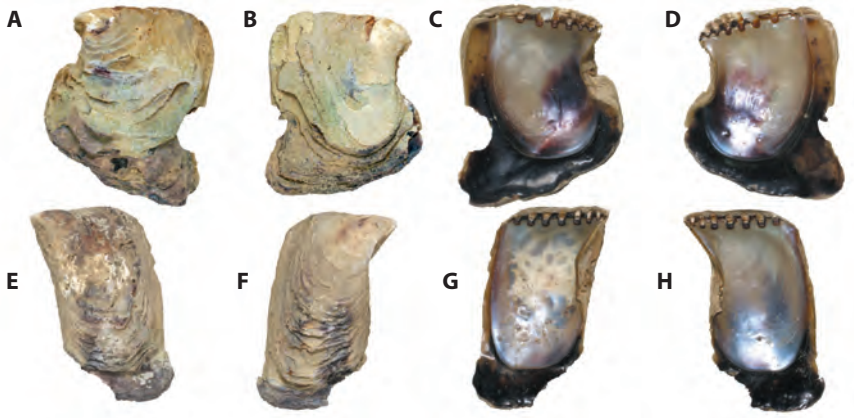
Shell rather small, up to 30 mm high, higher than long to nearly as long as high, irregularly rounded-oval to oblique-elongate according to the substrate to which it is attached. Fully grown specimens rather thick and solid in the middle and thinner in the non-nacreous part. Shell compressed to somewhat tumid; valves almost equally inflated. Byssal notch just in front of the hinge line, slightly larger in the right valve. Surface with rough, irregular growth lamellae. Hinge line with about 3-6 ligamental grooves. Nacreous area on the interior of same size in both valves, sharply delimited by a thin, protruding rim. Non-nacreous marginal part of the valves narrow, with rather short ventral prolongation. Valves deep purple, often lighter horn-coloured near the umbos. On the inside, non-nacreous part dark purple, nacreous part with purplish zones towards ventrally.



Distribution. Red Sea, East Africa southward to Eastern Cape (Keiskama River), South Africa. On the west African coast so far known only from northern Angola (Praia São Tiago, N of Luanda, Bengo province).

Biotope. High intertidally (medio-supralittoral) byssally attached deep in crevices between rocks, presumably locally common.

Remarks. This Indian Ocean species has only once been collected at the single West African locality mentioned above, but due to its cryptic habitat, it has possibly been overlooked by collectors and might be more widespread. It is quite unlikely to have been introduced in a locality which had, at that time, hardly any human impact. It is easily distinguished from *I. dunkeri* by its smaller size, the narrow non-nacreous part, the sharply delimited nacreous part which is equally-sized in both valves, the less compressed valves and the dark purple colouration. In contrast to the low-intertidal and subtidal *I. dunkeri*, this species lives in the high intertidal zone. The West African specimens are not distinguishable morphologically from those from the Indian Ocean. *Perna rupella* Dufo, 1840 and *Perna dentifera* Krauss, 1848 are synonyms.



4.12. *Isognomon nucleus* (Lamarck, 1819). A-D, Praia São Tiago, Bengo prov., N-Angola, intertidal (21.8 mm). E-H, same locality (25.0 mm).

Superfamily PECTINOIDEA

Family PECTINIDAE
Subfamily Pectininae
- Genus ***Pecten*** O.F. Müller, 1776 – 2 species
- Genus ***Nodipecten*** Dall, 1898 – 1 species
- Genus ***Bractechlamys*** Iredale, 1939 – 1 species
- Genus ***Aequipecten*** P. Fischer, 1886 – 4 species

Subfamily Pedinae
- Genus ***Mimachlamys*** Iredale, 1929 – 1 species
- Genus ***Manupecten*** Monterosato, 1889 – 1 species
- Genus ***Talochlamys*** Iredale, 1929 – 2 species
- Genus ***Hinnites*** Defrance, 1821 – 1 species

Subfamily Palliolinae
- Genus ***Palliolum*** Monterosato, 1884 – 1 species
- Genus ***Pseudamussium*** Mörch, 1853 – 2 species (1 treated)
- Genus ***Lissochlamys*** Sacco, 1897 – 1 species

Subfamily Camptonectinae
- Genus ***Delectopecten*** Stewart, 1930 – 1 species
- Genus *Hyalopecten* Verrill, 1897 – 1 species (not treated)

Family PROPEAMUSSIIDAE
- Genus ***Similipecten*** Winckworth, 1932 – 1 species
- Genus *Propeamussium* de Gregorio, 1884 – 1 species (not treated)
- Genus *Parvamussium* Sacco, 1897 – 1 species (not treated)
- Genus *Cyclopecten* Verrill, 1897 – 2 species (not treated)

Family SPONDYLIDAE
- Genus ***Spondylus*** Linnaeus, 1758 – 1 species

Superfamiliy Pectinoidea

The Pectinoidea include among others the very large family Pectinidae (scallops), mostly living in shallow marine environments, the mostly deep-water Propeamussiidae, and the cemented Spondylidae. Waller (1993, 2006) pioneered phylogenetic studies on the group. All of these share a unique ligament system having a central, internal ligament with a central core of rubbery material, adapted to rapid closing of the valves and swimming behaviour.

Family PECTINIDAE

Shells small (around 10 mm) to large (over 200 mm), thin and fragile to rather solid, very compressed to moderately inflated, inequivalve to nearly equivalve, generally equilateral. Outline more or less circular to higher than long, rarely longer than high, with hinge line straight and characteristically drawn out on each side of the umbos to form projecting "ears" or auricles. Surface mostly with radial sculpture, or smooth. Anterior auricle of right valve with a more or less developed byssal notch, the lower margin of which bears a series of small denticles (known as ctenolium which means "little comb"). Inside with a single muscle impression and indistinct pallial line. Hinge with raised ridges (crura) bordering each side of the resilifer, sometimes with additional elongate teeth bordering the hinge line along the auricles. Margins mostly appressed but sometimes slightly gaping near the auricles. Periostracum usually not very apparent. The species live byssally attached to hard substrate or free on the bottom, lying on the right ("lower") valve, with the often less convex or flat left valve as "upper" valve or lid. The worldwide species number is estimated at 264, among them 18 species from tropical West Africa.

The Pectinidae have always been very popular with shell collectors and are the subject of several publications and book chapters, both scientific and popular; numerous genera and subgenera have been proposed and different supraspecific arrangements presented. Taxa treated formerly as subgenera of *Chlamys* are today considered of generic level, and the systematic arrangement herein follows Waller (1993), Dijkstra & Kilburn (2001) and Dijkstra & Goud (2002), the latter publication being an exhaustive survey on the scallops of Mauritania, the Azores and the Macaronesian Islands (Madeira, Selvagens, Canary Islands, Cape Verde Islands). A reference book covering all aspects of biology, ecology, human utilisation and systematics of commercial scallops is Shumway & Parsons (2016).

Genus *Pecten* O.F. Müller, 1776. Shell medium-sized to large (up to 150 mm), rounded, solid, inequivalve with inflated right valve and flat or even concave left valve. Surface with strong, radial ribs which are smooth or bear finer, secondary riblets. Interspaces smooth or also with riblets. Auricles almost equal in size; byssal notch and ctenolium weak in juveniles and absent in adults.

Genus *Nodipecten* Dall, 1898. Shells medium-sized to large (over 160 mm), rounded, solid, equivalve, compressed. Anterior auricles moderately sized, posterior auricles somewhat smaller, both prominently ribbed; byssal notch moderately deep, with weak ctenolium. Surface with few broad radial ribs bearing thick nodules, with small riblets on the ribs and interspaces. Only few Recent species are known, one in the Eastern Atlantic. For more details, see Smith (1991).

Genus *Bractechlamys* Iredale, 1939. Shells medium-sized (up to 60 mm), rounded to elongate, solid, slightly inequivalve (rv more convex). Surface with 8–15 broad, regularly spaced primary ribs, sometimes with nodules and secondary radial riblets. *Bractechlamys* is actually very close to *Nodipecten* and differs in having a more pronounced byssal notch and a closely set commarginal microsculpture.

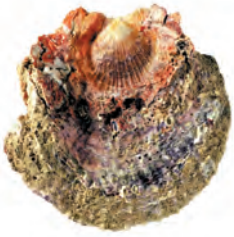
Genus *Aequipecten* P. Fischer, 1886. Shells small to rather large (over 80 mm), rounded, thin to rather solid, usually inequivalve with left valve slightly more convex than right valve, compressed to somewhat inflated. Anterior auricles moderately sized, posterior auricles somewhat smaller; byssal notch shallow to moderate, with well developed ctenolium. Surface with regularly arranged radial ribs, with commarginal sculpture in interspaces but no complex or shagreened microsculpture. Hinge line with well developed cardinal crura on both sides of the resilifer. Some species are frequently cited under the genus *Argopecten*, however, this is an American genus which is not present in the eastern Atlantic.

Genus *Mimachlamys* Iredale, 1929. Shells rather small to large (to 100 mm), equivalve, mostly higher than long, thin but solid, compressed. Auricles very unequal, the anterior rather large, the posterior small; byssal notch deep with well-developed ctenolium. Surface with numerous, simple and regularly spaced radial ribs, starting simultaneously at a very early stage of growth, reflected on the interior of the valves. No accessory ribs nor complex microsculpture in the interspaces of the ribs.

Genus *Manupecten* Monterosato, 1889. Shells medium-sized (to 70 mm), equivalve, rather thin, higher than long, oval, very compressed. Anterior auricles large, posterior auricles small and with tubercles. Surface with few broad, coarse radial ribs, numerous secondary riblets on them, and prominent

shagreened microsculpture throughout ontogeny. Cardinal crura well developed on each side of the resilifer. *Manupecten* differs from the Indo-Pacific genus *Semipallium* Jousseaume, 1928, by the large nodules on the auricles and lower number of ribs.

Genus *Talochlamys* Iredale, 1929. Shells rather small (up to 40 mm), almost equivalve to inequivalve, thin but solid, higher than long and often irregularly shaped, compressed. Auricles very unequal, the anterior rather large and bearing an imbricated radial sculpture, the posterior very small; byssal notch deep with well-developed ctenolium. Surface with numerous radial ribs, irregularly spaced and with secondary riblets intercalated; ribs with imbrications or spines on the top, and reflected on the interior of the valves; interspaces with fine commarginal lamellae or antimarginal striae in the interspaces. Species living free (byssally attached) or cemented like *Hinnites* on hard substrate with the right valve; Waller (1993) suggested that the cemented habit occurred independently in several lineages; the similar *Crassadoma* F. R. Bernard, 1986 differs in lacking complex microsculpture.



Genus *Hinnites* Defrance, 1821. Shells in their juvenile stage free-living, but later growth (very large, up to 170 mm) irregular, cemented to hard substrates by the right valve and becoming distorted, somewhat resembling *Spondylus*. Surface of left valve with numerous, low and irregular ribs, with additional riblets repeatedly intercalated in the interspaces as growth proceeds. Resilifer in very old specimens occasionally in a deep groove.

Genus *Pseudamussium* Mörch, 1853. Shells rather small to medium-sized (up to 60 mm), rounded, thin, compressed, left valve flatter than right valve, with few broad, radial folds and often small radial ribs, with inconspicuous antimarginal microsculpture. Auricles small, with shallow byssal notch.

Genus *Palliolum* Monterosato, 1884. Shells small (up to 15 mm), rounded, thin, very compressed, with very fine radial striae and a definite antimarginal microsculpture, both valves occasionally with different sculpture. Byssal notch shallow, ctenolium weak with closely spaced teeth. Hinge line with two cardinal crura on each side of the resilifer.

Genus *Lissochlamys* Sacco, 1897. Shells medium-sized, rounded, thin, very compressed. Surface smooth or with very fine radial sculpture, also antimarginal microsculpture. Auricles unequal, with strong radial ribs, and with a deeply incised byssal notch and a well-developed ctenolium with knobby teeth.

enus *Delectopecten* Stewart, 1930. Shells small, rounded, thin, compressed, nearly equivalve, with radial or reticulate sculpture or fine commarginal rows of granules on them. Auricles unequal, the posterior smaller and not well separated from the shell disk. Byssal notch well-developed, with prominent ctenolium.

Species treated (17)

Pecten keppelianus G.B. Sowerby III, 1905; *Pecten turtoni* E.A. Smith, 1890; *Nodipecten nodosus* (Linnaeus, 1758); *Bractechlamys corallinoides* (d'Orbigny, 1840); *Aequipecten flabellum* (Gmelin, 1791); *Aequipecten commutatus (*Monterosato, 1875); *Aequipecten atlanticus* (E.A. Smith, 1890); *Aequipecten nicklesi* Dijkstra, 1998; *Mimachlamys varia* (Linnaeus, 1758); *Manupecten pesfelis* (Linnaeus, 1758); *Talochlamys multistriata* (Poli, 1795); *Talochlamys abscondita* (Locard, 1898); *Hinnites corallinus* G.B. Sowerby I, 1827; *Palliolum incomparabile* (Risso, 1826); *Pseudamussium peslutrae* (Linnaeus, 1771); *Lissochlamys exotica* (Dillwyn, 1817); *Delectopecten vitreus* (Gmelin, 1791).

Other species reported in the area (2)

Hyalopecten pudicus (E.A. Smith, 1885). S. Tomé-Cameroon, 2250 m; off Gabon, 2270 m; off Angola, 1690 m (Knudsen 1970); Cape Verde basin 3825-4025 m (Dijkstra & Goud 2002).

Pseudamussium sulcatum (Müller, 1776). Mauritania and Cape Verde Islands (Dijkstra & Goud 2002).

Family PROPEAMUSSIIDAE

Shells small (commonly no more than 10 mm), usually thin and fragile and very compressed, equivalve in shape but commonly with a different sculpture n left and right valve, generally equilateral. Outline more or less circular, with hinge line straight and characteristically drawn out on each side of the umbos. Surface smooth or with delicate radial or commarginal sculpture. Anterior auricle of right valve with a more or less developed byssal notch, without a ctenolium. Inside with a single muscle impression and indistinct pallial line, commonly reinforced with radial ribs which are independent of the external sculpture. Periostracum usually not very apparent. The members of this family differ from Pectinidae mostly by the lack of a ctenolium in the byssal notch and the presence of the internal ribs, but molecular data strongly support that they are a distinct clade with a long separate evolutionary history. There are 157 species worldwide, mostly in rather deep water.

Genus *Similipecten* Winckworth, 1932. Shells small, rounded, thin, compressed, inequivalve, left valve slightly larger than right valve. Surface without visible sculpture. Ears rather large, byssal notch small, but marked.

Species treated (1)
Similipecten similis (Laskey, 1811).

Other species reported in the area (4)
Propeamussium lucidum (Jeffreys, *in* Wyville-Thomson, 1873). Cape Verde Islands, 950-1040 m (Dijkstra & Goud 2002).

Parvamussium fenestratum (Forbes, 1844). Cape Verde Islands, 185-646 m (Dijkstra & Goud 2002).

Cyclopecten hoskynsi (Forbes, 1844). Cape Verde Islands, 328 m (Dijkstra & Goud 2002).

Cyclopecten capeverdensis Dijkstra & Goud, 2002. Cape Verde Islands, 100-600 m.

Family SPONDYLIDAE

Shells rather small to large, irregularly circular or subcircular to oval, varying from higher than long to as long as high, thin but solid to extremely thick and heavy. Right valve more or less inflated, left valve slightly less inflated to nearly flat. Margins closed. Beaks mostly median. Ears rather small and equal-sized, no byssal notch. Surface with irregular radial ribs, often of different size, which usually bear short to very long, closed, fluted or lamellose spines. Between the spiny ribs are often ribs without spines. Hinge margin straight, in the right (lower) valve with a large, triangular cardinal area between margin and beaks. Hinge isodont, in both valves with resilifer in a pit and a hooked tooth and a socket symmetrically arranged on each side, teeth in the right valve situated next to the resilifer and the sockets at the outer side, opposite arrangement in the left valve. Often the valves of adult specimens cannot be separated without breaking the teeth. One adductor scar only, which is located on the posterior part of the valve. Like the scallops, the Spondylidae or thorny oysters are very popular with shell collectors. There are 67 species known worldwide, mostly in the Indo-West Pacific, one only in West Africa (for a review of the Atlantic and Mediterranean species, see Lamprell *et al.* 2001). The Spondylidae live cemented to hard substrate by the entire right valve, most of it or only the umbonal region. They are mostly inhabitants of hard bottoms, but some live on soft bottoms, attached to small objects.

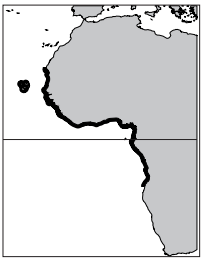
Genus *Spondylus* J. Sowerby, 1815. Characters of the family. Three subgenera are recognized, the only West African species belongs to *Spondylus* s.s.

Species treated (1)
Spondylus senegalensis Schreibers, 1793.

Pecten keppelianus G.B. Sowerby III, 1905

5.1. From Canarian fishing fleet operating off NW Africa (59.8 mm).

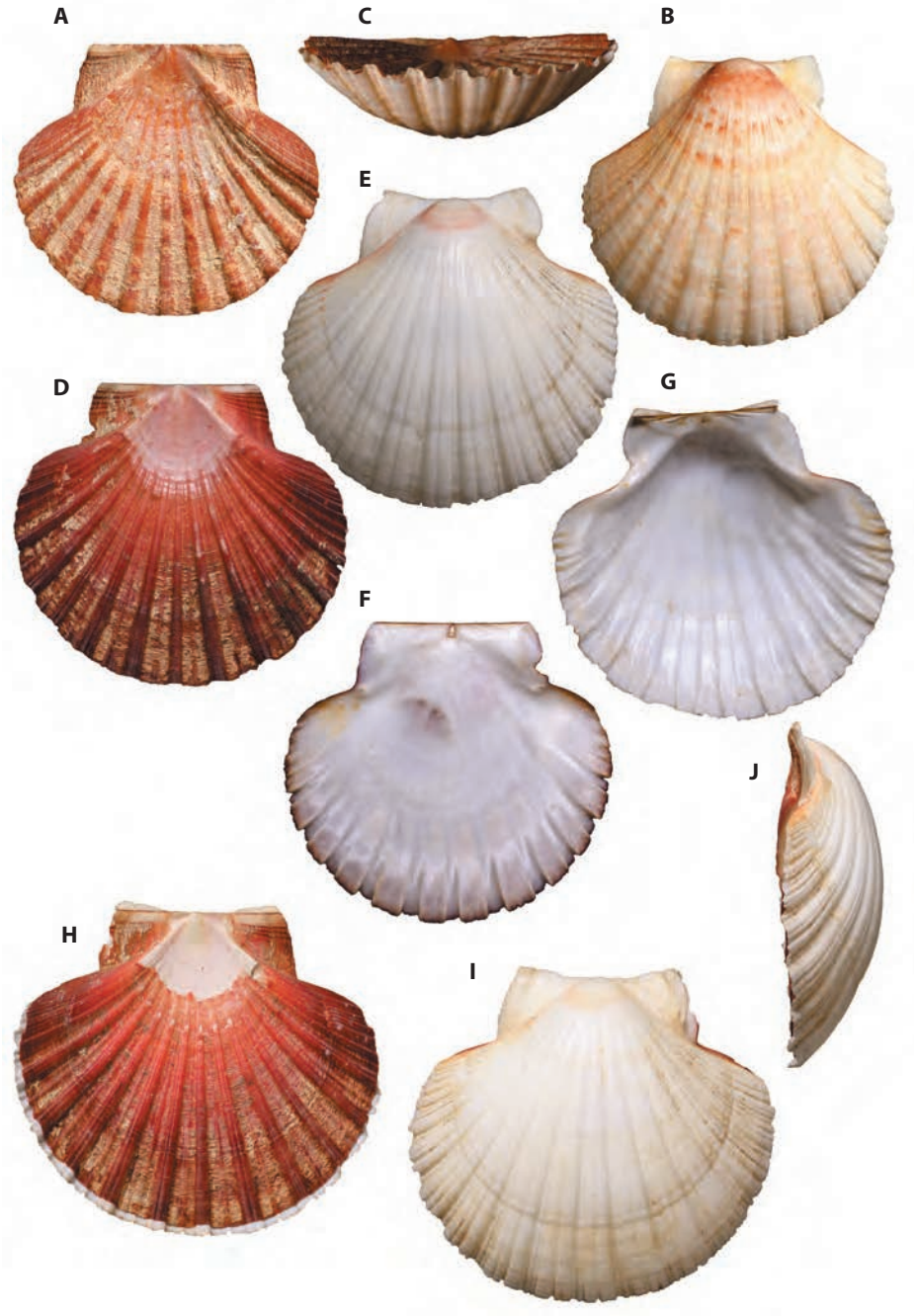
Shell up to 86 mm long, longer than high, with oval disk, rather thin but solid, with inflated right valve and flat to even slightly concave left valve. Beaks in the middle. Ears medium-sized, regular, with a very small, ill-defined byssal notch and without a ctenolium. Surface of the right (lower) valve with 12-13 low, broad, radial ribs and numerous, irregular, smooth, thinner riblets, the broad ribs bearing 2-4 riblets, the interspaces 1-3 riblets. Left (upper) valve with 11-12 large but narrow radial ribs and with small ribs, the interspaces of which are the exact "negatives" of the riblets on the opposite valve. Left valve also with very fine, close-set, commarginal lamellae, which are visible only under a lens (x 5-10). Ears with a few indistinct ribs, on the right valve often obsolete. Outside of left valve brick red, reddish brown or purplish brown, near the umbos light fawn, occasionally with dark brown zigzag markings. Right valve white, on the umbos occasionally light brown to pinkish.



Distribution. Mauritania (Cap Blanc) to southern Angola (Moçâmedes, Namibe province); Cape Verde Islands.

Biotope. On fine, mixed and coarse sand, also with calcareous algae and shell debris, offshore from 20 to 150 m, uncommon. The scallops live lying on the right valve, which is buried slightly in the sediment, the flat left valve being level with the sediment surface.

Remarks. This species has in the past been mistaken for *P. jacobaeus* (Linnaeus, 1758), a Mediterranean species which is also found in Madeira (figured in Segers *et al.* 2009). However, it is smaller than *P. jacobaeus*, has much lower radial ribs and is also distinguished by the presence of secondary ribs on both valves.



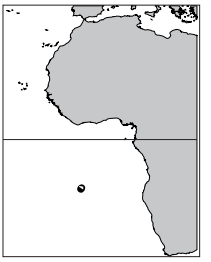
5.2. *Pecten keppelianus* G.B. Sowerby III, 1905. **A-C**, Mauritania, 20°39'N, 17°04.3'W, 60 m (37.6 mm). **D-G**, Cameroon, 3°54'N, 8°50'E, 65-70 m (59.4 mm). **H-J**, Congo Brazzaville, 4°45'S, 11°29'E, 100 m (65.0 mm).

Pecten turtoni E.A. Smith, 1890

5.3. **A**, St. Helena (19.4 mm). **B**, same locality (12.4 mm). **C**-**D**, St. Helena (28.4 mm).

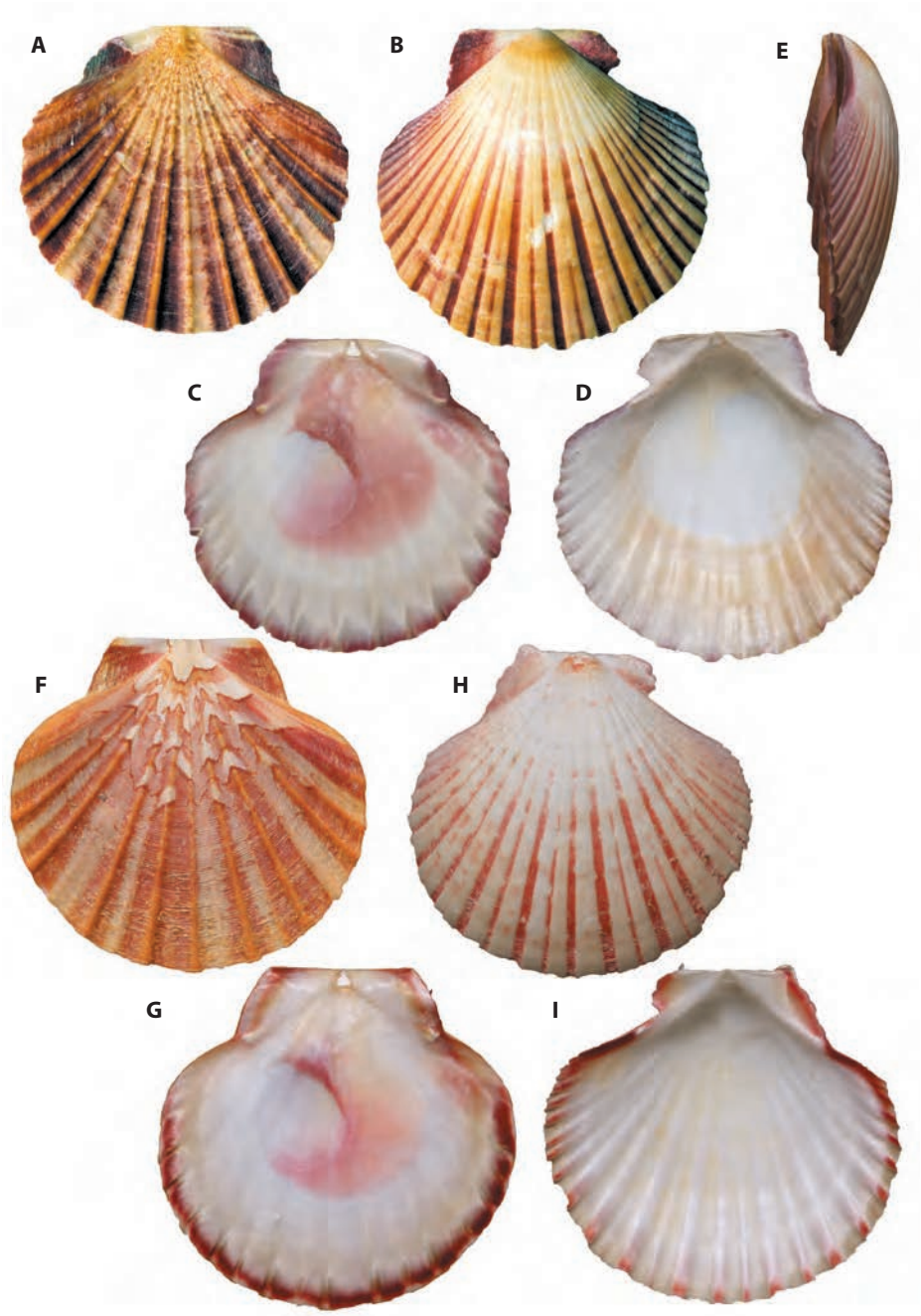
Shell up to 34 mm long, slightly longer than high, with subcircular disk, thin but rather solid, with somewhat inflated right valve and weakly concave left valve. Beaks median. Ears rather small, regular, with small byssal notch, ctenolium not seen. Surface of the right (lower) valve with about 17-19 broad, flat radial ribs, mostly divided into two sub-ribs by a shallow, more or less marked, longitudinal depression at or near the middle. Left (flat) valve with about 17-20 narrow and rather sharp, slightly irregularly placed ribs with broad interspaces. There are also very fine, dense, regular commarginal lamellate lines which are only visible under a lens (x 10-20) and stronger on the left valve. Ribs on ears indistinct or obsolete. Outside of left valve pinkish, orange-pink, brownish red or reddish, with 3-4 lighter rays and often with fine zigzag mottles on the earlier part. Right valve mostly light yellowish brown with purplish red rib interspaces, occasionally darker brown, ears on both valves purple.

Distribution. St. Helena, endemic.



Biotope. Not known, most probably sand with calcareous algae and shell debris in the sublittoral, uncommon.

Remarks. This endemic species is distinguished from *P. keppelianus* by its much smaller size, its higher disk with somewhat smaller ears and the consistently coloured and less tumid right valve. The species is rare in collections were it is mostly represented by beach specimens.

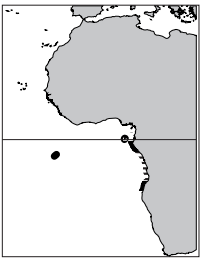


5.4. ***Pecten turtoni*** **E.A. Smith, 1890. A-E**, St. Helena (rv 30.8 mm, lv 31.1 mm), Jousseaume coll. **F-G**, St. Helena (34.5 mm). **H-I**, same locality (33.3 mm).

Nodipecten nodosus (Linnaeus, 1758)

5.5. Praia Emilia, São Tomé (87.7 mm).

Shell up to 130 mm long (Caribbean specimens up to 165 mm), slightly longer than high, with circular disk, rather thin but solid, compressed, both valves with nearly equal tumidity. Beaks more or less median. Ears medium-sized, anterior ears slightly larger than posterior ears, with rather deep, but narrow byssal notch. Ctenolium small, with about four free teeth. Surface with 8-9 strong, broad, wave-shaped, radial ribs which on the left valve bear large, strong, hollow nodules. Right valve without nodules, ribs only with more or less strong, transverse undulations. The whole surface is also covered with numerous, dense, radial riblets, which are present also on sides of the disk and on the ears. Exterior ribs reflected on the interior. Outside dark purplish red to reddish brown, more rarely bright orange. Right valve mostly lighter coloured than left valve, often interspaces of the small riblets darker than riblets. Inside dark purplish red or orange.



Distribution. Eastern Atlantic: Gabon (Port Gentil); southern Angola (Santa Maria and Lucira, Benguela); São Tomé; Ascension. Western Atlantic: Caribbean from the South coast of Yucatan and the Greater Antilles to the Lesser Antilles, South America from Guajira Peninsula east-and southward to Brazil (Santa Catarina State).

Biotope. On sandy bottoms with calcareous algae, shells, coral, gravel and sponges, offshore from 15 to 50 m, rare. Young specimens are also byssally attached to rocks.

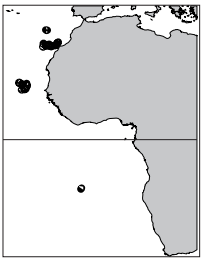
Remarks. This amphiatlantic species was discovered in the eastern Atlantic only at the beginning of the 1980s. The West African specimens have been separated as a geographic subspecies *N. nodosus gabonensis* Nicolay, 1981; however, the few known specimens fall well within the variability of the Caribbean populations. In contrast to the eastern Pacific sibling species *N. subnodosus* (G. B. Sowerby I, 1835) which can be clearly diagnosed, the eastern Atlantic specimens could only be separated from the Caribbean stock if this were proved by DNA analysis.

5.6. ***Nodipecten nodosus*** **(Linnaeus, 1758)**. Gabon (no precise locality), photographed in Pierre Bernard coll. (89.6 mm).

Bractechlamys corallinoides (d'Orbigny, 1840)

5.7. Agua Dulce, Tenerife, dive 3-7 m (31.8 mm).

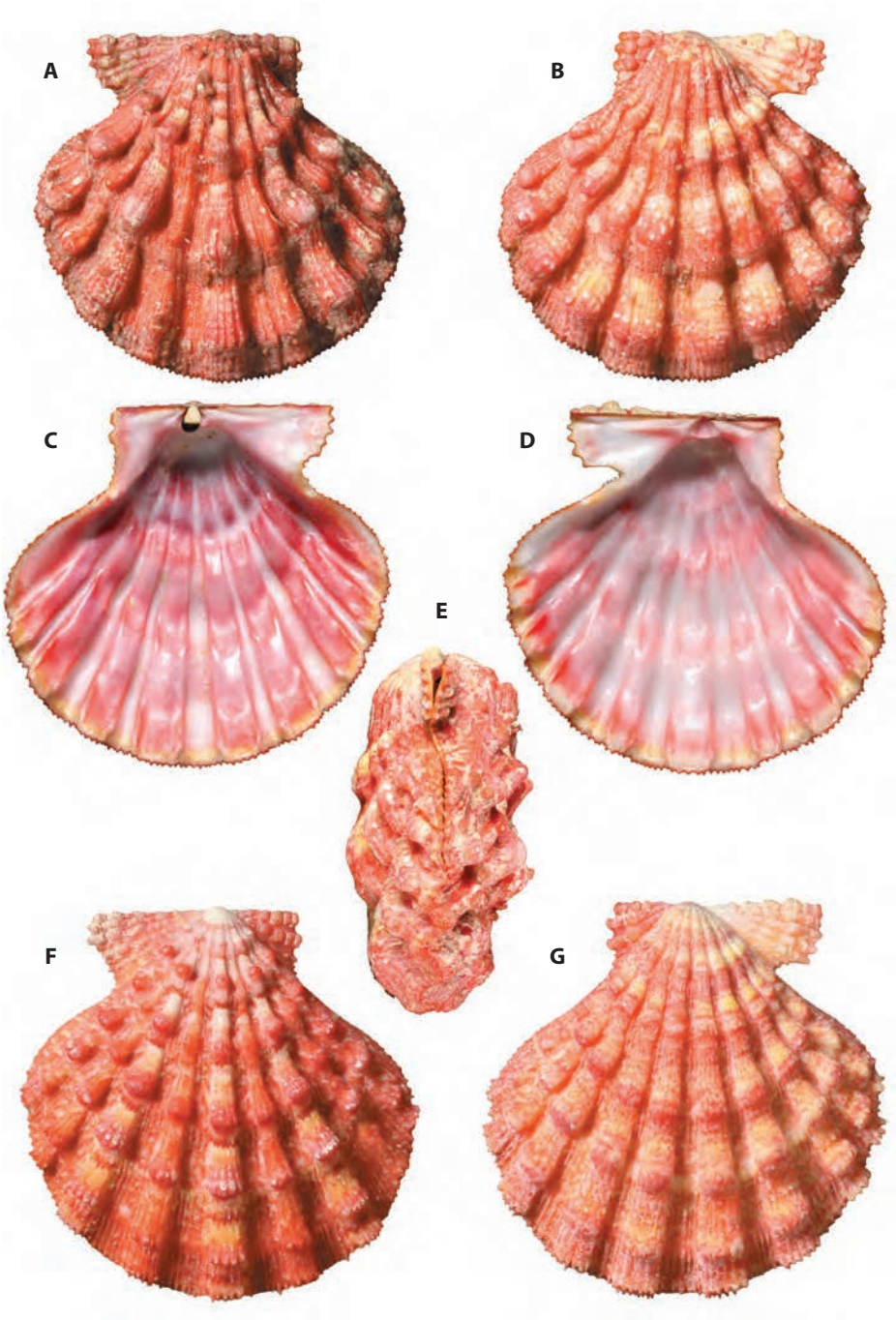
Shell up to 45 mm long, slightly longer than high or as high as long, with circular disk, rather thin but solid, somewhat inflated, right valve slightly more tumid than left valve. Beaks more or less median. Anterior ears medium-sized, posterior ears small. Byssal notch narrow but rather deep, ctenolium small, with 4-5 teeth. Surface with 9-11 strong, broad radial ribs bearing large, strong nodules which are more prominent in the left (upper) valve. The whole disk is also covered with fine, prominent, radial riblets. Ears also with radial ribs, the upper ones coarse and nodose, the lower ones finer. Exterior ribs impressed on the interior. Outside bright coral red to dark brownish red, occasionally yellowish with reddish dots or zones. Inside white with a pinkish hue, pink, bright "signal" red, or dark red with a lighter colour in the rib cavities.



Distribution. Azores, Madeira, Canary Islands; Cape Verde Islands; St. Helena.

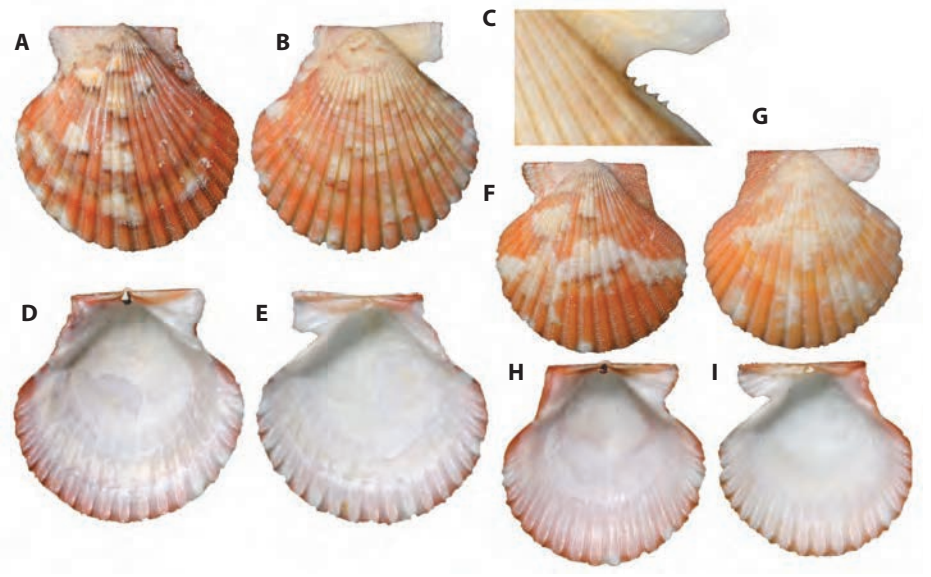
Biotope. On sandy bottoms with calcareous algae, shells, gravel, stones and other hard substrate, from 20 to about 100 m. Also byssally attached on rocky shores from 3 m downward; common.

Remarks. This is an exclusively insular species which is found neither on the West African continental shelf, nor on the islands in the Gulf of Guinea. A similar-looking Indian Ocean species is *B. nodulifera* (G.B. Sowerby II, 1842) from Somalia to Natal. Dijkstra & Goud (2002) placed this species in *Bractechlamys* Iredale, 1939, a mostly Indo-Pacific genus.



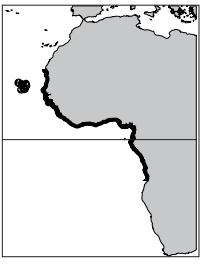
5.8. *Bractechlamys corallinoides* (d'Orbigny, 1840). A-E, Santa Luzia, Cape Verde Islands, 52 m (40.0 mm). F-G, Cape Verde Islands (44.6 mm), old coll. MNHN.

Aequipecten flabellum (Gmelin, 1791)



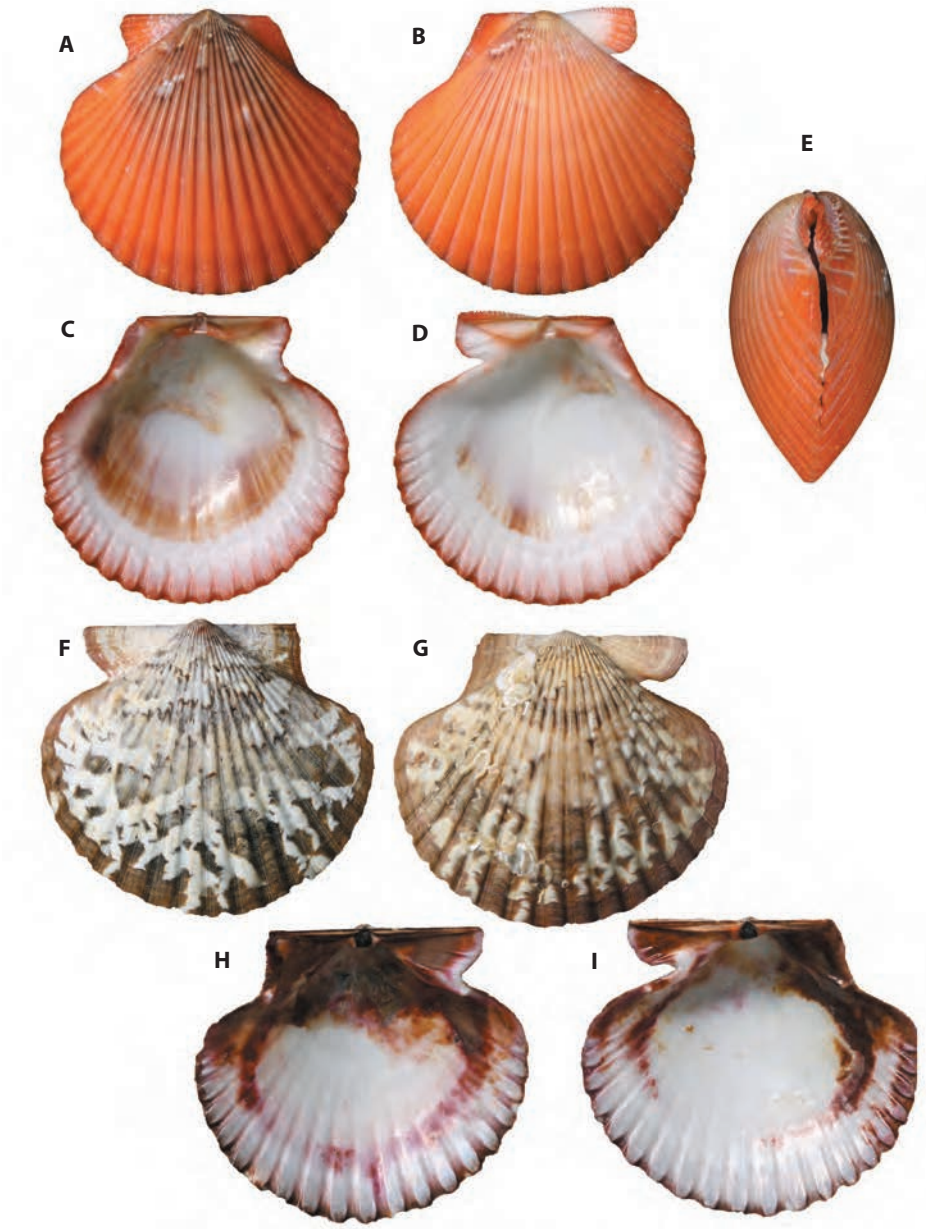
5.9. **A-E**, Mauritania, 18°56'N, 16°25'W, 20 m (24.5 mm; C, detail of the ctenolium, same valve as B). **F-I**, same locality (21.5 mm).

Shell up to 60 mm long, slightly variable in outline and ear shape, longer than high to nearly as high as long, with circular disk, quite thick and solid, inflated, with both valves of nearly equal tumidity. Beaks more or less median. Ears small to medium-sized, posterior ears cut obliquely to nearly vertically. Byssal notch more or less deep, narrow, ctenolium short, with about four small teeth. Surface with 20-23 rather prominent, rounded, radial ribs on the disk and very fine riblets on the sides of the disk, often becoming obsolete. There are also extremely fine, irregular, commarginal lamellae, which are only visible under a lens (x 5-10) and which are often obsolete or absent on the rib summits. Posterior ears with numerous, narrow, scaly riblets, anterior ears with fewer, broader and more spaced, weakly scaly ribs. Outside colour extremely variable, mostly bright orange red to salmon red, pink, brownish red or violet, occasionally yellowish or yellowish with brownish red mottles or zones, greyish or brownish with white mottles or zigzags. Inside white, with external colour showing through near the margin.



Distribution. Mauritania (Cap Blanc) to southern Angola (Santo Antonio, Benguela); Cape Verde Islands (São Tiago, according to Guerreiro & Reiner (2000) throughout the archipelago).

Biotope. Free on sandy bottom, mostly with shell debris, gravel, stones or calcareous algae, from about 10 to 30 m, but in calm bays also in shallower water, (*i.e.* from 1 m), there on fine and mixed sand, often with seagrass. Common to locally abundant.



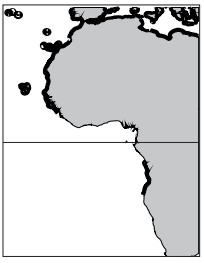
5.10. *Aequipecten flabellum* (Gmelin, 1791). **A-E**, Casamance, Senegal, 20-30 m (42.0 mm). **F-I**, Praia Etambar, Corimba, Luanda prov., N-Angola, on beach (60.0 mm).

Remarks. This species is regularly taken by trawlers as a by-catch; in some regions, *e.g.* off Guinea, it occurs in considerable quantities and population densities. However, most of these "scallop beds" seem to be rather small and therefore hardly exploitable, although the species can be included among the high quality edible scallops. Beach shells and valves are not uncommon at certain places.

Aequipecten commutatus (Monterosato, 1875)

5.11. Boavista, Cape Verde Islands, 15°26, 5'N, 23°14'W, 100 m (29.5 mm).

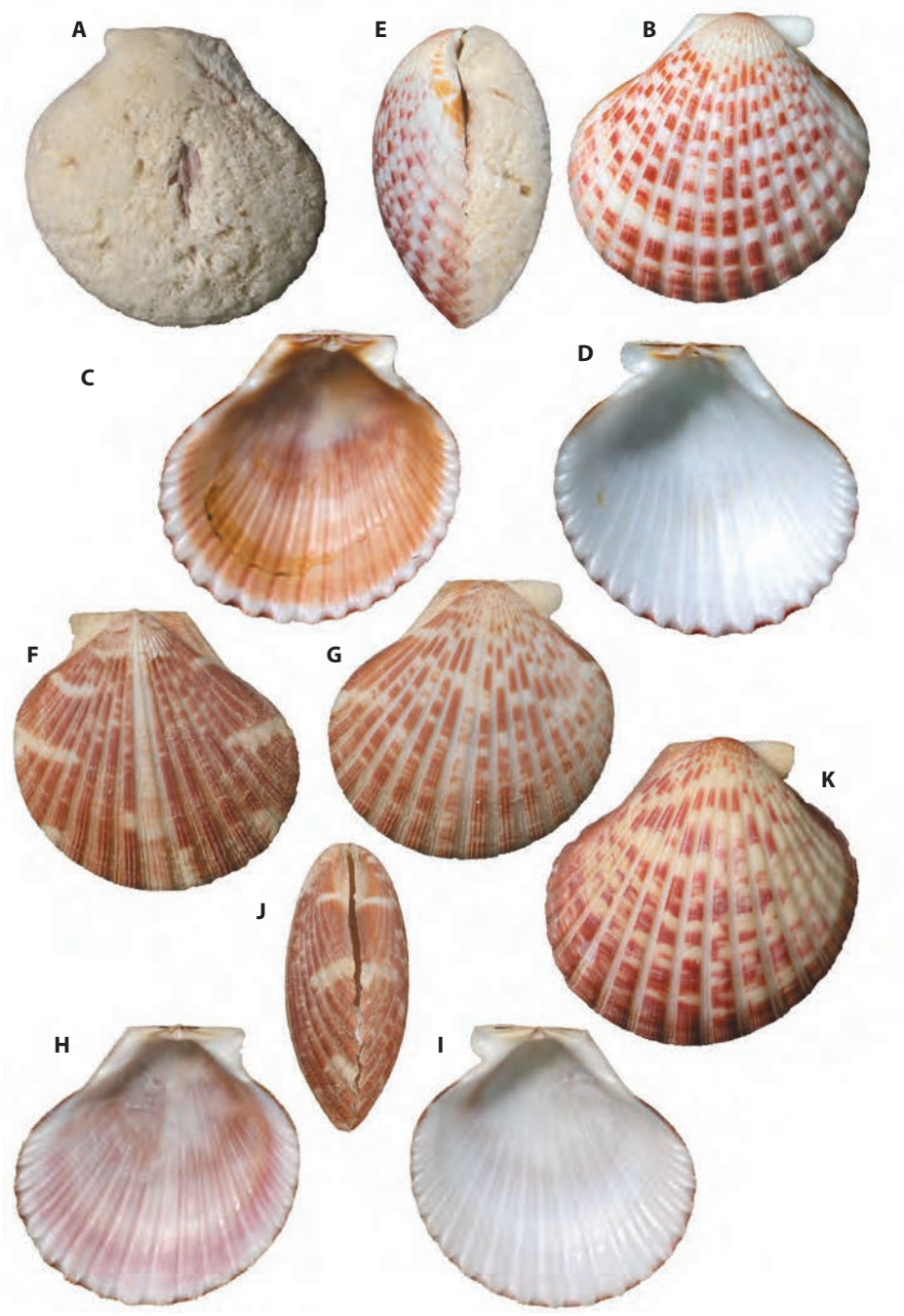
Shell up to 37 mm high, slightly variable in tumidity, about as high as long, subcircular, fully grown specimens often more or less oblique, solid, quite inflated, with right valve slightly more tumid than left valve. Beaks mostly slightly anterior to the vertical midline. Ears very small, especially the posterior ones which are cut obliquely, nearly in prolongation of the postero-dorsal margin. Byssal notch also very small. Ctenolium with 1-5 very small teeth, occasionally without any. Surface with 18-22 prominent, rounded radial ribs on the disk and several fine riblets on the sides of the disk. There are also very fine, irregular commarginal lamellae, often eroded on the rib summits. On the marginal part of the valves, the ribs bear occasionally 2-3 radial riblets which are mostly underlined by enlargement of the commarginal lamellae. Ears with fine, more or less scaly ribs, coarser on the right anterior ear only. Outside reddish to reddish brown with whitish mottles, dots and streaks, or yellowish white with reddish brown streaks, mottles and rays. Inside white to bright pink or white with brownish hue.



Distribution. Portugal (Setubal) to Guinea (9°14'N); N- and S-Angola (Luanda to Namibe prov.); Azores, Madeira, Canary Islands, Cape Verde Islands; western Mediterranean.

Biotope. On mixed and coarse sand, also with calcareous algae, gravel and shell debris, offshore from 20 to 250 m, not common.

Remarks. This species is occasionally taken in trawls, but is too small and too rare to be marketed. The species was for a long time misidentified as *Pecten solidulus* Reeve, 1853, however, this has considerably larger ears and is most probably the eastern Pacific *Argopecten circularis* (G.B. Sowerby I, 1835) (see Waller 1969) or as *Pecten gibbus* (Linnaeus, 1758), a Caribbean species. A subspecies with a limited distribution along the Zululand coast, South Africa is *A. commutatus peripheralis* Dijkstra & Kilburn, 2001.

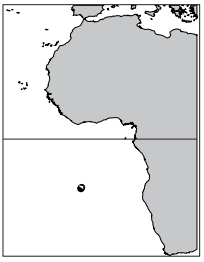


5.12. ***Aequipecten commutatus*** **(Monterosato, 1875). A-E**, Boavista, Cape Verde Islands, 15°26, 5'N, 23°14'W, 100 m (31.1 mm). **F-J**, Dakar region, Senegal, 14°47'N, 17°34'W, 135 m (31.8 mm). **K**, Palmeirinhas, Luanda prov., N-Angola, 60-80 m (30.0 mm).

Aequipecten atlanticus (E.A. Smith, 1890)

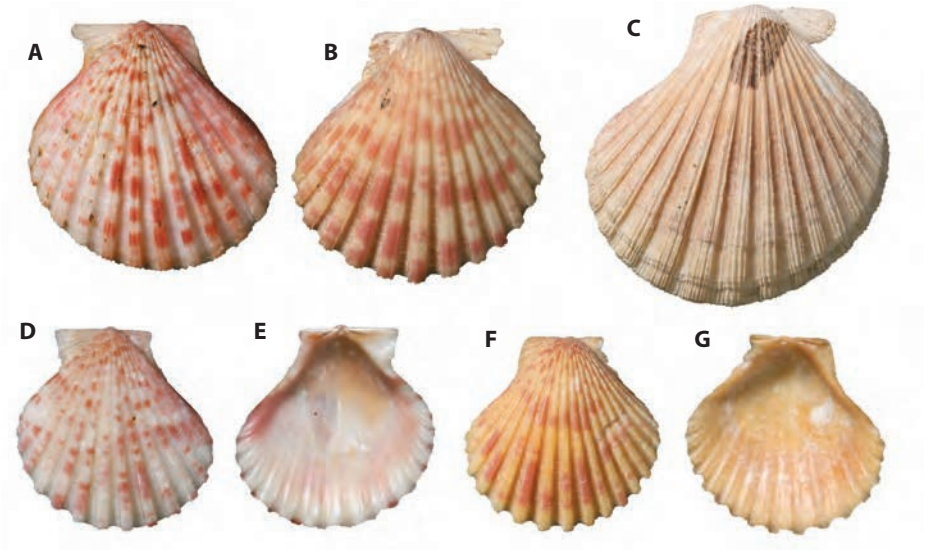
Shell up to 31 mm high and up to 32 mm long, slightly variable in tumidity, about as high as long, subcircular, oblique, solid, moderately inflated, with right valve a bit more tumid than left valve. Beaks in front of the vertical midline. Ears small, especially the posterior ones which are cut somewhat obliquely. Byssal notch very small. Ctenolium with about 3-4 very small teeth. Surface with 15-17 prominent, somewhat rounded, radial ribs on the disk and several fine riblets on the sides of the disk. The whole surface is covered with very fine, irregular, commarginal lamellae, near the margins somewhat scaly and on the rib summits often eroded. Ribs with 1-5 secondary riblets (one on top and two on the sides) which are mostly underlined by enlargement of the commarginal lamellae. In large specimens 1-4 riblets also appearing in the interspaces, on the last 3-10 mm of the disk. Ears with fine, more or less nodulose ribs, coarser on the right anterior ear only. Outside whitish with reddish to reddish brown mottles, dots and streaks. Inside pinkish to brownish.

Distribution. Known only from St. Helena, endemic.



Biotope. Apparently on mixed and coarse sand with calcareous algae, gravel and shell debris, offshore. Not common.

Remarks. *Aequipecten atlanticus* is very close to *A. commutatus*, with which it is often synonymized (*e.g.* Huber 2010). However, its smaller size and the fewer, larger and more prominent ribs distinguish it.

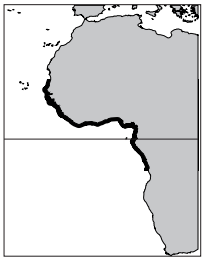


5.13. *Aequipecten atlanticus* (E.A. Smith, 1890). A-B, St. Helena (18.7 mm ht). C, St. Helena (30.4 mm). D-E, St. Helena (13.3 mm ht.). F-G, same locality (13.3 mm ht.).

Aequipecten nicklesi Dijkstra, 1998

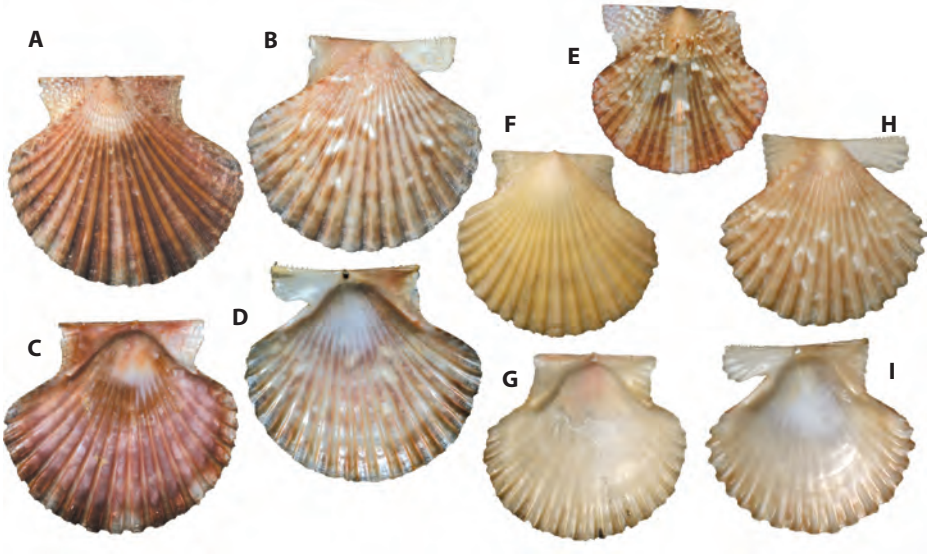
Shell up to 22 mm long, slightly longer than high to nearly as high as long, with circular disk, thin but rather solid, very compressed, left valve slightly flatter than right valve. Beaks more or less median. Ears rather large, byssal notch deep, ctenolium with about 5-6 free teeth, which are small but prominent. Surface with 18-23 radial ribs, the first and the last one thin, the other ribs broader, rounded and prominent, with about equally broad or slightly narrower interspaces. There are also very fine, close-set, rather regular to irregular, commarginal lamellae, which also cover the ears and which are mostly eroded on the rib summits. Ears with fine, radial ribs, except for the right anterior ear which has 5-6 coarser ribs with coarser, transverse lamellae and irregular transverse waves between the byssal notch and the beak. Outside dirty white, irregularly yellowish, orange, pink, reddish to brownish red, often with whitish to yellowish mottles, spots, zones or rays. Right valve mostly lighter coloured than left valve. Inside with outside colour or whitish to pinkish.

Distribution. Mauritania (17°54'N) to northern Angola (Luanda).



Biotope. On fine sand, also substrates with gravel, calcareous algae and shell debris, offshore from 30-200 m, in calm bays such as Baie de Pointe-Noire (Congo) also found in shallow water (3-6 m); uncommon to rare.

Remarks. This is a tropical species which becomes very rare at the northern and southern periphery of its range under strong seasonal influence of upwelling. A senior synonym, but preoccupied name, is *Pecten minutus* Nicklès, 1955 (*non* Bosc, 1801).

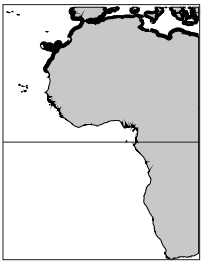


5.14. *Aequipecten nicklesi* Dijkstra, 1998. A-D, Abidjan region, Côte d'Ivoire (17.5 mm). E, Pointe-Noire, Congo Brazzaville, Plage Orstom, 3-5 m (11.2 mm). F-G, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (13.3 mm). H-I, same locality (13.0 mm).

Mimachlamys varia (Linnaeus, 1758)

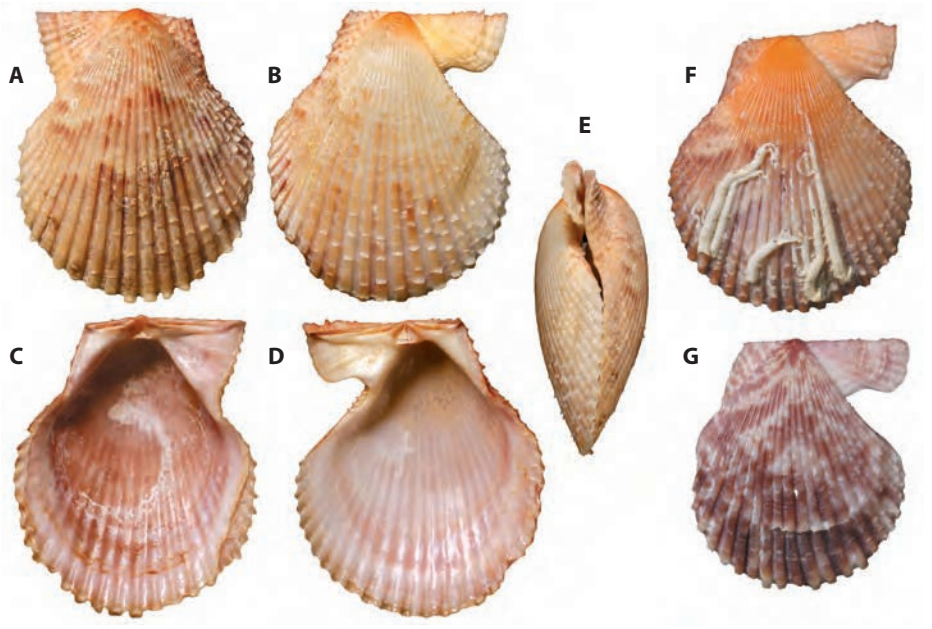
Shell up to 55 mm high, higher than long to (rarely) as long as high, with oval-circular disk, rather thin but solid, compressed, both valves with nearly equal tumidity. Beaks at or just anterior to the vertical midline. Anterior ears large, posterior ears rather small. Byssal notch broad and very deep, ctenolium with strong, scaly teeth. Surface with 25-35 regular, prominent, radial ribs bearing numerous scales, which in adult specimens are often partly eroded. Interspaces slightly narrower than ribs. Ears with slightly shallower ribs, on the right anterior ear transverse, irregular folds between the byssal notch and the beak. Outside greyish yellow, orange, pink, dark brownish or dark purple, often with lighter or darker mottles. Inside white to deep violet.

Distribution. Norway (64°N), Denmark, British Isles southward to Mauritania (Cap Blanc); throughout the Mediterranean.



Biotope. Byssally attached to rocks and other hard objects on rocky shores or soft bottoms or free on soft bottoms, from shallow water (1 m) to about 80 m; common in Europe, uncommon in Mauritania.

Remarks. This is a northern-temperate species which seems not to pass beyond the influence of permanent upwelling. Records from Senegal are unconfirmed. It was for a long time known as *Chlamys varia*.

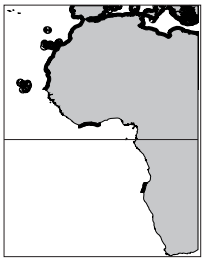


5.15. *Mimachlamys varia* (Linnaeus, 1758). **A**-**E**, Port-Etienne (now Nouadhibou), Mauritania (27.0 mm). **F**, same locality (25.6 mm). **G**, same locality (23.2 mm).

Manupecten pesfelis (Linnaeus, 1758)

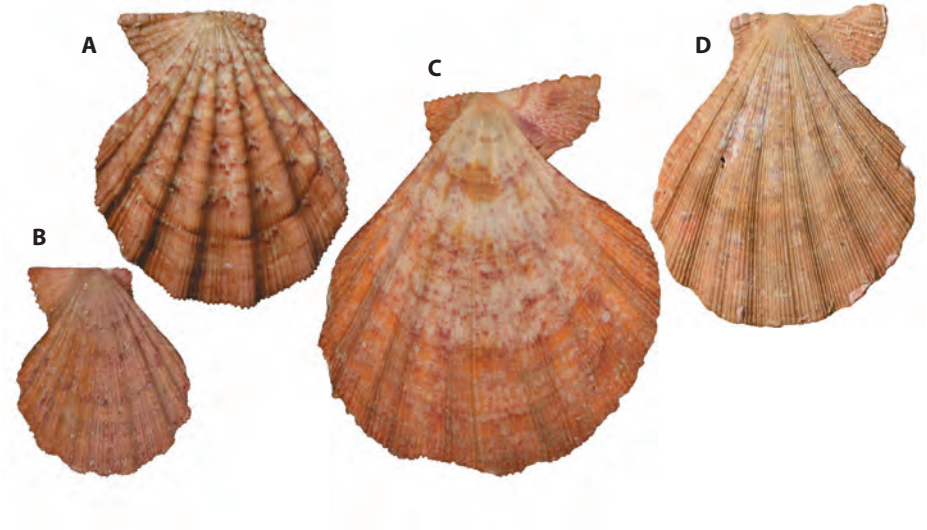
Shell up to 70 mm high, slightly variable in outline, considerably higher than long, occasionally slightly oblique, with oval disk, rather thin, compressed, left valve more tumid than right valve. Beaks more or less median or slightly anterior to the vertical midline. Anterior ears large, posterior ears small, byssal notch broad and deep, ctenolium small, with about 6-7 teeth. Surface with 7-8 broad, rounded radial ribs, undulating in cross section and on the right valve broader than the interspaces, on the left valve narrower. There are also numerous, narrow, close-set, slightly irregular riblets on both ribs and interspaces. Posterior ears with fine, radial ribs, anterior ribs with coarser ribs, a row of knobs along the hinge margin. Exterior ribs reflected on the interior. Outside irregularly brick red to brownish red, purplish brown, sometimes with partly orange or yellowish ribs, or whitish with reddish mottles. Inside white, with pinkish rim, to purplish.

Distribution. Ibero-Moroccan Gulf to Senegal (Dakar); Côte d'Ivoire; southern Angola (Lucira); Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.



Biotope. On sandy bottom with shells, calcareous algae, gravel and other secondary hard substrate, offshore from 50 to 200 m, in the Mediterranean also shallower; uncommon in the Mediterranean, very rare in West Africa.

Remarks. The species has a discontinuous distribution, with gaps in the northern and southern zones with entirely tropical conditions This is the type species of the genus *Manupecten*.

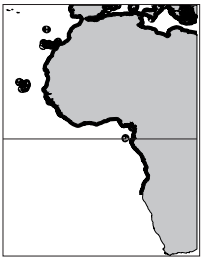


5.16. *Manupecten pesfelis* (Linnaeus, 1758). **A**, Mediterranean specimen from Oran, Algeria (52.3 mm), coll. Locard, MNHN. **B**, Abidjan region, Côte d'Ivoire (38.8 mm). **C**, same locality (70.0 mm). **D**, Baia da Lucira, Namibe prov. S-Angola, 90-100 m (48.3 mm).

Talochlamys multistriata (Poli, 1795)

5.17. *Talochlamys multistriata* (Poli, 1795). A-B, W of Conakry, Guinea, 9°30'N, 14°23'W, 29 m (15.0 mm ht). C-D, W of Ile Tannah, Guinea, 9°12'N, 14°16.3'W, 33 m (16.6 mm ht).

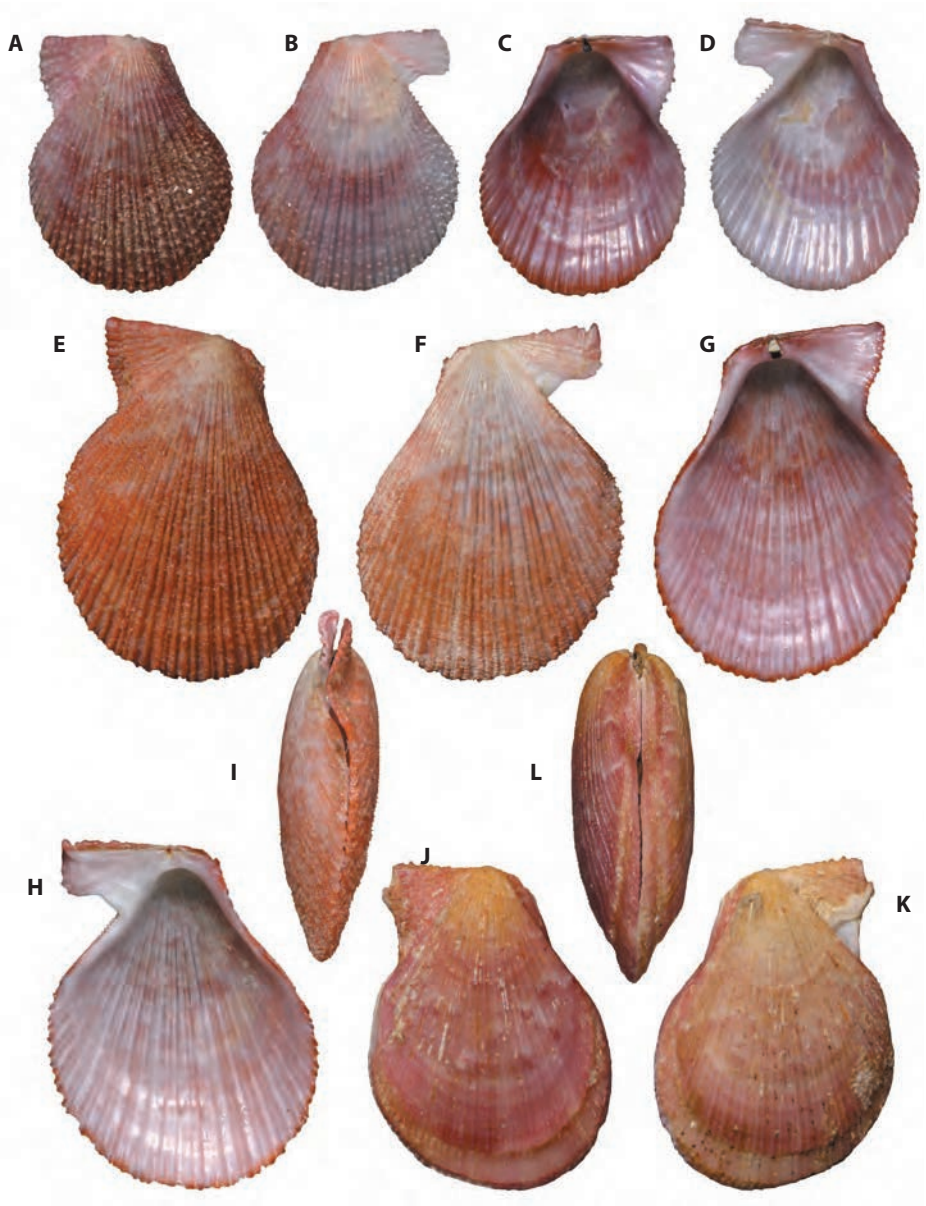
Shell up to 37 mm high (West African specimens usually not more than 25-27 mm), somewhat variable in outline, normally markedly higher than long, slightly oblique, with oval disk, thin but solid, compressed, with nearly equally tumid valves. Beaks somewhat anterior to the vertical midline. Anterior ears large, posterior ears very narrow, with oblique margin. Byssal notch broad and deep, ctenolium well marked, with several spines. Surface with about 30-50 irregular radial ribs bearing close-set scales. Ears also with irregular, scaly ribs, on the right anterior ear behind the byssal notch dense, transverse waves. Outside yellow, orange to bright orange red, reddish brown or irregularly violet, occasionally dirty whitish, often with irregular pattern of whitish or more intense ground colour. Inside whitish to violet, outside colour strongly showing through.



Distribution. Norway, British Isles southward to southern Angola (Lucira, Moçâmedes); Azores, Madeira, Canary Islands, Cape Verde Islands; islands in the Gulf of Guinea; throughout the Mediterranean.

Biotope. On soft bottom byssally attached to hard objects such as coral pieces, gorgonians, shells and stones, offshore from about 15 to 100 m, not uncommon. In Europe (Mediterranean) also shallower (from 1 m downwards) on rocky shores with calm, clear water, attached to the undersides of stones.

Remarks. This species has often been synonymized with the cemented northern European *Talochlamys pusio* (Linnaeus, 1758) (better known under its synonym *Hinnites distortus* (da Costa, 1778) or as *Crassadoma pusio*). A detailed account on this question was given by Waller (1993). He reported also *Crassadoma pusio* from West Africa (Côte d'Ivoire), but this could not be confirmed. Empty valves of *T. multistriata* are regularly found on Cape Verde Islands beaches. A very close Indo-Pacific species is *Talochlamys tincta* (Reeve, 1853) from the southern Arabian upwelling area, which Waller (1993) considered as a synonym. Valves of *Mimachlamys varia* are superficially similar but easily distinguished in having equal ribs.

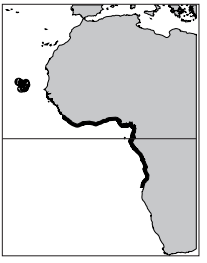


5.18. *Talochlamys multistriata* (Poli, 1795). **A**-**D**, W of Sierra Leone border, 9°06.6'N, 14.4'W , 45-47 m (13.4 mm ht). **E-I**, Ilha de Luanda, Luanda prov., N-Angola, 40-50 m (23.4 mm ht). **J-L**, Praia Amelia, Moçâmedes, Namibe prov., S-Angola, low tide (19.7 mm ht).

Talochlamys abscondita (Locard, 1898)

5.19. São Tiago, Cape Verde Islands, 150 m (syntype, 31.1 mm, photo Manuel Caballer/Recolnat).

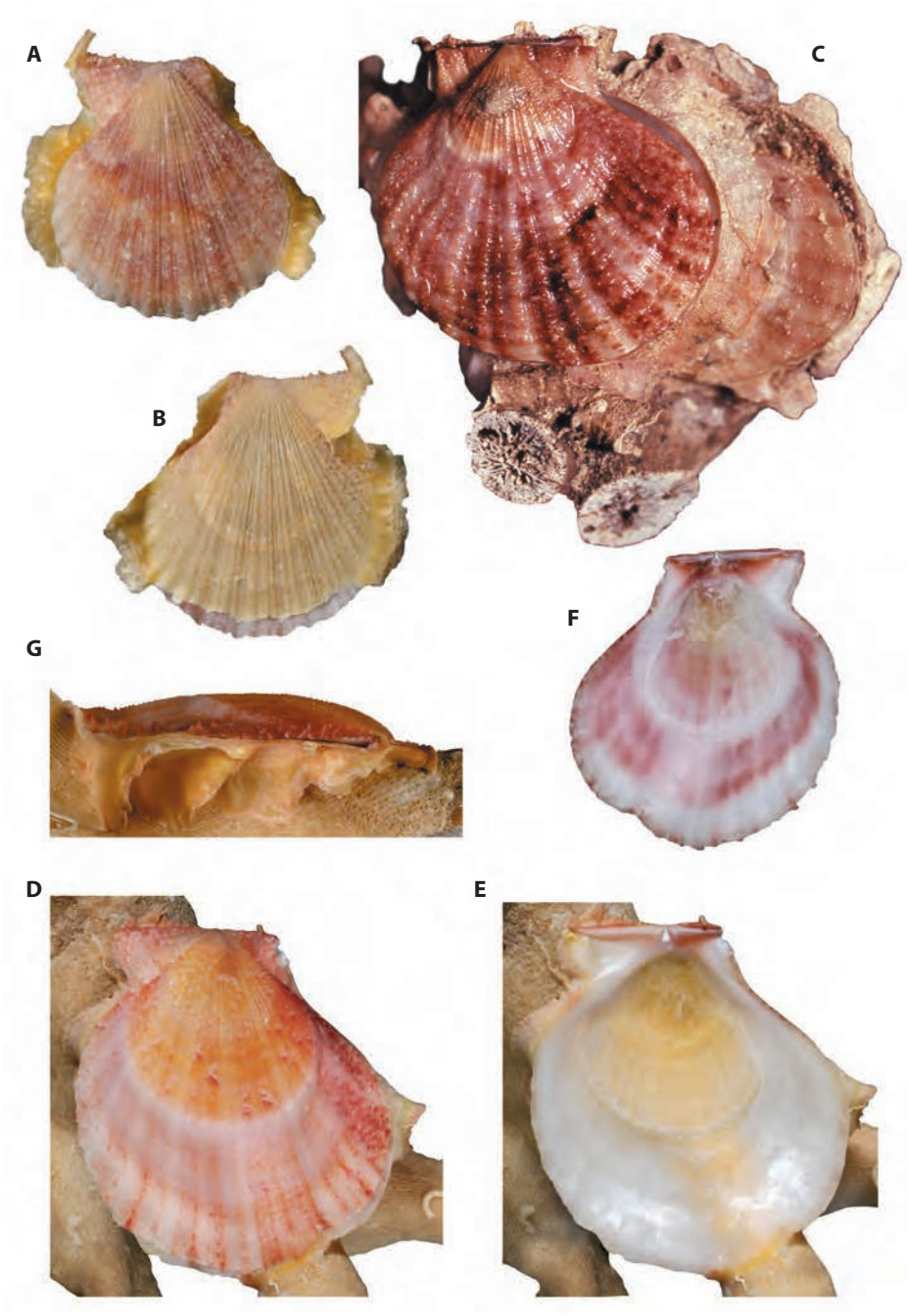
Shell up to 56 mm high, higher than long, with a regular "Chlamys" stage when young, then becoming irregular according to the hard substrate to which it is cemented. "Chlamys" stage 17-25 mm high, slightly higher than long, with medium-sized anterior ear and rather small posterior ear. Byssal notch narrow, but rather deep, in the irregular stage closed; ctenolium not seen. Surface of "Chlamys" stage with numerous, sharp, rather close-set, very finely scaly, radial ribs, about 10-18 ribs more prominent, those between them more or less smaller. Ribs on the irregular part of the upper (left) valve continuing to near the margins, there with coarse scales and not prominent. Lower (right) valve becoming heavily and irregularly lamellate; the shell is cemented to its substrate on these lamellae. Ears with similar ribs bearing scales. Outside of left valve pale brownish pink to reddish brown, occasionally with lighter rays. Right valve mostly yellowish, sometimes whitish, often with somewhat faded, reddish rays or streaks. Inside white to reddish pink, often with reddish rays.



Distribution. Sierra Leone (7°29'N) to southern Angola (Lucira, Namibe prov.); Cape Verde Islands.

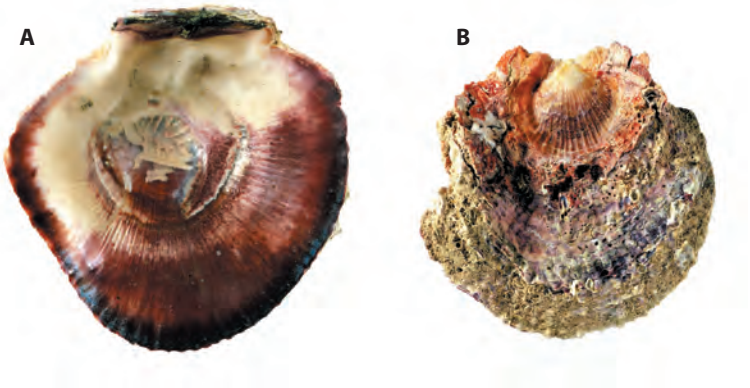
Biotope. On hard bottoms as well as on sandy bottoms cemented to hard substrate such has coral, shells, stones etc., well offshore from 40 to about 400 m, not common.

Remarks. This species is occasionally taken by trawlers operating in deeper water. The immediate ancestor is *Talochlamys ercolaniana* (Cocconi, 1873) from the Italian Pliocene, which, according to Adam (1960) and Waller (1993) might be considered conspecific. *Talochlamys pusio* (Linnaeus, 1758) from the European Atlantic coasts and the Azores is similarly attached in the adult stage but differs in having sharp, elevated ribs very similar to those of *T. multistriata*.



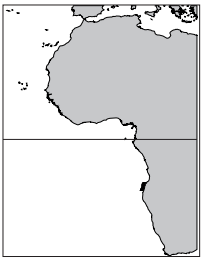
5.20. *Talochlamys abscondita* (Locard, 1898). **A**-**B**, Côte d'Ivoire, 5°01.5'N, 3°23.5'W, 70 m (21.1 mm). **C**, Ilha de Luanda, Luanda prov., N-Angola, 90 m, on *Dendrophyllia* coral (45.0 mm, reproduced from Gofas *et al.* 1985). **D**-**G**, same locality (36.0 mm; **G**, close-up of lamellae fixing shell to the hard substrate).

Hinnites corallinus G.B Sowerby I, 1827



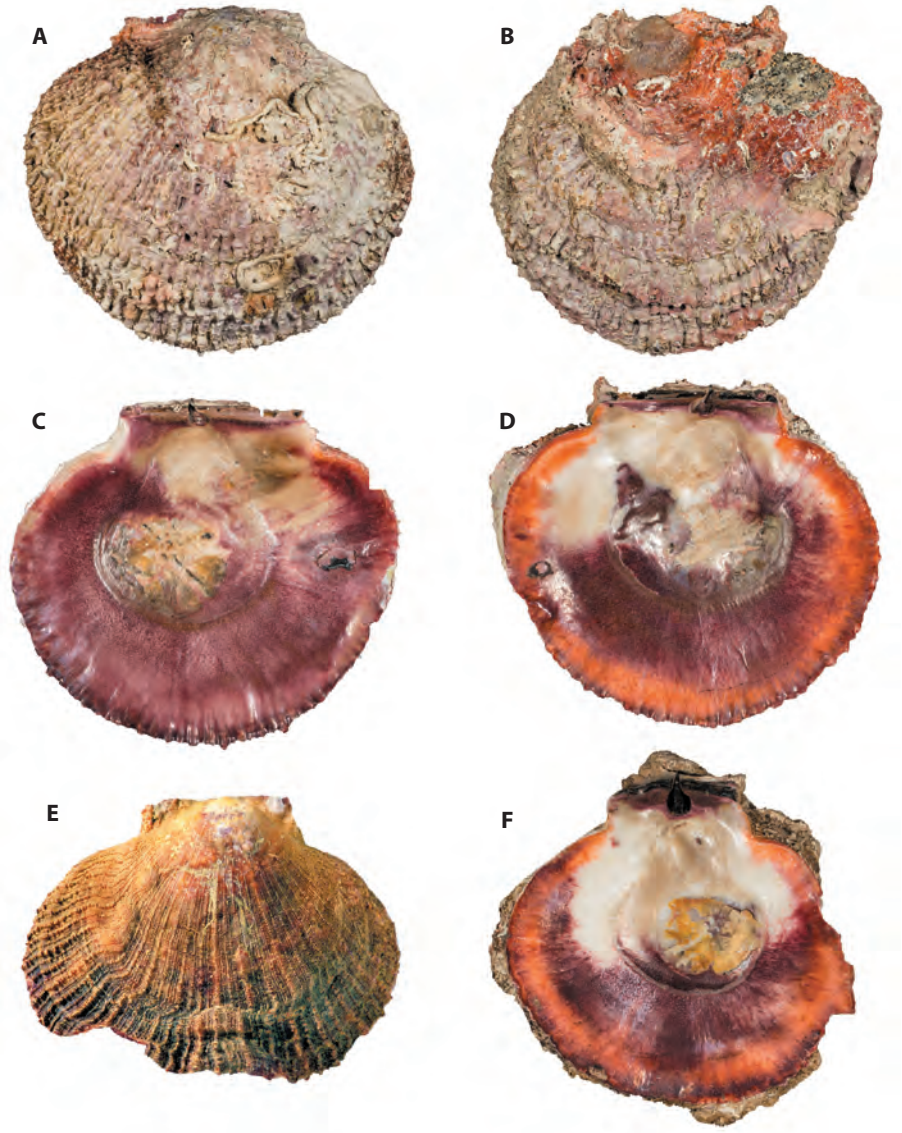
5.21. **A**, Praia do César, Baia da Lucira, Namibe prov., S-Angola, on rocks at low tide (106 mm). **B**, same locality (89 mm).

Shell large (largest specimen seen 170 mm high and 150 mm long), irregularly rounded, higher than long to longer than high, rather thick and solid. "Chlamys" stage variable, 12-25 mm high, about as high as long, with medium-sized anterior ear and smaller posterior ear, deep, but narrow byssal notch and well developed ctenolium with several teeth. Surface of "Chlamys" stage with 20-30 very weak, smooth, irregular radial ribs and 1-4 riblets or threads in each interspace, some of these riblets becoming additional "regular" ribs on the later, irregular stage. Sculpture becoming obsolete towards the umbos. Ears with faint, radial ribs. In adult specimens upper (left) valve with numerous coarse, irregular, scaly, more or less wavy ribs, unequal in size, and irregular growth lines. Lower (right) valve with broad, irregular, commarginal lamellae where in contact with the substrate and with radial ribs on the free growing parts. Outside bright orange to deep violet or brick red. Inside whitish to yellowish, with purplish stain of the adductor scar, with deep violet sector or nearly entirely deep violet. Lower valve often with an orange to brick red band along the margin.



Distribution. Initially considered endemic to the short coast strip in Southern Angola (Cosel & Gofas 1984). The report by Nolf (2005a) from Baia do Mussulo (Luanda province) could only be based on mislabelled specimens, and its known range in Angola is from Lucira Bay to Praia Amelia (Namibe province), in southern Angola and in a very different environment. According to Waller (1993), it extends further southward towards the SW coast of South Africa.

Biotope. Mostly attached to rocks but occasionally also to other hard substrate (shells etc.), on rocky shores, from low tide mark to about 10 m, either exposed to light or under rocks and in crevices, in moderately calm and very clear water; common, locally abundant. The species occurs together with the gastropod *Trochita* cf. *trochiformis* (Born, 1778) and several endemic species of *Conus*.

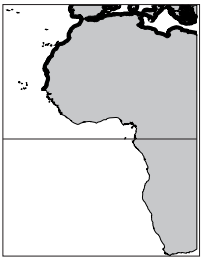


5.22. *Hinnites corallinus* G.B. Sowerby I, 1827. **A-D,** Baia de Santa Maria, Benguela prov., S-Angola (holotype of *H. spectabilis*, 113 mm, photo Manuel Caballer/Recolnat). **E**, Praia Amelia, Moçâmedes, Namibe prov., S-Angola, rocks below low tide (paratype of *H. spectabilis*, 98 mm). **F**, same locality (paratype of *H. spectabilis*, 127 mm, photo Manuel Caballer/Recolnat).

Remarks. *Hinnites corallinus* is restricted to the southern zone of strong seasonal upwelling with clear water. The species was described with the erroneous type locality "East Africa"; specimens from Angola were subsequently named *H. spectabilis* Cosel & Gofas, 1984, which is a synonym. *Hinnites crispus* (Brocchi, 1814) from the Italian Pliocene, the type species of *Hinnites*, is the ancestor and may even result in being the same species (for more details, see Waller 1993 and Nolf 2005a).

Pseudamussium peslutrae (Linnaeus, 1771)

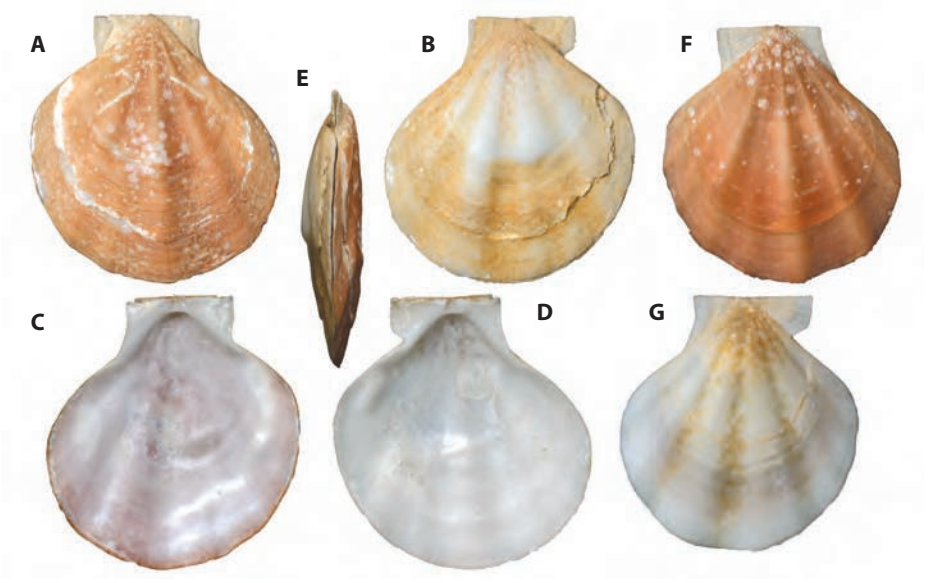
Shell up to 50 mm high (West African specimens to 34 mm), as high as long or slightly higher than long, with circular disk, thin, compressed, with left valve somewhat flatter than right valve. Beaks in the middle. Ears small, with small byssal notch in the right anterior ear. Ctenolium indistinct, with only 2-3 tiny spines. Surface with 5-8 broad, low but well marked, radial waves and fine, irregular radial striae which are always present on the umbos but often becoming obsolete towards the marginal part. There are also extremely fine, dense, radial threads, which are only visible under a lens (x 10-20). Ears with more or less pronounced commarginal lamellae and fine, radial ribs, these mostly on the anterior ears. Outside of the left (upper) valve mostly more or less intensely brick-red, often with scattered, whitish mottles. Right valve whitish, with brick-red umbonal zone. Ears white. Inside white.



Distribution. Northern Norway, southwest Iceland, Faroe and British Isles southward to Senegal (Dakar); throughout the Mediterranean.

Biotope. On muddy-sandy and sandy bottom, offshore from 80 to 250 m and deeper, in northern Europe also shallower, from 11 m downwards; uncommon.

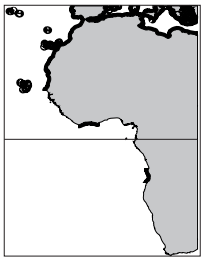
Remarks. This is a northern species; within the West African realm, it occurs only in deeper water, most frequently between 150 and 250 m. The species was better known under its synonym *Pecten septemradiatum* (O.F. Müller, 1776) (see Dijkstra 1999). Other synonyms are *Ostrea hybrida* Gmelin, 1781, *Pecten aspersus* Lamarck, 1819 and *P. nebulosus* Macgillivray, 1835.



5.23. *Pseudamussium peslutrae* (Linnaeus, 1771). **A-E,** Mauritania, 17°53'N, 16°31'W, 100 m (39.6 mm). **F-G**, off Dakar, Senegal, 14°48.5'N, 17°36'W, 100 m (20.7 mm).

Palliolum incomparabile (Risso, 1826)

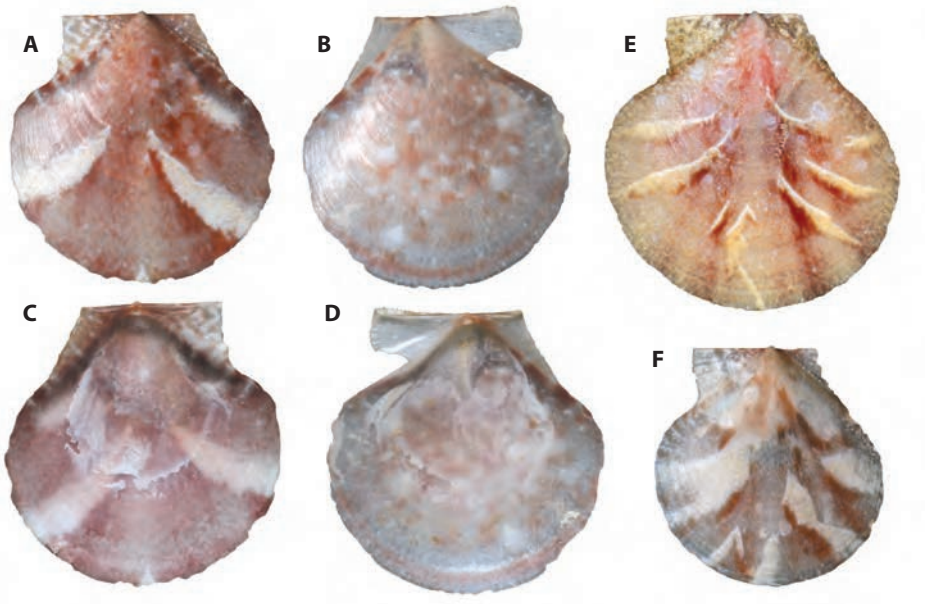
Shell up to 15 mm high, rounded, nearly equivalve, as long as high to slightly higher than long, thin and fragile, very compressed. Beaks more or less median. Anterior ear larger than posterior ear, byssal notch well developed, its lower margin with about 6 teeth. Surface glossy, smooth at first glance, but with numerous, irregular, extremely fine, radial striae, which diverge partly and which are visible under a lens (x 10-20) only. Ears also with fine, radial striae, which on the anterior ear of the right valve are coarser and less numerous. Transition zone between anterior ear of left valve and disk ornamented with thin, short, commarginal lamellae bearing a few fine scales. Valves translucent yellowish white to pale yellowish or pale pinkish, often with reddish to reddish brown zones or spots or with irregular, opaque-whitish chevrons, occasionally with close-set zigzag lines which give the impression of a net pattern.



Distribution. South Portugal to Senegal (Dakar region); Côte d'Ivoire; southern Gabon to southern Angola (Benguela); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

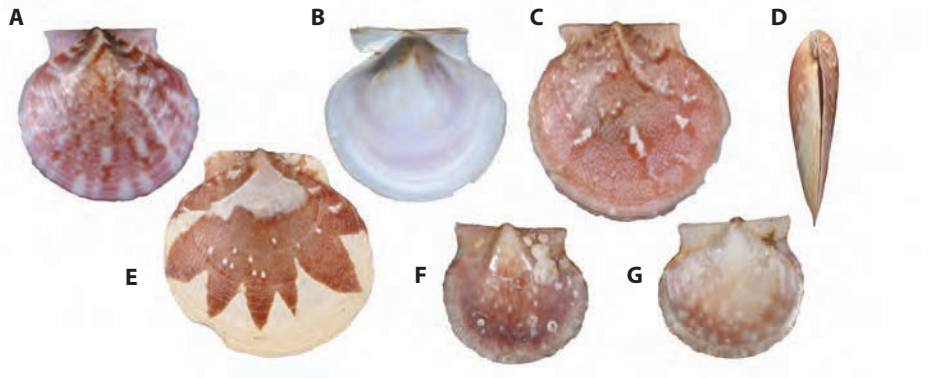
Biotope. On sandy bottom and so-called coralligenous, offshore, from about 30 to 250 m and deeper; rare.

Remarks. *Palliolum incomparabile* is easily distinguished by the typical, fine, diverging striae and is the type species of the genus *Palliolum*. In West Africa, this species is restricted to areas with upwelling influence; there are no records from the two typical tropical regions.



5.24. *Palliolum incomparabile* (Risso, 1826). **A**-**D**, Senegal, 14°23.1'N, 17°24.1'W, 65-70 m (12.3 mm). **E**, off Gorée, Senegal, 160-125 m (14.2 mm ht). **F**, Côte d'Ivoire, 4°35'N, 6°29'W, 200 m (11.0 mm).

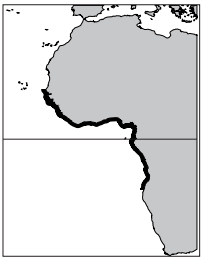
Lissochlamys exotica (Dillwyn, 1817)



5.25. **A**-**B**, Casamance, Senegal, 10-20 m (24.2 mm). **C**-**D**, same locality (30.8 mm). **E**, Cap Skirring, Casamance, beach drift (34.5 mm). **F**-**G**, Casamance, Senegal, 12°25.5'N, 17°07.1'W, 15-16 m, juvenile specimens (11.5 mm).

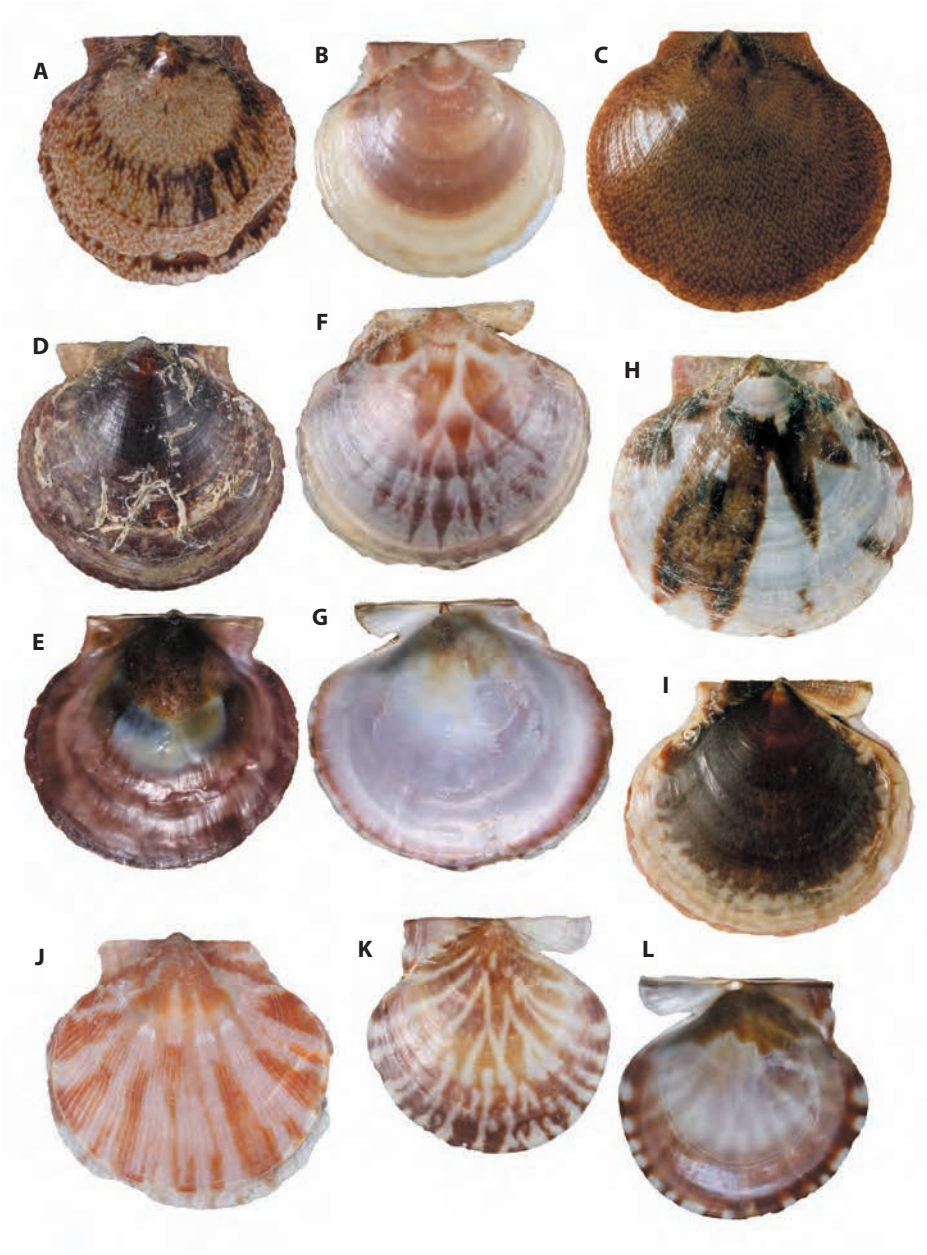
Shell up to 42 mm long, slightly longer than high, with circular disk, thin but solid, very compressed, nearly equivalve. Beaks more or less median. Ears medium-sized, byssal notch narrow and rather deep, ctenolium with numerous spines, continuing towards the beaks as a furrow between the right anterior ear and the disk. Surface smooth or with fine radial ribs on the umbonal part which only occasionally spread out over the whole shell. Under a strong lens (x 20-40), however, the left valve shows a pattern of extremely fine, irregular, slightly curved lines which are directed radially and which can be compared with broom traces on sand. Ears with more or less prominent radial ribs, on the right anterior ear also crossed by commarginal ridges resulting in small scales. Outside of the left valve reddish brown to dark violet brown, mostly with greyish white dots, mottles, zigzag markings, chevrons or larger triangular zones. Right valve often lighter coloured, varying from whitish with reddish brown umbonal region to brown with white mottles or dark brown with lighter marginal region. Inside white with pinkish hue to dark brownish violet.

Distribution. Senegal (Dakar) to southern Angola (Namibe province, Moçâmedes).



Biotope. On sandy mud and fine muddy sand, in shallow water from 1 to about 30 m, preferably in calm, more or less sheltered bays, often near mouths of rivers or creeks, attached to plant debris sunken on and into the bottom; common, locally abundant. The species occurs together with *Lembulus montagui*, *Scissodesma micronitida*, *Nasopharus elegans*, *Sinupharus curtus* and the snail *Naytia glabrata* (G.B. Sowerby II, 1842) and, in the inner Bay of Pointe-Noire, with *Fulvia fragilis congoensis*.

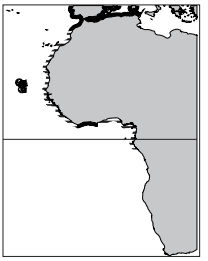
Remarks. Large specimens are occasionally taken in shrimp trawls. Empty valves are regularly cast ashore on certain beaches, but are mostly more or less worn. Most specimens from Angola are comparatively small, 7 to 20 mm only; they have been named *Pecten loveni* Dunker, 1853. This is *Pecten orbicularis* G.B. Sowerby II, 1842 and "L'Essan" of Adanson. "*Pseudamussium hybridum* (Gmelin, 1791)" was a misidentification by Rombouts (1991).



5.26. ***Lissochlamys exotica*** **(Dillwyn, 1817).** **A**, off Victoria (now Limbe), Cameroon, 3°44›N, 9°22›E, 22-24 m (24.1 mm). **B**, same locality (22.9 mm). **C**, Bota - Batoke, Cameroon, 3°37'N, 9°06'E, 23-38 m (30.8 mm). **D-E**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, 3-5 m (31.3 mm). **F-G**, same locality (32.7 mm). **H**, same locality (32.5 mm). **I**, same locality (29.0 mm). **J**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (28.8 mm). **K-L**, same locality (24.9 mm).

Delectopecten vitreus (Gmelin, 1791)

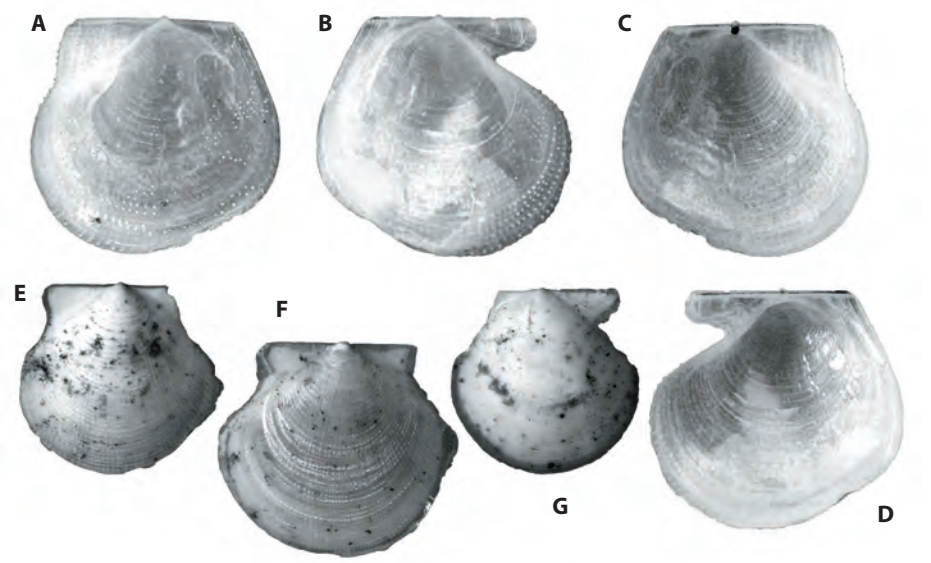
Shell up to 18 mm high, subcircular, about as long as high or a bit higher than long, thin and fragile, compressed, both valves with nearly equal tumidity. Beaks more or less median. Anterior ears rather large, posterior ears smaller and not demarcated from the rest of the shell. Byssal notch well developed, ctenolium with a few small spines. Surface with very fine radial striae and fine, commarginal lamellae bearing tiny beads, mostly on the marginal part. Ears with the same sculpture, right anterior ear with a few, small commarginal ribs. Sculpture best visible under a lens (x 10-20). Valves uniform hyaline white.



Distribution. Norway (70°N), British Isles southward to the Iberian Peninsula; whole coast of tropical West Africa (*fide* Dijkstra & Goud 2002) western Mediterranean; also in the western Atlantic from Newfoundland to Massachusetts.

Biotope. Byssally attached to hard objects such as deep-water coral, offshore from about 100 m but more commonly deeper on the slope; uncommon to rare.

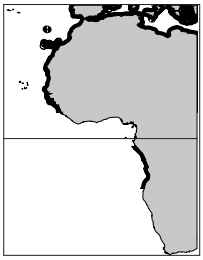
Remarks. Only few specimens of this widely distributed deep-water species has so far been reported from West Africa, off Liberia and Côte d'Ivoire between 380 and 510 m. The other specimens, sampled off Congo Brazzaville during the Zaiango project of Ifremer, may finally be another species of the genus. A close eastern Pacific species is *D. vancouverensis* (Whiteaves, 1893).



5.27. *Delectopecten vitreus* (Gmelin, 1791). A-D, off Liberia, 4°25.5'N, 8°29.5'W, 380 m (10.6 x 10.3 mm). E-G, *Delectopecten* cf. *vitreus,* off N-Angola, 7°18.38'S, 10°04.72'E, 363 m (largest spm. 5.7 mm).

Similipecten similis (Laskey, 1811)

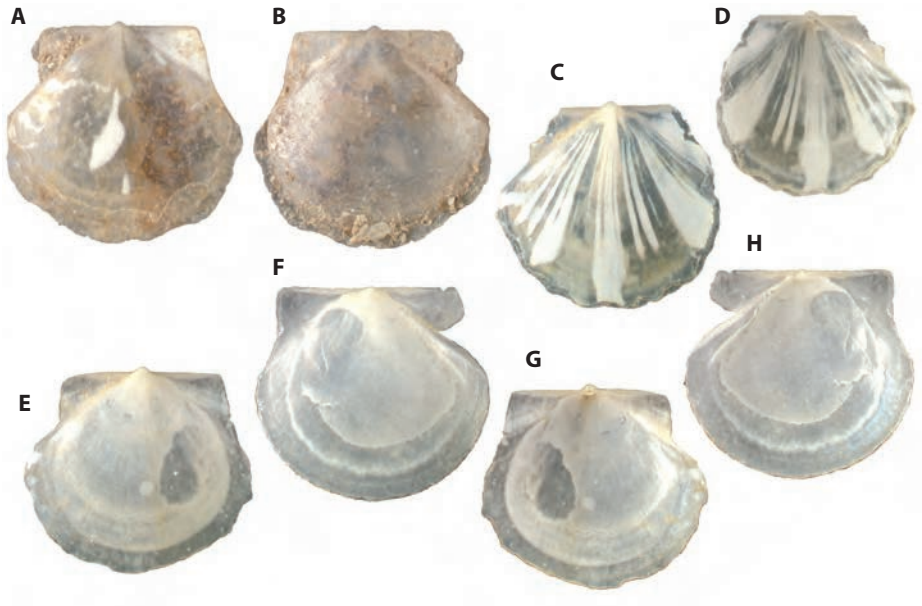
Shell very small, up to 6 mm long (European specimens up to 10 mm), slightly longer than high, with circular disk, very thin and compressed, inequivalve, with left valve slightly overlapping the right valve. Beaks in the middle or very slightly behind the vertical midline. Ears large, the posterior ones reaching nearly to the posterior margin and less separated from the disk than the anterior ears. Byssal notch small but deep, no ctenolium. Surface smooth, however, under a lens (x 10-20), fine growth lines and very fine, irregular radial lines are visible, also on the ears. In the furrow between the disk and the left anterior ear are small, dense, transverse lamellae. Valves translucent white, with opaque white spots, rays, zigzags or mottles and often with light brownish or yellowish hue.



Distribution. Northern Norway, southwest Iceland, Faroe, British Isles southward to Guinea (9°24'N); Gabon (2°30'S) and northern Angola (Ambrizete) to southern Angola (Praia Amelia, Moçâmedes); Madeira, Canary Islands, throughout the Mediterranean.

Biotope. On muddy sand, also with gravel or shell debris, offshore from 10-250 m, most common between 60 and 200 m; locally not uncommon.

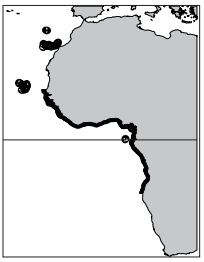
Remarks. This is a temperate species which has not yet been recorded from the tropical zone proper outside the alternant regions (from Guinea and Gabon only an empty valve). This is the type species of the genus *Similipecten*.



5.28. *Similipecten similis* (Laskey, 1811). A-B, Dakar, Senegal, 14°27'N, 17°33'W, 170-200 m (4.0 mm). C-D, S of Gorée, Dakar, Senegal, 65 m (3.3 mm. E-H, same locality (4.0 mm).

Spondylus senegalensis Schreibers, 1793

Shell up to 150 mm high and up to 125 mm long, variable in shape, tumidity and sculpture, irregularly rounded, about as long as high or slightly higher than long, thick and solid to very thick and heavy, inflated. Right valve more tumid than left valve. Ears equal and medium-sized. Surface with numerous, irregular, often more or less indistinct, radial ribs and riblets, about 5-12 of which bear short to long, fluted, scaly or leafy spines, the intermediary ribs between them smooth and somewhat indistinct or with very small, close-set spines, only visible under a lens (x 5-10). Right valve, where attached, with irregular, commarginal lamellae or lamellose spines. Inner margin crenulate. Outside mostly bright scarlet red, "signal" red or brick red, but often also orange, wine red or brownish red. Spines with the same colour or clearer, occasionally in a different colour, *e.g.* violet on brownish red or orange on deep pinkish. Inside white, with a typical marginal rim in the outside colour. Hinge teeth with brownish hue.

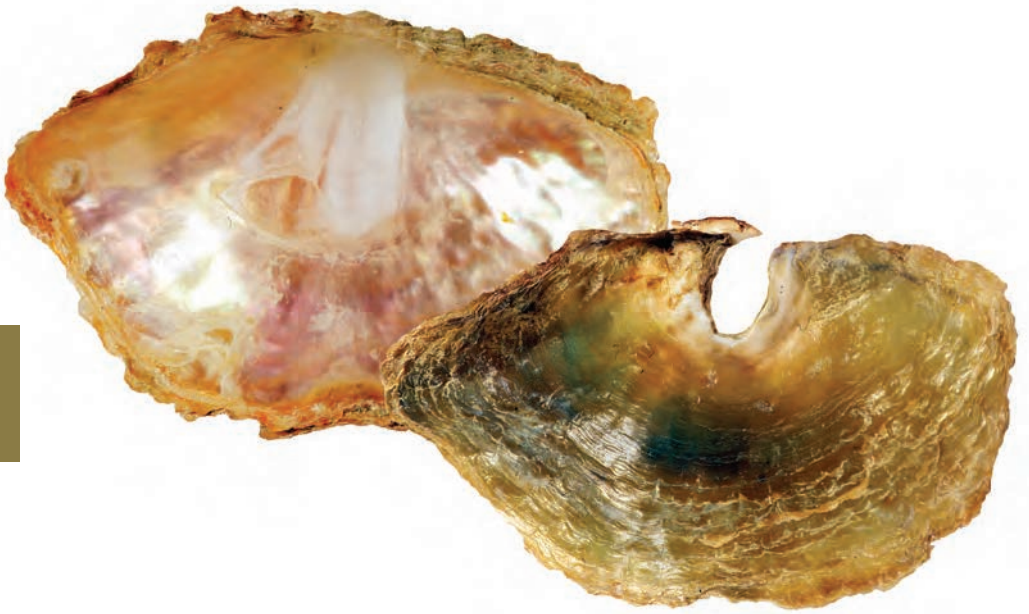


Distribution. Senegal (Dakar) to southern Angola (Lucira, Namibe province); Madeira, Canary Islands, Cape Verde Islands, São Tomé, Ilha do Principe, Annobon.

Biotope. Cemented to hard objects on soft bottoms such as sand with shells, gravel and calcareous algae, or on rocks, stones and oil drilling platforms, from about 3 to 50 m, common.

Remarks. The Mediterranean *Spondylus gaederopus* Linnaeus, 1758 is distinguished from *S. senegalensis* by the absence of a reddish marginal rim to the interior, a somewhat flatter upper valve and often finer and more numerous spines. Records of *S. gaederopus* from Cape Verde Islands (see Cosel 1982) refer to beachworn specimens of the present species. It is also variable in colouration, but does not show the outstanding scarlet red of the West African species. Some *S. senegalensis* from the southern part of their range (Gabon and southern Angola) may have finer spines, but this is considered a variety only, the red marginal rim being always present. This is "Le Guron" and "Le Satal" of Adanson. Synonyms are *S. powelli* E.A. Smith, 1892 and *S. inermis* Alvarado & Alvarez, 1964, the latter being based on a nearly spineless specimen from Annobon.

5.29. ***Spondylus senegalensis*** **Schreibers, 1793. A-D**, off Guinea, from commercial trawler (74.5 mm). **E-H**, Annobon, 1°27.5'S, 5°36.5'E, 35 m (45 mm width without spines).



Superfamily ANOMIOIDEA

Family ANOMIIDAE
- Genus ***Anomia*** Linnaeus, 1758 –1 species
- Genus ***Heteranomia*** Winckworth, 1922 –1 species
- Genus ***Monia*** Gray, 1850 – 1 species
- Genus ***Pododesmus*** Philippi, 1837 – 1 species

Superfamily PLICATULOIDEA

Family PLICATULIDAE
- Genus ***Plicatula*** Lamarck, 1801 – 1 species

Superfamilies Anomioidea and Plicatuloidea

Superfamily ANOMIOIDEA
Family ANOMIIDAE

The only family in the Anomioidea. Shells small to rather large, mostly rounded to more or less irregular according to the substrate, or regular when free-living, from very thin and fragile to thin but quite solid or rather thick, very compressed, inequivalve to nearly equivalve. Surface with irregular growth lines only, or with irregular radial sculpture. Hinge with internal ligament in the middle and often ridges at both sides. Umbos flattened and mostly more or less median. Right (lower) valve generally with a rounded byssal hole which may be closed or open to the dorsal margin, just in front of the ligament. Young animals have a flexible byssus; later the byssus becomes plug-like and more or less calcified; the hole is developed by the growing of the shell around the byssus. Adductor muscle scar near the middle, left valve with one or two byssal and pedal retractor muscle scars in addition to the adductor scar. These scars are important for species identification. There are 26 species known worldwide, four of them West African. The Anomiidae live attached to hard substrate such as rocks, stones, shells of living and dead molluscs or corals, while a few even inhabit mangrove roots. The shell reproduces in its form the surface of the substrate; specimens attached to *Pecten* consequently have corrugated shells. The systematic arrangement basically follows Huber (2010) with *Pododesmus* considered as distinct from *Monia*. The European species of the family were recently reviewed by Holmes (2017).

Genus *Anomia* Linnaeus, 1758. Shells medium-sized to rather large (up to 90 mm), irregularly oval to rounded, thin, translucent, with deep byssal embayment in the right valve. Left valve with three muscle scars. Surface with commarginal growth lines and often with variably developed radial sculpture.

Genus *Heteranomia* Winckworth, 1922. Shells small (usually less than 10 mm), irregularly rounded, thin and translucent, with two separate, smooth muscle scars in the left valve. Surface smooth or with radial, often scaly riblets.

Genus *Monia* Gray, 1850. Shells small to medium-sized (up to 50 mm), irregularly rounded, with a thin to mostly rather solid upper (left) valve. Surface of left valve often with radial sculpture, its interior with two separate or confluent muscle impressions, bearing radial furrows.

Genus *Pododesmus* Philippi, 1837. Shell medium-sized to large (up to over 100 mm), irregularly rounded, with a rather solid upper valve and more or less thin lower valve. Surface irregular, often with radially arranged scales. Byssal hole small to partly or wholly closed outside. Right valve with protruding resilifer. In the left valve, two adductor scars close together but not confluent, bearing radial furrows.

Species treated (4)
Anomia ephippium Linnaeus, 1758; *Heteranomia squamula* (Linnaeus, 1758); *Monia patelliformis* (Linnaeus, 1761); *Pododesmus* cf. *rudis* (Broderip, 1834).

Superfamily PLICATULOIDEA
Family PLICATULIDAE

Shells small to medium-sized, irregularly subcircular, oval or subtrigonal, higher than long to slightly longer than high, inequivalve to nearly equivalve, thin but solid to thick, generally more or less compressed. Margins closed, ears small or absent, no byssal notch. Surface with irregular radial ribs, waves, riblets or threads. Hinge in both valves with resilifer in a deep pit and a tooth and a socket symmetrically arranged on each side. Often the two valves can only be separated by breaking or fracturing the teeth which are well hooked into the sockets of the opposite valve. One adductor scar only. Only 17 Recent species are known worldwide, one of them on the West African coast. The Plicatulidae are hard-bottom dwellers which are cemented by the right valve to the substrate. They are mostly tropical, known from Indo-Pacific, eastern Pacific and western Atlantic. The single eastern Atlantic species has only recently been discovered.

Genus *Plicatula* Lamarck, 1801. Shells small to medium-sized, irregularly rounded to trigonal, rather compressed, with right (cemented) valve generally slightly more tumid than left valve. Hinge margin short, isodont with prominent, straight teeth, those in the right valve close together on each side of the resilifer, those on the left valve separated from the resilifer by the broad sockets of the opposite teeth. Muscle impression on the posterior part of the valve.

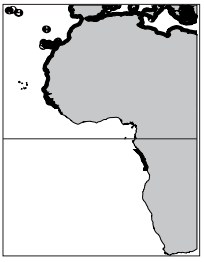
Species treated (1)
Plicatula angolensis Cosel, 1995.

6.1. This inlet at Barra do Dande (Bengo prov., N-Angola) is the type locality of *Plicatula angolensis*. The bivalve lives attached to the underside of rock slabs near the low tide level (Photograph by Matthew Kernick, Panoramio)

Anomia ephippium Linnaeus, 1758

6.2. Mauritania, 20°43'N, 16°59'W, 18 m (lv, 31.2 mm).

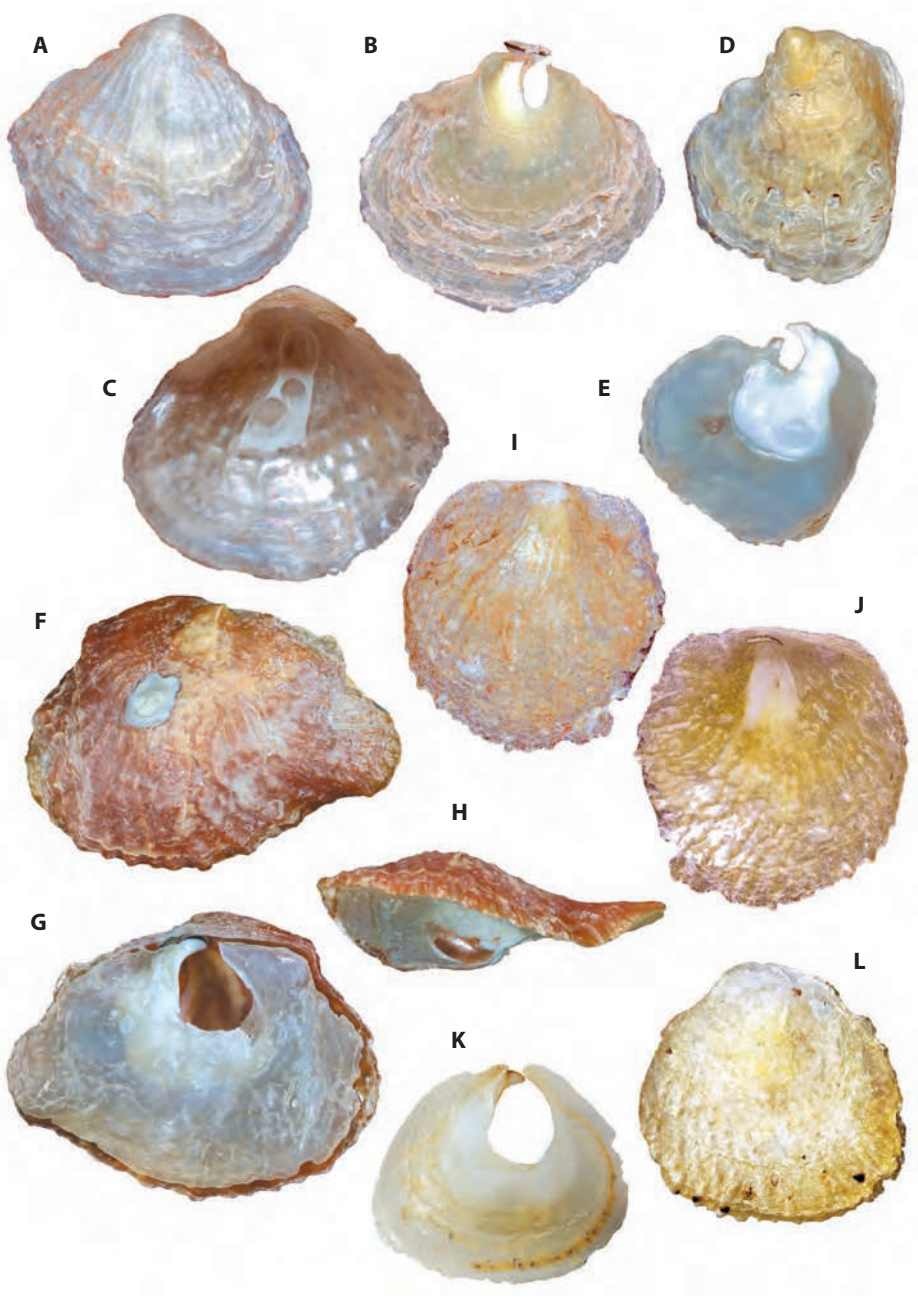
Shell up to 87 mm long, very variable in shape, irregularly rounded to oval, inequivalve, higher than long to longer than high, thin and brittle, left valve slightly thicker and stronger than right valve, somewhat larger and more or less inflated, right valve flat or concave. Beaks median or slightly anterior to the vertical midline. Surface with irregular, commarginal growth lines and growth lamellae, left valve often with irregular, low, radial ribs and riblets which vanish towards the ventral margin. Right valve with a dorsally open, high-oval byssal aperture. Resilifer narrow, broad and half-moon-shaped. Left valve with three separated muscle scars, right valve with one only. Valves translucent white, left valve from yellow to deep orange, right valve whitish, light greyish or greenish.



Distribution. Shetlands, British Isles and Channel southward to Senegal (Casamance) and Guinea (Conakry); Congo (Pointe-Noire) to northern Angola (Luanda); Azores, Madeira, Canary Islands; throughout the Mediterranean.

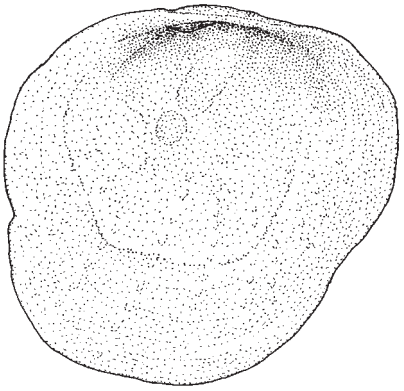
Biotope. On rocks, stones, shells of live and dead molluscs and other hard objects, from just above low water mark to offshore in about 150 m, mostly between 0 and 20 m. Common to abundant from Europe to Senegal, uncommon in Guinea, the Congo and Angola. In Guinea, it was found around the Conakry Peninsula and on Kassa Island on the rocky shores on the undersides and sides of stones near low tide mark. The water is murky, and the salinity is reduced in the rainy season. Accompanying molluscs were *Crassostrea tulipa*, *Pseudochama radians* and the gastropods *Turritella gemmata* Reeve, 1849, and *Stramonita haemastoma* (Linnaeus, 1767).

Remarks. This is a temperate species which, in the north as well as in the south, does not pass beyond the zones of seasonal upwelling. *A. ephippium* is the type species of the genus *Anomia*.



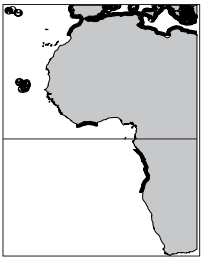
6.3. *Anomia ephippium* Linnaeus, 1758. **A**-**C**, Mauritania, 20°43'N, 16°59'W, 18 m (45.6 mm). **D**-**E**, SE of Gorée, Senegal, 14°31'N, 17°23.3'W, 19 m (30.0 mm). **F**-**H**, Cacuaco, Bengo prov., N-Angola (44.9 mm). **I**-**J**, same locality (44.0 mm). **K**-**L**, Futungo, Baia do Mussulo, Luanda prov., N. Angola (31.3 mm).

Heteranomia squamula (Linnaeus, 1758)



6.4. Morocco, 33°47'N, 7°56'W, 122 m (lv, 9.6 mm).

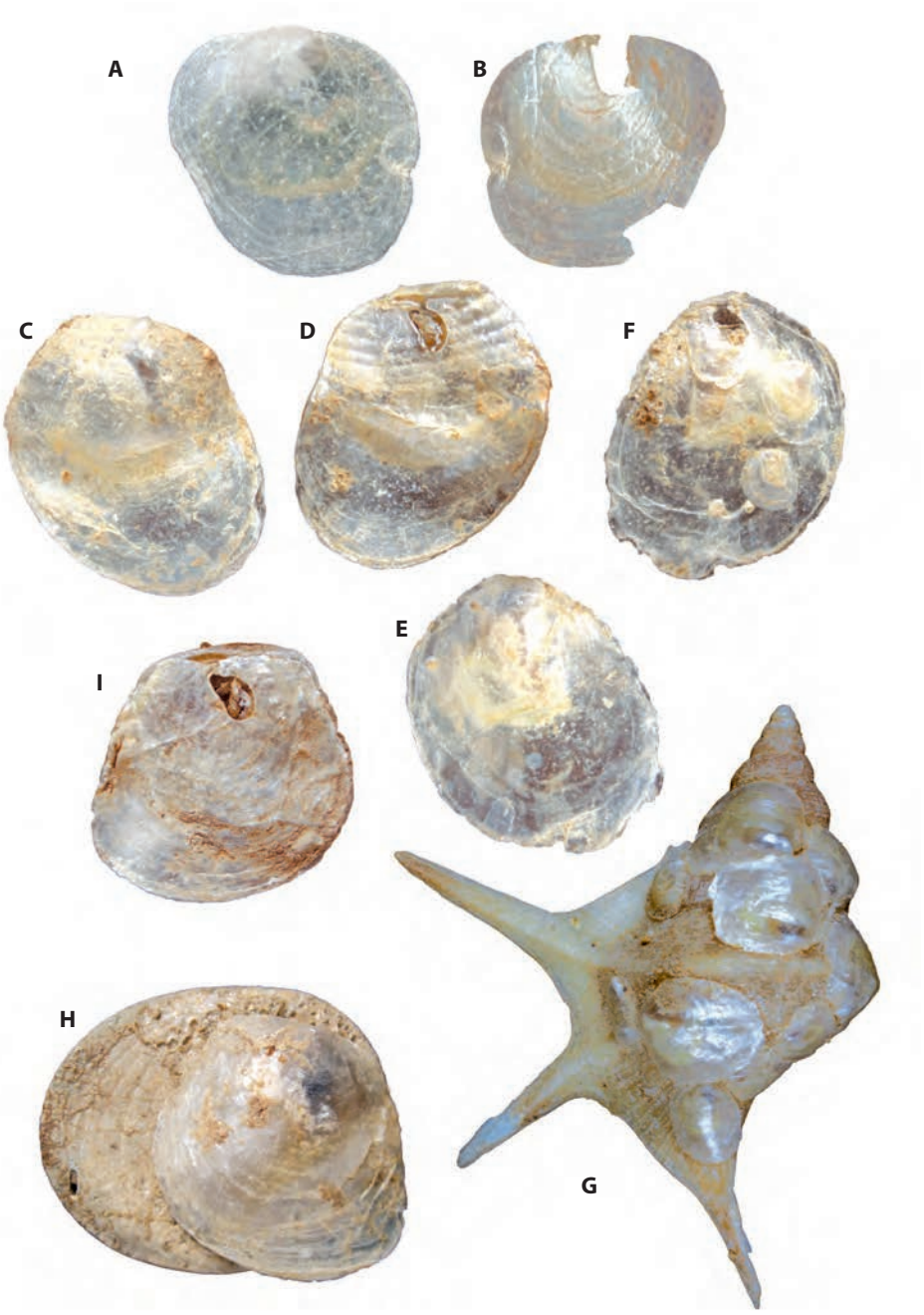
Shell small, up to 13 mm long (northern European specimens up to 22 mm), very variable in shape and sculpture, irregularly rounded to somewhat oval, inequivalve, very thin, left valve not very convex, right valve flat or irregular according to the substrate. Beaks more or less median. Surface smooth and with growth lines and -lamellae only or with small, more or less prominent scales, which are arranged radially. Byssal aperture in right valve oval, towards the dorsal margin nearly complete and leaving only a very small slit. Left valve with two close, but separated muscle impressions, which often are hardly visible; right valve with one muscle scar. Colour of valves translucent white.



Distribution. Iceland, Northern Norway, Faroe, British Isles southward to Morocco; Mediterranean; Cape Verde Islands; in West Africa recorded from Côte d'Ivoire and from southern Gabon to southern Angola (Porto Alexandre, Namibe province).

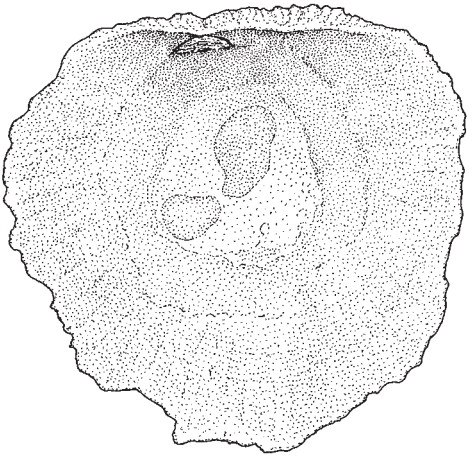
Biotope. On stones, gravel and shells of living and dead molluscs, mostly on soft bottom, offshore from 50 to about 110 m and deeper (in northern Europe also in shallow water, from low tide mark downward); in West Africa not common, in Europe common. Off Angola the species was mostly found attached to shells of live *Aporrhais elegantissima* Parenzan, 1970, in about 90-100 m.

Remarks. This species resembles juvenile *Anomia ephippium*, but is distinguished by possessing only two muscle impressions in the left valve, having a smaller byssal aperture and a slightly larger protoconch; the West African specimens are mostly smooth.



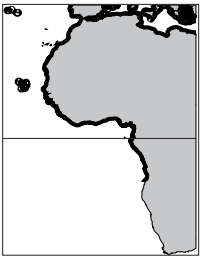
6.5. ***Heteranomia squamula*** **(Linnaeus, 1758).** **A-B**, Morocco, 33°47'N, 7°56'W, 122 m (9.6 mm). **C-D**, Ilha de Luanda, Luanda prov., N-Angola, 90-100 m (6.6 mm). **E-F**, same locality (6.7 mm). **G**, same locality, several specimens on a shell of *Aporrhais elegantissima* Parenzan, 1970. **H-I**, Ilha de Luanda, 40-60 m (6.5 mm) on a turbinid operculum.

Monia patelliformis (Linnaeus, 1761)



6.6. Ponta das Lagostas, Luanda prov., N-Angola, 5-20 m (lv, 21.2 mm).

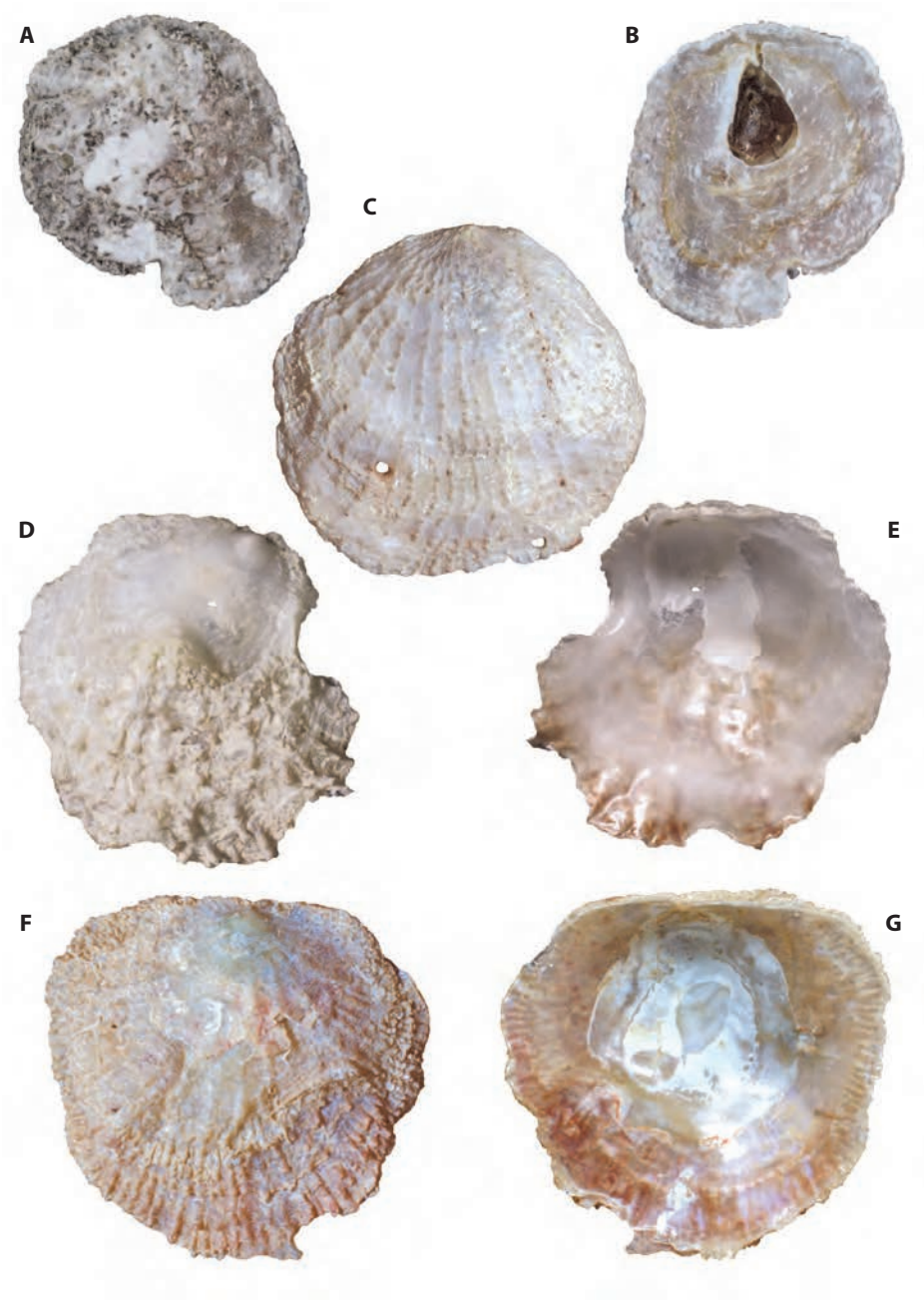
Shell up to 22 mm long (European specimens to 38 mm), variable in shape and sculpture, irregularly rounded to oval, with thin but strong left valve and fragile right valve. Left valve compressed, right valve flat. Beaks more or less median, not directly at the dorsal margin. Surface of left valve with very irregular, more or less numerous and close-set, often scaly, radial ribs or riblets, which are most prominent on the marginal half of the valve and which are sometimes bifurcating and occasionally obsolete. Immediate umbonal region smooth. Right valve with growth lines only. Byssal hole with a very narrow canal to the dorsal margin of the right valve. Left valve with two separated muscle scars. Outside of left valve whitish, cream or light brownish, sometimes with slightly darker brown dots close to the margins, occasionally with greenish, mostly on the umbos. Inside whitish to greenish, external colouration showing through, mostly along the margins.



Distribution. Southern Iceland, Norway (70.5°N), Faroe, British Isles to southern Angola (Benguela); Azores; Cape Verde Islands; throughout the Mediterranean.

Biotope. On rocky shores as well as on soft bottom attached to hard objects such as the undersides of stones and shells, from low tide mark to about 50 m; rare in West Africa, common in Europe.

Remarks. This species is easily recognized by its rather solid upper (left) valve with the mostly rough radial sculpture giving a somewhat *Patella*-like appearance, and the separate muscle impressions. Synonyms are *Anomia ornata* Locard, 1898, *A. striata* (da Costa, 1778) and *A. undulata* Gmelin, 1791.

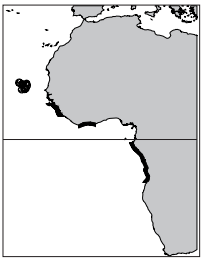


6.7. ***Monia patelliformis*** **(Linnaeus, 1761). A-B**, Porto dos Ferreiros, Brava, Cape Verde Islands, 30-50 m (12.7 mm ht). **C**, W of Baie de Sangarea, Guinea, 9°42'N, 15°33'W, 35 m (43.4 mm ht). **D-E**, W of Ile Tannah, Guinea, 9°12'N, 14°05.3'W, 30 m (20.1 mm). **F-G**, Ponta das Lagostas, Luanda prov., N-Angola, 5-20 m, (21.2 mm).

Pododesmus cf. *rudis* (Broderip, 1834)

6.8. Port-Gentil, Gabon, 0°55.8'S, 8°40.8'E, on the piles of an oil derrick platform, between 8 and 20 m; note closed byssal hole on lv (40.0 mm).

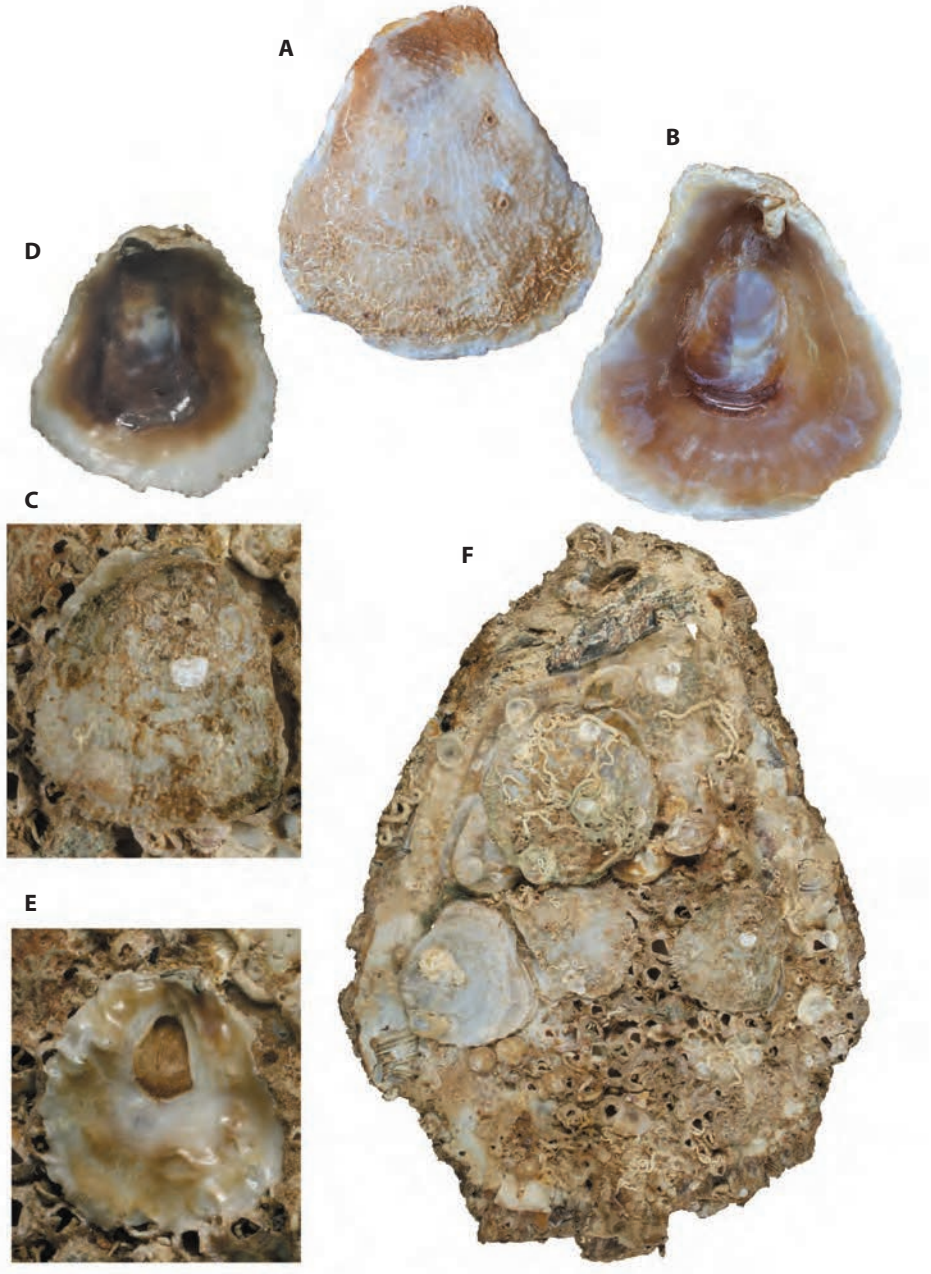
Shell up to 52 mm long, very variable in shape and sculpture, irregularly rounded to oval, higher than long to longer than high, with rather thin but solid left valve and thin right valve. Shell compressed, right valve flat. Beaks more or less median. Surface mostly with fine, irregular, close-set radial riblets bearing numerous, rather long scales. Occasionally riblets are less numerous or without scales and become obsolete on the umbonal part of the valve. Right valve often wholly cemented to the substrate, or alternatively, with byssal hole firmly closed by a calcareous plug. Resilifer impressed in the left valve and prominent in the right valve. Left valve with two close but separate muscle scars. Outside white, cream, yellowish, light brownish or greyish, occasionally with greenish. Inside of left valve white with brown central area or entirely dark brown with very narrow, white rim, occasionally white with light brownish hue only or entirely white. Right valve internally white, often tinged with light brown around the muscle scar area.



Distribution. Guinea (only a few empty valves found); Côte d'Ivoire; Gabon (Port-Gentil) to southern Angola (Moçâmedes, Namibe province); Cape Verde Islands.

Biotope. Cemented firmly to rocks, stones, dead mollusc shells and other hard objects, also to oil drilling platforms, from low water mark to about 35 m; common in southern Angola (where it lives together with *Hinnites corallinus*, otherwise uncommon to rare.

Remarks. The West African specimens are extremely close to the Caribbean *Pododesmus rudis* (North Carolina to Brazil, Bermudas), which inhabits a similar biotope. However, West African examples are darker brown on the inside of the left valve, and the muscle impressions are further apart. The West African populations are here provisionally considered conspecific with the Caribbean species. There may be distribution discontinuities in the northern and southern tropical zone proper.

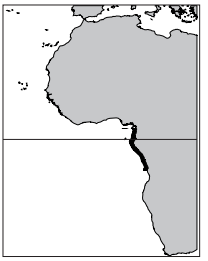


6.9. ***Pododesmus* cf. *rudis* (Broderip, 1834). A-B**, Port-Gentil, Gabon, 0°55.8'S, 8°40.8'E (47.1 mm) **C-E**, Palmeirinhas, Luanda prov., N-Angola (34.0 mm). **F**, same specimen with others *in situ* on a large oyster shell 210 mm high.

Plicatula angolensis Cosel, 1995

6.10. Port-Gentil, Gabon, on oil drilling platform piles (14.2 mm).

Shell up to 26 mm high, rounded to very irregular, higher than long to longer than high, rather thin but solid, somewhat inflated, with left valve flatter than right valve. Surface irregular, varying according to the substrate, with coarse growth stages and very irregular, rounded, occasionally scaly radial ribs. These are not visible everywhere, and the surface may become irregular and heavily encrusted by sessile organisms or the valve perforated by borers. Umbos of the left valve small, rounded and very prominent. Ears very small and ill-defined. Hinge in the right (lower) valve two strong and closely set hooked teeth forming together an elevated structure, and a small, very narrow resilifer between the teeth. These two teeth become fused close to the umbos and the upper part of the ligament, which is functional only in its lower part, is concealed beneath the fused teeth. Sockets of the opposite teeth form a deep cavity on the outer side of the rv teeth. Left (upper) valve with two strong, hooked teeth separated by a deep cavity containing the two sockets for the opposite teeth and the small resilifer. Outside whitish, inside white, occasionally stained with brown.



Distribution. Cameroon (3°27'N, 9°22'E, one dead valve) and Gabon (Port-Gentil) to northern Angola (Luanda).

Biotope. Cemented to rocks and other hard substrate (including oil drilling platforms), from low water mark to offshore (80-100 m). Just below low water, the species is mostly found under rocks which are deeply embedded in gravel, but where the water can still circulate. Not common.

Remarks. Although this species has been found both near the tidal zone and fairly deeper, the two forms are, according to the available material, not separable and are treated here as one species. This is the only record of the genus *Plicatula* for the eastern Atlantic. *P. angolensis* seems to be most common in the southern zone of seasonal upwelling and is absent from the greater part of the tropical zone proper, the atypical tropical zone in the Gulf of Guinea and the northern zone of seasonal upwelling (Senegal, Mauritania).

6.11. *Plicatula angolensis* Cosel, 1995. **A-B,** Barra do Dande, Bengo prov., N-Angola (paratype, 22.6 mm ht, photo Manuel Caballer/Recolnat). **C-E,** same locality (holotype, 26.5 mm ht, photo Manuel Caballer/Recolnat). **F-H**, same locality (paratype, 17.0 mm). **I**, Cabo Ledo, N-Angola, 10-40 m (specimens 7.0 and 3.5 mm).

Superfamily LIMOIDEA

Family LIMIDAE
- Genus ***Lima*** Bruguière, 1797 – 2 species (1 treated)
- Genus ***Acesta*** H. Adams & A. Adams, 1858 – 2 species
- Genus ***Ctenoides*** Mörch, 1853 – 1 species
- Genus ***Limaria*** Link, 1807 – 4 species
- Genus ***Limatula*** Wood, 1839 – 2 species (1 treated)
- Genus ***Notolimea*** Iredale, 1924 – 1 species

Superfamily Limoidea

This is a monotypic superfamily of bivalves which superficially resemble the Pectinoidea in having projecting "ears" on each side of the hinge line and a predominantly radial sculpture, but are not closely related to them and instead have a long, separate evolutionary history since the Palaeozoic. Contrary to the Pectinoidea, Limoidea are mostly inequilateral and generally lack a colour pattern.

Family LIMIDAE

Shells very small (less than 1 mm) to very large (over 250 mm), rounded, oval or subtrigonal, mostly higher than long, occasionally as long as high or longer than high, often oblique, generally equivalve, thin and fragile to thin and solid, compressed to inflated. Valves gaping anteriorly and posteriorly near the hinge margins, gaping anteriorly only or nearly to completely closed. Beaks more or less median or, in oblique species, behind the vertical midline. Surface smooth or with radial sculpture, rarely also with commarginal sculpture. Dorsal margin straight, with small auricles or ears at both sides. In some species anterior ears reduced or absent. Posterior ear often not well demarcated from the valve disk. Broadly triangular cardinal area between the beaks and the hinge margin. Ligament internal, situated in triangular resilifer in the middle of the cardinal area; Hinge teeth in adult specimens usually absent, or weak and arranged on both sides of the ligament. One adductor scar only. The Western Atlantic *Lima* and *Ctenoides* were revised by Mikkelsen & Bieler (2003).

The worldwide species number in this family, also known as "file clams", is estimated at 290, 12 of which are reported from West Africa. The Limidae live byssally attached to hard substrate or free on soft bottom; some build a nest with their byssus threads, to which they also attach other objects and which serves for protection. Many of the file-clams can swim by clapping their valves.

Genus *Lima* Bruguière, 1797. Shells medium-sized to rather large (to over 150 mm), subtrigonal, higher than long, slightly oblique, rather solid, compressed, with prominent, scaly, radial ribs. Hinge margin short, ears very small, anterior one even smaller than posterior one. For details, see Mikkelsen & Bieler (2003)

Genus *Ctenoides* Mörch, 1853. Shells small to rather large, oval, considerably higher than long, occasionally slightly oblique, rather thin but solid, compressed, with nearly equal-sized ears or else anterior ear somewhat larger. Byssal gape well marked, margins on both sides reflected. Surface with small to very fine, scaly, radial riblets which divaricate in the middle of the valve. Hinge with lateral teeth under the ends of the hinge margin.

Genus *Acesta* H. Adams & A. Adams, 1858. Shells large to very large (to over 250 mm), high-oval, rather thin, inequilateral, somewhat inflated, nearly smooth or with fine, often ill-defined, radial ribs. Anterior ears very small, beaks in the anterior part of the cardinal area.

Genus *Limaria* Link, 1807. Shells small to medium-sized, oval, more or less oblique, higher than long, thin, compressed to rather inflated, gaping at both sides, at one side only or closed. Ears nearly equal-sized, resilifer broad, no hinge teeth. Surface with fine, radial sculpture. Mantle tentacles capable of being extended considerably beyond the shell margins. *Mantellum* Mörch, 1853 (*non* Röding, 1798) is a synonym. The West African *Limaria* are still poorly known and present identification problems. The identification of some of them herein is still tentative, a revision of the group is overdue.

Genus *Limatula* Wood, 1839. Shells small (mostly less than 10 mm), high-oval, much higher than long, nearly equilateral, thin, very inflated, with appressed margins. Ears small, equal-sized, hinge without teeth. Surface with fine, radial sculpture, rarely also with commarginal sculpture. This is one of the most difficult genera of bivalves regarding species-level identification, and the deep-sea Atlantic species monographed by Allen (2004) are badly in need of taxonomic revision.

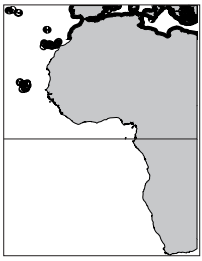
Genus *Notolimea* Iredale, 1924. Shells small, oval, somewhat higher than long, thin, nearly equilateral, inflated, with closed margin and strong radial ribs. Ears small and nearly equal-sized, hinge margin with numerous, small, taxodont teeth. Allen (2004) and Huber (2010) treated *Notolimea* as a synonym of *Limea* Bronn, 1831, but the type species of *Limea* is clearly oblique-inequilateral and *Notolimea* is here held as distinct.

Species treated (10)
Lima lima (Linnaeus, 1758); *Acesta excavata* (J.C. Fabricius, 1779); *Acesta angolensis* (Adam & Knudsen, 1955); *Ctenoides catherinae* Cosel, 1995; *Limaria tuberculata* (Olivi, 1792); *Limaria rotundata* (G.B. Sowerby II, 1843); *Limaria cf. pellucida* (C.B. Adams, 1846); *Limaria loscombi* (G.B. Sowerby I, 1823); *Limatula gwyni* (Sykes, 1903); *Notolimea crassa* (Forbes, 1844).

Other species reported in the area (2)
Lima marioni P. Fischer, 1882. Off Western Sahara, 640 m (Locard 1898).
Limatula smithi Allen, 2004. Angola Basin, 1007-4559 m (Allen 2004).

Lima lima (Linnaeus, 1758)

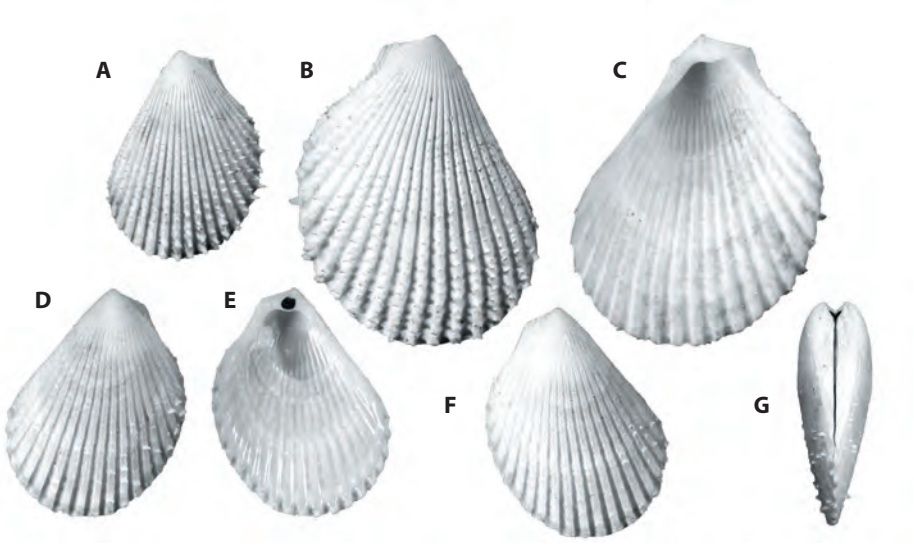
Shell up to 53 mm high, somewhat variable in outline, subtrigonal, considerably higher than long, slightly oblique, rather thin but solid, compressed. Beaks more or less median or slightly behind the vertical midline. Ears unequal, anterior ear small, posterior ear very small and nearly obsolete. Valves nearly completely closed, posterior byssal gape very narrow. Surface with 21-23 regular, prominent, rounded, radial ribs bearing close-set, sharp, scaly spines. Posterior ear with 5-8 narrower, scaly ribs. Cardinal area rather broad. Exterior ribs excavated on the interior. Valves entirely white.



Distribution. Eastern Atlantic: middle Portugal (S. Martinho) to Morocco (Agadir); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

Biotope. Byssally attached mostly to the undersides of rocks, stones, corals and other hard objects, in clear water, from about 2-4 m to offshore (100 m and occasionally deeper).

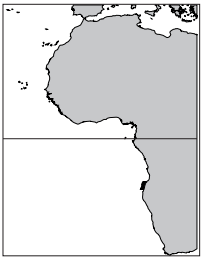
Remarks. This species reaches the eastern tropical zone only at the Cape Verde Archipelago, otherwise its eastern Atlantic range is confined to the northern warm-temperate region. This is the type species of the genus *Lima*. *Lima squamosa* Lamarck, 1818 is a synonym. The Western Atlantic counterpart, *L. caribbaea* d'Orbigny, 1842 is known from Bermuda, Southeast Florida, the Caribbean and South America to Brazil (Rio de Janeiro). A sibling Indo-Pacific species is *Lima vulgaris* (Link, 1807).



7.1. *Lima lima* (Linnaeus, 1758). A, SW of Ponta Tantão, Brava, Cape Verde Islands, 20 m (36.5 mm). B-C, same locality (53.6 mm). D-G, Cape Verde Islands, 90-100 m (27.4 mm).

Ctenoides catherinae Cosel, 1995

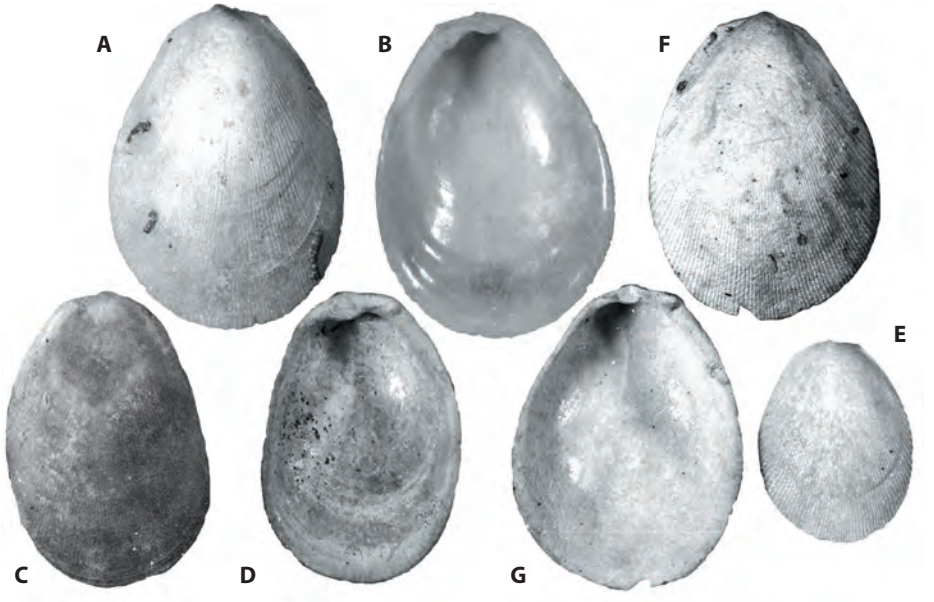
Shell small, up to 18 mm high and up to 12 mm long, high-oval, somewhat variable in outline, nearly symmetrical to slightly oblique, adult specimens much higher than long, rather thin and fragile, quite inflated. Beaks more or less median. Ears rather small, posterior ear indistinct and not demarcated from the disk. Valves posteriorly closed, anteriorly with short, narrow byssal opening just under the hinge line, margin on both sides slightly reflected. Surface with numerous, fine, slightly irregular, very close-set, rounded, radial ribs with tiny, rather regularly spaced, transverse constrictions, visible under a lens (x 10-20) only. Ribs in the middle of the shell narrowly divaricating. Ears also with narrow ribs. Cardinal area very narrow in juveniles and narrow to rather broad in fully grown specimens. Valves entirely white.



Distribution. Known from southern Angola (Baia da Lucira, no other localities) but so far found as dead valves only. A valve without locality data from the *Calypso* Expedition "Gulf of Guinea 1956" might originate from São Tomé or Ilha do Principe.

Biotope. Most probably mixed and coarse sand, from about 10 to 40 m; rare.

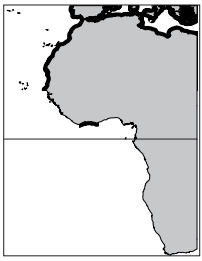
Remarks. This is the only eastern Atlantic record of the otherwise Caribbean and Indo-Pacific genus *Ctenoides*. The most similar species is *Ctenoides lischkei* (Lamy, 1930) from Japan and the adjacent Indo-Pacific. The Caribbean *C. mitis* (Lamarck, 1807) (= *C. tenera* (G.B. Sowerby II, 1843)) also has very fine ribs, but grows much larger.



7.2. *Ctenoides catherinae* Cosel, 1995. **A**-**B**, Doca, Baia da Lucira, Namibe prov. S-Angola, 10-20 m, calcareous algal debris, (holotype, 12.7 mm ht). **C**-**D**, same locality (paratype, 13.4 mm ht). **E**, same locality (paratype, 9.3 mm ht). **F**-**G**, same locality (paratype 14.1 mm ht).

Acesta excavata (J.C. Fabricius, 1779)

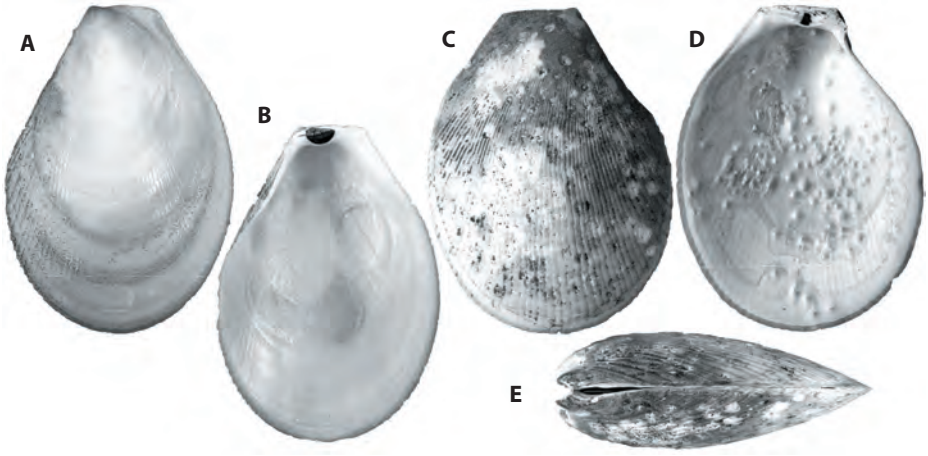
Shell large, up to 140 mm high, slightly variable in outline, high-oval, much higher than long, thin but rather solid, inflated. Beaks more or less median or slightly anterior to the vertical midline. Anterior ear considerably reduced and not visible in exterior view. Posterior ear medium-sized and not demarcated from the disk. Valves anteriorly with narrow byssal opening, posteriorly closed. Surface with numerous, more or less irregular, thin, low, close-set, radial ribs, becoming obsolete near the umbos and occasionally also in the middle of the valves. Interspaces in the middle of the valves often reduced to fine, radial grooves. Ribs also on the posterior ear. Periostracum pale straw-coloured to nearly colourless, often eroded on the umbonal part. Ribs occasionally weakly reflected on the interior near the margins. Valves entirely white to cream. Interior slightly iridescent.



Distribution. Greenland, S- and SW-Iceland; Northern Norway (especially in the deep fjords) southward to Senegal, Côte d'Ivoire; Azores; also known from the Western Mediterranean and both sides of Italy (Nolf & Verstraeten 2005; López-Correa *et al.* 2005).

Biotope. Occasionally on soft bottom suitable for trawling, on the continental shelf from about 270 m to 1000 m and deeper, but usually associated to escarpments on which it is byssally attached (López-Correa *et al.* 2005); not common anywhere.

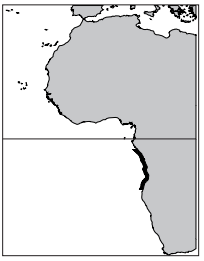
Remarks. This widespread deep-water species has been trawled at a few localities along the West African coast: off Mauritania, 320 and 425 m, off Dakar, 240-320 m and off Côte d'Ivoire (no depth information). West African specimens fall well within the variation limits. The Mediterranean specimens were given subspecific rank as *Lima excavata sublaevis* Nordsieck, 1969. This is the type species of the genus *Acesta*.



7.3. *Acesta excavata* (Fabricius, 1779). A-B, Dakar region, Senegal, 14°30'N 17°35.7'W, 240-320 m (94.5 mm). C-E, Abidjan region, Côte d'Ivoire (111.1 mm); note the large foraminifers covering the valves and scars on the inner side.

Acesta angolensis (Adam & Knudsen, 1955)

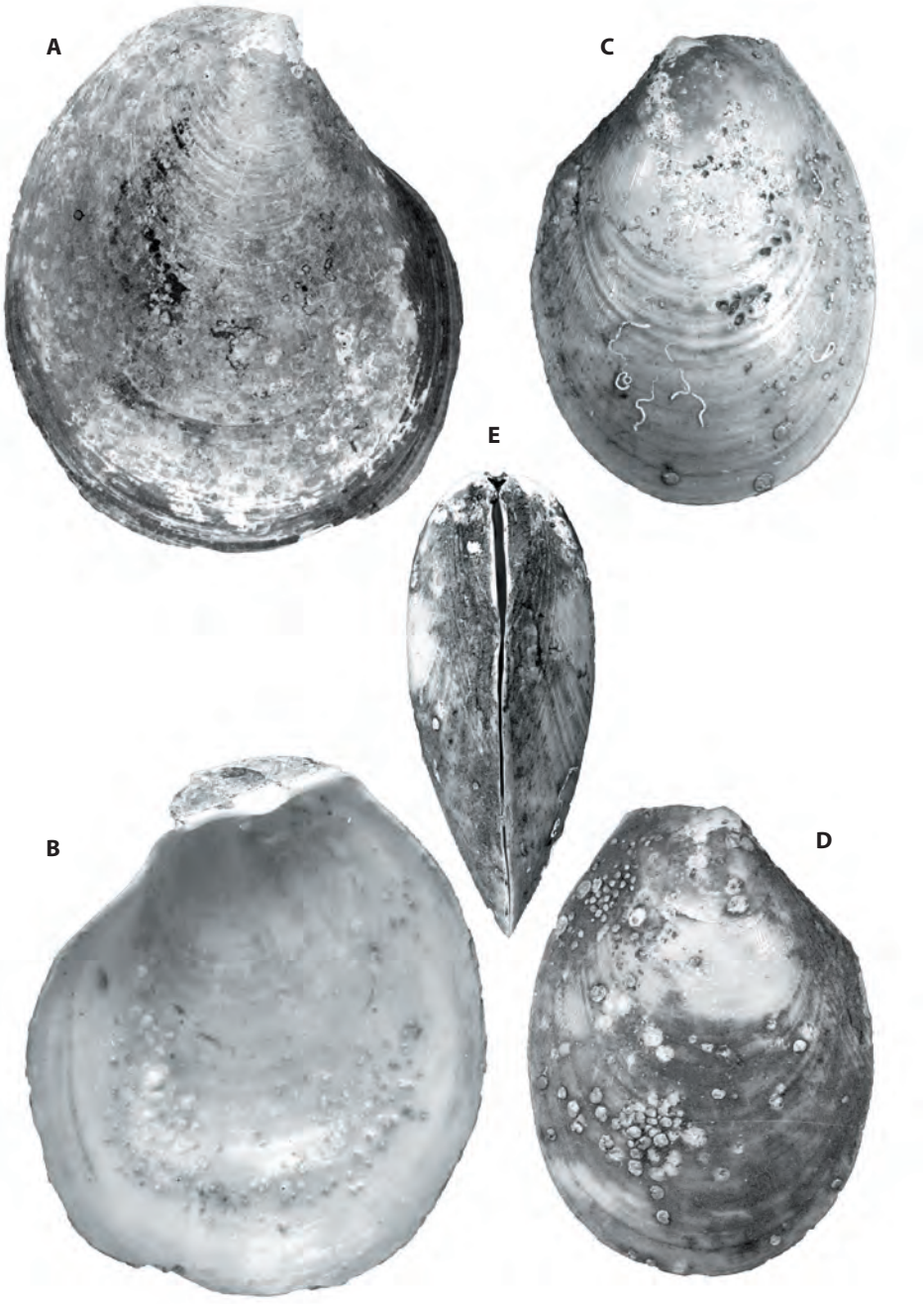
Shell large, up to 164 mm high and up to 130 mm long, slightly variable in outline, high-oval, much higher than long, thin and rather fragile, somewhat inflated. Beaks more or less median or slightly behind the vertical midline. Anterior ear very much reduced, but still visible as a small knob in exterior view. Posterior ear medium-sized and not demarcated from the disk. Valves anteriorly with a narrow byssal opening, posteriorly closed. Surface of the anterior and posterior slope with very fine, low, more or less ill-defined, radial riblets, middle part of the valves smooth, with only very faint, irregular radial striae, only visible under a lens (x 10-20). Posterior ear nearly smooth. Fully grown specimens with rather regular, very weak undulations along the margin and perpendicular to it, visible mostly by thickness differences of the periostracum. Periostracum thin, brownish to dark brown, in adult specimens persistent on the marginal area only. Valves entirely white. Interior not iridescent.



Distribution. Congo Brazzaville (Pointe-Noire) to southern Angola (Moçâmedes).

Biotope. Free on soft, mostly muddy bottom, on the slope from about 300 to 1000 m, not common.

Remarks. This species is distinguished from the very similar *A. excavata* by its larger, thinner, slightly less tumid and somewhat broader shell, which is less sculptured. The lunule of *A. angolensis* is shorter and often deeper than that of *A. excavata*, and the anterior auricles are smaller. Moreover, *A. excavata* lacks the fine undulations near the margins (for more information see Boss 1965 and Nolf & Verstraeten 2005). Specimens of both *Acesta* species are regularly found with parasitic foraminifers of the genus *Hyrrokkin* Cedhagen, 1994 on the shell. These foraminifers sit firmly on the surface of the *Acesta* and perforate the shell by making a very small hole through which they feed on the soft parts of the bivalve (Cedhagen 1994). The *Acesta* for its part tries to cover these holes by secreting further internal shell layers, causing nodule-like structures on the interior (see Marche -Marchad 1979). *A. angolensis* is occasionally taken by trawlers operating in deep-water and can also be found attached to crab traps in about 500 m around Moçâmedes (Namibe province).

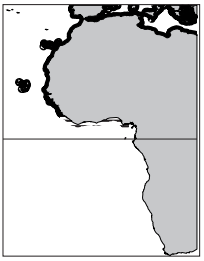


7.4. *Acesta angolensis* (Adam & Knudsen, 1955). A-B, off Pointe-Noire, Congo Brazzaville, 300 m (150 mm). C-E, Baia de Moçâmedes, Namibe prov., S-Angola, 300 m (109.7 mm).

Limaria tuberculata (Olivi, 1792)

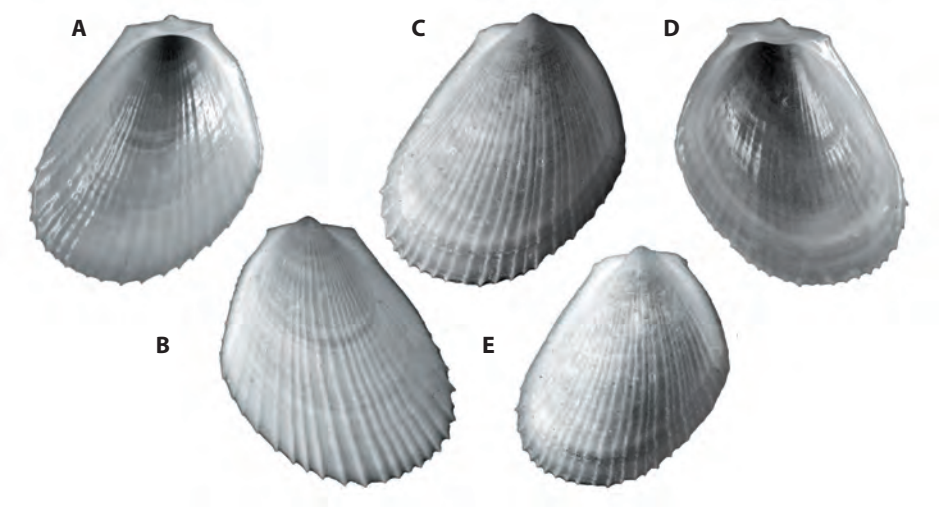
Shell up to 43 mm high and to 38 mm broad, variable in outline, obliquely oval, definitely higher than long (height-length ratio 1.15-1.35), thin but rather solid, inflated, gaping at both sides, anterior gape situated more ventrally than posterior gape. Beaks behind the vertical midline. Ears small, anterior ear slightly longer than posterior ear, the latter not demarcated from the valve disk. Surface with numerous (about 30-35), thin, slightly irregular radial ribs which often bear small nodules, mostly on the marginal part of the valves. Occasionally, smaller riblets are seen in the interspaces. Ears also with fine ribs. Hinge line short, about one third of shell length. Cardinal area very narrow, resilifer short and broad. Periostracum thin, pale yellowish to nearly colourless. External ribs reflected on the interior. Valves entirely white.

Distribution. Portugal (mouth of the Tagus) southward to Guinea (9°24'N); the few specimens obtained further southward to Nigeria by the R/V *Atlantide* may also belong to this species (Nolf 2005c); Canaries and Cape Verde Islands; throughout the Mediterranean.



Biotope. On sandy bottom, partly with seagrass, also with calcareous algae and shell debris, from shallow water (3-5 m) to about 40 m; uncommon south of Morocco, common in the Mediterranean. The species builds a nest of byssus threads.

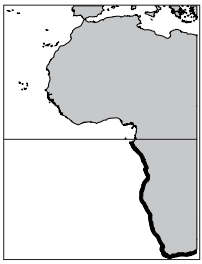
Remarks. This is the type species of the genus *Limaria* which was for a long time known under its well-established name *Limaria inflata* Link, 1807, now a synonym. It is occasionally cited as *Lima exilis* Wood, 1839, a very similar Crag (Tertiary of England) fossil which might be conspecific. From *L. rotundata* (see next entry) it differs by the narrower shape and more numerous ribs.



7.5. *Limaria tuberculata* (Olivi, 1792). A-B, SW of Madeleines, Dakar, Senegal, 51 m (23.3 mm). C-D, W of Rio Morébaya, Guinea, 9°24'N, 14°30'W, 38 m (22.5 mm). E, same locality (13.8 mm).

Limaria rotundata (G.B. Sowerby II, 1843)

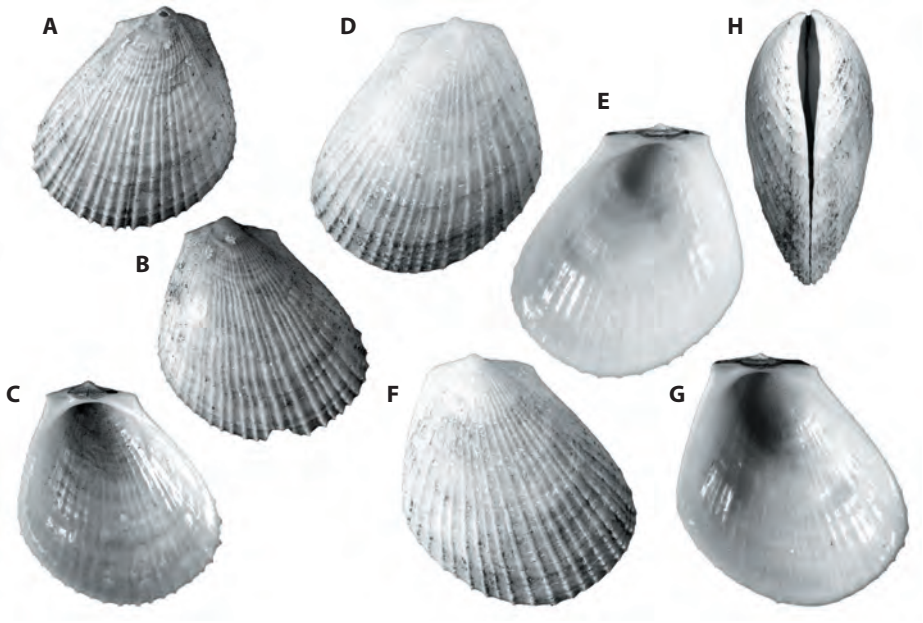
Shell up to 45 mm high and to 38 mm broad, variable in outline, obliquely-oval, higher than long, (height-length ratio 1.10-1.15), thin but rather solid, markedly inflated, gaping at both sides, anterior gape situated more ventrally than posterior gape. Beaks behind the vertical midline. Ears small, anterior ear slightly longer than posterior ear, the latter not demarcated from the valve disk. Surface with numerous (about 45), thin, slightly irregular radial ribs which often bear small nodules, mostly on the marginal part of the valves. Occasionally smaller riblets in the interspaces. Ears also with fine ribs. Hinge line long, about half of shell length Cardinal area very narrow, resilifer short and broad. Periostracum thin, pale yellowish to nearly colourless. External ribs reflected on the interior. Valves entirely white.



Distribution. Gabon (Port-Gentil), Congo Brazzaville (Loango; Pointe-Noire), Northern and southern Angola (Baia dos Tigres) and southward to South Africa (Saldanha Bay).

Biotope. On sandy bottom, mostly with stones on it or "in the holdfasts of kelp" (Nolf 2005c).

Remarks. This species is distinguished from *L. tuberculata* by the larger size and its less high and more stout-looking shell with fewer ribs, a longer hinge line and more inflated valves. It is the southern "counterpart" to the northern *L. tuberculata*.

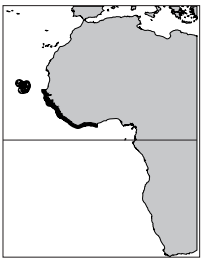


7.6. *Limaria rotundata* (G.B. Sowerby II, 1843). A-C, Port-Gentil, Gabon (24.0 mm). D-H, Futungo, Ilha do Destierro, Luanda prov., N-Angola (35.0 mm).

Limaria cf. *pellucida* (C.B. Adams, 1846)

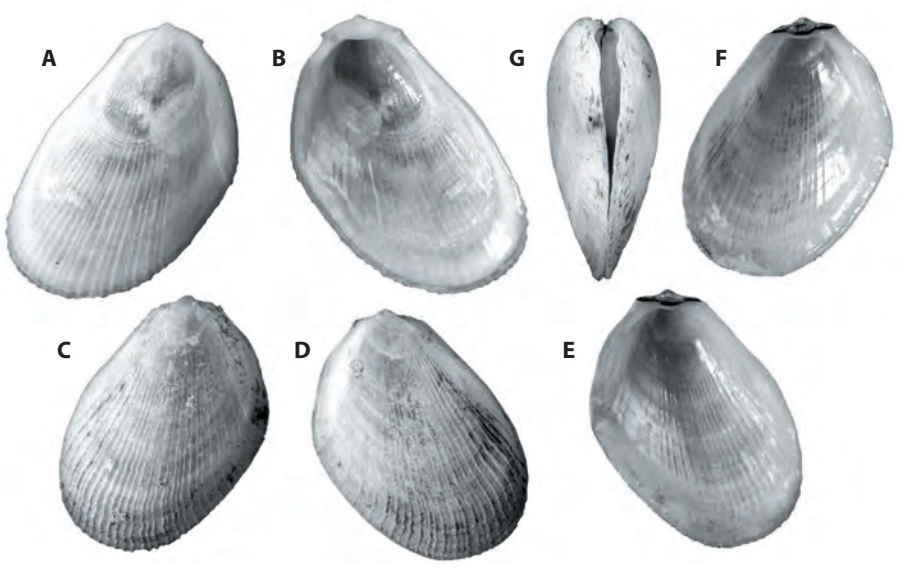
Shell small, up to 13 mm high and to 9 mm long, slightly variable in outline, high-oval, very oblique, thin and translucent, rather inflated, with a long, more or less narrow antero-ventral gape and a short, postero-dorsal byssal gape just under the hinge line. Beaks behind the vertical midline. Ears very small, anterior ear longer than posterior ear and not well demarcated from the valve disk, posterior ear short and somewhat protruding over the byssal opening. Surface with numerous, fine, sharp, thread-like, slightly irregular radial ribs and often finer riblets in the interspaces. Ears and adjacent anterior and postero-dorsal area with growth lines only and without radial ribs. Hinge margin short, cardinal area narrow, with short, very broad, triangular resilifer. Periostracum very thin, pale yellowish grey, nearly colourless and eroded on the umbonal part of the valve. External sculpture slightly reflected on the interior. Valves entirely white.

Distribution. Senegal (Dakar) to Côte d'Ivoire and perhaps further eastward; Cape Verde Islands.



Biotope. On fine, mixed and coarse sand, often with calcareous algae, shells, shell debris and gravel, offshore from 15 to about 40 m, uncommon.

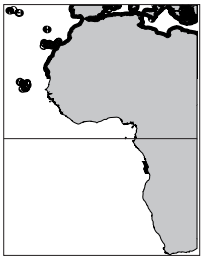
Remarks. This species is close to the European *L. hians* (Gmelin, 1791), but is much smaller, more inflated and has narrower gapes. Furthermore, the postero-dorsal margin is conspicuously convexity, whereas in *L. hians* it is less so. The Caribbean *L. pellucida* (C.B. Adams, 1846) is extremely close, and therefore the West African population is provisionally placed within the variability of this species.



7.7. *Limaria* cf. *pellucida* (C.B. Adams, 1846). A-B, Mindelo, São Vicente, Cape Verde Islands (14.3 mm). C-G, Abidjan region, Côte d'Ivoire (12.6 mm).

Limaria loscombi (G.B. Sowerby I, 1823)

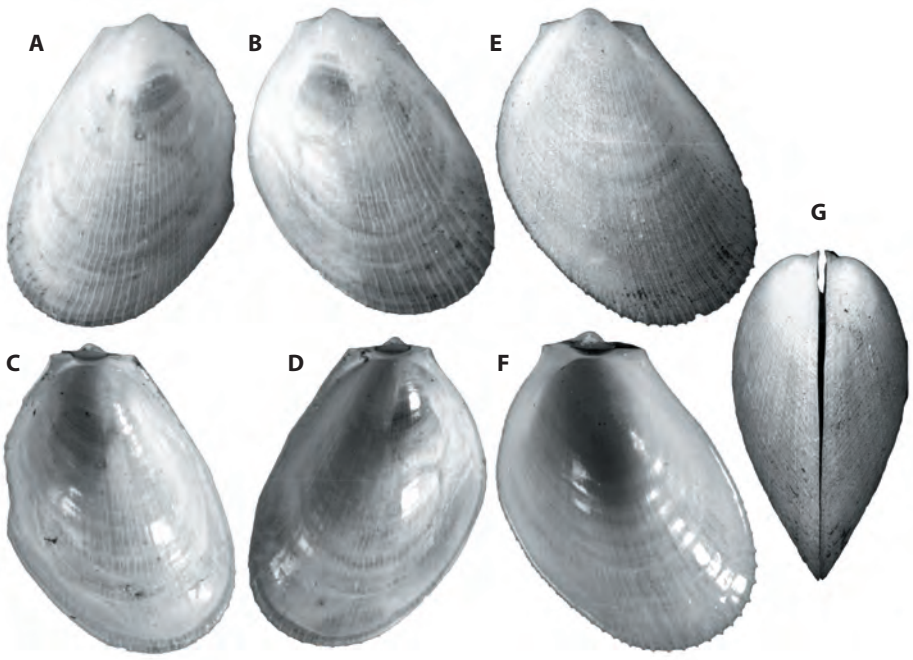
Shell small, up to 11 mm high and to 8 mm long (European specimens up to 19 mm high), obliquely-oval, higher than long, thin, inflated, with nearly completely closed valves. Beaks in front of the vertical midline. Ears small, nearly equal in size, anterior ear slightly longer. Surface with numerous, very fine, slightly irregular, thread-like, radial ribs and often smaller riblets between them, which themselves are uneven in size; ears smooth. Cardinal area narrow, ligament short and very broad. Periostracum very thin and nearly colourless, persistent only on the marginal area. External sculpture slightly visible on the interior. Valves entirely white.



Distribution. Norway (70°N), Faroe, British Isles southward to Mauritania (18°N); northern Angola (Luanda); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean. Uncommon in Europe, rare in West Africa.

Biotope. On muddy sand, fine and mixed sand, offshore from 35 m to about 100 m and deeper. Builds a nest out of its byssus threads.

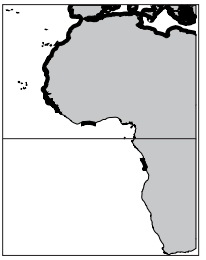
Remarks. This temperate species has a widely disjunct distribution; it has not been reported from the tropical zone proper and the zones with weaker upwelling. This is the type species of subgenus *Limatulella* Sacco, 1898.



7.8. *Limaria loscombi* (G.B. Sowerby I, 1823). A-D, Mauritania, 18°40'N, 16°31'W, 95 m (8.3 mm). E-G, Azores, 38°34'N, 28°32.5'W, 77 m (14.6 mm).

Limatula gwyni (Sykes, 1903)

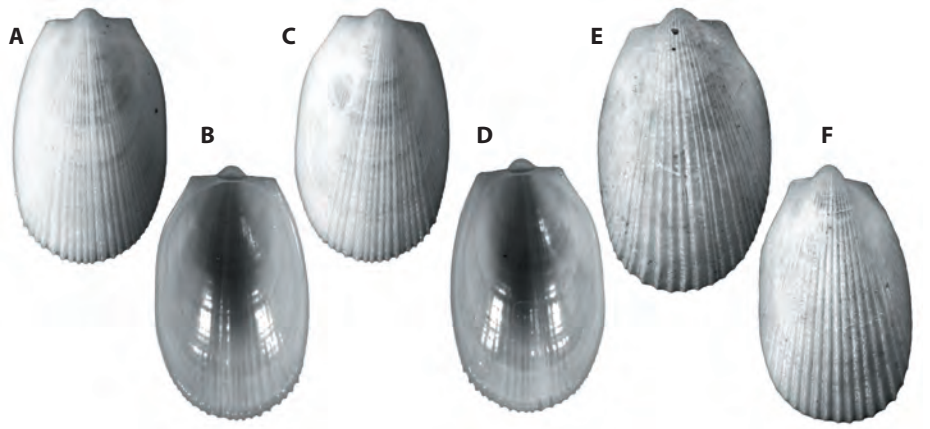
Shell small, up to 9 mm high, regularly high-oval, nearly equilateral, much higher than long, thin, very inflated, with closed valves. Beaks in the middle. Ears small, nearly equal-sized and not well demarcated from the valve disk. Surface with numerous (about 30-40), thin, fine, sharp, often slightly unequal, radial ribs and occasionally finer riblets in the interspaces. Near the ventral margin, the ribs are often slightly nodulose, a character visible only under a lens. The two middle ribs are either like the neighbouring ribs or slightly stronger; on the interior, they are always indicated by a shallow groove which is more prominent than the remaining reflections of the external ribs. Anterior ear smooth, posterior ear occasionally with very fine radial ribs. Cardinal area narrow, resilifer short and broad. Periostracum very thin, cream to nearly colourless. Valves entirely white.



Distribution. Norway (68°N), British Isles southward to Guinea (southwest of Conakry); Côte d'Ivoire; throughout the Mediterranean. A single very young valve from northern Angola (Ambrizete) might also belong to this species.

Biotope. On muddy sand, mixed sand and coarse sand, also with shell debris, from 20 to about 50 m, not common, rare in West Africa.

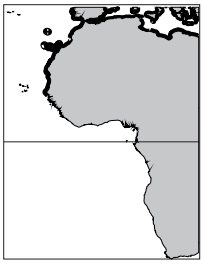
Remarks. This species is distinguished from the European *L. subauriculata* (Montagu, 1808) by growing twice as large and by the evenly, more broadly rounded ventral margin. This is *Lima elliptica* Jeffreys, 1863 (*non* Whiteaves, 1861) and *Lima sulcata* Brown, 1827 (*non* Lamarck, 1819). Huber (2010) proposed to reinstate the earlier name *Limatula nivea* (Brocchi, 1814) for this species, but this is not advisable because that name encompasses both the present species and *L. subauriculata* and was used prevalently for the latter by Mediterranean authors. The West African distribution pattern largely corresponds to the regions with weaker seasonal upwelling.



7.9. *Limatula gwyni* (Sykes, 1903). **A**-**D**, W of Sierra Leone border, Guinea, 9°03'N, 15°05'W, 109 m (7.0 mm). **E**, W of Ile Tannah, Guinea, 9°11.4'N, 14°52.5'W, 53 m (7.8 mm). **F**, W of Baie de Sangarea, Guinea, 9°42.4'N, 14°29'W, 31 m (7.1 mm).

Notolimea crassa (Forbes, 1844)

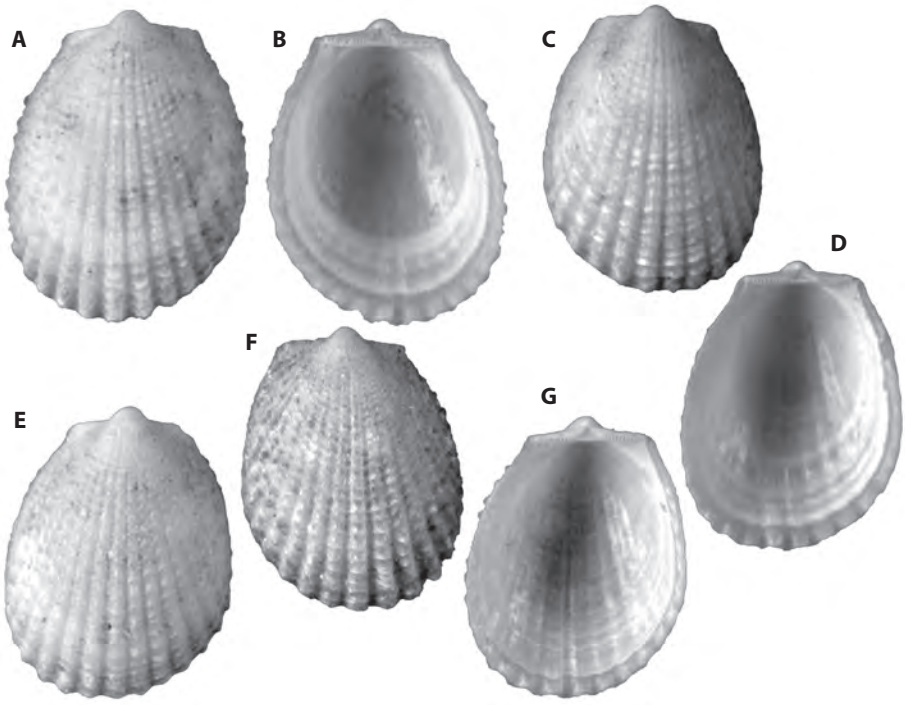
Shell very small, up to 4 mm high, oval, nearly equilateral, higher than long, thin but rather solid, inflated, with closed valves. Beaks in the middle. Ears equal-sized, not demarcated from the shell disk. Surface with about 20-30 strong, prominent, rounded, radial ribs crossed by thin, close-set commarginal lamellae which on the ribs are scaly. Ears with very dense, commarginal lamellae. Cardinal area rather broad and narrow, resilifer small, hinge line with numerous, small, taxodont teeth on both sides of the ligamental pit. External ribs indicated on the interior. Periostracum very thin, pale straw-coloured to nearly colourless. Valves entirely white to cream.



Distribution. Norway (59°N), W-Iceland, British Isles southward to Senegal (Dakar).

Biotope. On soft bottom, offshore from 150 to 250 m and deeper; not common.

Remarks. The Atlantic forms were distinguished by some authors (*e.g.* Allen 2004) as *Notolimea sarsii* (Lovén, 1846) from the Mediterranean *N. crassa*, but until more material is available this is not definitively settled.



7.10. *Notolimea crassa* (Forbes, 1844). **A**-**B**, off Cap-Vert Peninsula, Senegal, 250-150 m (4.2 mm). **C**-**D**, same locality (3.6 mm). **E**, same locality (3.9 mm). **F**-**G**, same locality (3.6 mm).

Superfamily OSTREOIDEA

Family GRYPHAEIAE
- Genus ***Hyotissa*** Stenzel, 1971 – 1 species
- Genus ***Neopycnodonte*** Stenzel, 1971 – 2 species (1 treated)

Family OSTREIDAE
- Genus ***Ostrea*** Linnaeus, 1758 – 1 species
- Genus ***Dendostrea*** Swainson, 1835 – 1 species
- Genus ***Crassostrea*** Sacco, 1897 – 1 species
- Genus ***Saccostrea*** Dollfus & Dautzenberg, 1920 – 1 species
- Genus ***Striostrea*** Vialov, 1936 – 1 species

Superfamily Ostreoidea

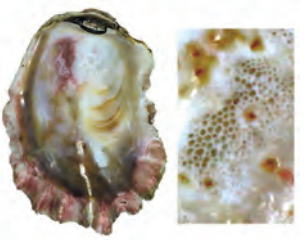
This superfamily includes the two extant families of oysters and a few extinct relatives. Oysters are the bivalves most frequently used for human consumption, and they are fished or farmed in many places of the world. They are among the most popular bivalves and are renown since the antiquity. The literature on all aspects of oysters is enormous; there exist also a few systematic accounts treating certain taxonomic or geographic groups or the whole superfamily. The supraspecific systematic arrangement given by Stenzel (1971) and Harry (1985) have recently been reappraised using molecular characters (*e.g.* Kirkendale *et al*. 2004; Salvi & Mariottini 2016). On the species level, the taxonomy of oysters is often extremely complicated. In many cases, names have been given to one species and then have been employed by subsequent authors for other species, sometimes several of them. This and other thorny taxonomic problems will only be solved by a comprehensive, modern, revision on worldwide basis, considering both shell morphology and anatomy of the soft parts, and also employing DNA-sequencing. The names of the species here treated are those generally used, although some of them for the moment can only be tentative.

Yonge (1967) provided an easy-to-read popular general introduction. Of the suborder Ostreina, a checklist of all supraspecific taxa with diagnosis, annotations and illustrations was compiled by Zaruba (1996), unfortunately in Czech language only (with brief English summary), which, anyway, is a "must" for oyster people. The most recent taxonomic treatment was provided by Huber (2010).

All oysters live on hard substrates to which they are cemented by the left valve. The attachment area can be very small to nearly valve-sized. Several oysters are incubatory, others have a planktonic larval phase.

Family GRYPHAEIDAE

Shells medium-sized to very large (up to 500 mm), more or less inequivalve, irregularly high-oval, rounded, triangular or distorted. Many species with a very convex left valve and flat to even concave right valve; other species with nearly equal valves. Shell structure with a diagnostic pattern of minute vesicles, often visible along the inner margins of the valve. Surface with or without irregular radial sculpture. Chomata not nodulose but more or less closely spaced ridges ("vermicular" and "lath" chomata, see Harry 1985). Contrary to the Ostreidae, the adductor muscle scar is closer to the hinge than to the ventral edge. There are also important distinctive characters in the soft parts and the embryonic shell: the digestive tract passes through the pericardium and the ventricle of the heart like in most bivalves and in the larval shell, the row of teeth and sockets along the hinge line is not interrupted. The species are not incubatory. Only 10 extant species are known, of which 3 are present in West Africa, but the family has an extensive fossil record.



Genus *Hyotissa* Stenzel, 1971. Shells medium-sized to large (over 200 mm), irregularly subcircular to high-oval, with vermicular chomata only, nearly equally convex right and left valve or slightly more convex left valve, and vesicular structure generally well visible along the inner margins. Surface with coarse, irregular radial folds. Attachment area small to large, shell more or less distorted according to the substrate. *Parahyotissa* Harry, 1985 was described as different from *Hyotissa* by its much smaller size, the lighter colour, and the ventral margin of the adductor scar not elevated, but was treated as a synonym of *Hyotissa* by Kirkendale *et al.* (2004).

Genus *Neopycnodonte* Stenzel, 1971. Shells medium-sized to large (over 200 mm), irregular, ovate to very high in outline, thin to quite thick but light-weighted due to the vesicular structure, with inflated left valve and flat to concave right valve. Surface smooth and foliate.

Species treated (2)
Hyotissa mcgintyi (Harry, 1985), *Neopycnodonte cochlear* (Poli, 1795).

Other species reported in the area (1)
Neopycnodonte zibrowii Gofas, Salas & Taviani, 2009. Off Mauritania, 243 m; off Angola, 291-307 m (Beuck *et al.* 2016).

Family OSTREIDAE

Shells medium-sized to very large, inequivalve to very inequivalve, more or less inequilateral, variable in shape, irregular to very irregular and distorted, but when not influenced by the substrate, general outline from high-elongate or high-oval to circular, somewhat triangular or long-oval. Valves generally thick but rather light because of spaces between the thin shell layers. Left (lower, cemented) valve often somewhat larger and mostly more convex than the right valve, which is often more or less flat or even concave. Surface with fine to coarse, irregular radial sculpture and irregular, commarginal, foliaceous layers. Hinge of adults without teeth, with an internal ligament; cardinal area very narrow to broad, with short to long, triangular resilifer in the middle. In many species there are small tubercles (anachomata) or nodules along the edge of the inner surface of the right valve, on both sides of the hinge line, occasionally around the whole valve. The left valve has corresponding pits (catachomata). Interior with one single adductor scar, nearly midway between hinge margin and ventral margin or closer to the ventral margin; adults without foot and byssus. Anatomically, Ostreidae (but not Gryphaeidae) differ from most other bivalves by having the digestive tract passing dorsally to the pericardium but not through the heart itself. Oysters have planktonic larvae, the larval shell with four teeth and sockets on each valve, arranged in two groups of two and two with a wide gap in the middle between them. The family contains both incubatory and

non-incubatory species. Ostreidae may be solitary but are more often, gregarious and can form vast reefs. Many species tolerate or need slightly reduced salinity or brackish water conditions, and seasonal salinity changes are often indispensable for their life cycle, others are fully marine. The oysters inhabit the tidal zone or are entirely subtidal but mostly in shallow water, they are found in turbid as well as in clear water. Thirty six species worldwide were listed by Harry (1981) who adopted a rather "lumping" species view, but more recent estimates reach 67 species, 5 of which in West Africa.

Genus *Ostrea* Linnaeus, 1758. Shells medium-sized to large (over 200 mm), thick but not very heavy, inequivalve, orbicular to sometimes higher than long or somewhat oval to irregularly triangular or distorted. Left valve deeper than right valve. Surface of left valve with irregular, with radial folds, right valve often smooth. Attachment area mostly small. Margin with typical, small, irregular folds. Chomata present at both sides of the hinge line. The species are incubatory.

Genus *Dendostrea* Swainson, 1835. Shells medium-sized to quite large (over 90 mm), rather thin but solid, very irregular, broadly-triangular to high-leaf-shaped or entirely distorted. Left valve more convex than right valve. Surface with irregular, prominent, radial ribs or folds, left valve often with short, finger-like projections around the attachment area, the so-called claspers which attach the shell to substrates like gorgonian stems. Chomata small, right valve with irregular, fine granules along the margins. The species are incubatory. The name has been variously spelled *Dendrostrea* of *Dendrostraea*, but these are incorrect subsequent spellings under ICZN Art. 32.5.1.

Genus *Crassostrea* Sacco, 1897. Shells medium sized to very large, high-oval to very high, often with nearly parallel anterior and posterior margins. Left valve slightly to markedly more convex than right valve. Surface with commarginal, lamellose growth lines and growth stages and often with irregular radial folds or ribs. Attachment area small to rather large. No chomata on sides of the hinge line. The species undergo a planktonic larval phase. These are the principal mangrove oysters. The genus has recently been redifined to comprise only the Atlantic lineage (Lazoski *et al.* 2011), whereas *Crassostrea angulata* (Lamarck, 1819) from Taiwan and the very closely related *C. gigas* (Thunberg, 1793) from Japan, which repeatedly were introduced in Europe for aquaculture purpose, have been transferred to the genus *Magallana* Salvi & Mariottini, 2016, sister to *Crassostrea* in the Pacific (Varela *et al.* 2007; Salvi & Mariottini 2016).

Genus *Saccostrea* Dollfus & Dautzenberg, 1920. Shells small to medium-sized, variable in shape, occasionally with very high, projecting cardinal area in the left valve, inequivalve, quite thick and solid. Left valve very inflated and often with a deep umbonal cavity. Right valve rather flat. Surface with irregular commarginal lamellae or commonly corroded. Attachment area large. Marginal area with radial folds. Chomata present, sometimes around the whole valves. The species of this genus are not incubatory.

Genus *Striostrea* Vialov, 1936. Shells medium-sized to very large (over 250 mm), massive and heavy, very irregular, rounded to high-oval, inequivalve, with a convex to very convex left valve and flat to convex, slightly smaller, right valve. Surface with dense, irregular, commarginal lamellae and in young specimens with fine, irregular radial striae. Cardinal area occasionally extremely prolonged, with hollow chambers in the cavity. Interior iridescent whitish, often with reddish brown. Chomata absent, indistinct or well marked. The species go through a planktonic larval phase.

Species treated (5)
Ostrea stentina (Payraudeau, 1826); *Dendostrea senegalensis* (Gmelin, 1791); *Crassostrea tulipa* (Lamarck, 1819); *Saccostrea cucullata* (Born, 1778); *Striostrea denticulata* (Born, 1778).

8.1. ***Crassostrea tulipa* (Lamarck, 1819).** Cap Roxo – Rio Cacheu, Guinea-Bissau, 12°09.5'N, 16°42'W, 8 m, on a live *Cymbium* of 200 mm.

8.2. *Striostrea denticulata* (Born, 1778). **A-B**, specimens scratched off from the hull of the R/V *Talisman* at Dahomey (now Benin) in 1893, 150 mm (the whole), MNHN old coll. **C-D**, inside of upper valves of the same specimens. **E**, accompanying label (misidentified as *Ostrea guineensis*).

Oysters as seafood in West Africa

Crassostrea tulipa, also known as *Crassostrea gasar*, is the principal West African food oyster. In former times it was often obtained by just cutting the mangrove roots to which oysters were attached in clusters and transporting th.e entire root (a severed root with the oysters could weigh up to 25 kg) to the place of processing. Today, with the decline of the mangroves due to pollution, climate change and overcollecting at many places, this should be banned. The oysters are mostly eaten directly by the local populations or sold on the village markets after the flesh has been taken out of the shells. *Crassostrea tulipa* has a great potential for being industrially farmed and exploited, and could be exported. Subrecent valves (about 5000 years old), which can attain 200 mm in height, are abundant in kitchen middens near the mouth of the Senegal River and in the quaternary deposits of Mauritania.

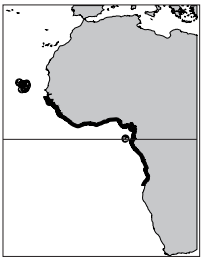
Farming experiments in Casamance revealed that small specimens from the open sea (see above) which have been transferred to sheltered basins and creeks bordered by mangroves and linked with the sea only by the Casamance River, cannot withstand the different ecological conditions, and died out rather rapidly (Gilles pers. comm.). This fact could support the opinion that two separate species of *Crassostrea* may be involved. However, only DNA analysis could provide confirmation. For detailed information on ecology and rearing of this oyster, see among others Ajana (1980), Gilles (1991) and Zabi & Le Loeuff (1993, there also additional bibliography). Another study carried out in Sierra Leone starting in 1974 (Kamara 1982) found that suspended culture was promising, with rafts producing an average 7-cm and 7-g oyster in 7 months.

Striostrea denticulata is known as "huître des rochers" to the inhabitants of Conakry (Guinea), as "huître de Pointe-Noire" in Congo. At least in these places it is collected and locally consumed. However, because of overcollecting and pollution, it seems to be nowadays less common than in the 1940s and 1950s.

Saccostrea cucullata is potentially a seafood item and is exploited as such in the Indian Ocean, but West African populations are either formed of individuals which are too small for this purpose (São Tomé, Congo) or live in scarcely populated places (southern Angola).

Hyotissa mcgintyi (Harry, 1985)

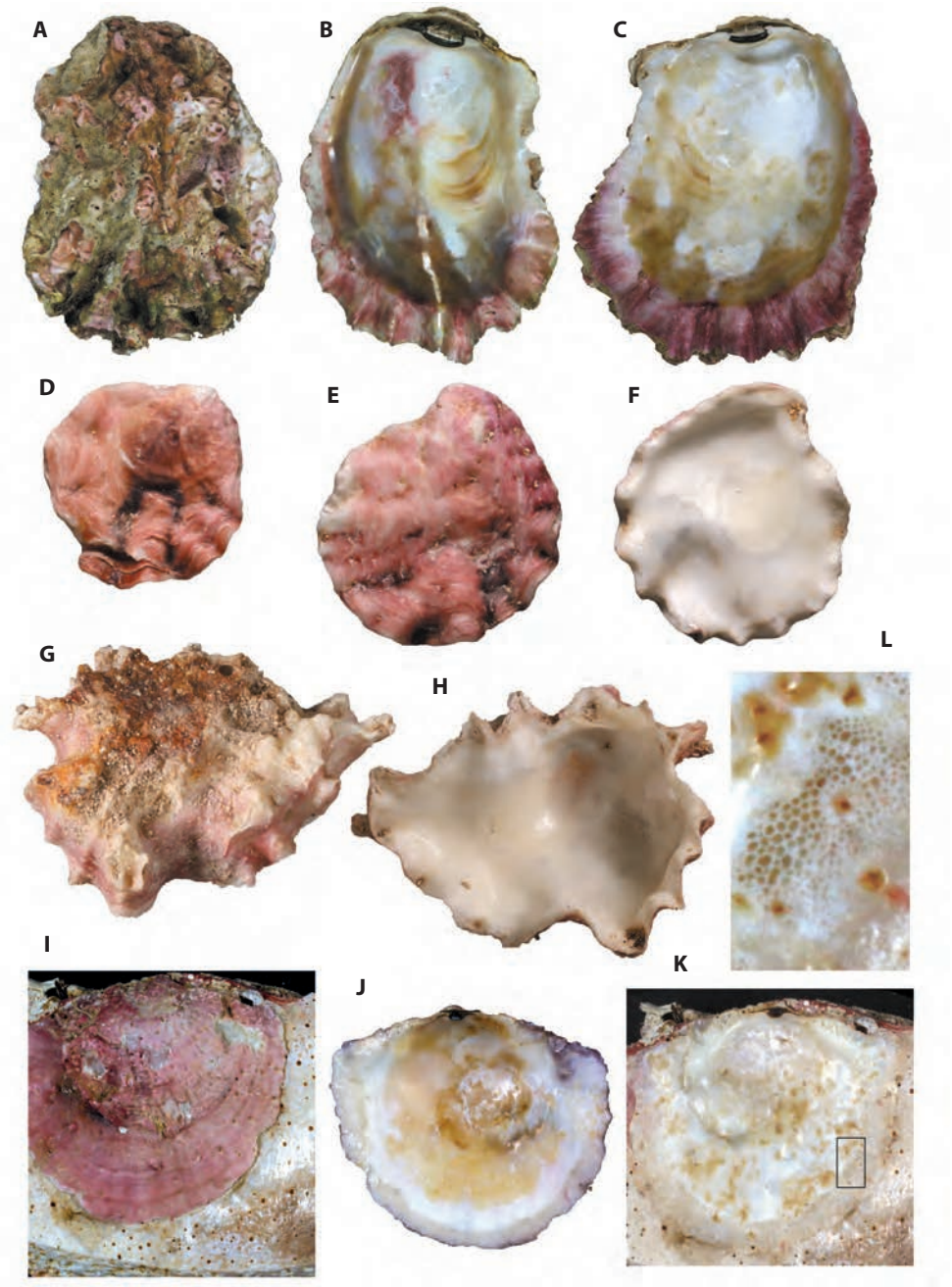
Shell up to 100 mm long and high, more or less rounded to somewhat higher than long and oval, irregular, rather thick and solid, with valves of nearly equal tumidity. Surface of the umbonal part irregular, marginal part with strong, irregular radial ribs occasionally bearing a few foliate spines and ending in sharply folded, sawtooth-like margins. Young specimens irregular according to the substrate; they can be very thin and at first glance difficult to assign to species. Hinge line straight, cardinal area more or less high and oblique-triangular; vermiculate chomata on the margin near the ligament only, not always well visible. Vesicular shell structure best visible under a lens (x 10-20) on the interior near the margins or where the valve is broken. Outside reddish to brownish, inside white, often stained with dirty greenish and with a greenish or reddish to dark purplish rim along the margin.



Distribution. Eastern Atlantic: Senegal (Casamance) to southern Angola (Santa Maria, Benguela); Cape Verde Islands, São Tomé, Ilha do Principe, Annobon; Western Atlantic: Southeast Florida; throughout the Caribbean to Colombia, Venezuela and the Lesser Antilles, perhaps more southward to Brazil.

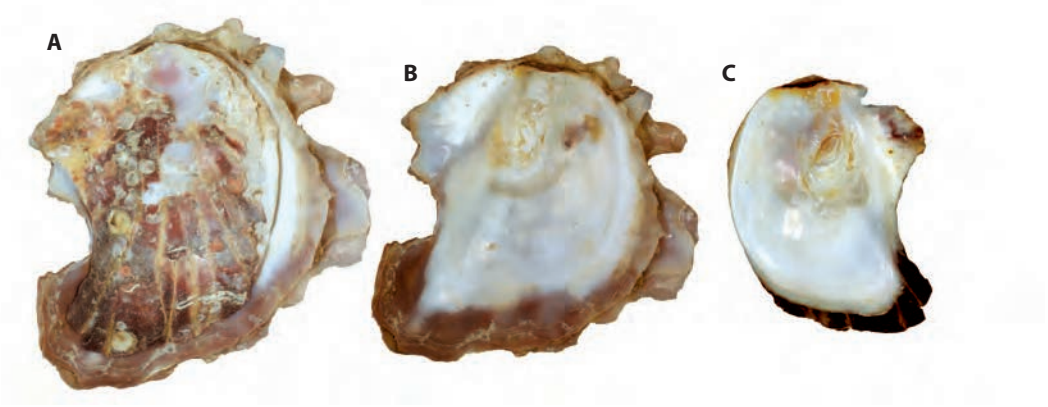
Biotope. On rocky bottom, gravel or sand with shells, coral pieces and calcareous algae, often also on wrecks and oil drilling platforms, from about 3 m to offshore, about 60 m, always in clear water; uncommon. On the vast continental shelf off Guinea it was found solitary or in clusters of at most four individuals. Accompanying molluscs were *Arcopsis afra*, *Talochlamys multistriata*, *Lyrocardium aeolicum*, *Chama crenulata*, and the snail *Muricanthus angularis* (Lamarck, 1822).

Remarks. This widespread tropical oyster is easily recognized by its vesicular shell structure. It is nowhere very common and is therefore not of commercial interest. Specimens are occasionally taken in trawls. This species was often synonymized with the close Indo-Pacific species *Hyotissa hyotis* (Linnaeus, 1758), which grows much larger (up to 200 mm) and which has often dark brown to purple or nearly black inside margins whereas in *H. mcgintyi* the margins are mostly whitish with lighter purple or red. Huber (2010) suggested to revive the earlier name *rosea* (Gmelin, 1791) but this is not in usage and meets the requirements for being declared "*nomen oblitum*". This is "Le Bajet" and "Le Vétan", of Adanson and the type species of *Parahyotissa*.



8.3. *Hyotissa mcgintyi* (Harry, 1985). **A**-**C**, W of Ile Tannah, Guinea, 9°12'N, 15°28.5'W, 41 m (65 mm). **D**-**H**, Santa Maria, Ilha do Sal, beach drift (30.5 + 37.0 + 55.0 mm). **I**-**K**, Baia Santa Maria, Benguela prov., S-Angola (juvenile spm.38.6 mm). **L**, Detail of the framed area of K showing the vesicular structure characteristic of Gryphaeidae.

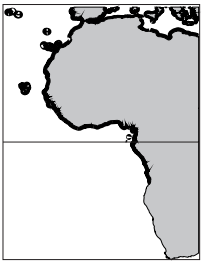
Neopycnodonte cochlear (Poli, 1795)



8.4. W of Rio Morébaya, Guinea, 9°24'N, 15°34.3'W, 60-62 m (lv 55.3 mm ht; **A**, whole shell; **B**, inside of lv.; **C**, inside of rv).

Shell up to 60 mm high, irregular to high-oval, mostly higher than long, but also occasionally as long as high, very thin, with very inflated left valve and much smaller, thinner and flat to concave right valve which is deeply sunken into the left valve. Surface with irregular growth lines and some irregularly lamellate growth stages. Left valve often with very shallow and more or less indistinct, irregular radial waves which occasionally are scaly. Margin entire or irregularly sinuous, occasionally with long, finger-like projections. Right valve with growth lines only, its marginal part foliaceous, very thin and fragile and often breaking off when the valve is removed from the left valve. Hinge line short, cardinal area small, oblique-triangular. Outside whitish, yellowish, brownish or pinkish. Inside white, often with brownish areas, with external colour showing through on the marginal part.

Biotope. Mostly on soft bottoms, attached to hard, elevated objects such as shells, pebbles, coral pieces, gorgonians, also on cables and wrecks, offshore from about 35 m to 250 m and deeper, solitary or gregarious in more or less small clusters; not common.



Distribution. S and SW of Ireland (Grande Sole, Petite Sole, 49°-50°N) southward to northern Angola (Luanda); Annobon; Azores, Madeira, Canaries (Hernández *et al.* 2011), Cape Verde Islands (Locard, 1898); throughout the Mediterranean. Also cited in the Western Atlantic, the Eastern Pacific and the Indo-Pacific.

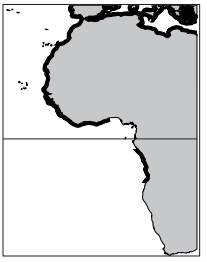
Remarks. This species is occasionally brought up by trawlers working in deeper water, it is too small to be exploited commercially. This is the type species of the genus *Neopycnodonte*.

8.5. *Neopycnodonte cochlear* (Poli, 1795). **A**-**C**, W of Rio Morébaya, Guinea, 9°24'N, 15°34.3'W, 60-62 m (lv 57.1 mm ht). **D**-**E**, same locality, on sea urchin spines (32.0 mm). **F**, same locality. **G**-**H**, same locality (lv 70.0 mm ht). **I**-**J**, same locality (lv 56.1 mm ht).

Ostrea stentina Payraudeau, 1826

8.6. Port-Etienne (now Nouadhibou), Mauritania (27.3 mm ht).

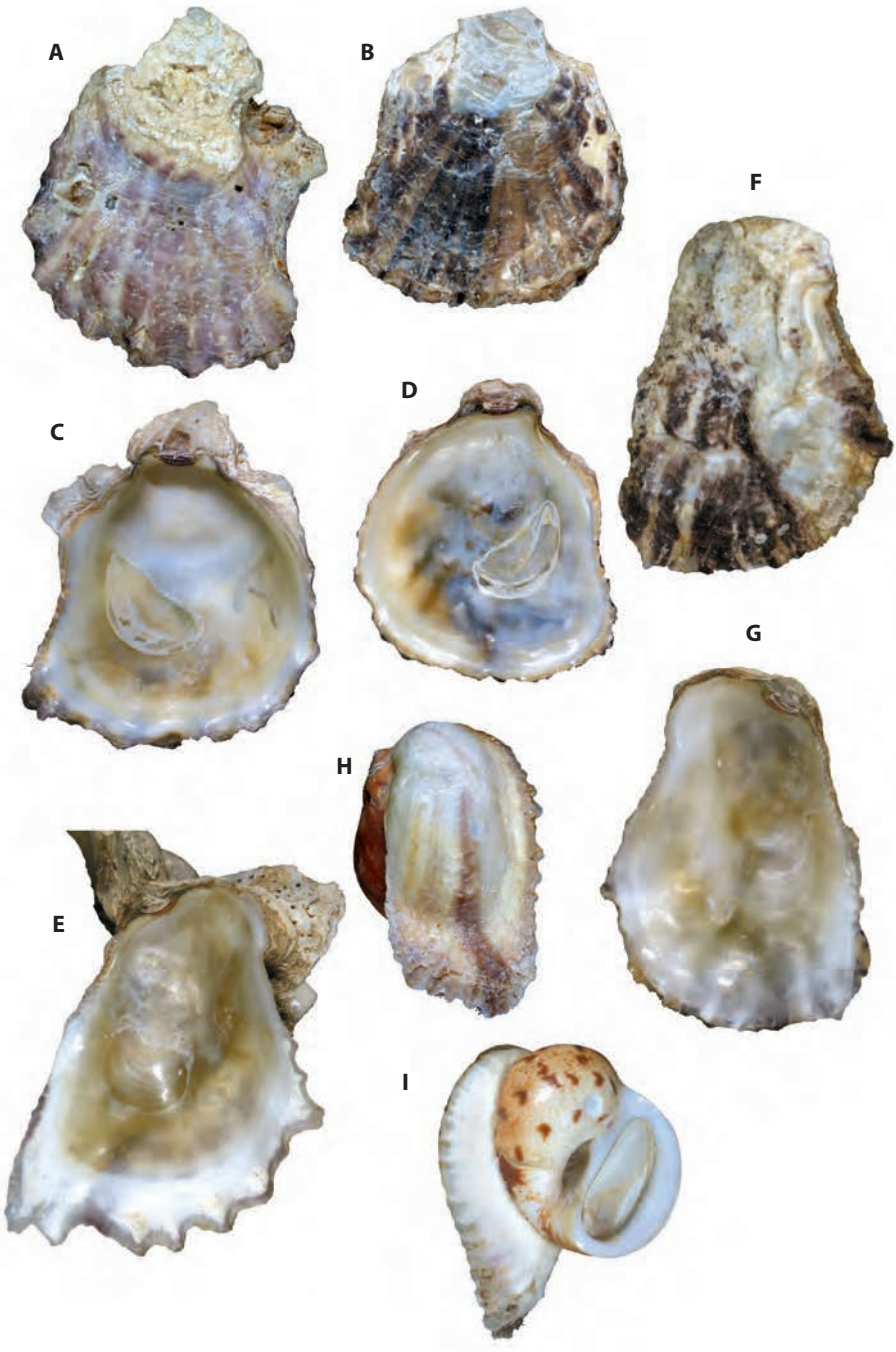
Shell up to 60 mm high, extremely variable in shape, as long as high or, mostly, higher than long, rounded, irregularly oval, triangular, trapezoidal or even curved resembling a too short boomerang, rather thin but solid, left valve convex, right valve very slightly convex or flat. Surface of the left valve with irregular radial ribs or folds, generally 12-15, disappearing towards the middle and the attachment area. Right valve with commarginal growth lines or lamellae, only occasionally with radial ribs. Margins irregularly crenulate or finely undulate. Hinge line short, cardinal area rather broadly triangular, not very high. Attachment area small to rather large. Chomata small to indistinct, extending for a small distance on both sides of the hinge line. Outside whitish to purplish brown, inside white, greenish, greyish, bluish grey or light bluish violet.



Distribution. Southern Portugal (Setubal) to Ghana; Gabon (Port-Gentil) to northern Angola (Luanda); throughout the Mediterranean. Not recorded from the southern (eastern) typical tropical region.

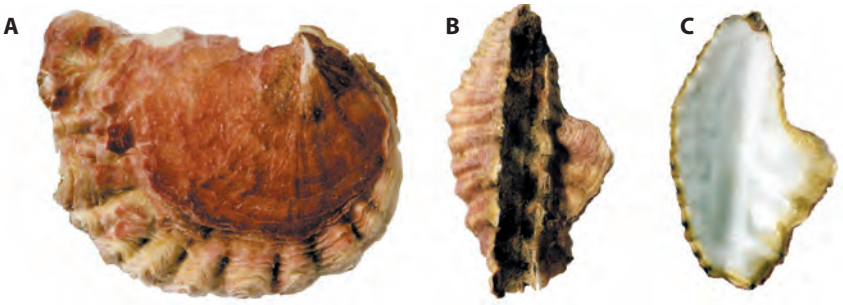
Biotope. On various types of hard substrate such as rocks, stones, pebbles, gorgonian stems, shells and other oysters (*e.g. Dendostrea senegalensis*), from 1 m to about 30 m, occasionally deeper. Also in lagoons, inlets and creeks, but under more marine conditions than *Crassostrea tulipa*, with which it occasionally co-occurs; common.

Remarks. This oyster is too small for being marketed. Empty valves are occasionally cast ashore. A synonym is *Ostrea guineensis* Dunker, 1853, and specimens from Mauritania were misidentified by Dautzenberg (1910) as "*O. lacerans* Hanley, 1856", which is *Dendostrea senegalensis*. *Ostrea capsa* Fischer von Waldheim, 1807 may also be this species and this name was revived by Huber (2010); however it has not been in usage and meets the requirements for being declared "*nomen oblitum*". This is "Le Garin" of Adanson. This species was hitherto placed in the genus *Ostreola* Monterosato, 1884, however, molecular work (Shilts *et al.* 2007) suggested that *Ostreola* is synonym of *Ostrea*.



8.7. ***Ostrea stentina*** **Payraudeau, 1826. A-D**, off Senegal, 13°53'N, 17°07'W, 100 m (37.5 mm ht). **E-G**, Praia Etambar, Corimba, Luanda prov., N-Angola (37.0 and 32.5 mm ht). **H-I**, same locality (31.1 mm ht).

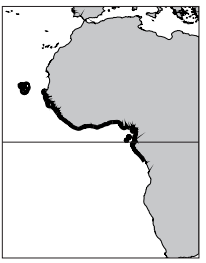
Dendostrea senegalensis (Gmelin, 1791)



8.8. **A**, Cap Lopez, Gabon, on the underside of a buoy, 1 m (60 mm). **B**-**C**, Pointe Gombé, Libreville, Gabon (65 mm).

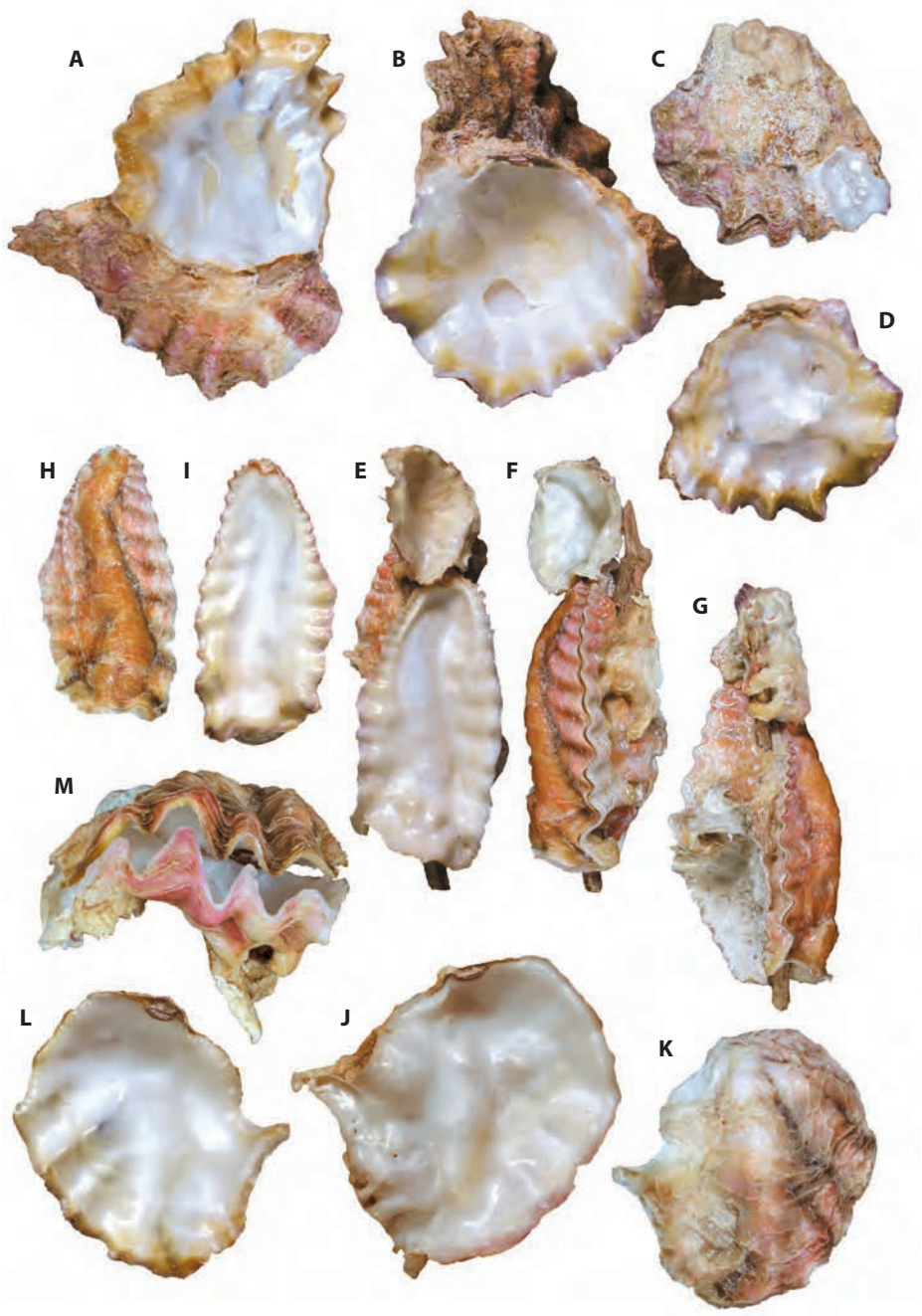
Shell up to 70 mm high, extremely variable in shape, irregularly rounded-trigonal, high-leaf-shaped or entirely distorted, rather thin but solid. Left valve little to very inflated, right valve correspondingly very to slightly convex. Surface with irregular, strong, radial folds or ribs and fine growth lines. Right valve in the middle and umbonal region irregularly smooth, corresponding to the surface of the substrate. Left valve with short claspers around the attachment area, which, in case the specimen lives on gorgonian stems, grasp the stem from both sides reminding a bit of the "legs" of a caterpillar. Margins sharply folded according to the surface ornamentation. Hinge line short, cardinal area small and triangular. Chomata small, often ill-defined and sometimes obsolete, mostly so in the left valve. Numerous, very fine nodules irregularly and more or less densely arranged along the rim of the right valve. Outside cinnabar red, occasionally pinkish to reddish brown or yellowish with red, inside white with yellowish to greenish yellow rim.

Distribution. Senegal (Kayar) to the Congo (Pointe-Noire); Cape Verde Islands; São Tomé, Ilha do Principe, Annobon.



Biotope. Attached to hard objects, mostly gorgonians but also shells, corals and stones as well as on buoys and ship hulls, from shallow water (2-10 m) to well offshore (40-70 m) and occasionally deeper; common around the islands, on the continental shelf uncommon to rare. In Annobon, the species was found in common clusters with *Hyotissa mcgintyi* and *Chama crenulata*, in Pointe-Noire with *Ostrea stentina*.

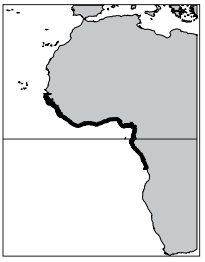
Remarks. This rather small and uncommon oyster is not commercialized. Empty valves are occasionally found on some beaches, *e.g.* the "Plage Mondaine" of Baie de Pointe-Noire (Congo Brazzaville). This species was often erroneously cited as *D. folium* (Linnaeus, 1758) which is an Indo-Pacific species; the name *Ostrea frons* Linnaeus, 1758 (a species known from the Caribbean) was also employed for West African specimens (*e.g.* Nicklès 1950). It may be that the Caribbean *Dendostrea frons* is conspecific with *D. senegalensis* but this has to be assessed by DNA analysis. A synonym is *O. lacerata* Hanley, 1845. This is the "Le Rojel" of Adanson.



8.9. ***Dendostrea senegalensis*** **(Gmelin, 1791). A-D**, Annobon, 15-40 m (lv 46.6 mm). **E-I**, Ilha do Principe, 40 m, (43.2 mm ht). **J-M**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, in fishermen's nets (34.3 mm).

Crassostrea tulipa (Lamarck, 1819)

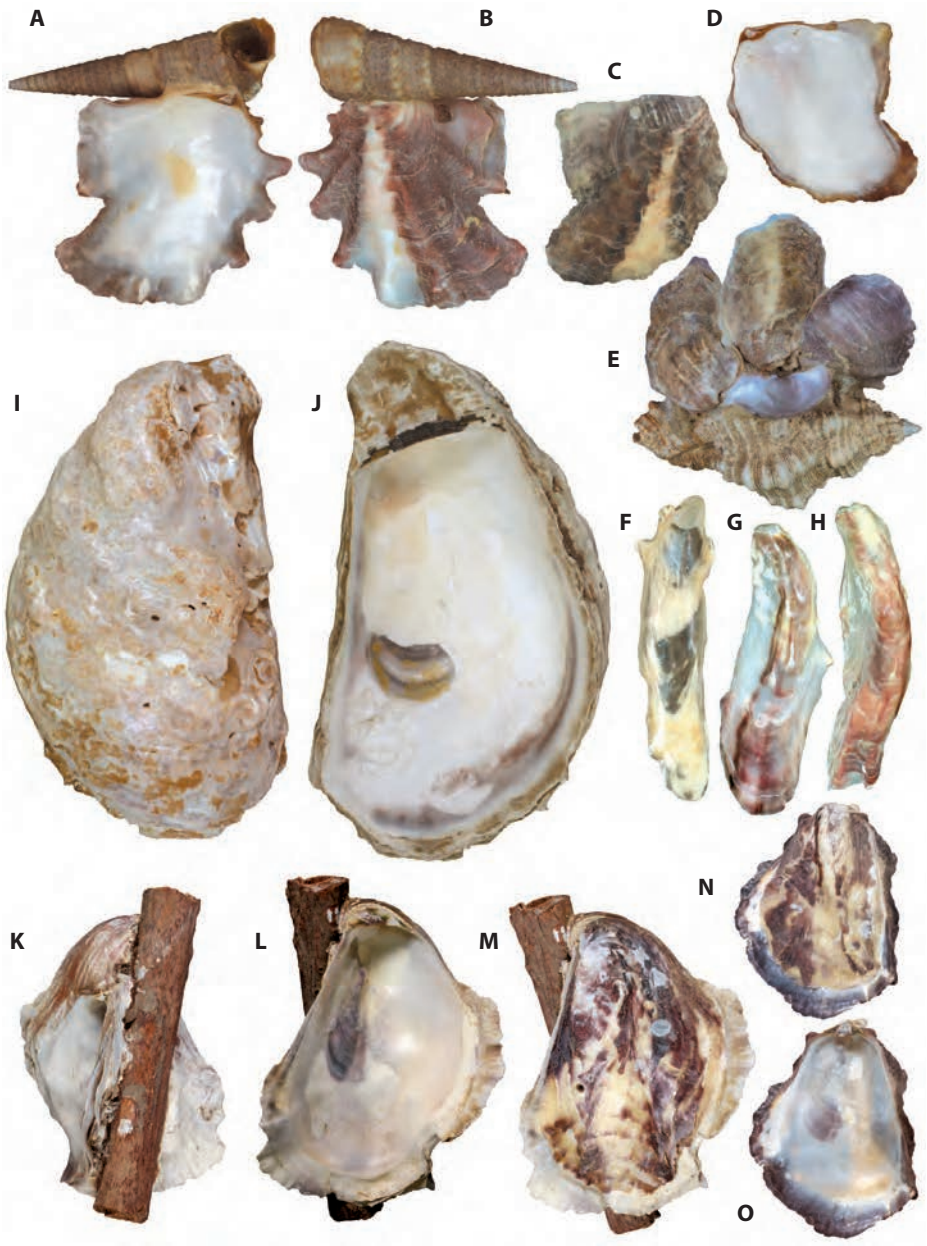
Shell up to 130 mm high, extremely variable in shape, irregularly high-oval to very high-elongate, rather thin, left valve somewhat larger and slightly to markedly more tumid than right valve which is convex to nearly flat. Surface with irregular commarginal growth lines or more or less prominent growth lamellae and often irregular radial ribs or undulations. Margin entire or irregularly undulating. Young specimens replicating the form of the substrate. Hinge line short to rather long, cardinal area high and oblique, beaks more or less bent to the right. Attachment area rather small to large and then nearly covering the whole left valve. Outside mostly reddish brown to deep violet, frequently with yellowish-whitish or with darker rays. Inside white, slightly iridescent, often tinged with violet; muscle impression more or less violet.



Distribution. Eastern Atlantic: Senegal (Petite Côte) to northern Angola (Luanda); Ilha do Principe. Based on genetic data, the species was claimed (Lapègue *et al.* 2002 and Varela *et al.* 2007, under the name *Crassostrea gasar* "Adanson") to be the same as *C. brasiliana* (Lamarck, 1819) from the Western Atlantic: French Guiana southward to SE Brazil (Paranaguá, Paraná State), but nevertheless Amaral & Simone (2014) still hold *C. brasiliana* as distinct and consider that *C. gasar* (= *C. tulipa*) is exclusively Eastern Atlantic.

Biotope. On shores composed of rocks and other hard substrate and, above all, on mangrove roots (see front cover), but also on hard objects such as shells on soft bottom, occasionally forming banks. The species lives mostly in protected bays, lagoons, inlets and creeks with seasonally changing salinity levels and tolerates reduced as well as raised salinity. *C. tulipa* is also found in the open sea, but only in murky water with a certain influence of brackish water conditions. It is mostly intertidal (from above mid-tide level downward), but can also be found subtidally down to 10 m and occasionally deeper, as *e.g.* off Guinea-Bissau. In the latter type of biotope, the oyster remains very small; it can form dense coverage on any hard object and does not exempt the shells of live large gastropods such as *Cymbium* spp. (see Figure 8.1) and *Pugilina morio* (Linnaeus, 1758). Off Guinea-Bissau, accompanying molluscs are *Mesocibota allocostata*, byssally attached between the oysters, *Muricanthus varius* (G.B. Sowerby II, 1834), which feeds on the oysters, and *Pugilina morio*. In intertidal mangrove biotopes, *C. tulipa* is associated with *Littoraria angulifera* (Lamarck, 1822), *Tympanotonus radula* (Linnaeus, 1758), *Senilia senilis*, *Austromacoma nymphalis* and *Tagelus adansonii*, occasionally also *Pugilina morio*. The estuarine, hardbottom-dwelling *Turritella gemmulata* Reeve, 1849 is also present and occasionally was found as substrate for the oyster (see Fig. 8.10).

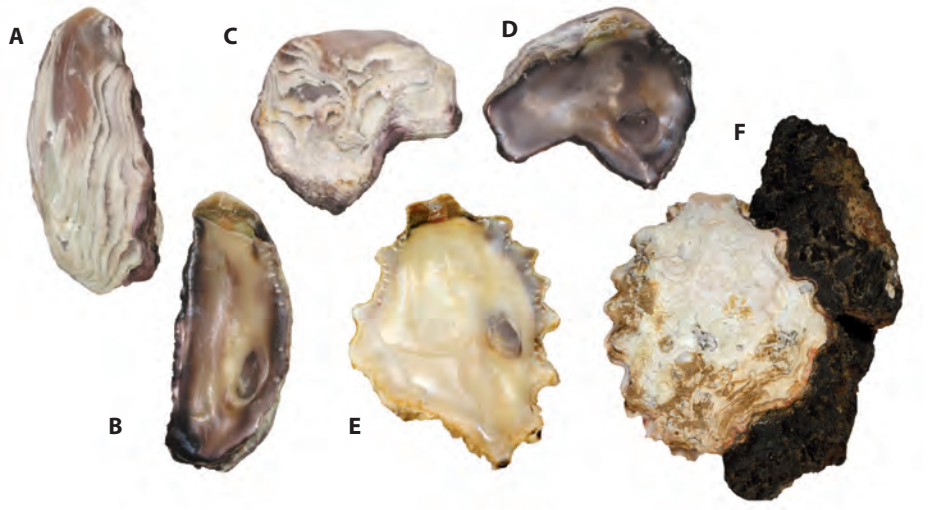
Remarks. This is "Le Gasar" of Adanson (1757). The name *C. gasar*, first used as an available binomial name by Dautzenberg (1891) is the most commonly used name for this species and is the earliest name with an unambiguous West African type locality. However *Ostrea tulipa* Lamarck, 1819, described from unknown locality, has precedence and has been used as the valid name by several authors (*e.g.* Nicklès 1950; Huber 2010). This is also *Ostrea parasitica var. B* Gmelin, 1791, a name used by Dautzenberg (1910). Very closely related species in the Atlantic are *C. rhizophorae*



8.10. *Crassostrea tulipa* (Lamarck, 1819). **A-D**, Essoukoudiak Bôlon, Guinea-Bissau, Casamance border (28.5 mm w). **E**, same locality (27.6 mm). **F-H**, Abéné-Kafountine, Casamance, beach drift, three narrow valves from extremely dense subtidal populations (shell height about 20 mm). **I-J**, Baie de Cap Lopez, Gabon (70 x 129 mm). **K-M**, Baia do Mussulo, Luanda prov., N-Angola (78 mm ht). **N-O**, same locality (58 mm).

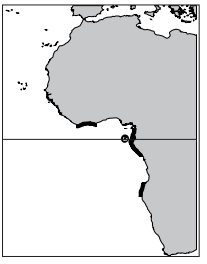
(Guilding, 1828) from the Caribbean and Brazil, *C. brasiliana* (Lamarck, 1819) from Brazil, and *C. virginica* (Gmelin, 1791) from the east coast of North America.

Saccostrea cucullata (Born, 1778)



8.11. A-B, Kribi (Eboundja), S-Cameroon (19.5 mm ht). C-D, same locality (13.0 mm ht). E-F, Praia Emilia, São Tomé (57.0 mm ht).

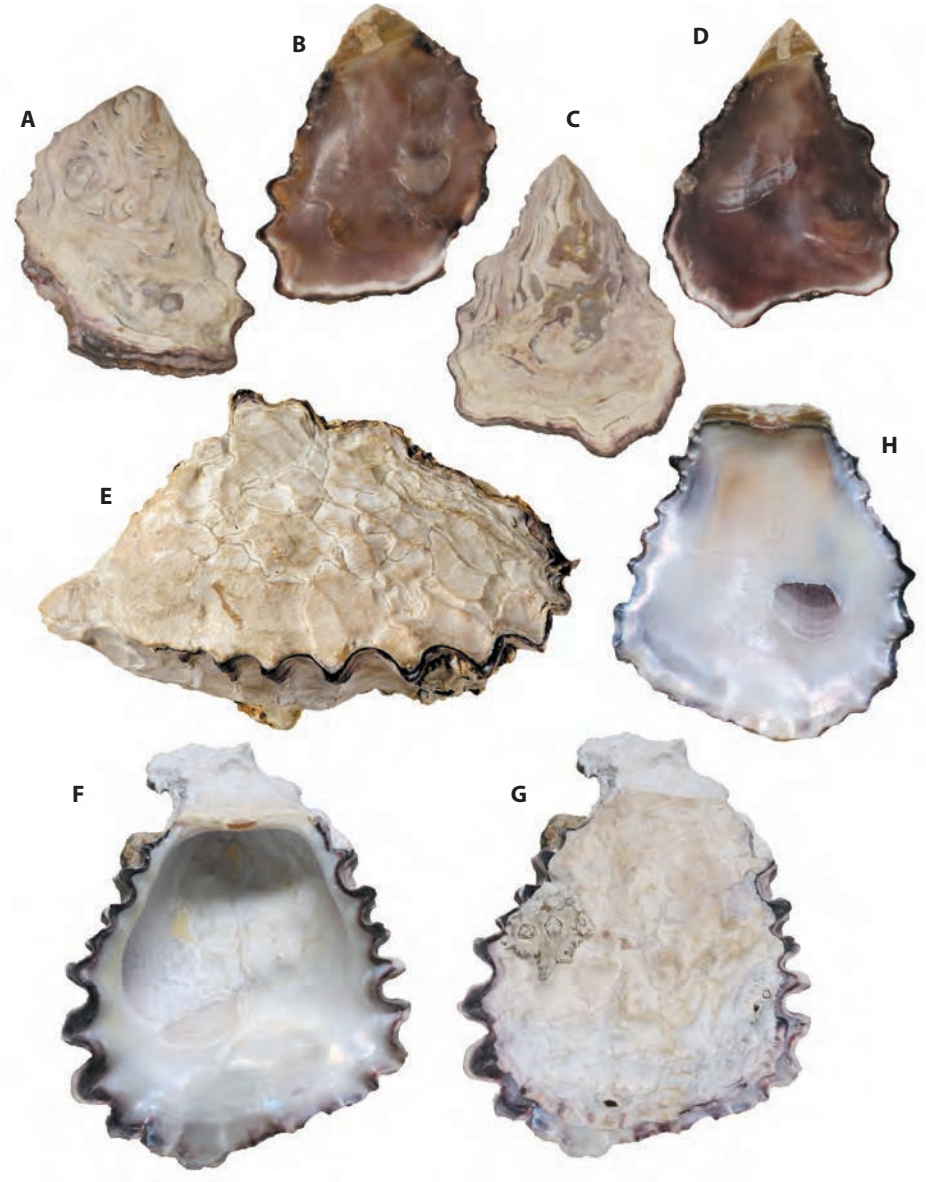
Shell up to 90 mm high, very variable in shape, higher than long, irregular, oval to somewhat triangular, rather thick and solid, with very inflated left valve and slightly convex, somewhat smaller, right valve. Surface with radial ribs, often only visible near the margin, and occasionally irregular commarginal lamellae, but mostly entirely eroded. Margin more or less folded or undulated. Hinge line rather short and straight. Cardinal area in the left valve high-triangular to extremely high and cornucopia-like. Attachment area mostly stretching over the whole length of the left valve. Chomata along the whole margin. Outside chalky white to greyish, along the margins deep purplish. Inside white, slightly iridescent, with narrow, purplish black rim; right valve, and to a less extant also left valve tinged with pale brownish violet.



Distribution. Côte d'Ivoire; Cameroon (Kribi) to Congo Brazzaville (Pointe-Noire); southern Angola (Baia dos Limagens, Benguela-Namibe); São Tomé, Ilha do Principe. Western part of the Indian Ocean from South Africa (Natal) to the Red Sea.

Biotope. Prefers rocky shores, attached to boulders and stones, occasionally also on mangroves, from between tide marks to just under low tide mark. Common to abundant in the Indo-Pacific, only locally common in West Africa. Tolerates also reduced salinity.

Remarks. There are no characters which could separate the West African population of this oyster from the East and South African population; they are hence considered conspecific, but separated by a gap from Algoa Bay to Benguela. Crowded specimens may develop high

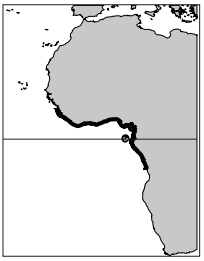


8.12. *Saccostrea cucullata* (Born, 1778). **A**-**D**, Pointe-Noire, Congo Brazzaville (46.0+ 46.6 mm ht). **E**, Baia de Santa Maria, Benguela prov., Angola (96 mm). **F**-**H**, Baia dos Limagens, Benguela prov., S-Angola, (85.0 mm ht).

conical attached valves and small, lid-like free valves. The species is too difficult to collect to be marketed in West Africa but may be consumed locally; however, it is largely commercialized in the Indo-Pacific region (India, SE-Asia etc.). The widely used spelling "*O. cucullata*" is a misspelling by Born (1780). Synonyms are *O. cornucopiae* Gmelin, 1791 and perhaps also *Ostrea forskahlii* Gmelin, 1791.

Striostrea denticulata (Born, 1778)

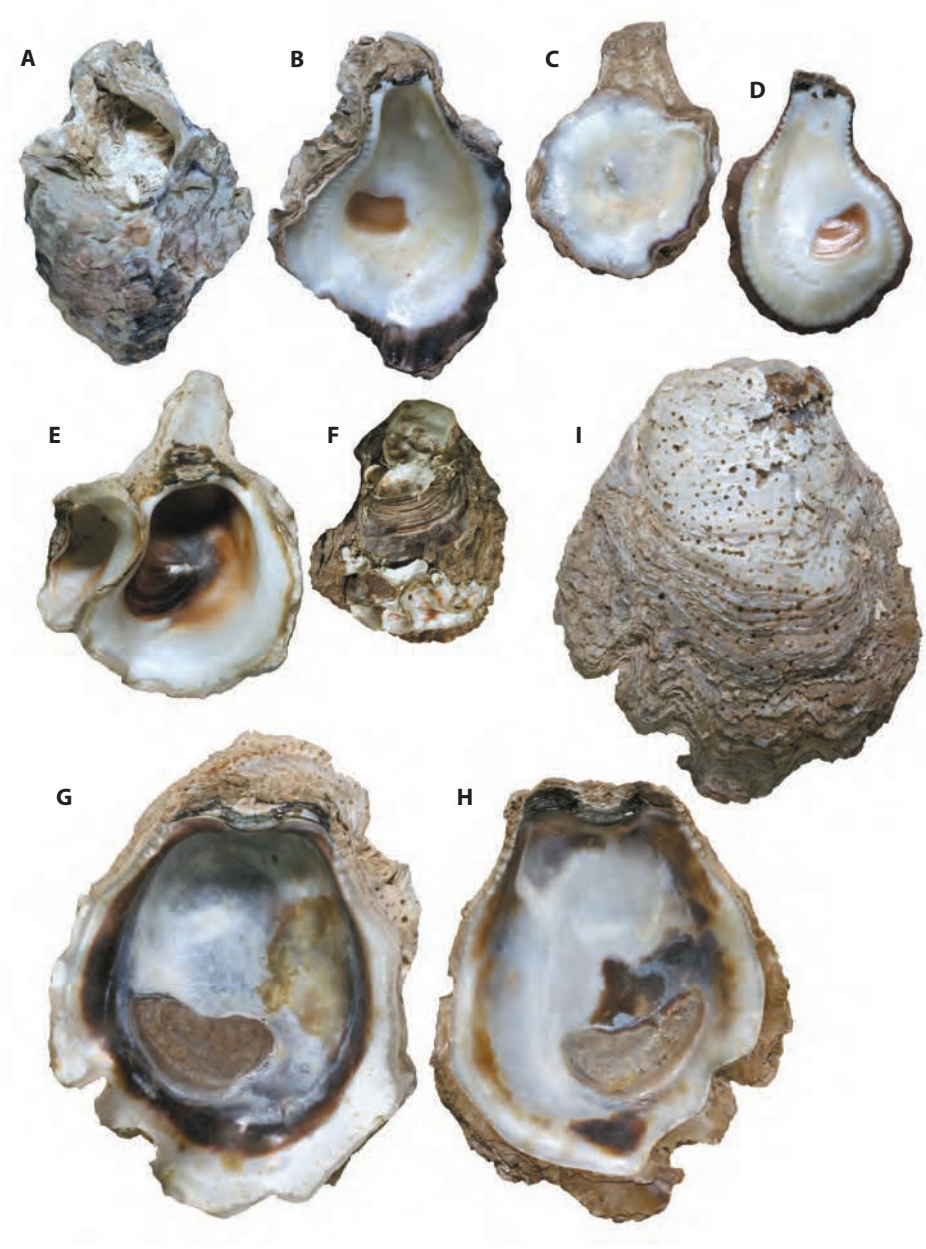
Shell up to 220 mm high, very variable in shape and tumidity, irregularly rounded to high-oval or entirely distorted, lamellate, adult specimens thick and solid to extremely thick and heavy. Shell rather compressed; when undisturbed and on flat substrate, valves with nearly equal tumidity, but left valve always with umbonal cavity. When irregular, left valve more convex, umbonal cavity occasionally very deep. Surface with irregular commarginal lamellae which contain periostracal substance. Young specimens have often small, irregular, radial riblets. Margins nearly entire to irregularly undulated. Hinge line short to rather long, cardinal area high and oblique to very high, oblique or twisted. Attachment area mostly large and more or less occupying the whole left valve. Chomata either obscure to absent or present and well developed for a short distance on both sides of the hinge line. Muscle impression large and kidney-shaped. Outside irregularly purplish brown to brownish violet. When the lamellae are removed, a dirty whitish colouration appears. Inside iridescent white, in the left valve often deep purplish brown, leaving a more or less broad, marginal rim, in the right valve less coloured to nearly entirely white.



Distribution. Guinea (Conakry area) to northern Angola (Luanda); São Tomé.

Biotope. Attached to rock and stones, often exposed to the open sea with more or less agitated water, from extreme low tide to about 10 m, locally common. Also found on ship hulls. On certain places also in calm water attached one to another.

Remarks. The southern populations (Cameroon-Angola) tend to have more prolonged beaks with deeper umbonal cavity in the right valve than those from Guinea. Empty valves and valve clusters are occasionally found on the beach. Behind the beach in the northern part of the Baie de Pointe-Noire, very large valves can be found in subfossil outcrops. The other species in the genus *Striostrea* are *S. prismatica* (Gray, 1825) (= *S. iridescens* (Hanley, 1854)) from tropical West America and *S. margaritacea* (Lamarck, 1819) from South Africa and the South of Madagascar to Arabia (Huber 2010).



8.13. ***Striostrea denticulata*** **(Born, 1778). A-D**, Côte d'Ivoire (no more precision) (41.4 mm). **E-F**, Kribi, Cameroon, on beach (62.6 + 44.5 mm ht). **G-I**, Cacuaco, Bengo prov., N-Angola, 0-1 m (97 mm ht).

Superfamily **CARDITOIDEA**

Family **CARDITIDAE**
- Genus ***Cardita*** Bruguière, 1792 – 2 species
- Genus ***Carditamera*** Conrad, 1838 – 2 species
- Genus ***Lazariella*** Sacco, 1899 – 1 species
- Genus ***Cardiocardita*** Anton, 1839 – 5 species
- Genus ***Akardita*** La Perna, Brunetti & Della Bella, 2018 – 1 species
- Genus ***Glans*** Megerle von Mühlfeld, 1811 – 1 species
- Genus ***Centrocardita*** Sacco, 1899 – 2 species
- Genus ***Cardites*** Link, 1807 – 1 species

Family **CONDYLOCARDIIDAE**
- Genus ***Condylocardia*** F. Bernard, 1896 – 7 species
- Genus ***Carditopsis*** E.A. Smith, 1881 – 2 species (1 treated)
- Genus *Carditella* E.A. Smith, 1881 – 1 species (not treated)
- Genus ***Cuna*** Hedley, 1902 – 1 species

Superfamily **CRASSATELLOIDEA**

Family **ASTARTIDAE**
- Genus ***Astarte*** J. Sowerby, 1816 – 1 species
- Genus ***Digitaria*** S.V. Wood, 1853 – 1 species

Family **CRASSATELLIDAE**
- Genus ***Crassatina*** Löbbecke & Kobelt, 1881 – 11 species

Superfamilies Carditoidea and Crassatelloidea

Superfamily CARDITOIDEA

This superfamily includes the two archiheterodont families with predominantly radial sculpture: the medium sized Carditidae and the minute Condylocardiidae. The latter may as well have arisen by paedomorphosis, an evolutionary process through which animals still retaining juvenile characters (including small size) become capable of reproduction; their phylogenetic relationship with the Carditidae still remains to be elucidated but preliminary data (González & Giribet 2014) indicate that at least some members of the Condylocardiidae could be derived Carditidae.

Family CARDITIDAE

Shells small to rather large (usually 10-30 mm, exceptionally over 100 mm), thick and solid, equivalve, mostly inequilateral with prosocline beaks situated in front of the vertical midline. Outline variable, oval or rounded to trapezoidal or more or less subtrigonal, sometimes irregular. Surface with mostly strong radial ribs which may bear commarginal scales or knobs. Hinge plate strong and thick, with two cardinals on the left valve, two or three cardinals on the right valve, and laterals weakly developed or absent. Adductor muscle scars subequal, no pallial sinus. Inner margin crenulate accordingly with the external ribs.

Many species of the Carditidae have non-planktotrophic development: they incubate the eggs, the larval phase taking place within the mantle cavity; the larvae live on the inner gills of the female and are released at the beginning of the teleoconch development. There are 141 species known worldwide, 15 from West Africa. The general outline adopted by Hain (1985) and Huber (2010) is followed here in a simplified way, leaving out subfamilies and subgenera. For general information and evolution, see Yonge (1969).

Genus *Cardita* Bruguière, 1792. Shells small to medium-sized (usually 10-30 mm, exceptionally over 80 mm), thick and solid, rather elongate, trapezoidal or modioliform, often irregular, more or less inflated. Beaks nearly subterminal at the anterior end. Surface with radial ribs bearing knobs or scales. Hinge with two cardinals on the left valve and three cardinals on the right valve, laterals obsolete.

Genus *Carditamera* Conrad, 1838. Shells small to medium-sized (to over 60 mm), moderately thick, elongate-trapezoidal with parallel dorsal and ventral margin or elongate-trigonal, quite compressed. Beaks mostly in the anterior fourth of the valves. Surface with strong radial ribs. Hinge with two cardinals, anterior and posterior laterals on each valve. The presence of definite lateral teeth distinguishes this genus from *Cardita*, which has a similar aspect externally. The genus is mostly distributed along both coasts of the Americas.

Genus *Lazariella* Sacco, 1899. Shells medium-sized (to 30 mm), oblong-trigonal. Beaks only slightly in front of the vertical midline. Surface with strong radial ribs. Hinge with two cardinals on both valves, the anterior one thick and triangular, and with an ill-defined posterior lateral. This taxon has been treated as a subgenus of *Carditamera*, but differs so much in dentition and outline that it has been raised to genus status by Huber (2010). There is only one extant species, living in West Africa.

Genus *Cardiocardita* Anton, 1839. Shells medium-sized (to 60 mm), thick and solid, oval-subtrigonal, anteriorly rounded, posteriorly slightly tapering, somewhat compressed to very inflated. Beaks in front of the vertical midline. Surface with strong, regular radial ribs bearing knobs or short spines. Lunule small, no escutcheon. Hinge with two cardinals in the left valve and three cardinals in the right valve, laterals reduced to small anterior knobs in each valve. Ventral pallial line thickened posteriorly, with a very faint pallial sinus-like sinuosity. An exclusively West African genus.

Genus *Akardita* La Perna, Brunetti & Della Bella, 2018. Shells small (to 20 mm), thick and solid, oval-subtrigonal, oval or somewhat subcircular, compressed, anteriorly and posteriorly rounded, ventral margin convex to partly straight. Beaks slightly in front of the vertical midline. Surface with flat, close-set radial ribs. Hinge with two cardinals in the left valve and three cardinals in the right valve, laterals obsolete. The only extant species lives in West Africa. *Cyclocardia* Conrad, 1867, which encompasses a group of boreal species, is similar in shape and hinge structure but differs in being more rounded, not elongate and in having a thick periostracum.

Genus *Glans* Megerle von Mühlfeld, 1811. Shells small (to 20 mm), somewhat trapezoidal, oval-rectangular or oval, quite thick and solid, inflated to very inflated. Beaks subterminal. Surface

with strong radial ribs bearing nodules or scales. Hinge with two cardinals in the left valve and a very large and thick, triangular cardinal on the right valve; anterior laterals rather weak to moderately strong.

Genus *Centrocardita* Sacco, 1899. Shells in general shape close to *Glans* but less trapeziform and posteriorly more rounded, often more tumid, and with laterals small to obsolete. Ribs with scales or short spines. Most of the species are found in the Indo-Pacific.

Genus *Cardites* Link, 1807. Shells medium-sized, trapezoidal to rounded, oval or oval-trigonal, thick and solid, inflated to very inflated, with posterior margin rounded or somewhat obliquely truncated. Beaks in front of the vertical midline. Surface with strong radial ribs bearing more or less distinctly developed scales. Interspaces V-shaped. Hinge with two well developed cardinals in both valves, the anterior one in the right valve only faint. Laterals small to becoming obsolete.

Species treated (14)
Cardita calyculata (Linnaeus, 1758); *Cardita rufescens* Lamarck, 1819; *Carditamera contigua* (Dautzenberg, 1910); *Carditamera rolani* Cosel, 1995; *Lazariella regularis* (G.B. Sowerby III, 1913); *Cardiocardita ajar* (Bruguière, 1792); *Cardiocardita tankervillii* (W. Wood, 1828); *Cardiocardita obesa* Cosel, 1995; *Cardiocardita gabonensis* Cosel, 1995; *Cardiocardita lacunosa* (Reeve, 1843); *Akardita monodi* (Nicklès, 1953); *Glans afra* Cosel & Gofas, 2018; *Centrocardita aculeata* (Poli, 1795); *Centrocardita inquinata* (Nicklès, 1955); *Cardites umbonatus* (G.B. Sowerby III, 1904).

Family CONDYLOCARDIIDAE

Shells very small to minute (less than 1 mm to a few millimetres), rather thick and solid, equivalve, subtrigonal or trapezoidal, frequently higher than long. Surface with weak to strong radial ribs which are close-set or with narrow interspaces. Protoconch rather large in relation to the shell size and usually separated from the teleoconch by a more or less prominent rim. Lunule present but mostly ill-defined. Inner margin often faintly to strongly dentate according to the external ribs. Beaks in the middle, slightly behind or in front of the vertical midline. Hinge margin thick, hinge with up to three cardinals in each valve, some of them fused proximally to form a characteristic hook-shaped structure; laterals generally present. No pallial sinus. Ligament internal, situated in a small, sunken and central resilifer. Additional external ligament present in *Carditella*.

An estimate of the actual number of living species is difficult, but about 130 species are currently accepted. Most of the 11 species known at this time from West Africa were discovered during the preparation for this volume (Salas & Rolán 1990; Salas & Cosel 1991). Some Condylocardiidae are incubatory and have non-planktotrophic development; they are easily recognizable by their mostly very large protoconch. The condylocardiids live mostly in mixed and coarse sand.

Genus *Condylocardia* F. Bernard, 1896. Shells very small to minute, thick and solid, more or less obliquely-subtrigonal, about as long as high, rather inflated. Surface always with more or less strong radial ribs. Protoconch large and saucer-shaped. Hinge with three cardinals and well developed laterals on both valves; the anterior cardinals of the right valve fused proximally forming a hook-like structure which continues to the anterior lateral. Ligament more or less rounded, wholly internal.

Genus *Carditopsis* E.A. Smith, 1881. Shells minute, thick and solid, subtrigonal, about as long as high or longer than high, rather inflated. Surface with broad, close-set radial ribs and with granules or scales on them. Protoconch not separated by a rim from the rest of the shell. Hinge usually with two anterior cardinals, the posterior one reduced or absent; anterior and posterior laterals well developed on each valve. Ligament rounded, in the middle of the hinge.

Genus *Cuna* Hedley, 1902. Shells very small to minute, rather solid, high-subtrigonal and more or less oblique, higher than long, inflated. Surface with close-set radial ribs, commarginal striae or both. Lunule and escutcheon present. Protoconch rather small and rounded, usually ill-defined. Ligament only partly internal, not reaching the inner margin of the hinge plate. Hinge usually with two cardinals in the left valve, right valve with strong and broad anterior and rudimentary posterior cardinal.

Species treated (9)

Condylocardia bravensis Salas & Rolán, 1990; *Condylocardia tridacniformis* Salas & Rolán, 1990; *Condylocardia carditoides* Salas & Rolán, 1990; *Condylocardia verdensis* Salas & Rolán, 1990; *Condylocardia angolensis* Salas & Cosel, 1991. *Condylocardia ameliae* Salas & Cosel, 1991; *Condylocardia boucheti* Salas & Cosel, 1991; *Carditopsis gofasi* Salas & Cosel, 1991; *Cuna gambiensis* Nicklès, 1955.

Other species reported in the area (2)

*Carditopsis dartevelle*i Nicklès, 1952. Gabon (Port Gentil), subfossil. No Recent ascertained occurrence.

Carditella capensis E.A. Smith, 1885. S-Angola (Praia Amelia-Baia dos Tigres, Thiele & Jaeckel 1931); South Africa.

Superfamily CRASSATELLOIDEA

This group comprises the mostly boreal family Astartidae and the mostly tropical Crassatellidae, convincingly shown to be closely allied (González & Giribet 2014).

Family ASTARTIDAE

Shells very small to medium-sized (to over 50 mm), mostly thick and solid, equivalve, subcircular, high-oval, rounded-trigonal or trigonal. Surface generally with weak to strong commarginal ribs, occasionally oblique ribs. Lunule and escutcheon normally present. Beaks anterior to the vertical midline or in the middle. Hinge with two cardinals on the left valve, three on the right valve. Ligament external, with nymph and without defined internal resilifer. Pallial sinus absent.

Only two species of this generally boreal to cold-temperate family reach tropical West Africa. The worldwide species number is estimated at 41.

Genus *Astarte* J. Sowerby, 1816. Shells rather small to medium-sized, oval, oval-trigonal or somewhat trapezoidal, thick and solid, more or less compressed. Surface with weak to strong, regular, commarginal ribs or waves, occasionally becoming obsolete or missing towards the ventral part of the valve. Left valve with two well developed cardinals, right valve with three cardinals, the middle one very strong and triangular, the anteriormost very weak. Laterals inconspicuous to obsolete. Pallial line without sinus. Inner margin smooth or crenulate.

Genus *Digitaria* S.V. Wood, 1853. Shells small, oval to subcircular, rather solid, compressed. Lunule and escutcheon absent. Surface with regular, curved, oblique incisions. Hinge with two strong cardinals and two laterals in the left valve and a weak anterior, a strong middle and a very thin posterior cardinal and two laterals in the right valve. Ligament on small nymphal plate. *Woodia* Deshayes, 1860, is a synonym.

Species treated (2)
Astarte fusca (Poli, 1795); *Digitaria digitaria* (Linnaeus, 1758).

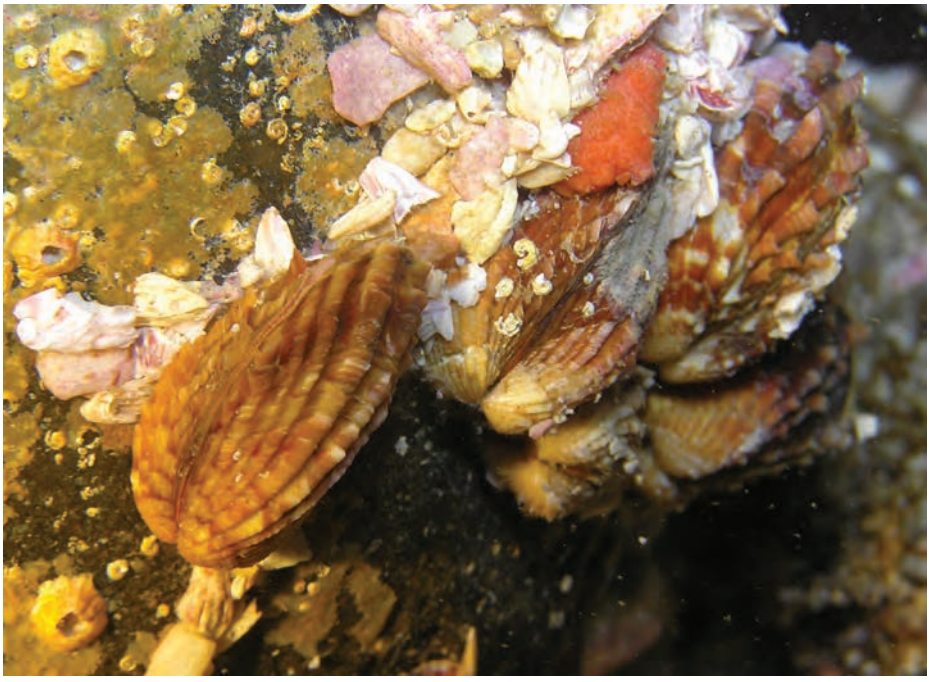
Family CRASSATELLIDAE

Shells very small to rather large, equivalve, suboval, trapezoidal, subrectangular, subtriangular or triangular, thin but solid to very thick and heavy. Surface smooth or with commarginal sculpture, occasionally irregular on the posterior part. Periostracum generally rather strong

and thick and persistent over the whole shell. Beaks mostly in front of the vertical midline. Hinge generally with two cardinals in the left valve and one cardinal in the right valve, ligament internal in conspicuous resilifer. Contrary to the predominantly cold-water Astartidae, this is a predominantly circumtropical group with 85 species worldwide, mainly in the genera *Crassatella*, *Crassatina*, *Eucrassatella*, *Talabrica* and *Crassinella*, eleven from West Africa. The West African Crassatellidae are still very poorly known and not at all easy to understand, which is underlined by the recent description of three new species and the probable presence of as yet undescribed species in West Africa. Juvenile specimens are sometimes especially difficult to assign to a proper species.

Genus *Crassatina* Löbbecke & Kobelt, 1881. Shells medium-sized (to over 30 mm), thick and solid, oval to subtrigonal with posterior margin rounded to somewhat truncated, compressed to moderately inflated. Beaks near the vertical midline or in front of it. Surface with commarginal ribs, occasionally diverging on the posterior part of the valves. Lunule and escutcheon generally deeply impressed. Ligament internal, rather large, but not reaching the lower margin of the hinge plate. Inner margin of valves finely crenulate. The genus is nowadays restricted to tropical West Africa, albeit the name has been used for Australian and New Zealand fossils. Eleven species are recognized but it cannot be excluded that more species, undescribed and cryptic, are present. The subgenus *Scissulatina* Huber, 2010 is defined by having a bipartite sculpture, commarginal on the anterior part of the shell and changing abruptly to oblique on the posterior part contrary to *Crassatina s. str.* which has commarginal sculpture over the whole surface. The four small species of more trigonal outline and millimetric size were "tentatively" assigned by Huber (2010) to genus *Salaputium* Iredale, 1924. Except for size, this does not fit the morphology of the Australian type species *Salaputium fulvidum* (Angas, 1871), much more inequilateral and with a pallial line markedly deflected posteriorly. It is also inconsistent with the Australian centre of distribution of the latter. A new genus may be needed but too little is yet known and these are left provisionally under *Crassatina*.

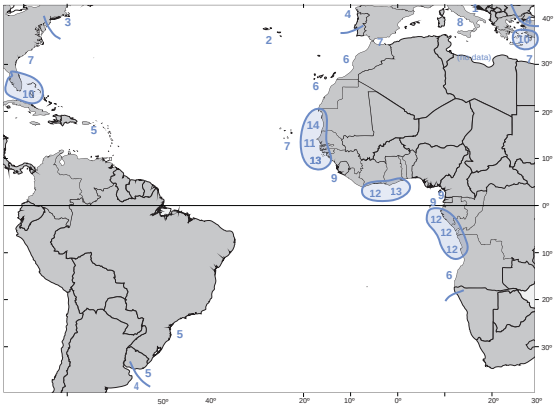
Species treated (11)
Crassatina contraria (Gmelin, 1791); *Crassatina corrugata* (Adams & Reeve, 1850); *Crassatina ornata* (Gray, 1833); *Crassatina guineensis* Cosel & Gofas, 2018; *Crassatina paeteli* (Maltzan, 1885); *Crassatina triquetra* (Reeve, 1842); *Crassatina alba* Cosel, 1995; *Crassatina dakarensis* Cosel, 1995; *Crassatina marchadi* Cosel, 1995; *Crassatina congoensis* (Jaeckel & Thiele, 1931); *Crassatina modesta* (H. Adams, 1869).



9.1. Living specimens of *Cardita rufescens*, byssally attached to the underpart of a rock slab. Dakar area, 5-10 m (photograph by Patrice Petit De Voize).

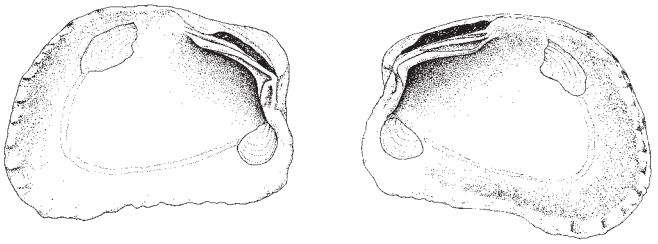
West Africa, an outstanding centre of diversity for archiheterodont bivalves.

The Archiheterodonta (superfamilies Carditoidea and Crassatelloidea) are a geologically old group of bivalves which is more species-rich in West Africa than elsewhere in the Atlantic Ocean (Fig. 9.2). These species-rich areas tend to correspond with the areas of seasonal upwelling (see Fig. I.15, page 41). In addition, the genera *Cardocardita* and *Akardita* (Carditidae) and *Crassatina* (Crassatellidae) are endemic of this part of the world ocean, two of them forming local radiations. Surprisingly one of the other centres of species richness is in the Arctic, there populated by the family Astartidae which has only two representatives in West Africa.



9.2. An estimate of the species richness of the Archiheterodonta (Carditoidea and Crassatelloidea) in the Atlantic and the Mediterranean, highlighting the three West African species-rich areas.

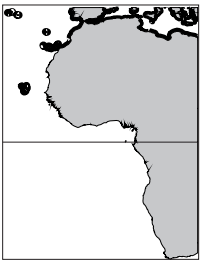
Cardita calyculata (Linnaeus, 1758)



9.3. Baia de Calhau, São Vicente, Cape Verde Islands (12.7 mm).

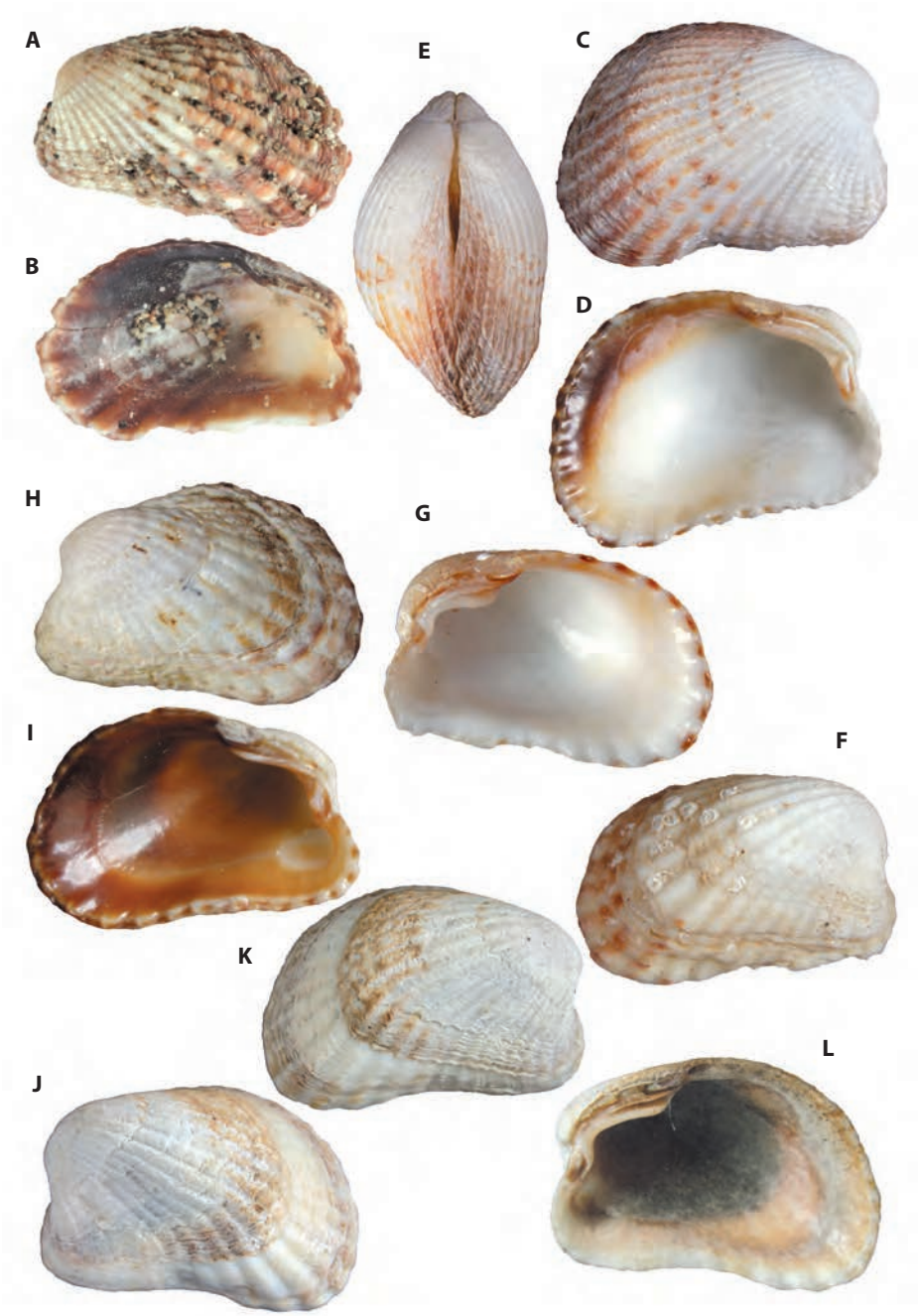
Shell up to 20 mm long (European specimens larger, up to 32 mm long), very variable in shape, somewhat elongate to elongate, subrectangular to modioliform, more or less irregular, rather thick and solid, inflated. Beaks at the anterior end, nearly terminal. Surface with 17-23 rounded radial ribs, narrow on the anterior half, broader and more prominent on the posterior half, bearing irregular scales. Interspaces narrow, ribs on the anterior half often nearly fused. Lunule small, rather broad and deep, no escutcheon. Periostracum thin, pale brownish, slightly wrinkly, eroded on the earlier parts of the valves. Surface often more or less corroded. Inner margin denticulate, corresponding to the external ribs. Outside whitish, usually with brown spots or points on the ribs and often with brownish posterior marginal area. Inside white, often with brown zones or flecks, mostly on the postero-dorsal part.

Distribution. North Portugal (north of Porto) to Morocco (mouth of Oued Draa); Azores, Madeira, Canary Islands, Cape Verde Islands (hitherto reported only from São Vicente and Brava); throughout the Mediterranean.



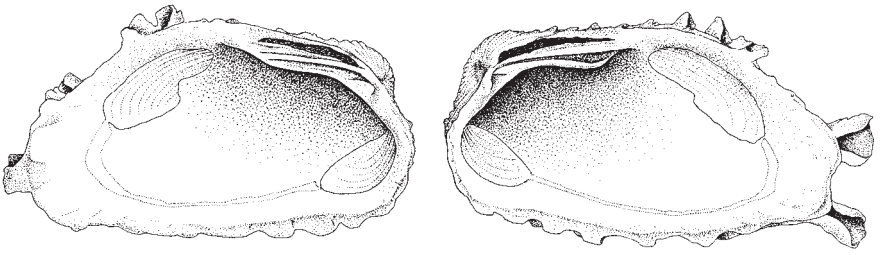
Biotope. Byssally attached to hard substrates such as the underside of rocks and stones, also on smaller hard objects (shells, pebbles etc.) on coarse sand and gravel, from low tide mark to about 60 m, occasionally deeper, to 200 m, common.

Remarks. Within the tropical Eastern Atlantic, this temperate European-Mediterranean species is restricted to the Cape Verde Islands, on the continental coast it is replaced by *C. rufescens* (see next entry). Most specimens of *C. calyculata* from the Cape Verde Islands are rather short and high, with narrow and more regular ribs. They have been reported in the past as *C. calyculata decurtata* Monterosato, 1878, a form described from the Mediterranean. As intermediate forms between this and the common, more elongate form occur at all localities, separation is not possible. Nevertheless, specimens of *C. calyculata* from the Canary Islands (Tenerife) and the Azores (Horta, Faial) have been found with juveniles of protoconch size in the shell cavity, which means that they are incubatory and lack a planktonic larval phase. The examined Mediterranean and Cape Verde Islands specimens had no juveniles within the shells, although the protoconch is of about the same size as that of the specimens from other Atlantic islands. Dispersal may have taken place through attachment to floating objects.



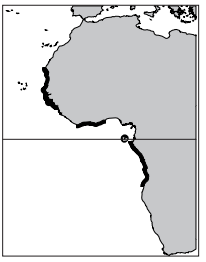
9.4. *Cardita calyculata* (Linnaeus, 1758). **A**-**B**, Las Palmas, Playa Las Canteras, reef in front (11.5 mm). **C**-**E**, Baia de Calhau, São Vicente, Cape Verde Islands (12.7 mm). **F**-**G**, same locality (13.0 mm). **H**-**I**, Baia de Salamanza, São Vicente, Cape Verde Islands (10.1 mm). **J**-**L**, Agua Doce, Santa Luzia, Cape Verde Islands (12.6 mm, MNCN).

Cardita rufescens Lamarck, 1819



9.5. Dakar, Senegal, low tide (lv, 20.9 mm).

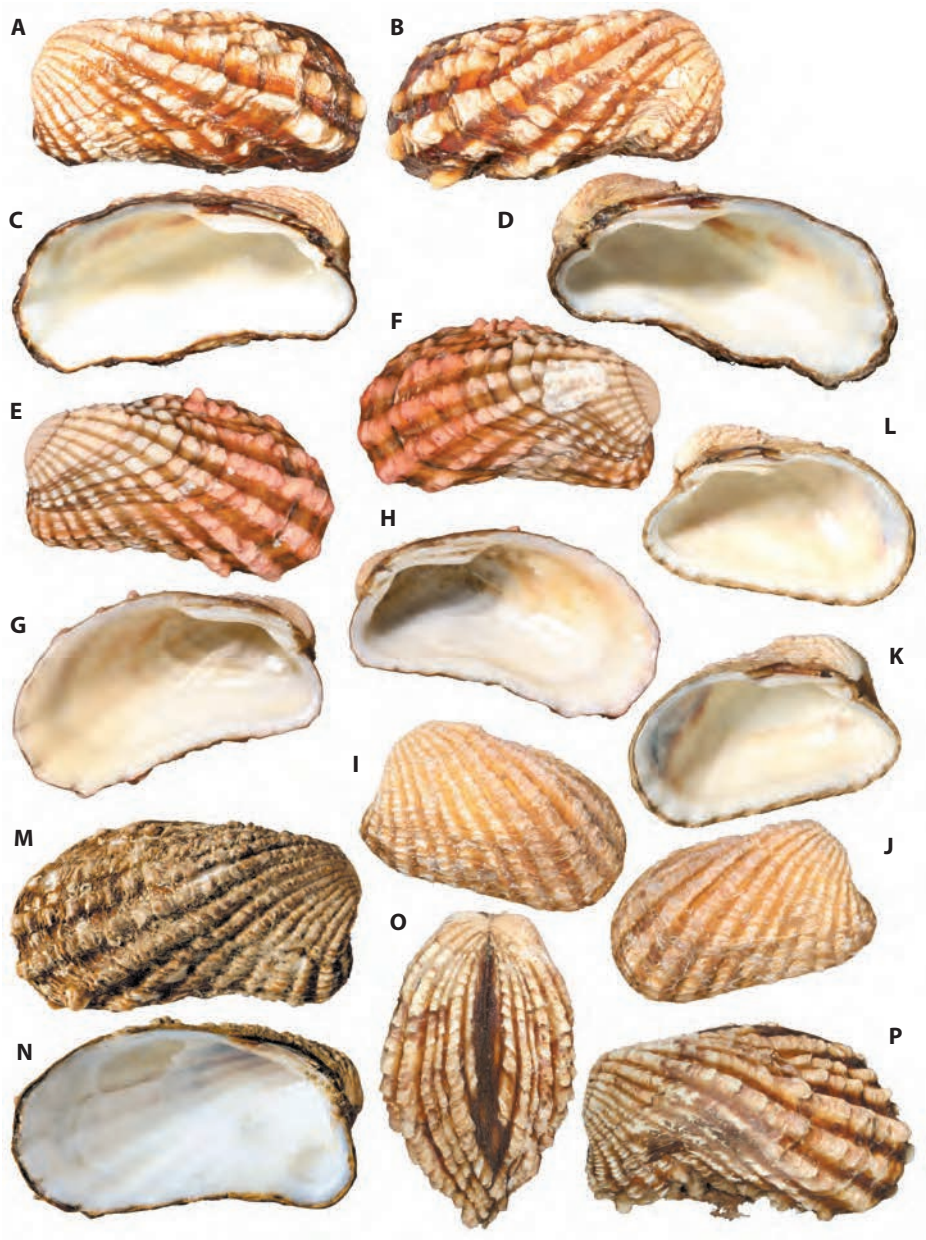
Shell up to 45 mm long, very variable in shape, elongate-subrectangular to somewhat mytiliform, thick and solid, very inflated. Beaks at the anterior end, subterminal. Surface with 13-17 radial ribs, on the anterior part smaller and closer-set, on the posterior part coarser and larger, with more marked interspaces. Anterior ribs bearing knobs or very dense, short scales, posterior ribs with more or less well developed larger scales which occasionally are quite long. Lunule very small, short, broad and heart-shaped. No escutcheon. Periostracum brown, dull and wrinkly on the marginal part, often eroded on the scales or part of the ribs. Inner margin slightly denticulate, corresponding to the external ribs. Outside whitish with brown spots, flecks or zones or entirely brownish red to pinkish red. Inside white, often with brown, purplish brown or pale brown zones or with pale pinkish hue.



Distribution. Mauritania (Cap Blanc) to Senegal (Casamance) and Guinea (9°11'N); Côte d'Ivoire Ghana; Gabon (Port-Gentil) and Congo Brazzaville (Pointe-Noire) to southern Angola (Lucira, Namibe province); São Tomé.

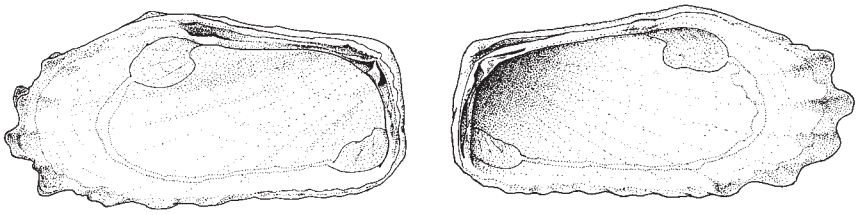
Biotope. On rocky shores, byssally attached to the undersides of rocks, stones and other hard substrate (see Fig. 9.1), from low tide mark to about 20 m, off Guinea found down to 42 m; common.

Remarks. This species was for a long time known as *C. senegalensis* Reeve, 1843, although Dautzenberg (1891: 42) already had mentioned it under Lamarck's earlier name. Huber (2010) examined Lamarck's type specimen in MHNG and confirmed the conspecificity with *C. senegalensis*. The species is close to *C. calyculata*, but is larger and has a much smaller protoconch than *C. calyculata*. This proves that *C. rufescens* is not a subspecies of *C. calyculata* but that two different species are involved. *C. rufescens* seems to be confined to the zones of continuous or intermittent seasonal upwelling; it has not yet been recorded from the two entirely tropical zones north and southeast of Côte d'Ivoire and Ghana. This is "Le Jeson" of Adanson.



9.6. *Cardita rufescens* Lamarck, 1819. **A-D**, Port Etienne (now Nouadhibou), Mauritania (31.1 mm). **E-H**, Dakar, Senegal (29.3 mm). **I-L**, Praia das Conchas, Ilha de São Tomé (26.6 mm). **M-N**, Bissonga, Baia da Lucira, Namibe prov., S. Angola (43.1 mm). **O-P**, Praia do Cesar, Baia da Lucira, Namibe prov., S-Angola (39.0 mm).

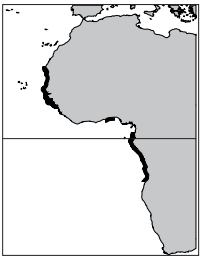
Carditamera contigua (Dautzenberg, 1910)



9.7. Etambar, Corimba, Luanda, N-Angola, low tide (5.0 mm).

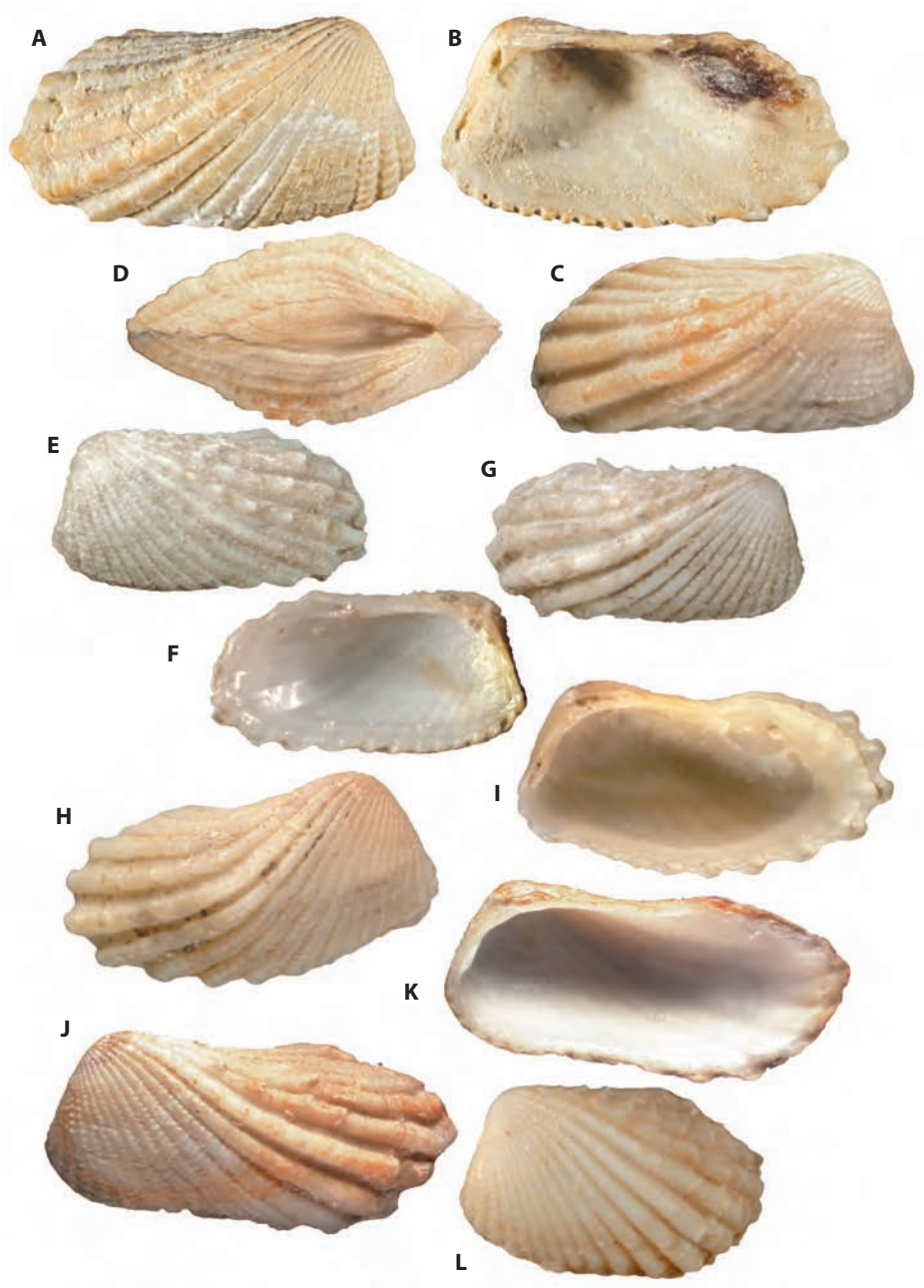
Shell very small, 3-9 mm long, somewhat variable in shape, elongate, subrectangular with more or less parallel dorsal and ventral margin, rather thick and solid, inflated to very inflated. Beaks close to the anterior end, nearly terminal. Surface with 16-19 radial ribs which are narrow, low and rather close-set on the antero-ventral part and broad, prominent and with deep and marked intervals on the posterior and postero-dorsal part. Anterior ribs crossed by weak commarginal ridges causing a granulose sculpture. Posterior ribs rounded, with more or less scattered scales which can be quite long. Lunule small and rather broad, escutcheon narrow and more or less ill-defined. Periostracum thin, pale yellowish and slightly wrinkly, usually persistent only in the interspaces. Inner margin dentate in accordance with the external ribs. Outside whitish, with occasional light brownish spots and mottles on the posterior ribs. Inside white, sometimes with brown zones on the posterior or postero-dorsal part.

Distribution. Mauritania (Cap Blanc) to Guinea (Conakry); Ghana (Huber 2010) and Togo; Bahia de Corisco (Equatorial Guinea) to southern Angola (Benguela prov.).



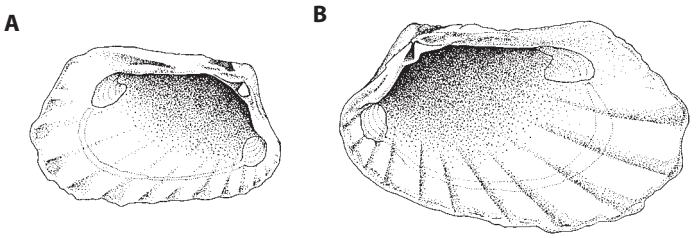
Biotope. On rocky coasts, often within thick and dense algae layers or turfs on the rock surface, but most probably also on coarse sand with gravel, from low tide level to about 5 m, occasionally deeper, to 15 m, locally not uncommon.

Remarks. This species resembles *Cardita calyculata*, but is much smaller, more elongate, more inflated and less variable, and has the conspicuous posterior lateral which is absent in *Cardita*. The protoconch is very small but does not necessarily suggest planktotrophic development.



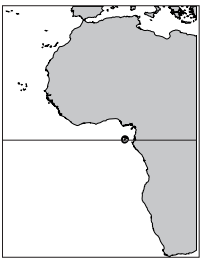
9.8. *Carditamera contigua* (Dautzenberg, 1910). **A**-**B**, N. of Pointe Cansado, Mauritania, 6-8 m (syntype, rv, 7.9 mm, photo Manuel Caballer/Recolnat). **C**-**D**, Baie de Gorée, Senegal, near wreck of the "Tacoma", 12-15 m (5.2 mm). **E**-**G**, Katchek, Iles Tristão, Guinea (4.2 mm). **H**-**I**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, N of lighthouse, beach drift at low tide (5.4 mm). **J**-**K**, Praia Etambar, Corimba, Luanda prov. N-Angola, low tide (6.4 mm). **L**, Caotinha, Benguela prov., S-Angola, low tide (4.1 mm).

Carditamera rolani Cosel, 1995



9.9. **A**, left valve, Praia Emilia, São Tomé, 5 m (2.7 mm). **B**, right valve, Praia Mutamba, São Tomé, 5 m (3.7 mm).

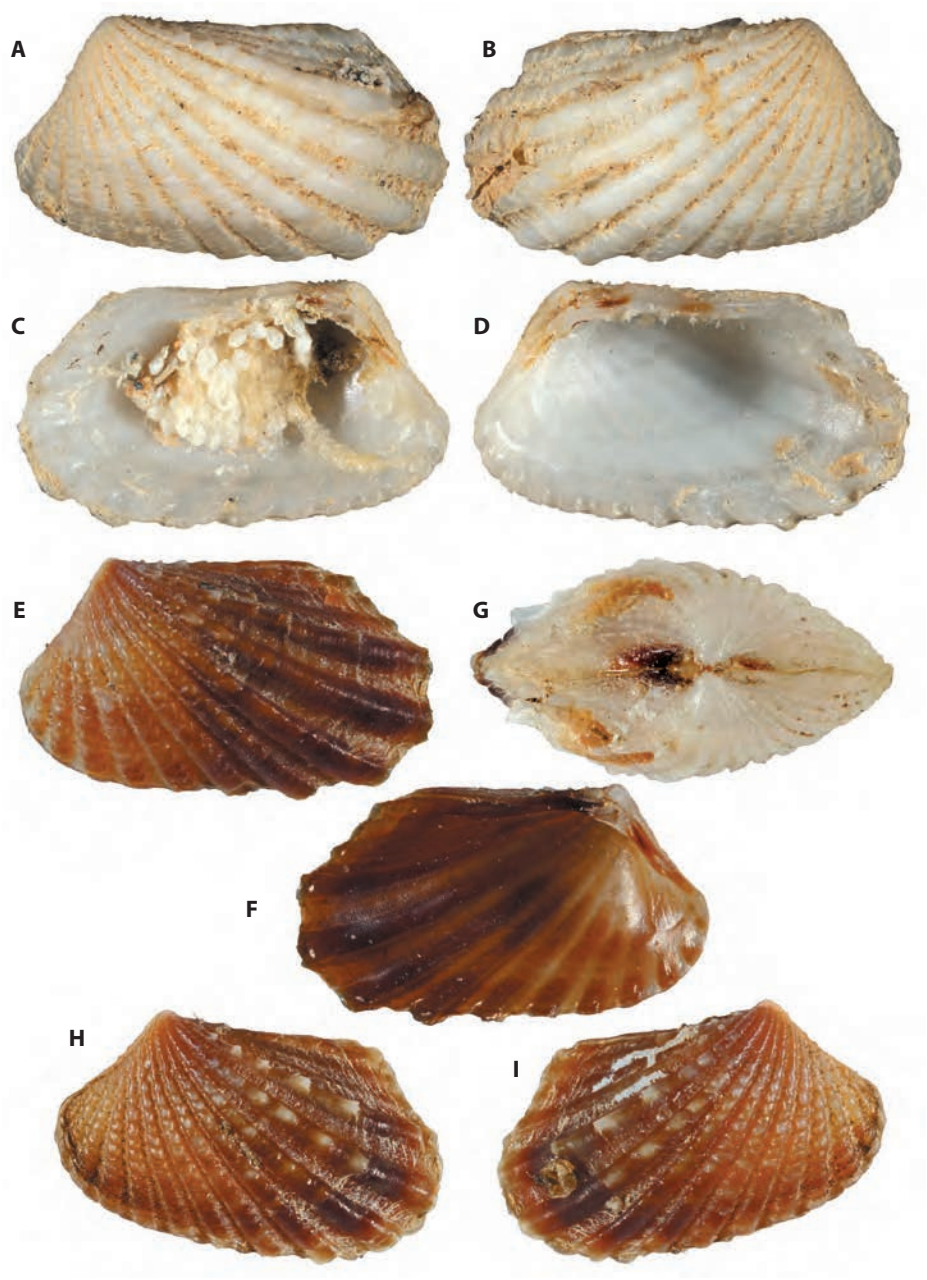
Shell very small, up to 3.7 mm long, variable in outline, subrectangular-trapezoidal, rather thick and solid, quite inflated. Beaks subterminal, situated near the anterior end. Surface with 14-16 strong radial ribs which bear close-set transverse, generally not very prominent nodules and which gradually increase in thickness towards posterior, the two or three ribs ending at the postero-ventral corner being the largest and often bearing scales. Interspaces much narrower than ribs. Lunule short and narrow, escutcheon rather broad, both well-defined. Periostracum very thin, transparent and nearly colourless. Inner margin dentate corresponding to the external sculpture. Protoconch rather small, prominent, with an irregular sculpture, separated from the teleoconch by a rim. Outside uniform whitish to cream or uniform dark brown, occasionally white with a brown spot or zone near the posterior margin, or light brownish. Inside with outside colouration, occasionally with dark brown zones on the hinge line.



Distribution. Only known from Ilha de São Tomé, apparently endemic.

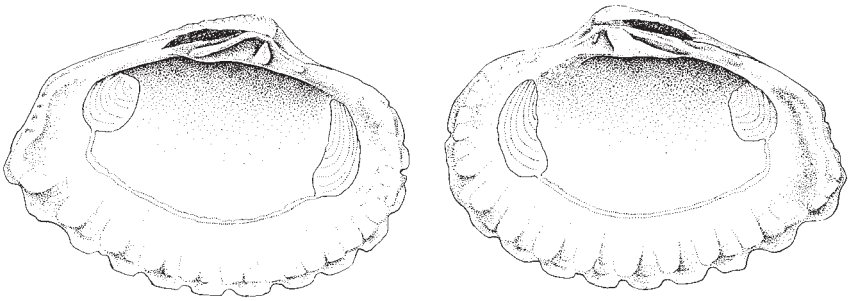
Biotope. On rocky shores, on rocks in algal mat, in about 2-3 m, uncommon.

Remarks. This is the smallest West African species of the Carditidae. It is very close to *Carditamera contigua* but distinguished from it by its smaller size and the shorter, more regular and more trapezoidal valves with non-terminal beaks. It cannot be taken as a juvenile of *C. contigua* as stated by Huber (2010: 655). It is definitely adult: all collected specimens of *C. rolani* attain the same very small size; moreover, the species is incubating, and two of the collected specimens, among them the holotype of 3.6 mm, were found with juveniles in the mantle cavity (Fig. 9.10C). It occurs together with *Glans afra*, which is much larger, much shorter and has more prominent and more regular ribs.



9.10. ***Carditamera rolani*** **Cosel, 1995. A-D**, Praia Emilia, São Tomé, 5 m (holotype, 3.6 mm; note the juveniles incubated in the lv). **E-F**, Esprainha, São Tomé, rocks at low tide (paratype, 3.3 mm). **G**, same locality (paratype, 3.3 mm). **H-I**, same locality (paratype, 2.7 mm); all photos by Manuel Caballer/Recolnat.

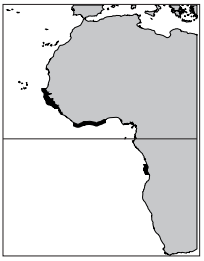
Lazariella regularis (G.B. Sowerby III, 1913)



9.11. Baie de Gorée, 20 m (21.6 mm).

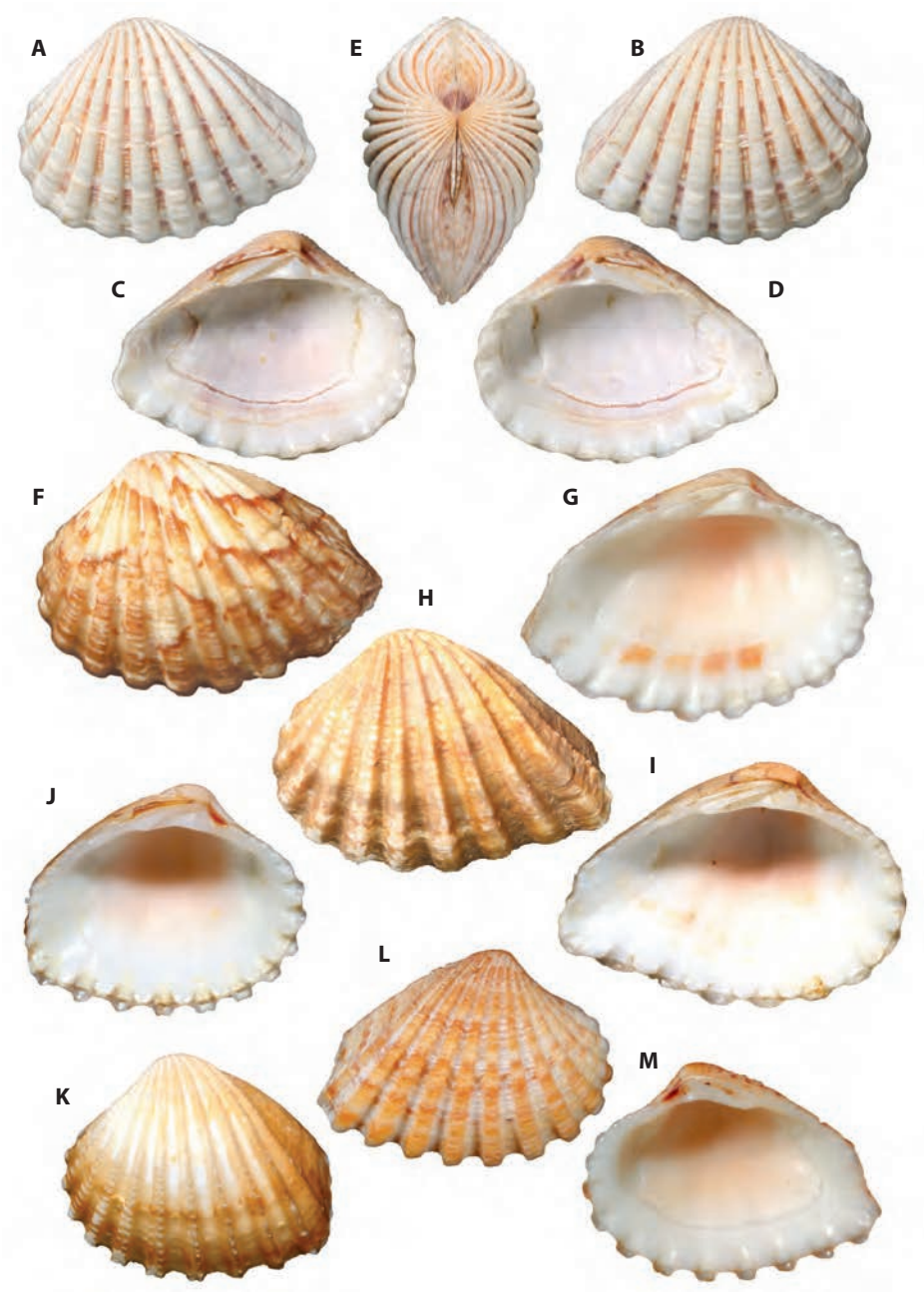
Shell up to 30 mm long, oblong-trigonal, with anterior margin rounded, posterior part tapering and posterior margin obliquely truncated, thick and solid, inflated. Beaks in front of the vertical midline. Surface with 12-14 strong, broad, subquadrate, regular, radial ribs, bearing weak, irregular, nodulose, transverse costae. Interspaces rather broad, deep and U-shaped. Posterior area smooth or with one or two thin and narrow radial ribs. Lunule small, rather narrow and heart-shaped. Periostracum dull, yellowish brown to light brown. Inner margin denticulate according to the external ribs. Outside white, with scattered brownish zones or bands, occasionally interspaces of ribs brown. Lunule brown. Inside white, often with salmon pink under the beaks and occasionally with brown colouration near the posterior margin.

Distribution. Senegal (Dakar) to Guinea (9°30'N); Côte d'Ivoire to Ghana; Congo Brazzaville to northern Angola (Palmeirinhas, Luanda). Distribution gaps in the typical tropical zones are likely.



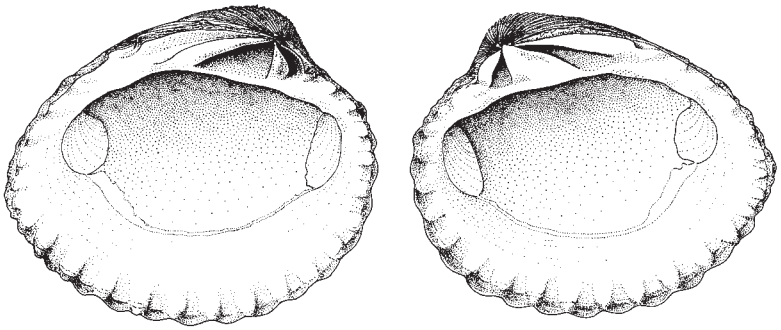
Biotope. In fine or mixed sand, also with gravel, offshore from 20 to about 80 m, rare.

Remarks. The type species of the genus *Lazariella*, *Cardita subalpina* Michelotti, 1839 from the Lower Miocene of France and Northern Italy is most probably the ancestor of the Recent West African species.



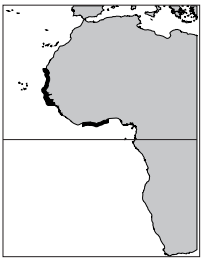
9.12. *Lazariella regularis* (G.B. Sowerby III, 1913). **A-E**, Baie de Hann, Dakar, Senegal, 20-30 m (32.4 mm). **F-G**, W Baie de Sangarea, Guinea, 09°42'N, 15°33'W, 30-35 m (29.5 mm). **H-I**, W of Rio Dangara, Guinea, 10°12'N, 13°06'W, 20 m (29.3 mm). **J-K**, off Abidjan, Côte d'Ivoire (17.6 mm). **L-M**, Praia do Buraco, Palmeirinhas, Luanda prov., N-Angola (18.1 mm).

Cardiocardita ajar (Bruguière, 1792)



9.13. Baie de Gorée, Senegal, 5-20 m (31.4 mm).

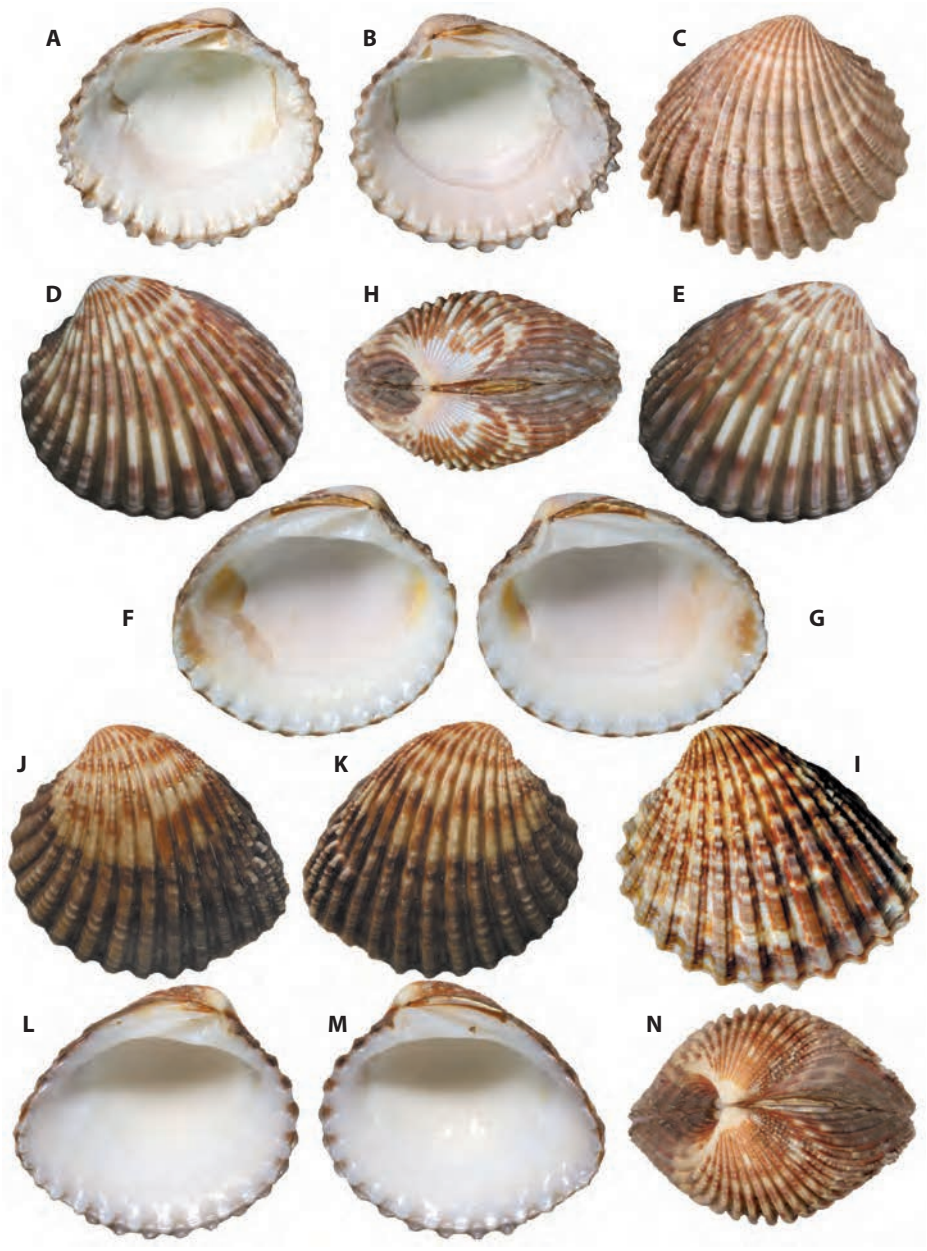
Shell up to 40 mm long, suboval, with anterior margin rounded and posterior margin rounded-tapering, thick and solid, inflated. Beaks well anterior to the vertical midline. Surface with 22-25 strong, square ribs which are broader at their base and which bear weak transverse nodules, especially on the anterior and posterior ribs. Interspaces deep, flat and slightly narrower than the top of the ribs. Lunule deeply impressed, very small and rather narrow. Periostracum rather thin and dull brownish, often eroded on the rib nodules. Inner margin denticulate corresponding to the external ribs. Outside reddish brown to brown with irregular, whitish bands and mottles or more white with brown zones. Inside white, often with pale brownish hue under the beaks or on the umbonal half.



Distribution. Mauritania (Cap Blanc) to Senegal (Casamance) and extreme North of Guinea (10°33' N), also from Côte d'Ivoire to Togo (only a few worn beach valves seen).

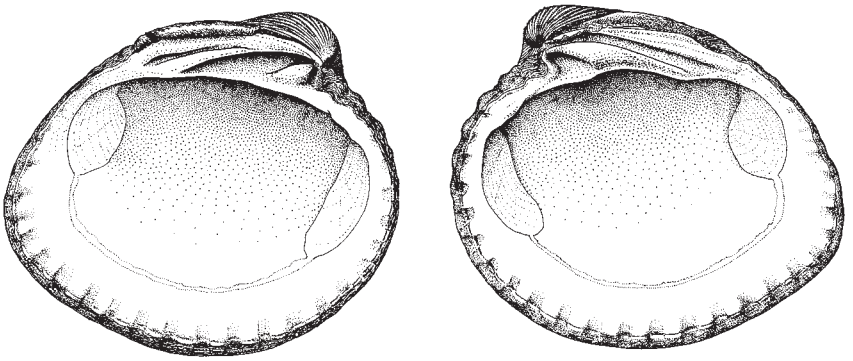
Biotope. In fine, mixed and coarse sand, also on sand patches between rocks and on sand with calcareous algae and shell debris, from extreme low tide to about 30 m, common to abundant.

Remarks. This species inhabits the northern zone of seasonal upwelling; it becomes rarer in southern Casamance and is absent from Guinea and more southward. Records from the tropical zone proper mostly refer to members of the closely related *C. obesa* complex (see below), however, there seems to be an isolated distribution pocket of *C. ajar* on the coasts of Côte d'Ivoire, Ghana and Togo, judged from several beach-worn specimens from some localities of that region. *Cardiocardita ajar* has a very small protoconch which is an indication for a short pelagic larval phase. This is the type species of the genus *Cardiocardita* and "L'Ajar" of Adanson.



9.14. ***Cardiocardita ajar*** **(Bruguière, 1792).** **A**-**C**, Mauritania, 20°00'N, 17°08'W, 20 m (32.1 mm). **D**-**H**, M'Bour, Petite Côte, Senegal, beach drift (25.0 mm). **I**, Baie de Hann, Dakar, Senegal (30.5 mm). **J**-**N**, N-Casamance, Senegal, 12°46'N, 17°12'W, fine sand, 22 m (30.0 mm).

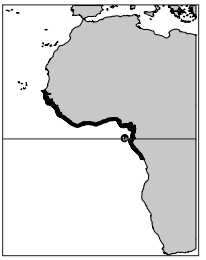
Cardiocardita tankervillii (W. Wood, 1828)



9.15. Baie de Gorée, Senegal, 8 m (46.4 mm).

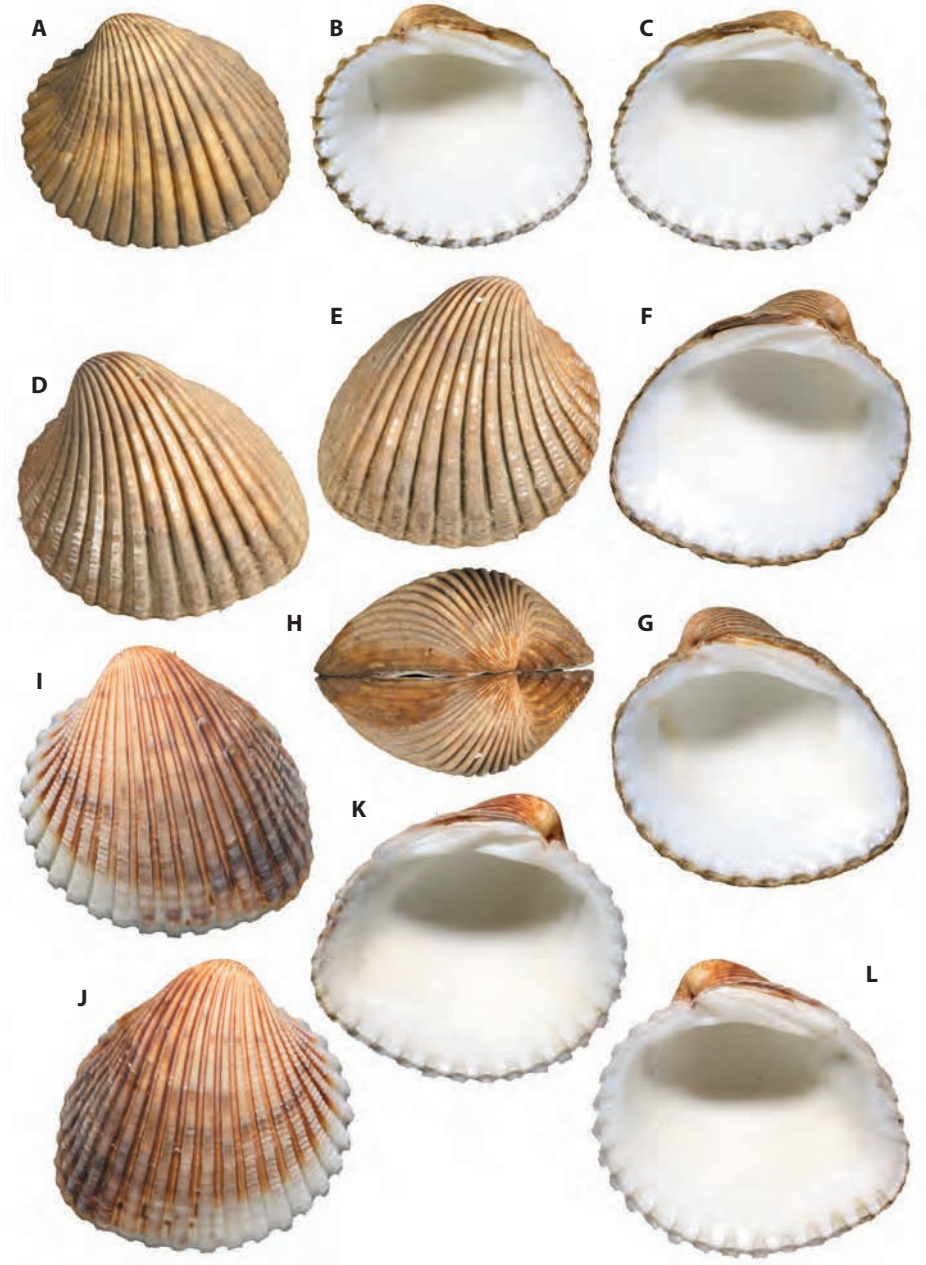
Shell up to 58 mm long, somewhat variable in outline, oval-subtrigonal, only slightly longer than high or as high as long, with broadly rounded anterior end and slightly obliquely-truncated posterior end, very thick and solid, inflated. Beaks well in front of the vertical midline. Surface with 25-28 strong, square, radial ribs with flat or slightly rounded top, on the anterior part of the valves bearing weak, transverse nodules, often obsolete or missing. Interspaces deep and narrower than the width of the ribs, U-shaped. Lunule very small, broader than long, deeply impressed, no escutcheon. Periostracum rather thick, dark brown, somewhat velvety, with very tiny bristles arranged radially and only visible under a lens (x 20-40). Inner margin denticulate, corresponding to the external ribs. Outside whitish-cream, with more or less isolated brownish speckles or more extensive light to dark brownish zones, occasionally nearly uniform brown. Inside white.

Distribution. Senegal (Dakar) to northern Angola (Luanda); Ilha do Principe.



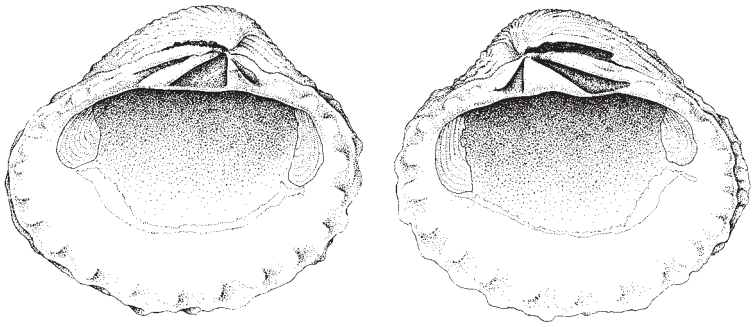
Biotope. In fine, mixed and coarse sand, also with calcareous algae, coral and shell debris, from about 5 to 40 m, common.

Remarks. This is the largest and heaviest West African carditid. It is not uncommonly taken in trawls. "*C. tankervillei*" is a misspelling. This species is sometimes placed in the genus *Cardites* Link, 1807 but Huber (2010) placed it correctly in *Cardiocardita*.



9.16. ***Cardiocardita tankervillii*** **(W. Wood, 1828). A-C**, Kafountine, N-Casamance, Senegal, 12°44'N, 16°59.5'W, 9 m (37.1 mm). **D-H**, W of Ile Kouffin, Guinea, 10°30'N, 15°43.5'W, 21 m (45.6 mm). **I-L**, Ile Banié, Baie de Corisco, Gabon, sand in shallow water (58.2 mm).

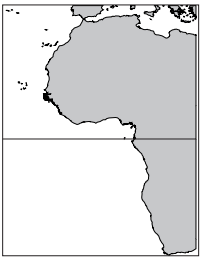
Cardiocardita obesa Cosel, 1995



9.17. Casamance, 12°47.2'N, 17°12.4'W, 24 m (18.6 mm).

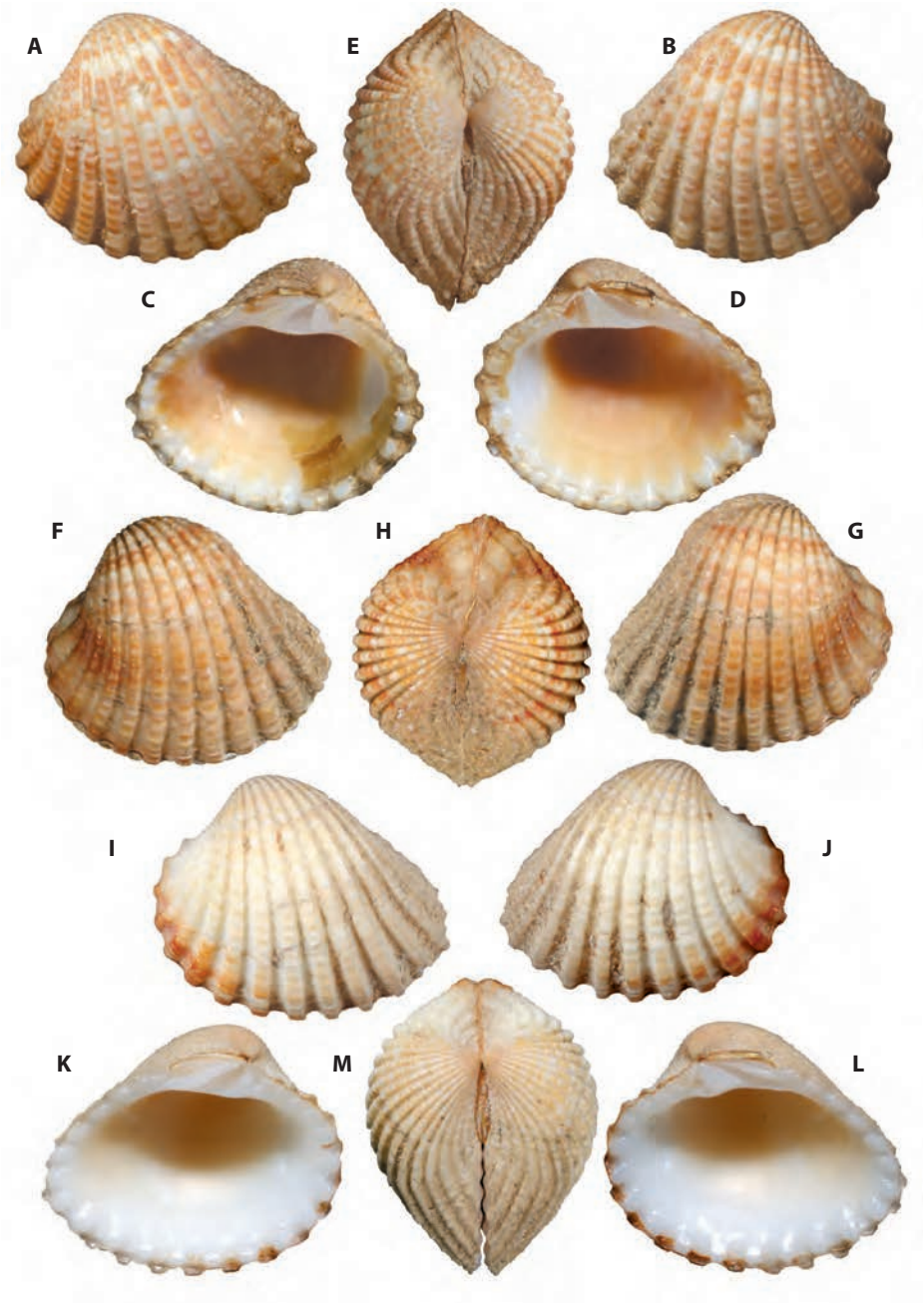
Shell up to 25 mm long, suboval, with anterior margin well rounded and posterior margin rounded-tapering, thick and solid, very inflated. Beaks globose, situated well anterior to the vertical midline. Surface with 20-22 strong, broad radial ribs, which have a square transverse profile in their top part and broaden considerably to their base and which bear broad, transverse nodules which often become more or less obsolete on the marginal part of the valves, giving the ribs here a more rounded profile. Interspaces rounded-concave. Lunule very small, broad, heart-shaped and rather deeply impressed. Periostracum thin, dull, light greyish, mostly persistent on the marginal half of the valve. Inner margin dentate corresponding to the external sculpture. Outside white, white with pale brown commarginal zones and lines or irregular spots and streaks on the ribs, or more or less uniform pale brown with a few lighter commarginal zones. Inside white or with salmon reddish brown in the umbonal cavity, down to the pallial line or nearly on the whole inside.

Distribution. Hitherto known only from Senegal (Casamance).



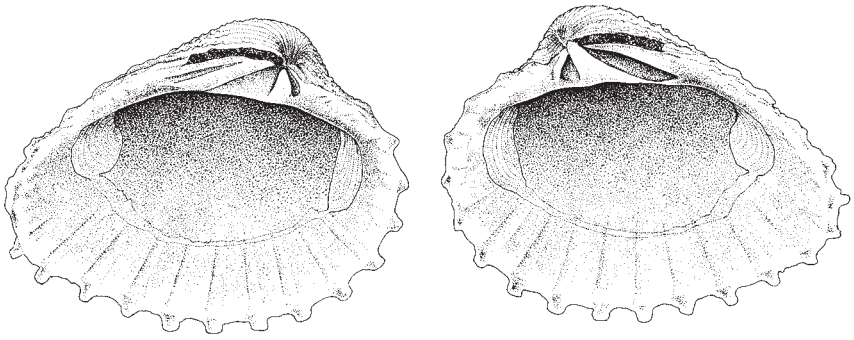
Biotope. In clean, fine and mixed sand, often with shell debris, offshore between 18 and 35 m, locally not uncommon.

Remarks. This species is very close to *C. gabonensis* (see next entry) with which it shares the prominent umbos. *C. gabonensis* is less inflated and has more square ribs with sharp angles at both sides of their top. Its hinge plate can be as strong as in *C. obesa* but also much narrower. *Cardiocardita ajar*, with which *C. obesa* occurs sympatrically in Casamance, is larger, has less globose umbos, is less inflated and less elongate and has a broader posterior end. The only population known of *C. obesa* was found off Casamance along a coastal strip of about 60 km, where it occurs together with the also quite range-restricted *Pharus chenui* (see there). The species has not yet been found off Guinea-Bissau, the known northern limit of *C. gabonensis*.



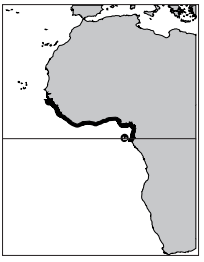
9.18. ***Cardiocardita obesa*** **Cosel, 1995. A-E**, Presqu'île aux Oiseaux, Kafountine, N-Casamance, 12°46'N, 17°12'W, 22 m (paratype, 23.7 mm). **F-H**, same locality (paratype, 17.9 mm). **I-M**, Casamance, Senegal, 12°43'N, 17°21.2'W, 34 m, sand (19.6 mm).

Cardiocardita gabonensis Cosel, 1995



9.19. Port Gentil on sand 3-6 m (paratype, 22.2 mm).

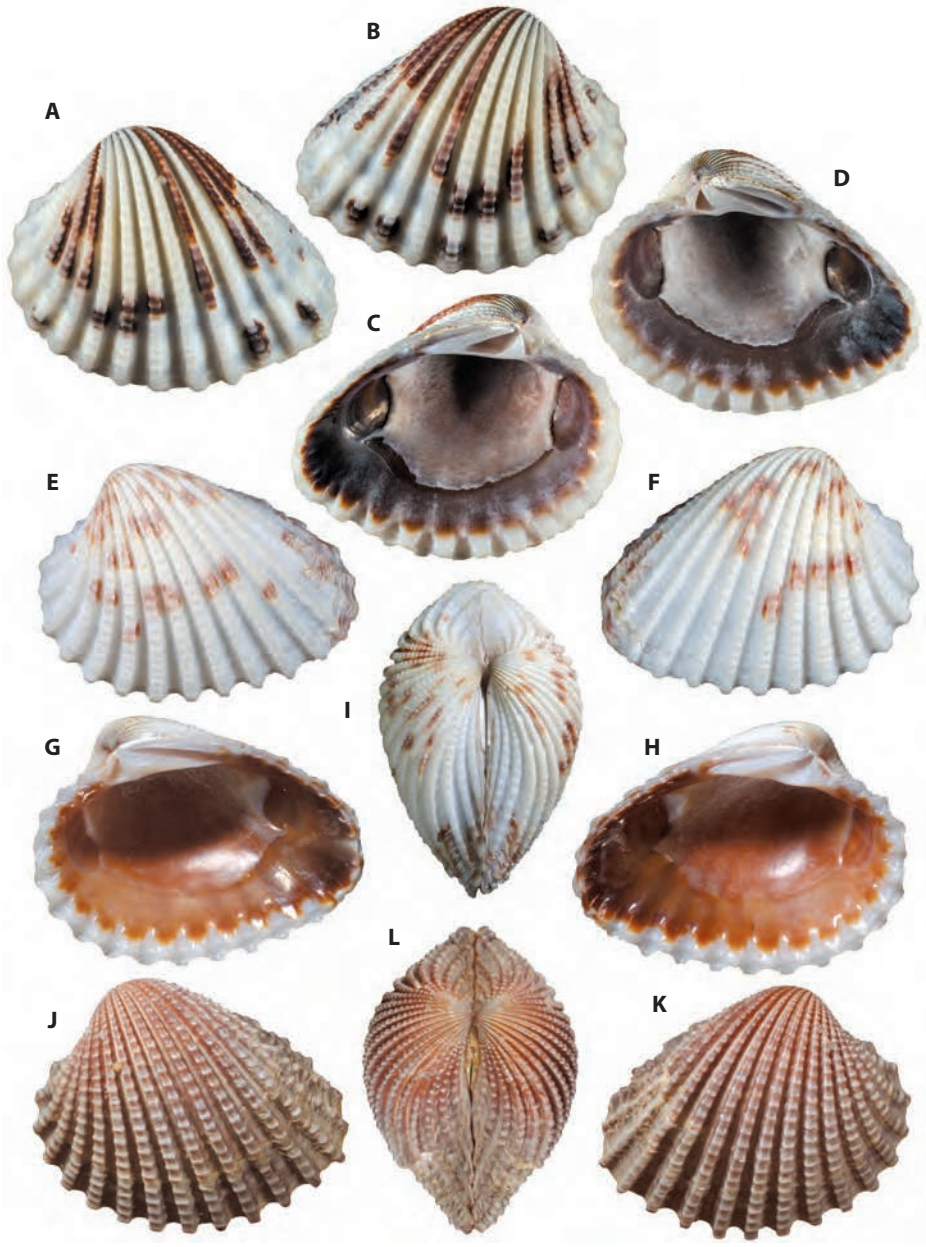
Shell up to 25 mm long, somewhat variable in shape, suboval to elongate-oval, with the anterior margin nearly semicircular and the posterior margin tapering and narrowly rounded, thick and solid, inflated. Beaks well in front of the vertical margin. Surface with 19-22 strong, square radial ribs bearing prominent, regular, close-set, transverse nodules. Lower part of the ribs broadening, interspaces deep, at the bottom flat and narrower than the top of the ribs. Lunule very small, short, broad and heart-shaped. Periostracum thin, dull, light yellowish grey. Inner margin denticulate corresponding to the external pattern. Outside dark brown with lighter transverse rib nodules and lighter interspaces, white with all ribs completely or partly dark brown, white with brown spots or speckles on the ribs, entirely white or light brownish with whitish commarginal bands on the ventral part. Inside white or reddish brown to dark brown with a narrow marginal white band and a white hinge plate.



Distribution. Guinea-Bissau (North of Rio Geba) to Gabon (Port-Gentil) and possibly Baie de Pointe-Noire (Congo Brazzaville); Ilha do Principe.

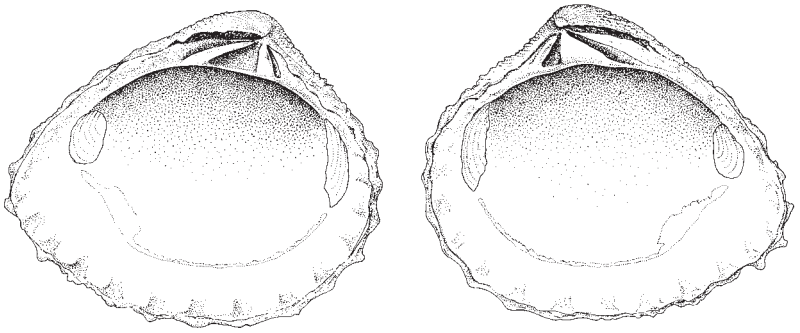
Biotope. In clean fine sand, also sand with shell debris, from shallow water (3-5 m, Gabon) to more offshore (10-20 m, Guinea-Bissau, Guinea and southward), not common everywhere.

Remarks. This species, which is restricted to the tropical zone, is very close to *C. obesa* and *C. lacunosa*. The latter, however, is slightly shorter, thinner-shelled and has ribs with narrower crests; it tends to inhabit more sheltered places than *C. gabonensis*. Specimens from Pointe-Noire (Congo Brazzaville) are smaller and may represent another species. From *C. ajar*, this species usually differs in its slightly more elongate outline and in the nodules extending over the whole length of the ribs.



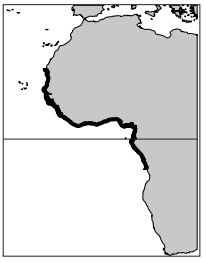
9.20. *Cardiocardita gabonensis* Cosel, 1995. A-D, Port-Gentil, Gabon, 0°38'S, 8°43'E (holotype, 26.3 mm, photo Manuel Caballer/Recolnat). E-I, Port-Gentil, Gabon, sand, 3-6 m (25.6 mm). J-L, same locality (20.5 mm).

Cardiocardita lacunosa (Reeve, 1843)



9.21. Cacuaco, Angola, on beach (18.6 mm).

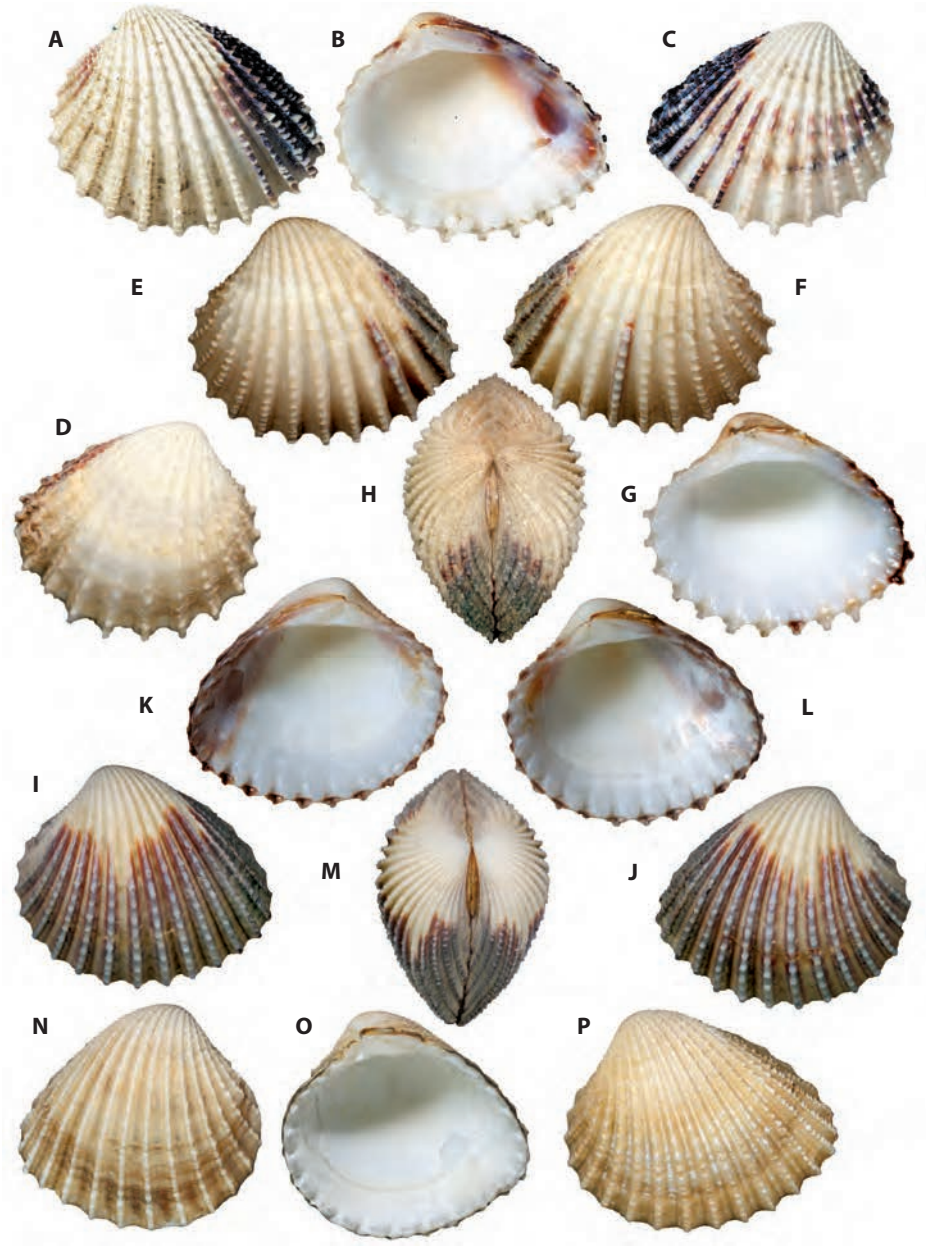
Shell up to 23 mm long, suboval, with rounded anterior margin and tapering posterior part, rather solid, inflated. Beaks anterior to the vertical midline. Surface with 21-24 strong, radial ribs with narrow, square crests bearing regular scaly nodules or short scales on the top. Lower part of the ribs considerably broadening towards the base. Interspaces between the rib bases about as broad as the rib tops but apparently much broader due to the shape of the ribs. Lunule small, more or less broad, not always well defined. Periostracum very light greyish brown, dull, often eroded on the top of the ribs. Inner margin denticulate corresponding to the exterior ribs. Outside entirely white or whitish with a brown zone on the posterior area, occasionally also with brown ribs or entirely reddish brown with whitish umbonal region. Inside white, sometimes with brown postero-dorsal part and occasionally with a pale salmon hue under the beaks.



Distribution. Mauritania (Cap Blanc) and Senegal (Ouaran, Petite Côte) to northern Angola (Luanda).

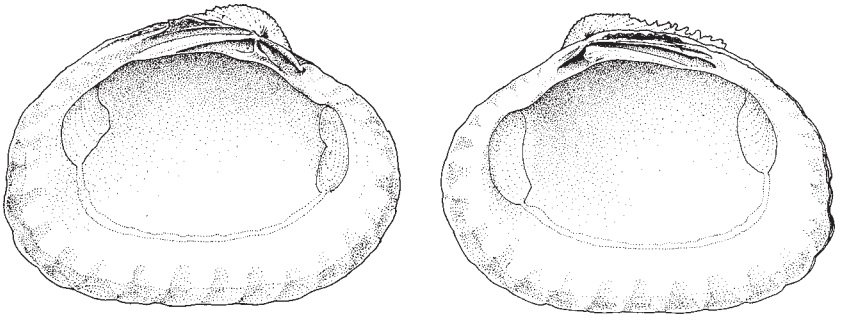
Biotope. In more or less muddy sand and fine sand, by preference in calm bays and semi-sheltered areas, mostly in somewhat turbid water, from low tide mark to about 10 m, occasionally deeper, to 25 m, common, to the north becoming rarer. Tolerates salinity reduction within certain limits.

Remarks. This species is easily distinguished from all other *Cardiocardita* species by the shape of the ribs with narrow top and very broad bottom, and by the narrow, regular scales on the ribs.



9.22. *Cardiocardita lacunosa* (Reeve, 1843). **A**-**B**, off Casamance, Senegal (21.0 mm). **C**, same locality (18.3 mm). **D**, Grand Bassam, Côte d'Ivoire, 25 m (16.8 mm). **E**-**H**, Cap Esterias - Pointe Idolo, Gabon, beach drift (19.4 mm). **I**-**M**, Cacuaco, Bengo prov., N-Angola, beach drift (14.7 mm). **N**-**O**, same locality (16.6 mm). **P**, same locality (18.6 mm).

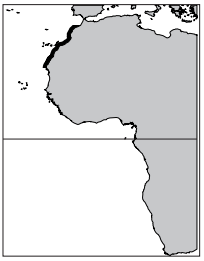
Akardita monodi (Nicklès, 1953)



9.23. SW of Cap Bojador, West Sahara, 24°58.3'N, 15°32.6'W, 50 m (14.7 mm).

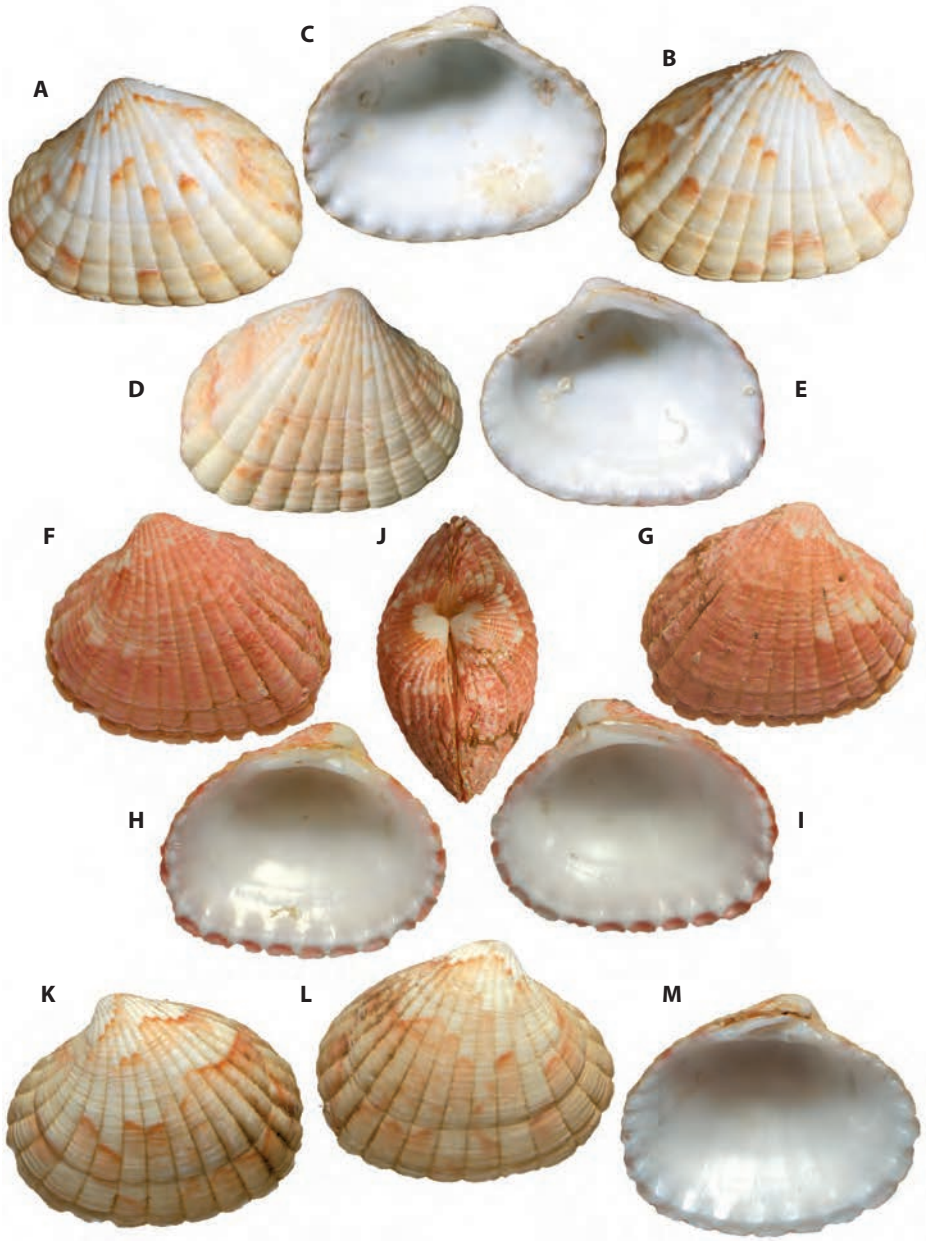
Shell up to 18 mm long, somewhat variable in outline, oval to oval-rectangular, with anterior and posterior margin rounded and ventral margin slightly convex to nearly straight, rather thick and solid, compressed. Beaks more or less anterior to the vertical midline. Surface with rather flat and broadly rounded, contiguous radial ribs which are crossed by commarginal grooves on the umbonal part and irregular growth lines and coarser growth stages in the middle and the marginal part. Radial ribs on the posterior area narrower and with scattered, coarse nodules. Lunule small, rather short and heart-shaped, no escutcheon. Periostracum thin, very faintly yellowish to almost colourless, transparent. Inner margin dentate corresponding to the exterior ribs. Outside white, white with reddish brown spots or chevrons, nearly uniform pink, or more or less pink with whitish rays and reddish brown spots, zones and markings. Inside white.

Distribution. Atlantic Morocco (35°N) and West Sahara to Mauritania (Baie du Lévrier).



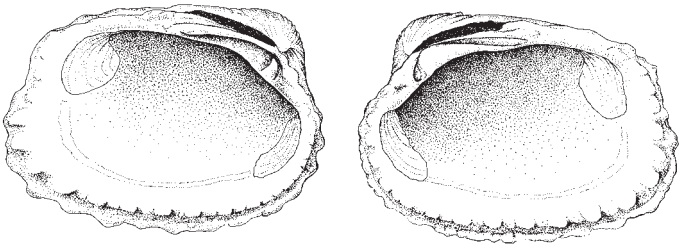
Biotope. In mixed sand with calcareous algae and shell debris, offshore from about 30 to 100 m, rare. Off West Sahara (25°N), it was found together with live *Gari pseudoweinkauffi* and shells of *Astarte fusca* and *Crassatina modesta*.

Remarks. This species has a rather restricted range and is confined to the northern zone of permanent upwelling. It is the only recent representative of *Akardita* and was previously assigned to *Cyclocardia*, an otherwise curcumboreal genus, until La Perna *et al.* (2018) erected a new genus. It is poorly known and was hence mistaken as *Cardita ajar* by Bacallado *et al.* (1975: pl. 3 fig. 5). The protoconch is very small which indicates a short free-swimming larval phase.



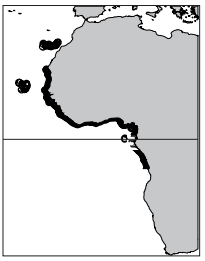
9.24. ***Akardita monodi*** **(Nicklès, 1953). A-C**, West Sahara, 24°56.2'N, 15°34.6'W, 53 m (17.8 mm). **D-E**, same locality (18.0 mm). **F-J**, West Sahara fishing grounds (15.0 mm). **K-M**, same locality (19.3 mm).

Glans afra Cosel & Gofas, 2018



9.25. Praia São Tiago, Bengo, Angola, low tide (15.9 mm).

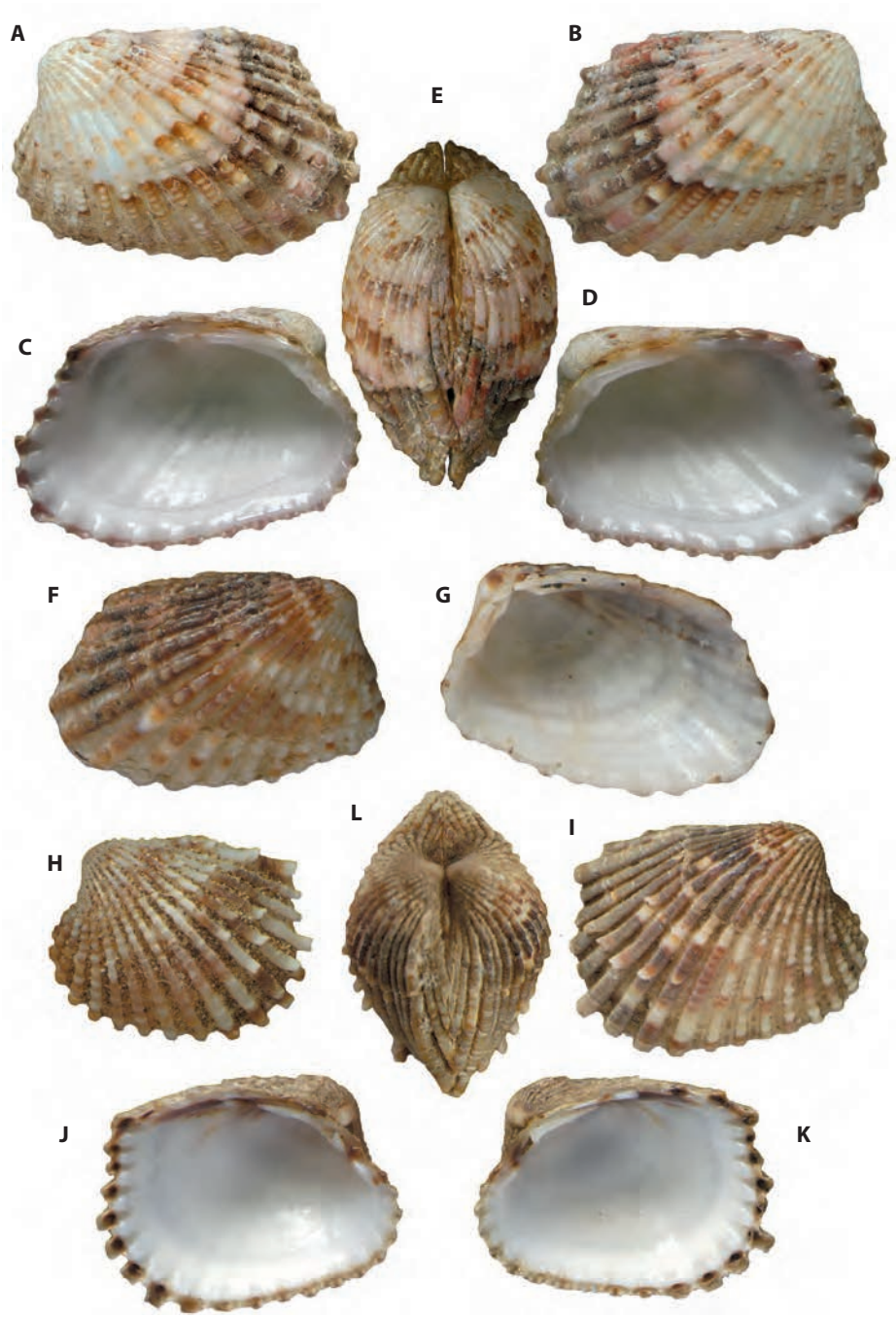
Shell up to 25 mm long, variable in shape, rather elongate, rectangular to subrectangular, with dorsal and ventral margin nearly parallel and posterior margin obliquely truncated, quite thick and solid, inflated. Beaks at the anterior end, subterminal. Surface with 20-23 radial ribs, the prominent and rounded or somewhat squarish top part separated from the low base by a groove on each side. Top of the ribs with more or less marked transverse nodules, posterior ribs with scattered scales. Posterior area with two to three thinner ribs, giving the impression of a radial depression. Lunule small, heart-shaped and impressed, no escutcheon. Periostracum thin, dull and light yellowish brown. Inner margin weakly undulate to dentate corresponding to the exterior ribs. Outside whitish, with often large brown zones, irregular commarginal bands or smaller brownish streaks, spots and flecks. Occasionally ground colouration pinkish. Inside white, sometimes with light to dark brown in the postero-dorsal part, occasionally with pinkish hue along the margins.



Distribution. Mauritania to northern Angola (Luanda); Canary Islands, Cape Verde Islands; São Tomé, Ilha do Principe, Annobon.

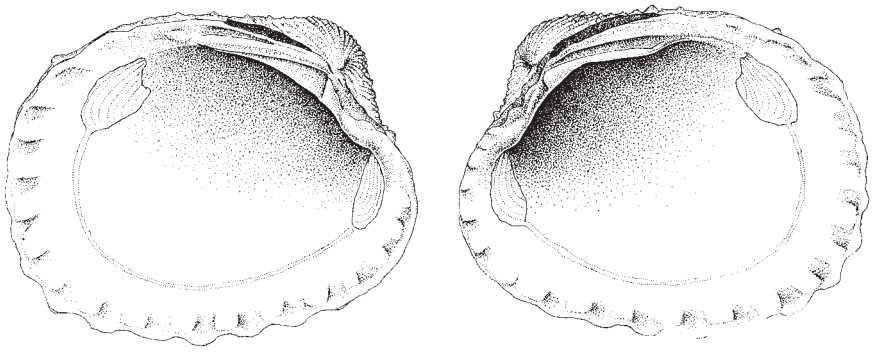
Biotope. Byssally attached to rocks, at the undersides of stones and other hard substrate, but also free on sandy bottom with shell debris, from shallow water (just below low tide level) to about 70 m, not uncommon.

Remarks. This species resembles, and is probably related to the Mediterranean *Glans trapezia* (Linnaeus, 1767), the type species of the genus. It has been reported from West Africa under this specific name (*e.g.* Nicklès 1952; 1955). The West African taxon grows to well over 20 mm long whereas Mediterranean specimens are usually less than 10 mm long and hardly ever larger than 12 mm. *Glans trapezia* is more rectangular in shape, with a more vertical posterior margin, never posteriorly rounded as in the larger specimens of *G. afra*. The ribs are less numerous, somewhat coarser in *Glans trapezia*, the anterior ones with more prominent nodules, and the posterior ribs also nodose, not forming broadly spaced scales as in *G. afra*. Inside, *Glans trapezia* has a more rounded and well-marked posterior adductor scar, usually tinged with brown, whereas that of *G. afra* is always white and rather indistinct. The protoconch of the West African species is smaller (120 µm in diameter instead of 160 µm).



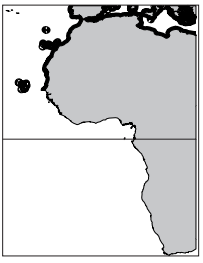
9.26. ***Glans afra*** **Cosel & Gofas, 2018. A-E**, Praia Mouro Peixe, São Tomé (paratype, 18.0 mm). **F-G**, Pointe Noire, Plage Sauvage (13.0 mm). **H**, Ponta da Mina and Ponta Novo Destino, Principe Island, 1º39.0'N, 7º26.0'E, 6 m (6.5 mm). **I-L**, Ilha de Luanda, N-Angola, 40-60 m (7.5 mm).

Centrocardita aculeata (Poli, 1795)



9.27. Dakar, 14°50.1'N, 17°29.3'W, 150 m (16.2 mm).

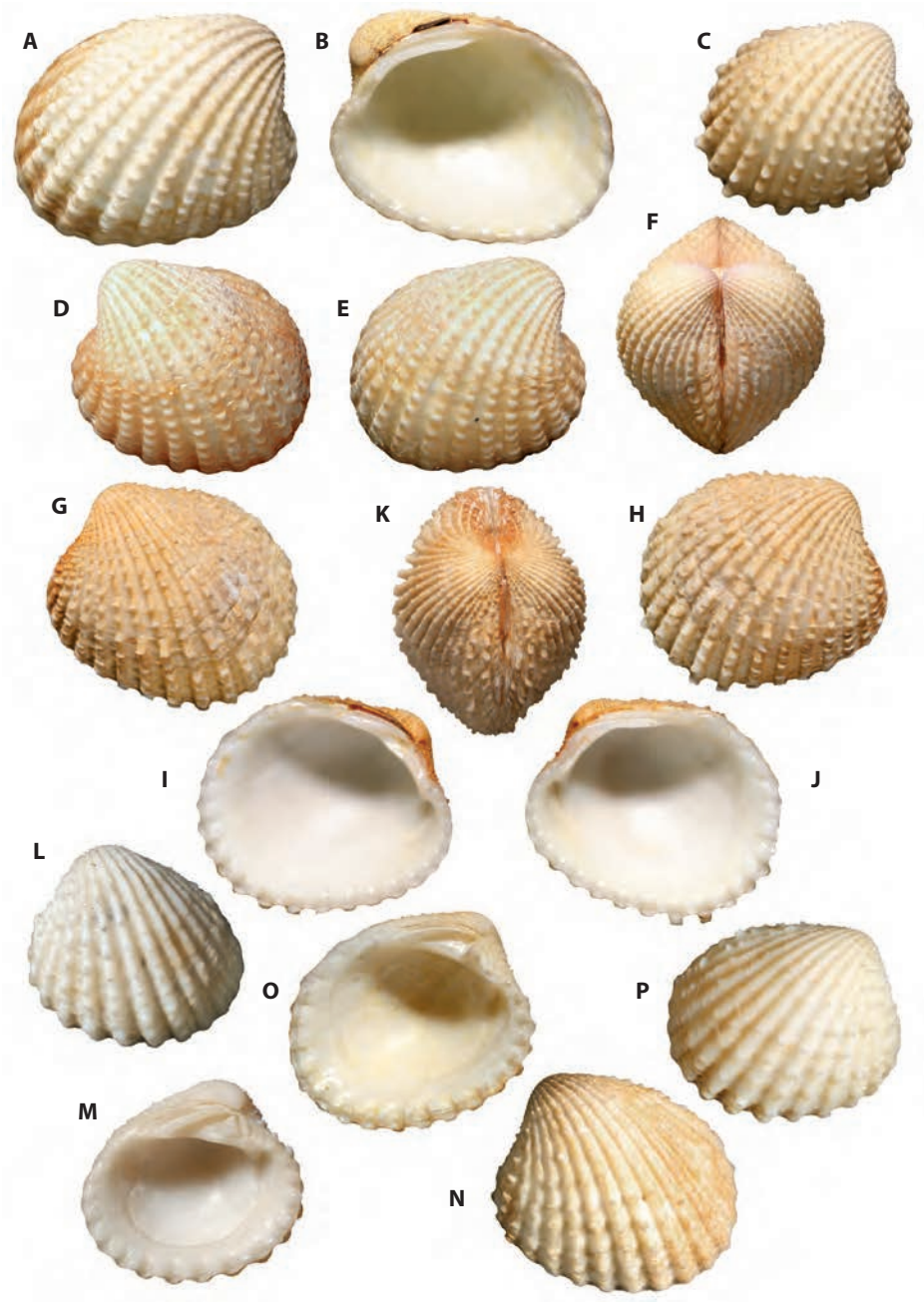
Shell up to 24 mm long, variable in outline, tumidity and thickness of hinge plate, oval to nearly subcircular, with anterior margin narrowly rounded and posterior margin broadly rounded, thick and solid to occasionally very thick and heavy, considerably inflated to nearly globose. Beaks near the anterior end, subterminal. Surface with 18-20 strong, rounded, radial ribs bearing regular, prominent and quite close-set nodules or short scales. Interspaces as broad as the ribs. Lunule short, broad and heart-shaped, no escutcheon. Periostracum thin, dull, pale yellowish brown to nearly colourless. Inner margin denticulate corresponding to the external ribs. Outside whitish to very pale brownish yellow, inside white.



Distribution. Southern Portugal (Sagres) to Senegal (Dakar region); Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

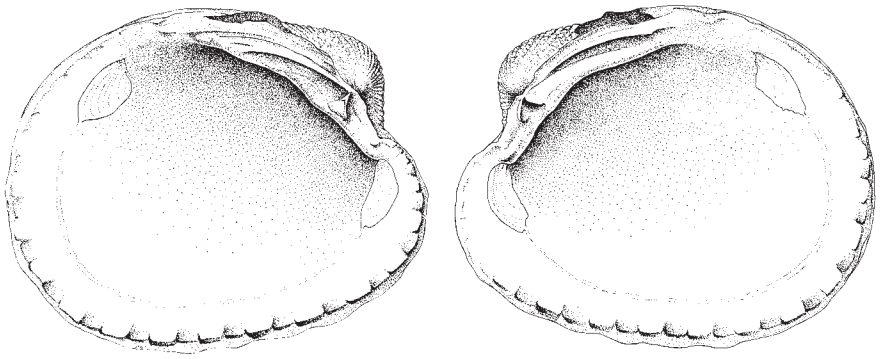
Biotope. In fine sand and mixed sand, also with calcareous algae, shell debris and coral, offshore from 50 to about 200 m, occasionally deeper, in the Mediterranean also shallower, not common.

Remarks. This species is very variable, particularly in tumidity and length/height ratio; thus specimens from the Cape Verde Islands may be nearly spherical, whereas Mediterranean specimens are in general more elongate and less inflated; specimens from the West African continental shelf show all kinds of intergrades. Moreover, two morphs have been collected on the Mauritanian and Senegalese coasts: the "normal" form with very inflated valves and a rather thin hinge plate, and a morph with broad to very broad hinge plate and sometimes less inflated valves, this latter as empty valves only. They are linked by intergrades and seem to be ecological variants. The protoconch of this species is very small and only slightly separated from the teleoconch.



9.28. ***Centrocardita aculeata*** **(Poli, 1795).** **A**-**B**, Between Maio and Boavista, Cape Verde Islands, 15°26.5'N, 23°14'W, 100 m (24.1 mm). **C**, same locality (18.7 mm). **D**-**F**, Between Maio and Boavista, Cape Verde Islands, 15°37'N, 23°09'W, 120-150 m (20.4 mm). **G**-**K**, Lompoul, Grande Côte, Senegal, 15°38'N, 17°00'W (14.3 mm). **L**-**M**, *C. aculeata*, "thick" morph, S of Dakar, Senegal, 150-200 m (lv, 19.9 mm). **N**-**O**, SW of Nouakchott, Mauritania, 17°44'N, 16°27'W, 100 m (lv, 20.8 mm). **P**, same locality (rv, 19.8 mm).

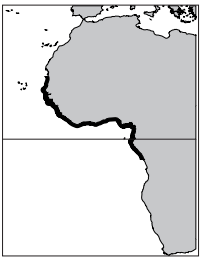
Centrocardita inquinata (Nicklès, 1955)



9.29. Mauritania (32.4 mm).

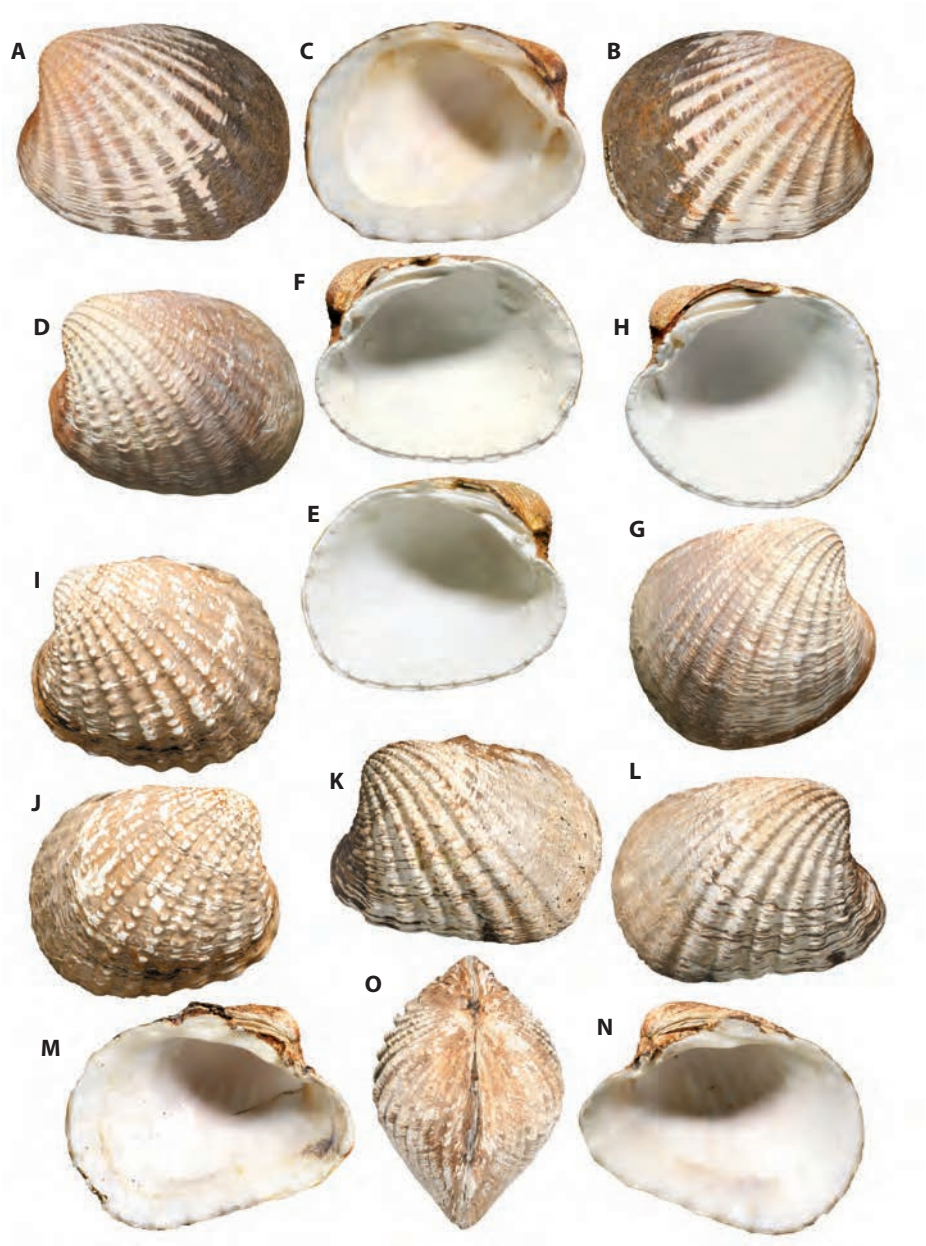
Shell up to 41 mm long, variable in outline, oval to suboval, with anterior margin narrowly rounded and posterior margin very broadly rounded, comparatively thin but solid, quite inflated. Beaks subterminal, near the anterior end. Surface with 14-16 rounded radial ribs bearing transverse nodules, more prominent on the anterior ribs, weaker or more or less obsolete on the posterior part of the valves. Interspaces more or less broad, flat, with irregular commarginal growth lines. Lunule short, broad, heart-shaped and deeply sunken. Periostracum rather thick, dull and greyish brown, mostly eroded on the ribs. Inner margin denticulate, corresponding to the external ribs which are often weakly visible on the interior surface. Outside and inside white.

Distribution. Mauritania (18°30'N) to the Congo Brazzaville (Pointe-Noire).



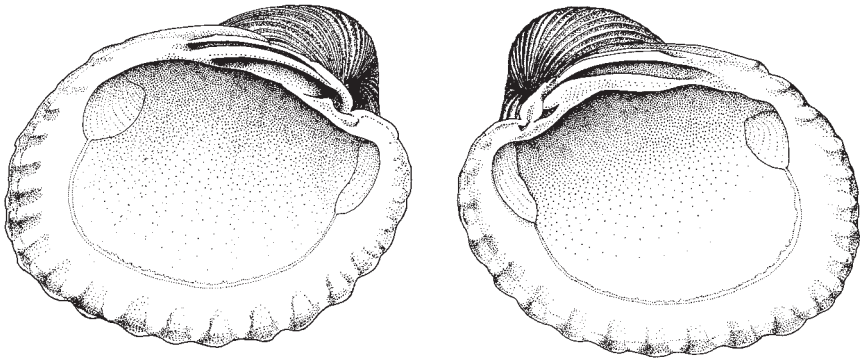
Biotope. In muddy bottom, well offshore from about 100 to 300 m depth, not common.

Remarks. This deeper shelf and slope species is distinguished from *Centocardita aculeata* by its larger and less inflated shell, its broader ribs with less pronounced nodules and the entirely white colouration. It may occasionally be taken in shrimp trawls.



9.30. ***Centrocardita inquinata*** **(Nicklès, 1955).** **A**-**C**, Fadiouth, Petite Côte, Senegal, 13°53'N, 17°07'W, 100 m (29.5 mm). **D**-**F**, off Rio Cacheu, Guinea-Bissau, 12°03'N, 17°23'W, 300 m (27.5 mm). **G**-**H**, same locality (27.6 mm). **I**-**J**, off Pointe-Noire, Congo Brazzaville, 300 m (23.6 mm). **K**-**O**, same locality (41.3 mm).

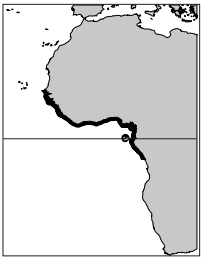
Cardites umbonatus (G.B. Sowerby III, 1904)



9.31. Bota-Batoke, 3°59'N, 8°58.5'E, Cameroon, 40-45 m (32.7 mm).

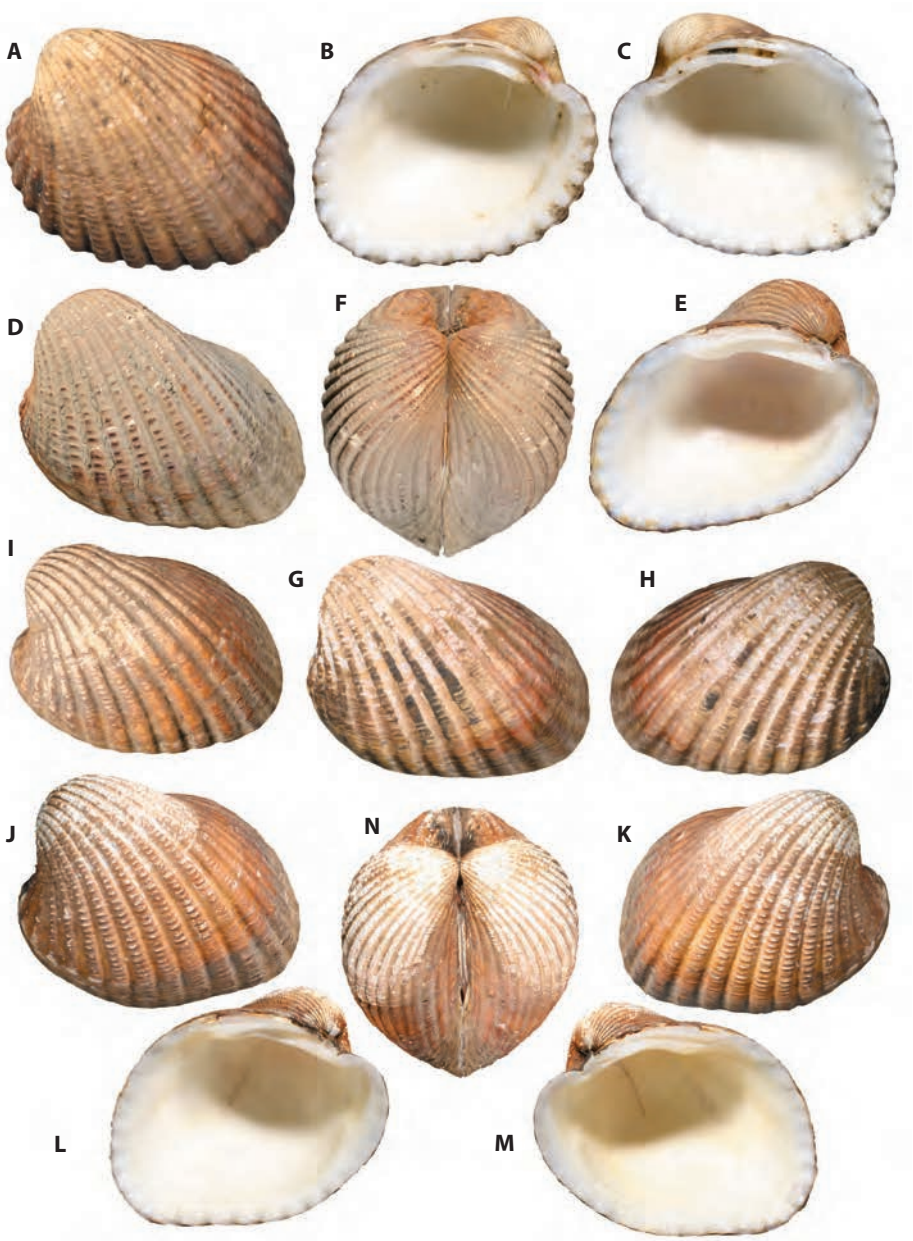
Shell up to 42 mm long, quite variable in outline, oval to elongate-oval, with anterior margin rather narrowly rounded and posterior margin broadly rounded-truncated, thick and solid, very inflated to globose. Beaks prominent and well anterior to the vertical midline, nearly subterminal. Surface with 20-24 strong, rounded radial ribs, bearing close-set, transverse nodules, becoming obsolete or missing on the anterior and posterior ribs. Interspaces narrow, on the anterior part of the valve flatter, on the posterior part rounded. Lunule deeply impressed, short, broad and continuing under the slightly raised umbos. Periostracum rather thin, brownish, mostly eroded on the ribs or the rib nodules. Inner margin slightly dentate, corresponding to the external sculpture. Outside more or less light reddish brown, sometimes darker on the posterior marginal part. Inside whitish to cream, rarely with a pale salmon hue under the beaks.

Distribution. Senegal (Dakar; rare) to northern Angola (Luanda); São Tomé.



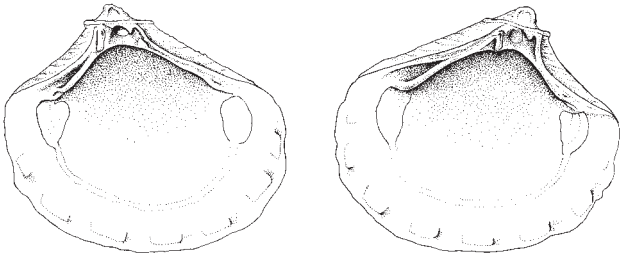
Biotope. In muddy sand and fine sand, offshore from 30 to about 100 m, rare at the northern and southern periphery of its range, more common between Sierra Leone and the Congo. At São Tomé dredged at 5 m.

Remarks. Rather high specimens of this species may superficially resemble some specimens of *Centrocardita aculeata*, however, the latter is distinguished by its smaller size, the more prominent ribs with scales and the different lunule. *Cardites umbonatus* is occasionally found in the by-catch of shrimp boats, mostly in the Cameroon region.



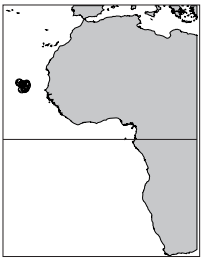
9.32. ***Cardites umbonatus*** **(G.B. Sowerby III, 1904).** **A**-**B**, Liberia, 6°40'N, 11°23'W, 51 m (lv, 26.2 mm). **C**, same locality (rv, 26.0 mm). **D**-**F**, Abidjan region, Côte d'Ivoire (33.1 mm). **G**-**H**, W of Victoria (now Limbe), Cameroon, 3°55.2'N, 8°52'E (36.5 mm). **I**, Pointe-Noire, Congo Brazzaville (41.1 mm). **J**-**N**, same locality (42.3 mm).

Condylocardia bravensis Salas & Rolán, 1990



9.33. Brava, Cape Verde Islands (1.7 mm).

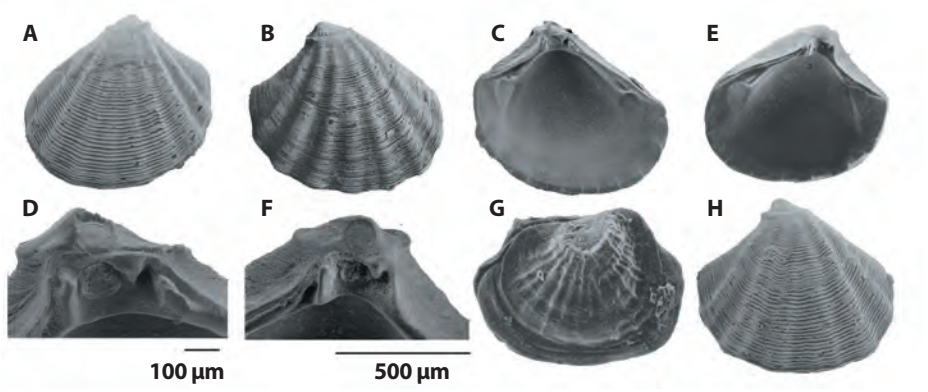
Shell about 1.8-2 mm long, oval-subtrigonal, slightly longer than high, rather inflated, thick and solid. Beaks behind the vertical midline. Surface with 8-10 broad, low, rounded radial ribs, the central ones (1 to 3) usually not reaching the protoconch rim. There are also very fine, close-set, regular commarginal striae over the whole surface of the teleoconch. Lunule and escutcheon large and well defined. Protoconch prominent, with fine, irregular radial striae and marked rim. Periostracum very thin, dull, pale yellowish to nearly colourless, persistent mostly between the commarginal striae. Inner margin weakly denticulate according to the exterior sculpture. Ligament wholly internal, in rounded resilifer. Outside dull whitish to cream, inside white.



Distribution. Cape Verde Islands, endemic. Known from Brava, São Tiago and Ilha do Sal.

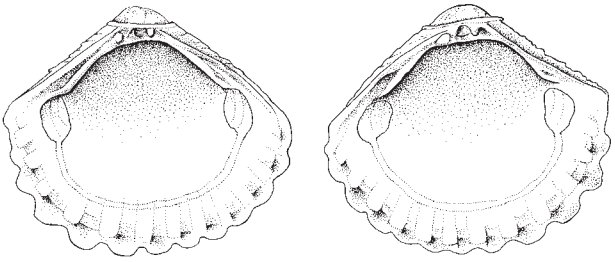
Biotope. In sand with shell debris, in shallow water (5-8 m), not common.

Remarks. This is the only *Condylocardia* so far encountered on Brava Island.



9.34. *Condylocardia bravensis* Salas & Rolán, 1990 (SEM micrographs courtesy C. Salas). **A**, Brava Island, Cape Verde Islands (lv, holotype, 2.0 mm). **B**, same locality (rv, 1.9 mm). **C**, same locality (lv, paratype, 2.0 mm). **D**, detail of the hinge of the same valve. **E**, same locality (rv, paratype, 1.8 mm). **F**, detail of the hinge of the same valve. **G**, same locality, incubating juvenile (0.33 mm). **H**, same locality (lv, paratype, 1.7 mm).

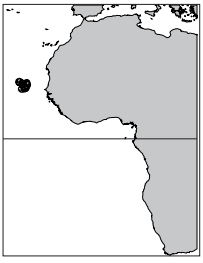
Condylocardia carditoides Salas & Rolán, 1990



9.35. Baia Rigona, Ilha do Sal, Cape Verde Islands, 5 m (holotype, 1.7 mm).

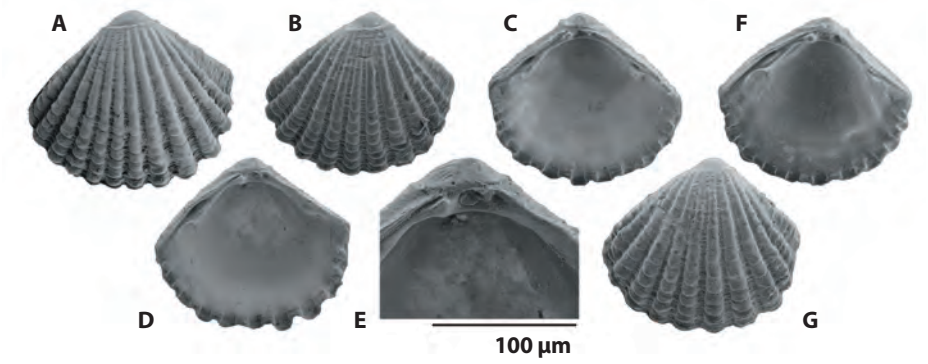
Shell minute, 1.0-1.8 mm long, oval-subtrigonal, longer than high, inflated, thick and solid. Beaks slightly behind the vertical midline. Surface with 11 to 14 strong, rounded, radial ribs bearing more or less prominent knobs or scales. Interspaces narrow but clear, with very fine, commarginal lamellae. Lunule and escutcheon large and broad, delimited by the first or last radial rib. Protoconch rounded, quite large, rim present but not very prominent. Periostracum very thin, nearly colourless and persistent only in the interspaces between the radial ribs on the marginal part of the valves. Inner margin strongly denticulate according to the exterior ribs. Internal ligament small, resilifer rounded. Outside dirty whitish, with white protoconch, inside white.

Distribution. Cape Verde Islands, endemic. Found in São Tiago, São Vicente and Ilha do Sal.



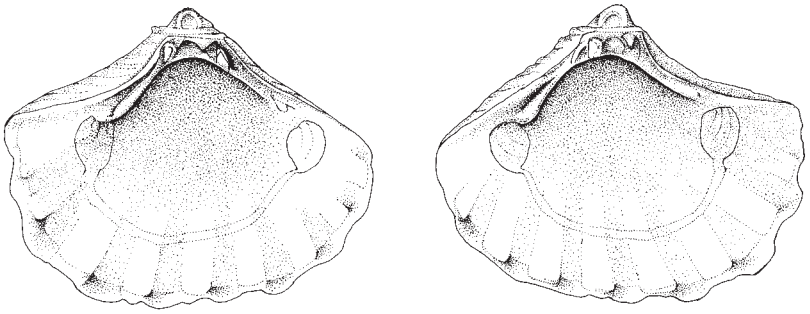
Biotope. In mixed sand with shell debris, from 1 to 15 m, not common.

Remarks. This species externally resembles a small *Cardita* or a *Carditopsis*. However, hinge and protoconch show that it belongs to *Condylocardia*. The external sculpture somewhat resembles *C. angolensis* but the outline is clearly more equilateral.



9.36. *Condylocardia carditoides* Salas & Rolán, 1990 (SEM micrographs courtesy C. Salas). **A**, Rigona, Ilha do Sal, Cape Verde Islands, 5 m (lv of holotype, 1.7 mm). **B**, São Tiago, Cape Verde Islands (lv of paratype, 1.4 mm). **C**, same locality (lv of paratype, 1.5 mm). **D**, same locality (rv of paratype, 1.4 mm). **E**, detail of the hinge of the same valve. **F**, same locality (paratype, 1.5 mm). **G**, same locality, (paratype, 1.5 mm).

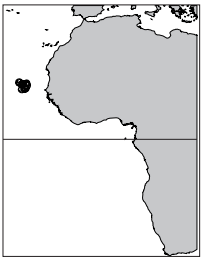
Condylocardia tridacniformis Salas & Rolán, 1990



9.37. Boavista, Cape Verde Islands (holotype, 1.7 mm).

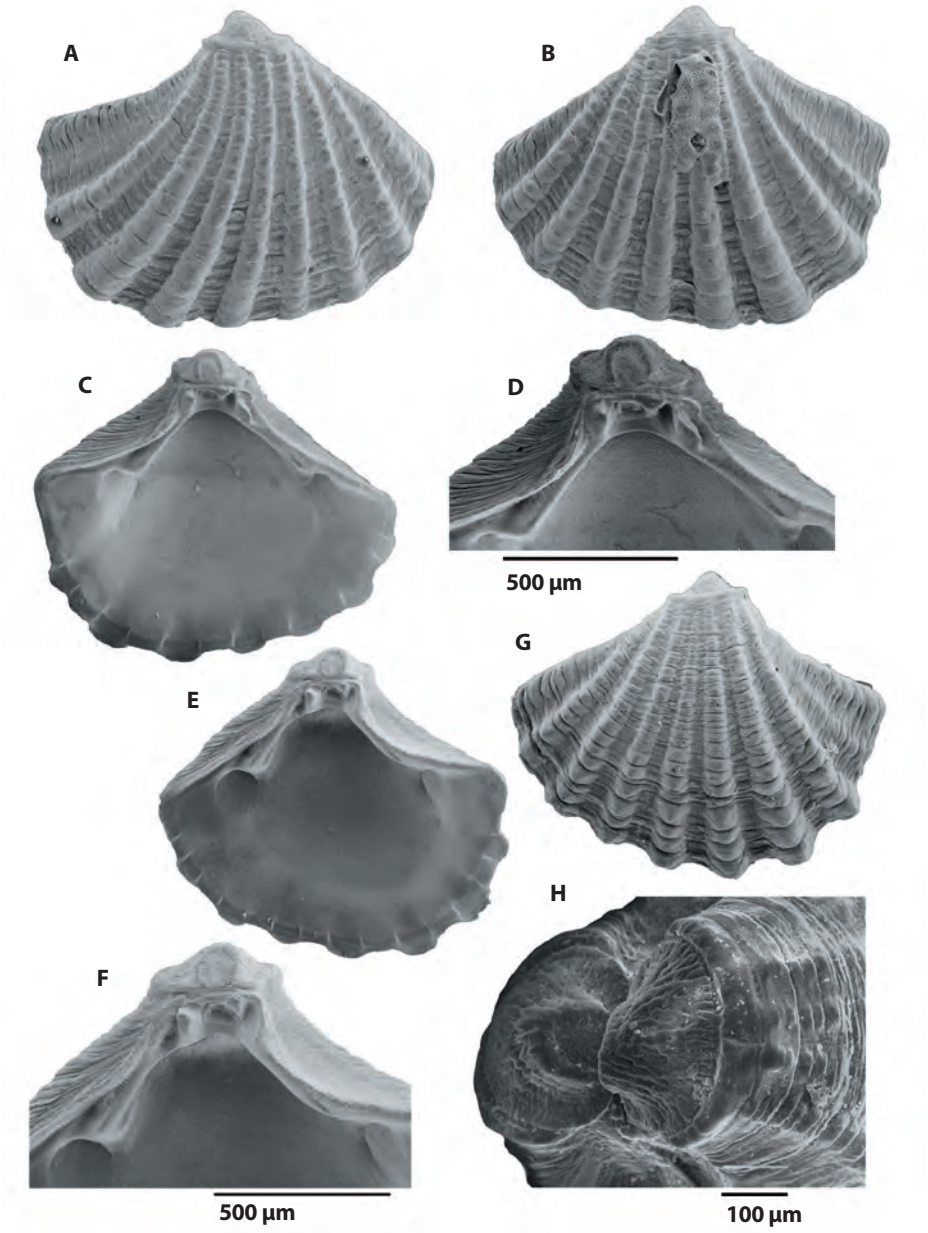
Shell very small, about 2.0-2.8 mm long, variable in outline, oval-subtrigonal (young specimens) to somewhat rostrate anteriorly in adult specimens, resembling a minute *Tridacna*, longer than high, thick and solid, very inflated. Beaks more or less median in juvenile specimens, in adults behind the vertical midline. Surface with nine widely spaced, strong and very prominent radial ribs which are crossed by commarginal striae, forming small knobs and incisions on the radial ribs, especially on the marginal part of the valves. Lunule and escutcheon large, broad and deep, but with ill-defined delimitation. Protoconch small but prominent, with well-defined rim. Periostracum very thin, pale yellowish to colourless, persistent only near the margins. Inner margin strongly denticulate, according to the external ribs. Ligament wholly internal, resilifer somewhat rounded. Outside cream, with pale brownish posterior third. Inside white.

Distribution. Cape Verde Islands, endemic. Recorded from São Tiago, Boavista, Ilha do Sal and São Vicente.



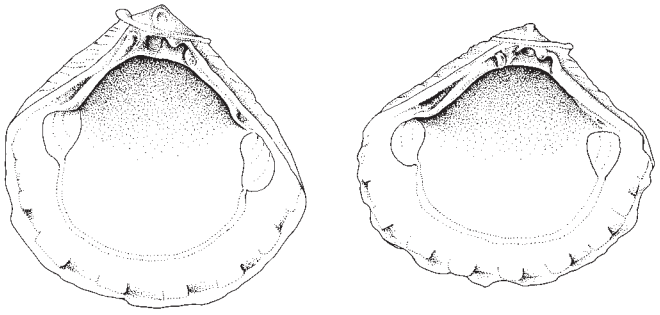
Biotope. In sand with shell debris, from 1 to about 15 m, not uncommon.

Remarks. This species, the only *Condylocardia* so far known from Boavista, is characterized by its peculiar shape which resembles a miniature *Tridacna* and cannot be mistaken for any other West African species.



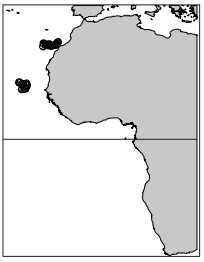
9.38. *Condylocardia tridacniformis* Salas & Rolán, 1990 (SEM micrographs courtesy C. Salas). **A**-**B**, Sal Rei, Boavista, Cape Verde Islands, 6 m (holotype, 1.7 mm). **C**, same locality (lv, paratype, 1.5 mm). **D**, detail of the hinge of the same valve. **E**, same locality (rv, paratype, 1.4 mm). **F**, detail of the hinge of the same valve. **G**, Baia Teodora, Boavista, Cape Verde Islands, 6 m (1.8 mm). **H**, protoconch of a specimen from the same locality.

Condylocardia verdensis Salas & Rolán, 1990



9.39. Baia Rigona, Ilha do Sal, Cape Verde Islands, 5 m (paratypes, both 1.4 mm).

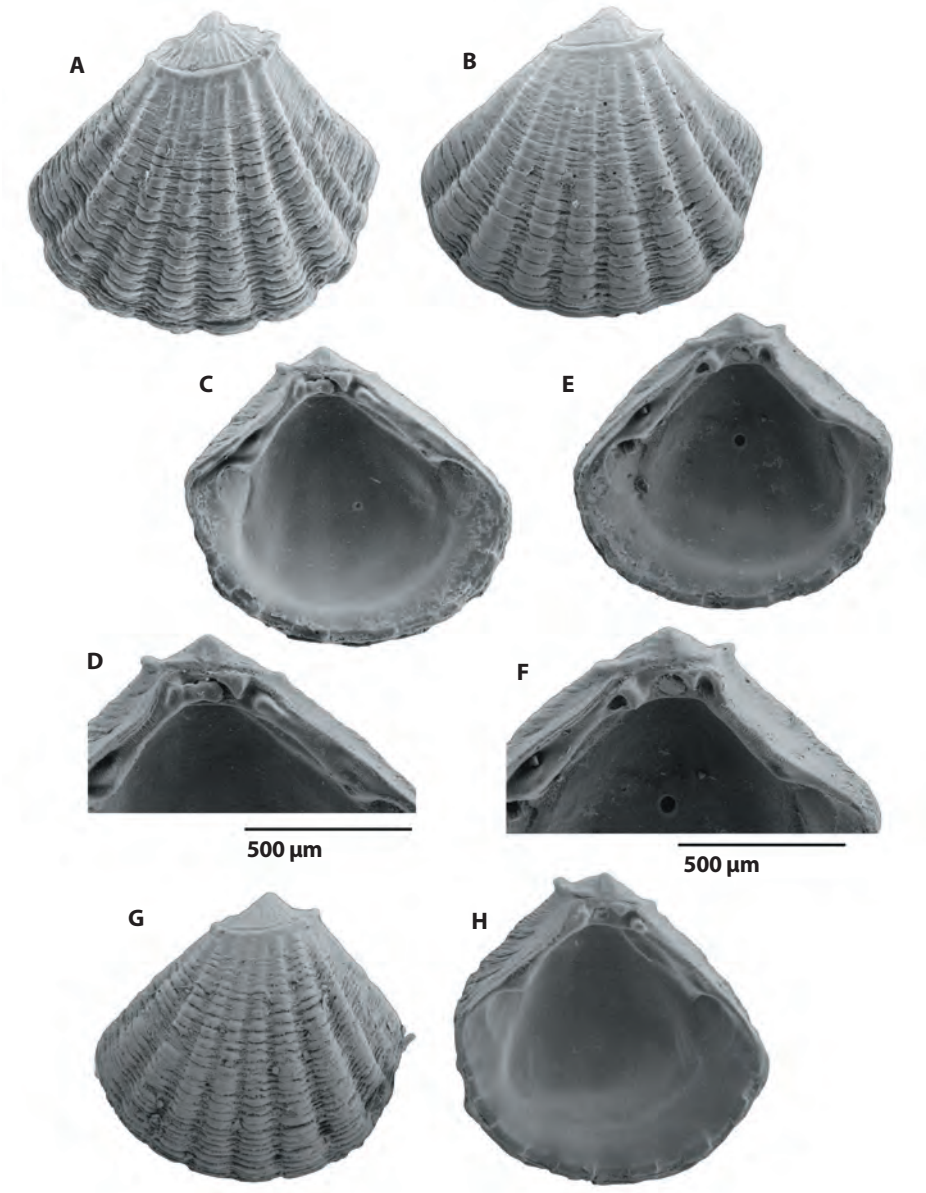
Shell minute, 1.0-1.2 mm long, subtrigonal, slightly longer than high, inflated, thick and solid. Beaks slightly behind the vertical midline. Surface with 8-11 broad, rounded, rather low, radial ribs with narrow interspaces and with dense, narrow, slightly irregular commarginal lamellae which cover the whole surface of the teleoconch. Where the lamellae cross the radial ribs, these have fine transverse incisions. Lunule and escutcheon large, with ill-defined delimitations, formed by the first and last radial rib. Protoconch very large in relation to the adult valve, prominent, with dense, weak, somewhat irregular radial ribs, some bifurcating; rim well defined. Periostracum extremely thin and colourless. Inner margin broadly denticulate according to the external ribs. Internal ligament very small, resilifer rounded. Outside white, white with brownish umbonal region or entirely brown to reddish brown. Inside white to brownish.



Distribution. Canary Islands (Hernández *et al.* 2011) and Selvagens, Cape Verde Islands, so far only from the islands of São Vicente, Sal and Sta. Luzia.

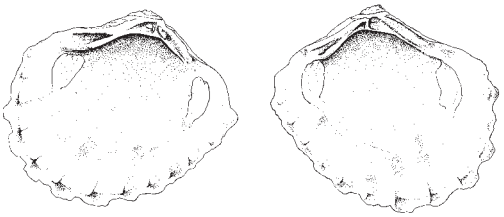
Biotope. In sand, in 1-15 m, not common.

Remarks. This species is closest to *C. bravensis*, but is smaller, shorter, and all ribs are continuous to the protoconch. The four Cape Verde Islands species of *Condylocardia* are incubatory; they lack a planktonic larval phase and grow their juveniles within the mantle cavity of the adult until to the end of the larval (protoconch) stage. This explains the endemism of the species in the archipelago and their local diversity with species restricted to certain islands only. Similar cases in the Cape Verde Islands are known from non-planktotrophic gastropod groups such as many *Conus*, the genus *Euthria* and the Marginellidae. *C. verdensis* is the only *Condylocardia* known so far from Sta. Luzia and from the Canaries, and seems to be the most widespread species.



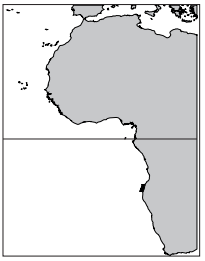
9.40. *Condylocardia verdensis* Salas & Rolán, 1990 (SEM micrographs courtesy C. Salas). **A**, Rigona, Ilha do Sal, Cape Verde Islands, 5 m (lv of holotype, 1.2 mm). **B**, same locality (lv of paratype, 1.2 mm). **C**, same locality (lv of paratype, 1.3 mm). **D**, detail of the hinge of the same valve. **E**, same locality (rv of paratype, 1.3 mm). **F**, detail of the hinge of the same valve. **G**, same locality (lv of paratype, 1.3 mm). **H**, same locality (lv of paratype, 1.3 mm).

Condylocardia angolensis Salas & Cosel, 1991



9.41. Santa Marta, Lucira, S-Angola, 40 m (1.9 mm).

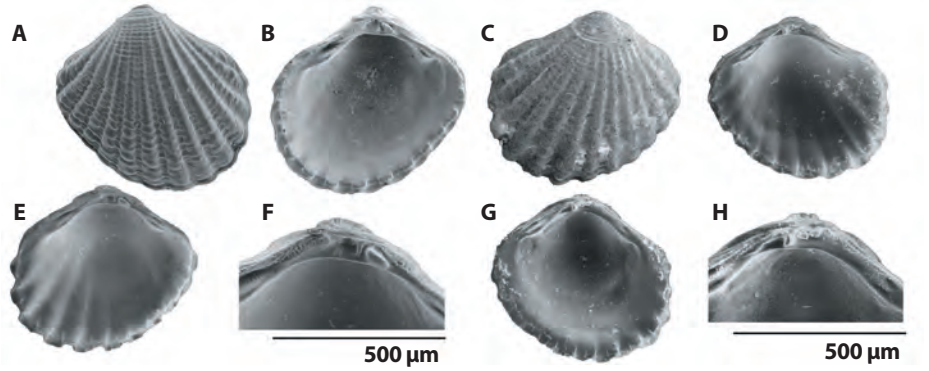
Shell minute, 2.0-2.3 mm long, obliquely oval-subtrigonal, longer than high, inflated, rather thick and solid. Beaks behind the vertical midline. Surface with 14-15 strong, elevated, rounded radial ribs with narrow, but well marked interspaces, crossed by a commarginal sculpture which consists of very thin lamellae in the interspaces of the ribs and weak transverse indentations on the ribs themselves, giving them a somewhat nodose appearance. Lunule and escutcheon very small and ill-defined. Protoconch rather large, with irregular, narrow, commarginal ridges and a prominent rim. Periostracum very thin and colourless, persistent only in the interspaces of the ribs. Inner margin dentate according to the external ribs. Ligament internal, in a somewhat triangular resilifer. Outside white, with small light brown spots or irregular zones. Inside white, with external colouration showing through.



Distribution. Known only from a small area on the coast of southern Angola (Lucira, Namibe province).

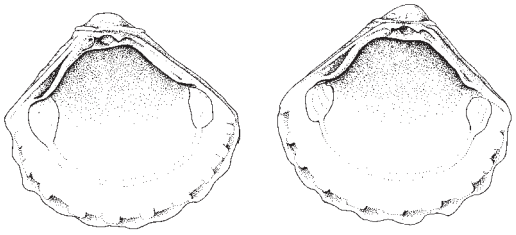
Biotope. In mixed and coarse sand with shell debris offshore from 10 to 40 m, not common.

Remarks. In general outline this species somewhat resembles the Cape Verde Islands C. *carditoides* but is more oval, with a more bulging posterior part.



9.42. *Condylocardia angolensis* Salas & Cosel, 1991 (SEM micrographs courtesy C. Salas). **A**-**B**, Bissonga, Baia de Lucira, S-Angola, 10-20 m, maerl (lv, holotype, 1.8 mm). **C**, Santa Marta, Baia de Lucira, S-Angola (rv, paratype MNCN, 1.5 mm). **D**, same locality (rv, paratype, 1.2 mm). **E**, same locality (lv, paratype MNCN, 1.2 mm). **F**, detail of the hinge of the same valve. **G**, same locality (rv, paratype, 1.1 mm). **H**, detail of the hinge of the same valve.

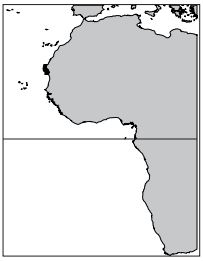
Condylocardia boucheti Salas & Cosel, 1991



9.43. Baie de l'Etoile, Mauritania, on seagrass bed (holotype, 1.4 mm).

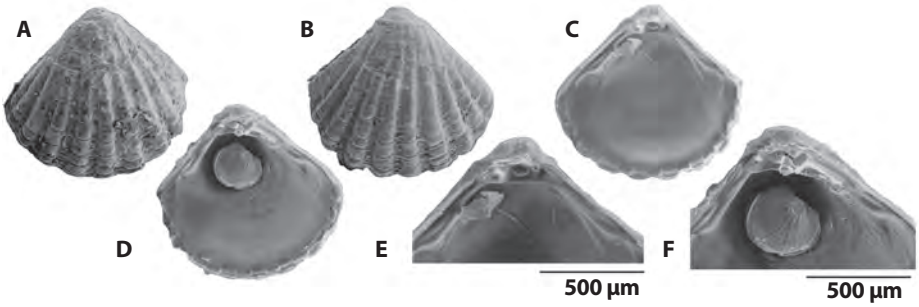
Shell minute (1.4 mm long and 1.25 mm high), subtrigonal, a bit longer than high, thick and solid, very inflated. Beaks just behind the vertical midline. Surface with 10 broad, prominent rounded radial ribs and slightly narrower interspaces. There are also fine commarginal striae forming small transverse incisions on the ribs, especially near the margins. Lunule and escutcheon long and rather broad, delimited by the first and last radial rib. Protoconch large, with numerous weak, irregular radial ribs, some of them bifurcating; prominent rim between protoconch and teleoconch. Periostracum thin and nearly colourless, persistent mostly in the rib interspaces and on the marginal part of the valves. Inner margin dentate, corresponding to the external rib sculpture. Small internal ligament in oval resilifer. Outside whitish with light brownish zones, inside dull whitish with external colouration showing through. Incubated protoconchs white.

Distribution. Only known from northern Mauritania (Baie de l'Etoile).



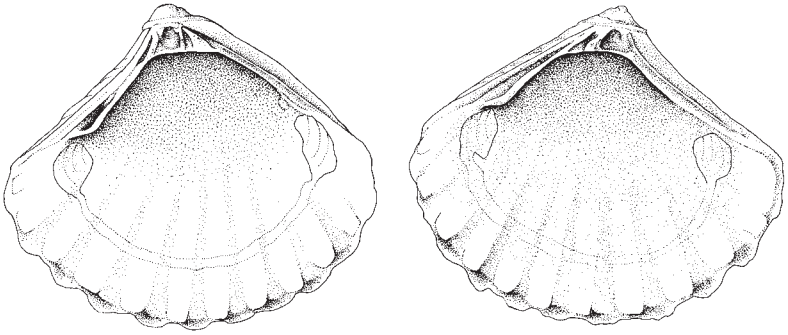
Biotope. Not known, most probably sand with seagrass in the lower intertidal zone and just below, rare.

Remarks. This species is the only *Condylocardia* known from so far from the northern upwelling zone; it is closest to *C. carditoides* but is somewhat higher, has 11-14 ribs instead of ten, and its hinge plate has a broader, more spondyliform central part.



9.44. *Condylocardia boucheti* Salas & Cosel, 1991 (SEM micrographs courtesy C. Salas). **A-D**, Baie de l'Etoile, Mauritania, intertidal seagrass bed with mud (holotype, 1.4 mm). **E-F**, details of the hinge of the same valves, and incubated juvenile.

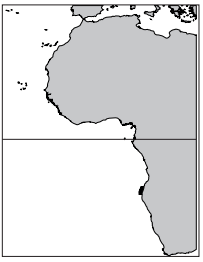
Condylocardia ameliae Salas & Cosel, 1991



9.45. Praia Amelia, S-Angola, 40-60 m (1.9 mm).

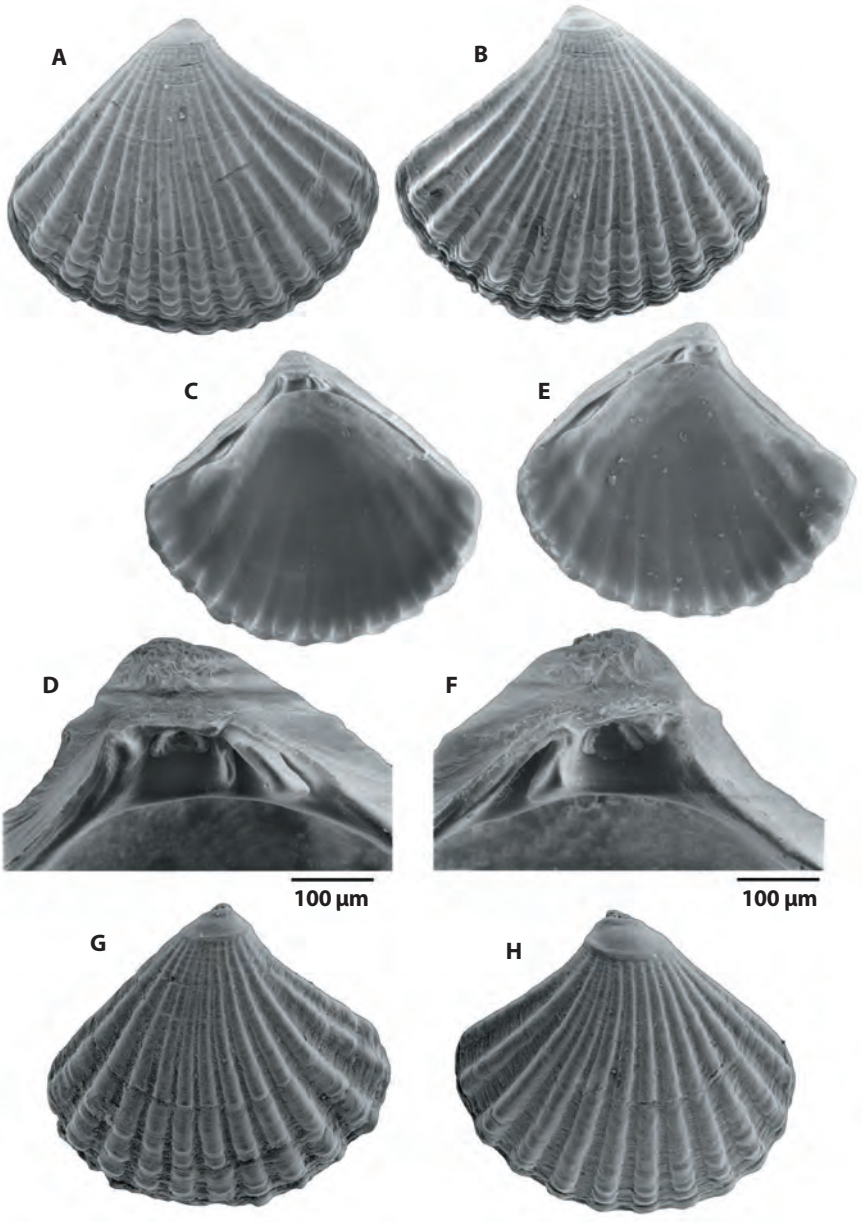
Shell minute, 2.0-2.2 mm long, subtrigonal, longer than high, somewhat inflated, quite thick and solid. Beaks nearly in the middle, just in front of the midline. Surface with 13-14 prominent, rounded, rather close-set radial ribs with much narrower interspaces, all ribs reaching the protoconch rim. There are also fine commarginal lamellae, more developed in the interspaces. Ribs near the margins with shallow transverse nodules, becoming obsolete towards the beaks. Lunule deep, escutcheon narrow and ill-defined. Protoconch rather large, with irregular, nearly smooth surface, delimited by a fine commarginal rim. Periostracum thin, almost colourless, mostly persistent in the rib interspaces. Inner margin denticulate according to the external ribs. Small internal ligament, in a rounded-triangular resilifer. Outside entirely white, light brownish or brown, with lighter coloured umbos, inside white with external colouration showing through.

Distribution. Southern Angola (Chapeu Armado-Praia Amelia), endemic.



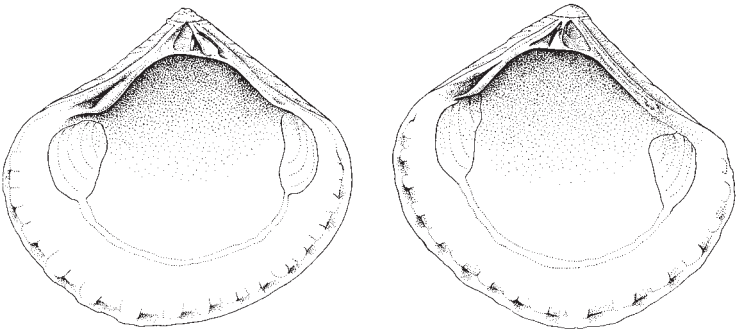
Biotope. In mixed and coarse sand, also among rocks, from shallow water to about 60 m, not common.

Remarks. This species resembles *Carditopsis gofasi* in outline (see below) but is easily distinguished by its smaller size, sculpture in which all ribs reach the protoconch, and the different hinge. It cannot be mistaken for any other West African *Condylocardia*. Like the Capeverdian species, this Angolan *Condylocardia* shares its distribution range with other endemic molluscs *e.g.* of the genus *Conus*.



9.46. *Condylocardia ameliae* Salas & Cosel, 1991 (SEM micrographs courtesy C. Salas). **A**-**B**, Praia Amelia, Namibe prov., S-Angola, 40-60 m (holotype, 2.1 mm). **C**-**D**, same locality (paratype, 1.6 mm). **E**-**F**, details of the hinge of the same valves. **G**, same locality (paratype, 1.6 mm). **H**, same locality (paratype. 1.6 mm).

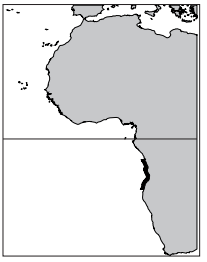
Carditopsis gofasi Salas & Cosel, 1991



9.47. Ilha de Luanda, Luanda prov. N-Angola, 40-60 m (3.8 mm).

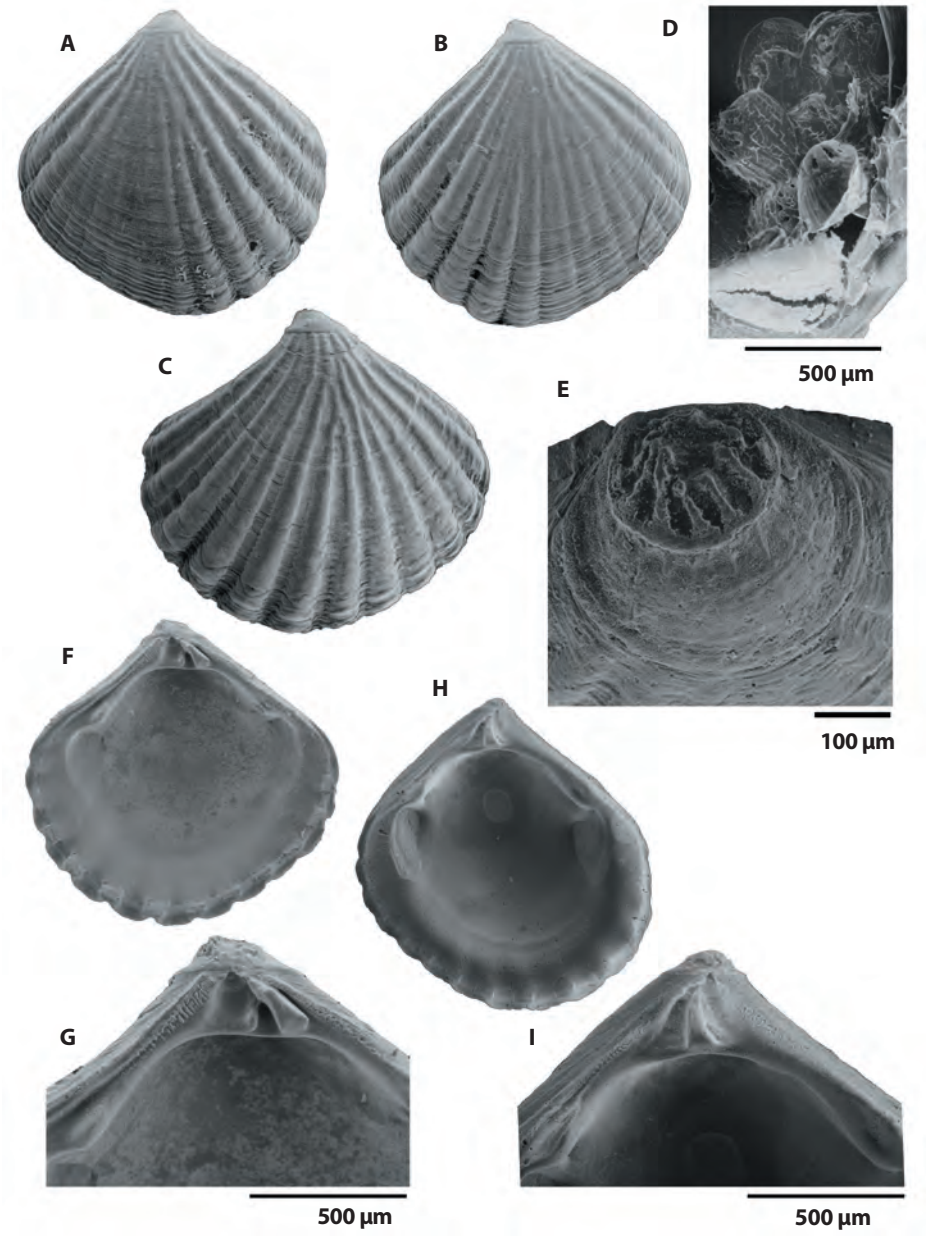
Shell very small, 3-4 mm long, rounded-subtrigonal, very slightly higher than long or as high as long, rather inflated, thick and solid. Beaks somewhat behind the vertical midline. Surface with 14-17 prominent, rounded, radial ribs with very narrow but marked interspaces. Middle ribs bifurcating on the umbonal part under the protoconch. Interspaces with fine, commarginal lamellae, obsolete on the ribs. Lunule rather deep, escutcheon narrow, neither well delimited. Embryonic shell with both protoconch I and protoconch II delimited by a commarginal rim. Protoconch I with irregular and more or less deep furrows, protoconch II smooth, rim to the teleoconch well marked. Periostracum very thin, nearly colourless, persistent only in the interspaces of the ribs and near the margins. Inner margin dentate according to the external sculpture. Internal ligament in a triangular pit. Outside entirely white, white with brown on the anterior part or occasionally entirely brown. Inside white, with exterior colouration showing through.

Distribution. Northern Angola (Ambrizete) to southern Angola (Namibe province).



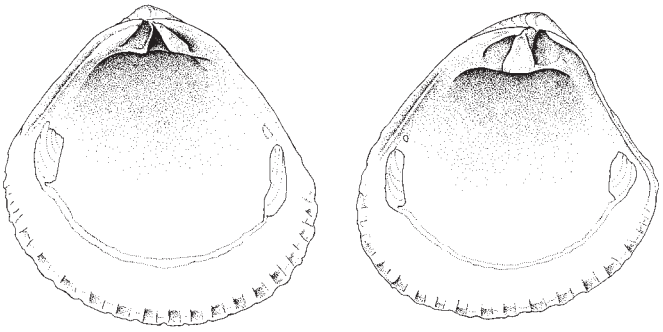
Biotope. In fine, mixed or coarse sand, often with shell debris, from shallow water (5-10 m) to more offshore, about 80 m, not uncommon.

Remarks. This species is rather close to the Pleistocene fossil *Carditopsis dartevellei* Nicklès, 1952, but is distinguished by its larger shell and less prominent ribs without scales. In *C. dartevellei* the median ribs are never bifurcated, and all reach the protoconch.



9.48. *Carditopsis gofasi* Salas & Cosel, 1991 (SEM micrographs courtesy C. Salas). **A-B**, Ilha de Luanda, Luanda prov. N-Angola, 40-60 m (paratype, 2.2 mm). **C**, same locality (rv. holotype, 2.1 mm). **D**, same locality, incubating larval shells in a 2.3 mm shell. **E**, protoconch of a specimen from Ilha de Luanda, 40-60 m. **F**, Ambrizete, Zaire prov., N-Angola, 40-80 m (2.2 mm). **G**, detail of the hinge of the same valve. **H**, same locality (2.2 mm). **I**, detail of the hinge of the same valve.

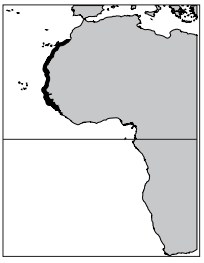
Cuna gambiensis Nicklès, 1955



9.49. SE of Gorée, Senegal, 33-34 m (3.0 mm).

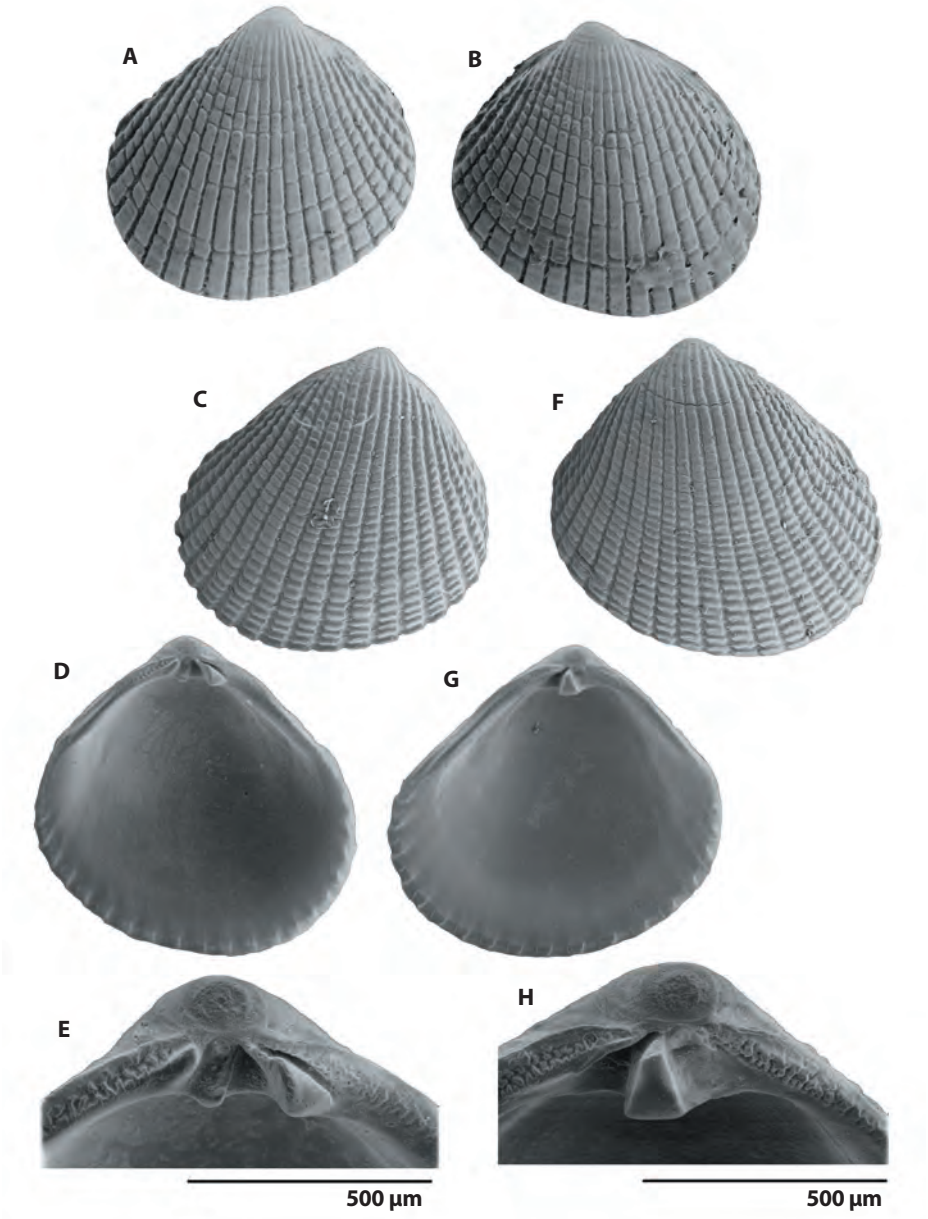
Shell very small, 2.5-3.2 mm long, somewhat rounded-trigonal, slightly longer than high or nearly as high as long, very inflated, rather thick and solid. Beaks slightly behind the vertical midline. Surface with 20 to 26 broad, low and flat radial ribs, the most lateral ones not reaching the protoconch, but ending at the limit of the anterior and posterior areas. Ribs crossed by irregular, commarginal constrictions, resulting in low nodules and constrictions on the ribs. Lunule and escutcheon not distinctly marked. Embryonic shell small, divided into protoconch I and protoconch II, delimited from the teleoconch by a poorly marked rim. Periostracum very thin, colourless, mostly persistent in the interspaces of the ribs. Inner margin denticulate according to the external sculpture. Ligament internal, in triangular pit. Outside dirty white, inside white.

Distribution. Atlantic Morocco, Agadir (Moukrim *et al.* 2010) to Guinea (Conakry).



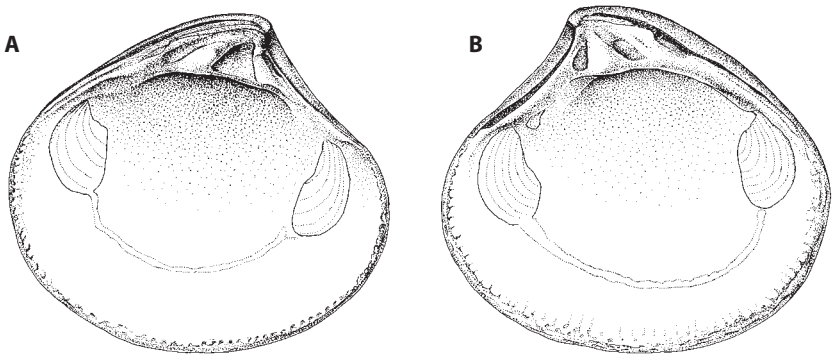
Biotope. In fine muddy sand or fine sand, from shallow water (1-3 m) to further offshore (15-20 m), common.

Remarks. This in the only species of *Cuna* hitherto known from the Eastern Atlantic. According to the protoconch, it has planktotrophic development, which explains its large distribution area coinciding with the northern zone of seasonal upwelling.



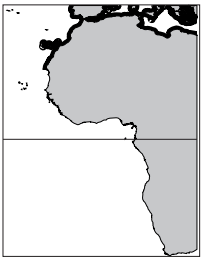
9.50. ***Cuna gambiensis*** **Nicklès, 1955** (SEM micrographs courtesy C. Salas). **A**-**B**, Kafountine, N-Casamance, 12°50.4'N, 16°58.8'W, 13-14 m (2.0 mm). **C**-**D**, Ile Roume, Guinea (2.1 mm). **E**, detail of the hinge of the same valve. **F**-**G**, same locality (2.1 mm). **H**, detail of the hinge of the same valve.

Astarte fusca (Poli, 1785)



9.51. **A**, left valve, Cap Blanc, Mauritania, 20°30'N, 17°13'W, 36 m, RMNH (22.9 mm). **B**, right valve, Gibraltar (16.2 mm).

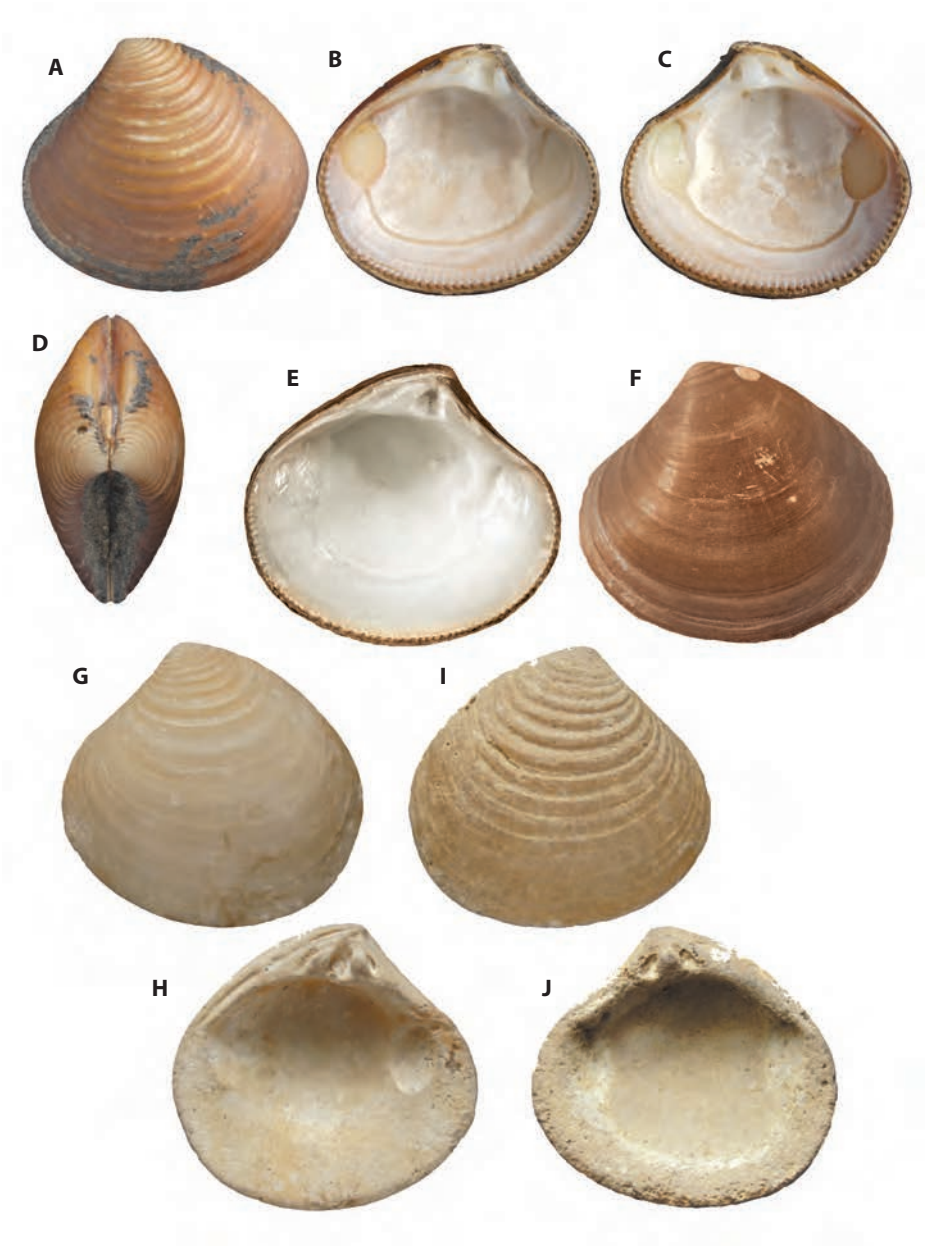
Shell up to 24 mm long, oval-trigonal, with rounded anterior and posterior margin, thick and solid, compressed. Beaks small, prominent and slightly anterior to the vertical midline. Surface with more or less prominent commarginal ridges, often becoming obsolete on the anterior part or near the ventral margin, surface occasionally smooth, with growth stages only, apart from commarginal ridges on and close to the umbos. Lunule rather large and inset, escutcheon long, not sharply delimited. Periostracum thick, light brown to nearly black, smooth, occasionally eroded on the beaks. Inner margin finely crenulate. Outside whitish to light brown, inside of nearly the same colour.



Distribution. Ibero-Moroccan Gulf to Mauritania (20°30'N); Canary Islands; throughout the Mediterranean.

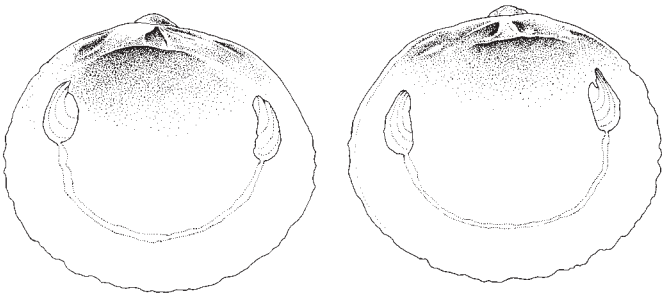
Biotope. On mixed and coarse sand, also with shells and shell debris, and on coralligenous, offshore from about 30 to 100 m, not common.

Remarks. This is the southernmost species of an otherwise cold-temperate genus. Its West African range coincides more or less with the zone of permanent upwelling.



9.52. ***Astarte fusca*** **(Poli, 1795). A-D**, Gibraltar, old coll. MNHN (16.2 mm). **E-F**, Mauritania, 20°30'N, 17°13'W, 20 m (22.7 mm). **G-H**, Dakar region, Senegal, 15°38'N, 17°09'W, 130 m (14.7 mm). **I-J**, same locality (14.6 mm).

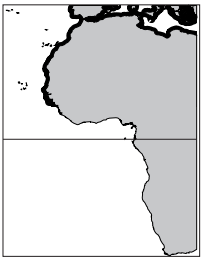
Digitaria digitaria (Linnaeus, 1758)



9.53. SW of Cap Manuel, Dakar, 50 m (two specimens, both 3.5 mm).

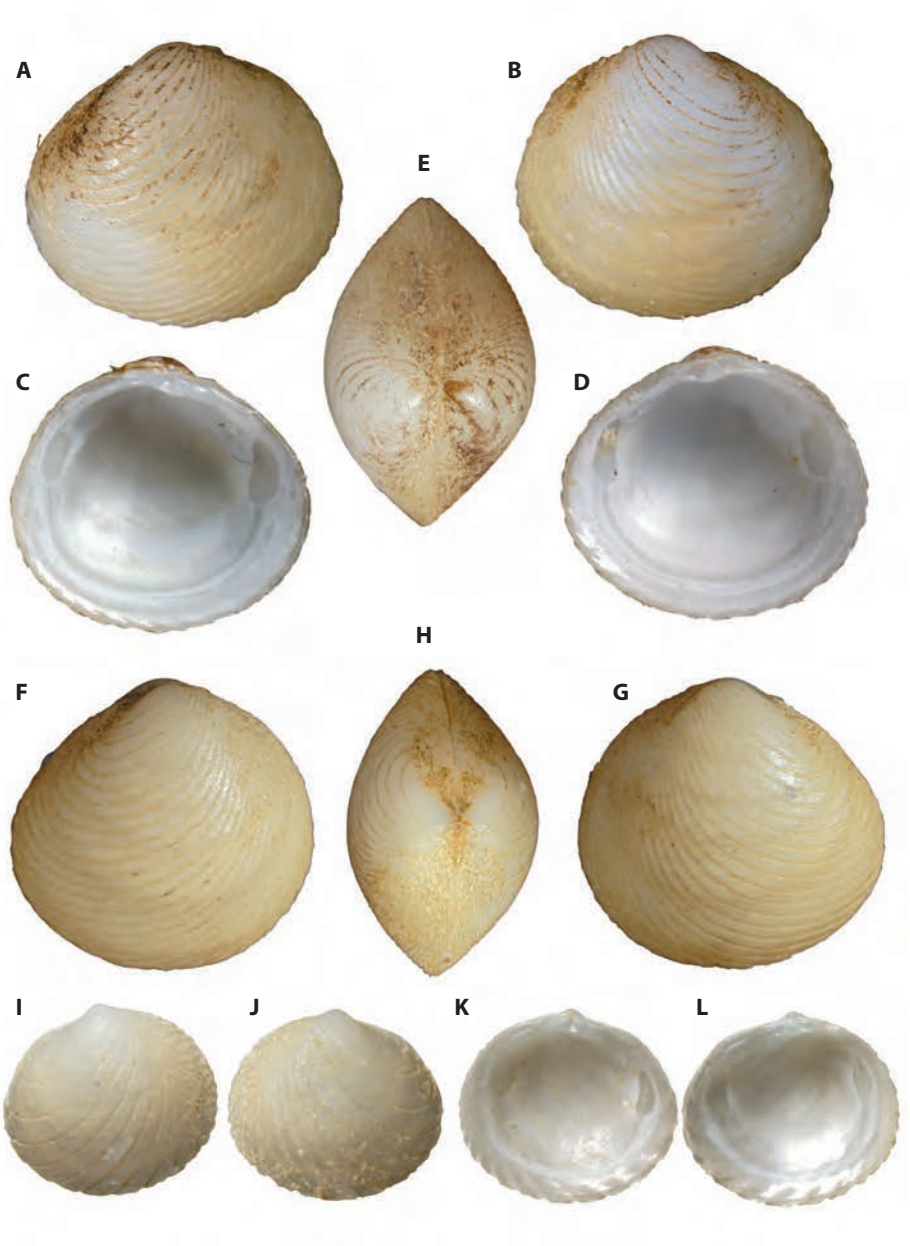
Shell small, 4-8 mm long, somewhat variable in outline, high-oval to subcircular, quite thick and solid, compressed. Beaks small, more or less median or just behind the vertical midline. Surface with regular incisions which begin at the postero-dorsal margin and descend in a curve towards the ventral and anterior margin; the posterior ones are quite close-set and meet the postero-ventral margin, the anterior incisions are more spaced and end at the antero-ventral and the anterior margin. The anterior incisions do not reach the antero-dorsal margin but run parallel and close to it, reaching the beaks. There are also fine, irregular, commarginal growth lines. Periostracum thin, greyish brown to nearly colourless. Inner margin undulating, corresponding to the external sculpture. Outside white (most West African specimens), umbos sometimes yellowish to pinkish, or valves entirely light brown, reddish brown or dark brown; inside white, pink or brown.

Distribution. Bay of Biscay (Capbreton) to Guinea-Bissau (10°19'N); southwestern part of Mediterranean.



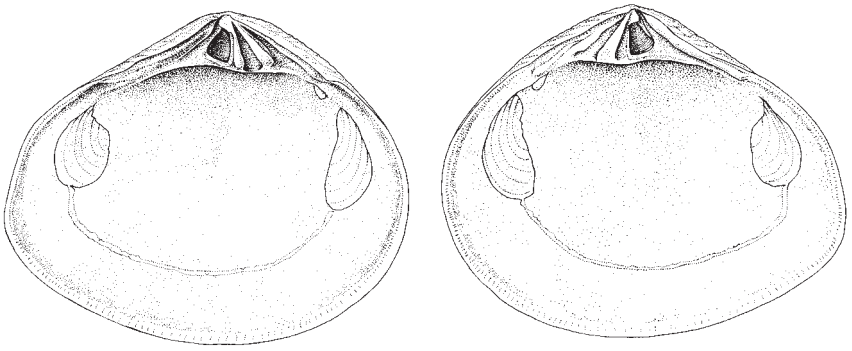
Biotope. On mixed and coarse sand, offshore from 15 m to about 250 m, occasionally deeper, not common.

Remarks. This species is easily recognized by its peculiar sculpture. It is a temperate species, in West Africa restricted to the northern zones of permanent and seasonal upwelling.



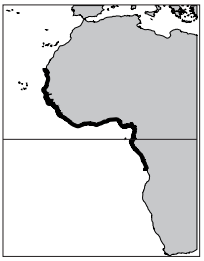
9.54. *Digitaria digitaria* (Linnaeus, 1758). **A**-**E**, Lompoul, Senegal, 150 m (7.0 mm). **F**-**H**, same locality (6.4 mm). **I**-**L**, SW of Cap Manuel, Dakar region, Senegal, 50 m (3.5 mm).

Crassatina (*Scissulatina*) *contraria* (Gmelin, 1791)



9.55. Cacuaco, Bengo, N-Angola, 5-10 m (33.3 mm).

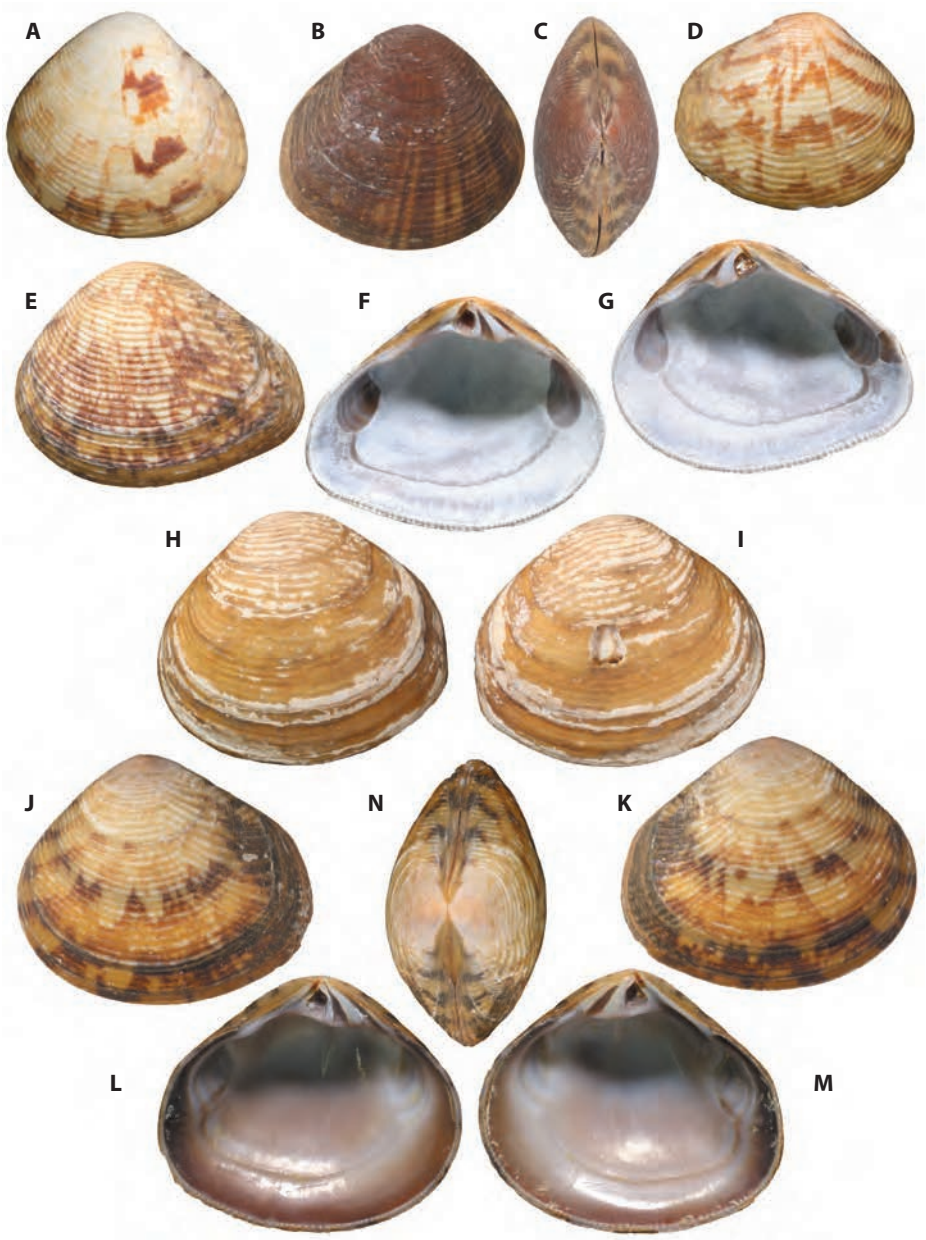
Shell up to 32 mm long, variable in shape and tumidity, oval-subtrigonal, slightly longer than high, with anterior margin rounded, posterior part tapering and posterior margin obliquely truncated, thick and solid, rather compressed. Beaks slightly anterior to the vertical midline. Surface with commarginal ridges which on the anterior half are regular, and which on the posterior part abruptly become coarser and change their direction by descending obliquely or in zigzags. Lunule and escutcheon impressed but not sharply delimited. Periostracum rather thin, yellowish brown to dark brown, dull. Inner margin finely crenulate. Outside whitish, light bluish grey, yellowish or yellowish pink, with dark brownish zigzag markings, often in horizontal bands. Inside white, white with pinkish hue under the beaks or brownish marginal rim, or wholly light to dark brown.



Distribution. Mauritania (Cap Blanc) to northern Angola (Luanda); Ilha do Principe.

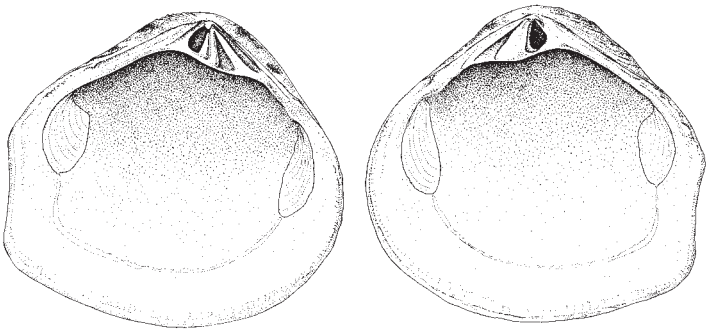
Biotope. In mixed and coarse sand, often with rocks or stones or in sandy patches on rocky coasts, from extreme low water to about 10 m, common.

Remarks. This is the largest of the West African *Crassatina*. It is common in the northern and southern part of its range, more uncommon in the atypical tropical regions (Côte d'Ivoire) and extremely rare in the typical tropical zones (one record from Sierra Leone). Empty valves are not uncommon on some beaches. The species was for a long time known as *Crassatella divaricata* (Gmelin, 1791), however, that species is a venerid of the genus *Gafrarium* Röding, 1798.



9.56. *Crassatina contraria* (Gmelin, 1791). **A**, Port Etienne (now Nouadhibou), Mauritania (25.0 mm). **B**-**C**, same locality (26.0 mm). **D**, same locality (27.0 mm). **E**-**G**, Somone, Senegal (28.8 mm). **H**-**I**, Abidjan, Côte d'Ivoire (28.5 mm). **J**-**N**, Praia São Tiago, Bengo prov., N-Angola (28.7 mm).

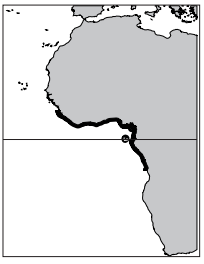
Crassatina (*Scissulatina*) *corrugata* (Adams & Reeve, 1850)



9.57. Guinea, 9°35.5'N, 14°48'W, 32 m (16.1 mm).

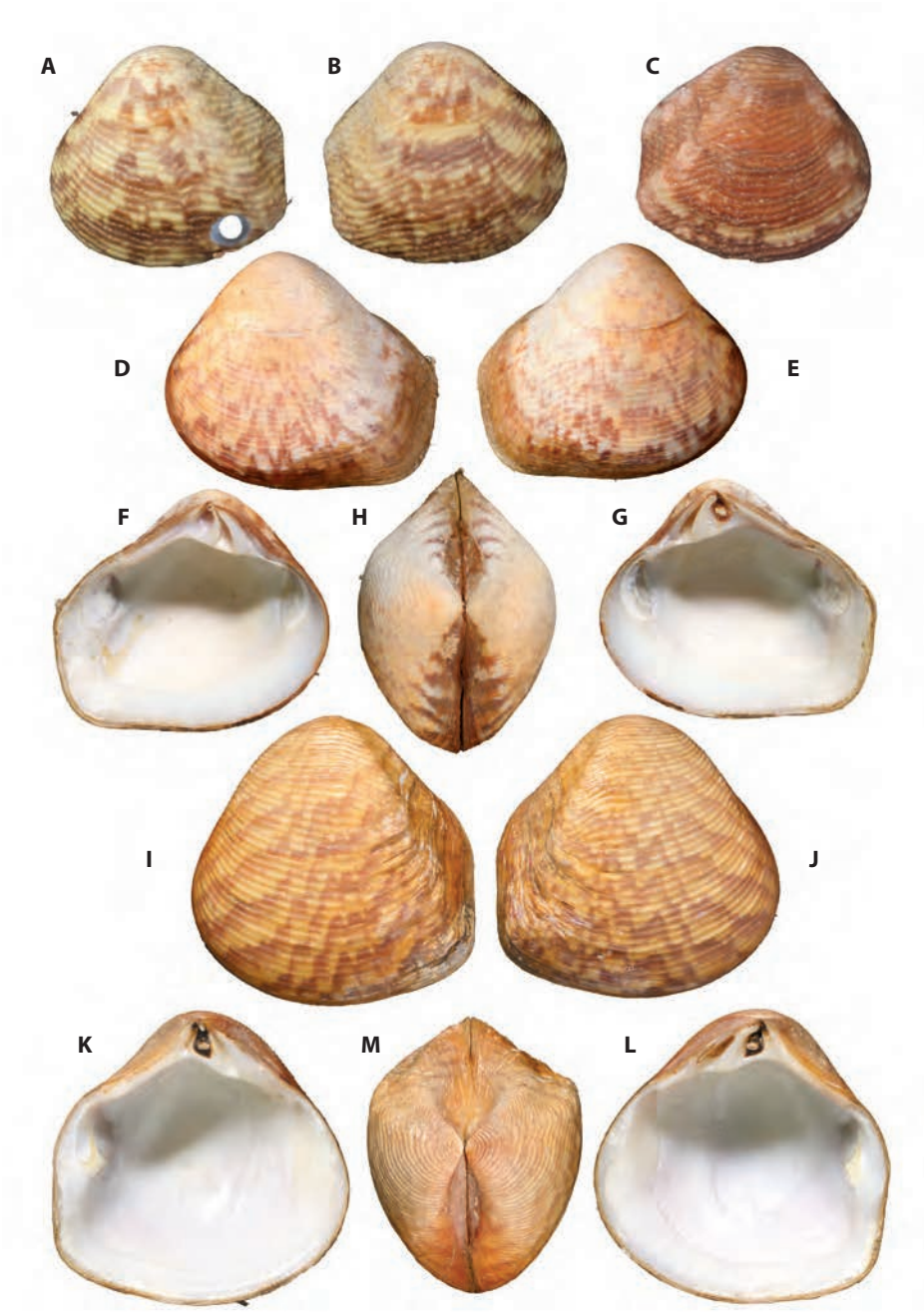
Shell up to 30 mm long, slightly variable in shape, high-trapezoidal, as high as long to slightly longer than high, with rounded anterior margin and somewhat vertically truncated posterior margin, thick and solid, very inflated. Beaks prominent, in general slightly anterior to the vertical midline. Surface with fine, regularly spaced ridges which are more or less commarginal on the anterior half and irregularly descending, often in zigzags, on the posterior half. Posterior area with a weak radial wave in the middle and well delimited by a rounded posterior angle. Lunule and escutcheon rather large, more or less impressed but not very sharply delimited, escutcheon often somewhat broader than lunule. Periostracum rather thin, pale yellowish to light brown. Inner margin finely crenulate. Outside whitish, yellowish, pinkish or orange-brown, with irregular, dense, reddish brown to dark brown zigzag markings. Inside white, stained more or less intensely with violet, mostly in the middle or the antero- and postero-dorsal part.

Distribution. Guinea (Conakry, 9°30'N) to northern Angola (Luanda); São Tomé, Ilha do Principe.



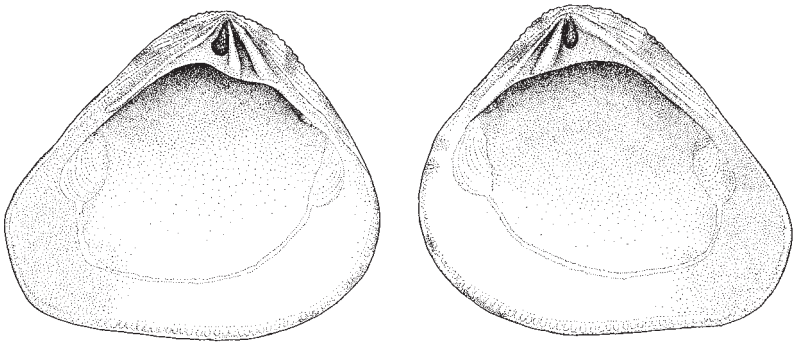
Biotope. In mixed and coarse sand, mostly with gravel and often with shell debris or stones where the species occurs together with *Diplodonta brocchii*, *Diplodonta undata*, *Talochlamys multistriata* and *Pitar rudis*, offshore from about 20 to 80 m, occasionally deeper; around São Tomé and Principe as shallow as in 8-10 m, not common.

Remarks. This species was known until recently as *Crassatella angolensis* Nicklès, 1955, now held as a synonym. It is distinguished from *C. contraria* by its higher and more inflated shell with the conspicuously truncated posterior margin. Huber (2015: 382) mentions two syntypes of *Crassatella corrugata* Adams & Reeve, 1850 in BMNH, mislabelled with the locality "Philippines, Sulu Sea", and found them conspecific with the West African *C. angolensis*. Specimens from the islands in the Gulf of Guinea are somewhat more elongate with a longer posterior part. They may perhaps belong to a separate species.



9.58. ***Crassatella corrugata*** **(Adams & Reeve, 1850)**. **A**-**B**, W of Ile Kabak, Guinea, 9°18'N, 14°18'W, 36 m (16.5 mm). **C**, W of Kassa/Conakry, Guinea, 9°35.5'N, 14°48'W, 32 m (15.9 mm). **D**-**H**, Cais de Santa Ana, Ilha do Principe, 11 m (25.3 mm). **I**-**M**, Ilha de Luanda, Luanda prov., N-Angola, 90 m (27.6 mm).

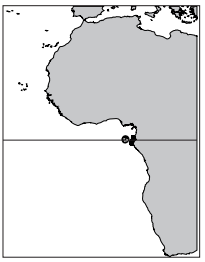
Crassatina (*Scissulatina*) *ornata* (Gray *in* Griffith & Pidgeon, 1833)



9.59. Cais de Santa Ana, Ilha do Principe, 11 m (21.3 mm).

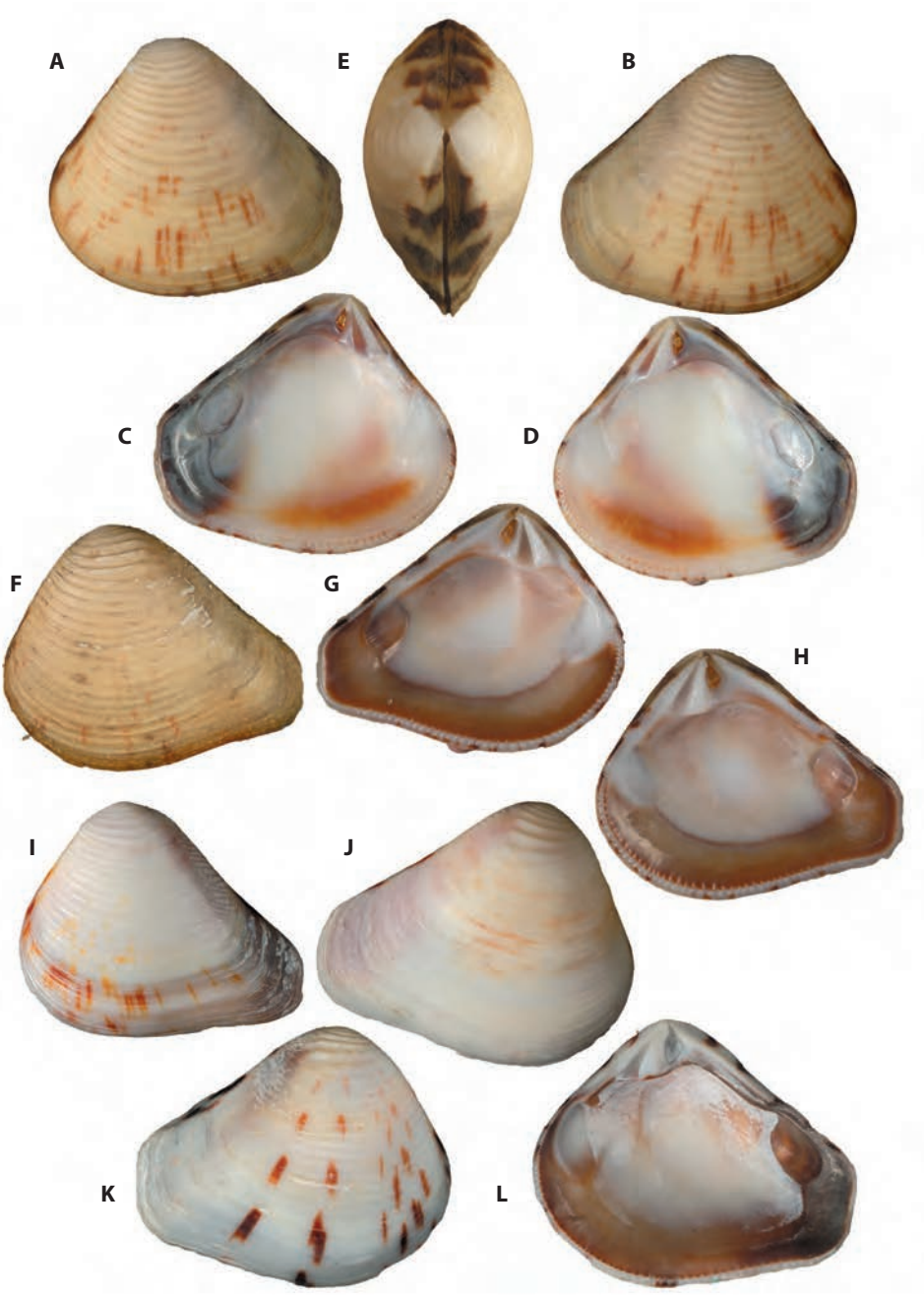
Shell up to 25 mm long, somewhat variable in outline, trigonal, more or less longer than high, with anterior margin rather narrowly rounded, posterior part tapering and posterior margin narrowly truncated, very thick and solid, not very compressed. Beaks in front of the vertical midline. Hinge plate broad with strong teeth. Surface with numerous strong, close-set, slightly irregular, commarginal ridges which disappear on the posterior half. On the earlier part ridges much more widely spaced, resembling waves and not strictly commarginal, descending slightly towards posterior. Posterior slope with fine, oblique, irregular wrinkles which often are more or less obsolete. Posterior angle rounded and indistinct. Lunule and escutcheon large, with slightly rounded delimitations. Periostracum light yellowish brown to dark brown, usually persistent on the whole shell. Inner margin finely crenulate. Outside whitish, with irregular dark brown blotches or zigzag markings, arranged more or less radially. Inside whitish with dark chestnut brownish posterior part or marginal area, often tinged with pale brownish hue or even entirely brown.

Distribution. Gabon (Ile Banié to Port-Gentil); São Tomé, Ilha do Principe.



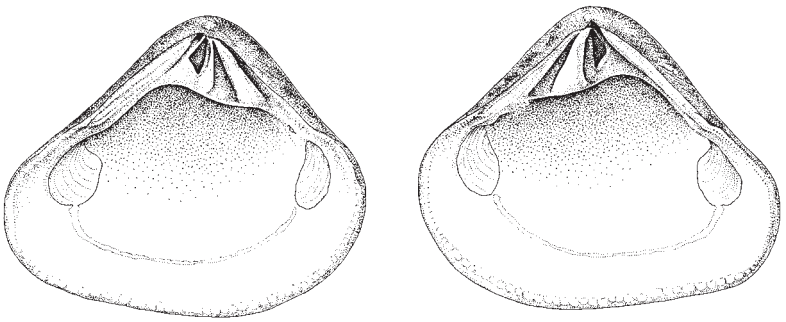
Biotope. In sandy bottom in shallow water (2-10 m), uncommon.

Remarks. This species is distinguished from *C. contraria* by its triangular shell and more consistently commarginal sculpture which, however, is only present on the anterior and middle part. It is also characterized by the presence of more widely spaced subcommarginal waves on the earlier part of the shell. The small irregular wrinkles on the posterior slope have the same direction as the oblique sculpture in the posterior part of *C. contraria* and *C. angolensis* and underline the close relationship to these species. *C. ornata* is confined to the southern tropical zone, and, like some other mollusc species which are principally distributed on the islands in the Gulf of Guinea, it touches the mainland only in northern Gabon, between Libreville and Cap Lopez.



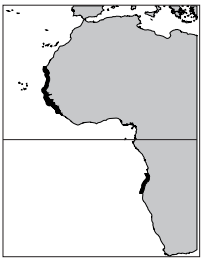
9.60. ***Crassatina ornata*** **(Gray *in* Griffith & Pidgeon, 1833).** **A-E**, Cais de Santa Ana, Ilha do Principe, 11 m (21.3 mm). **F-H**, São Tomé, old coll. MNHN (23.2 mm). **I**, Port-Gentil, Gabon, 0°43'S, 8°47.5'E, near wharf, dredge spill from harbour (lv, 24.6 mm). **J**, same locality (26.8 mm). **K-L**, Mondah, Baie de Corisco, Gabon (rv, 26.8 mm).

Crassatina (*Crassatina*) *guineensis* Cosel & Gofas, 2018



9.61. Diembéring, Casamance, Senegal, 12°29.6'N, 17°24.3'W, 35 m (23.4 mm).

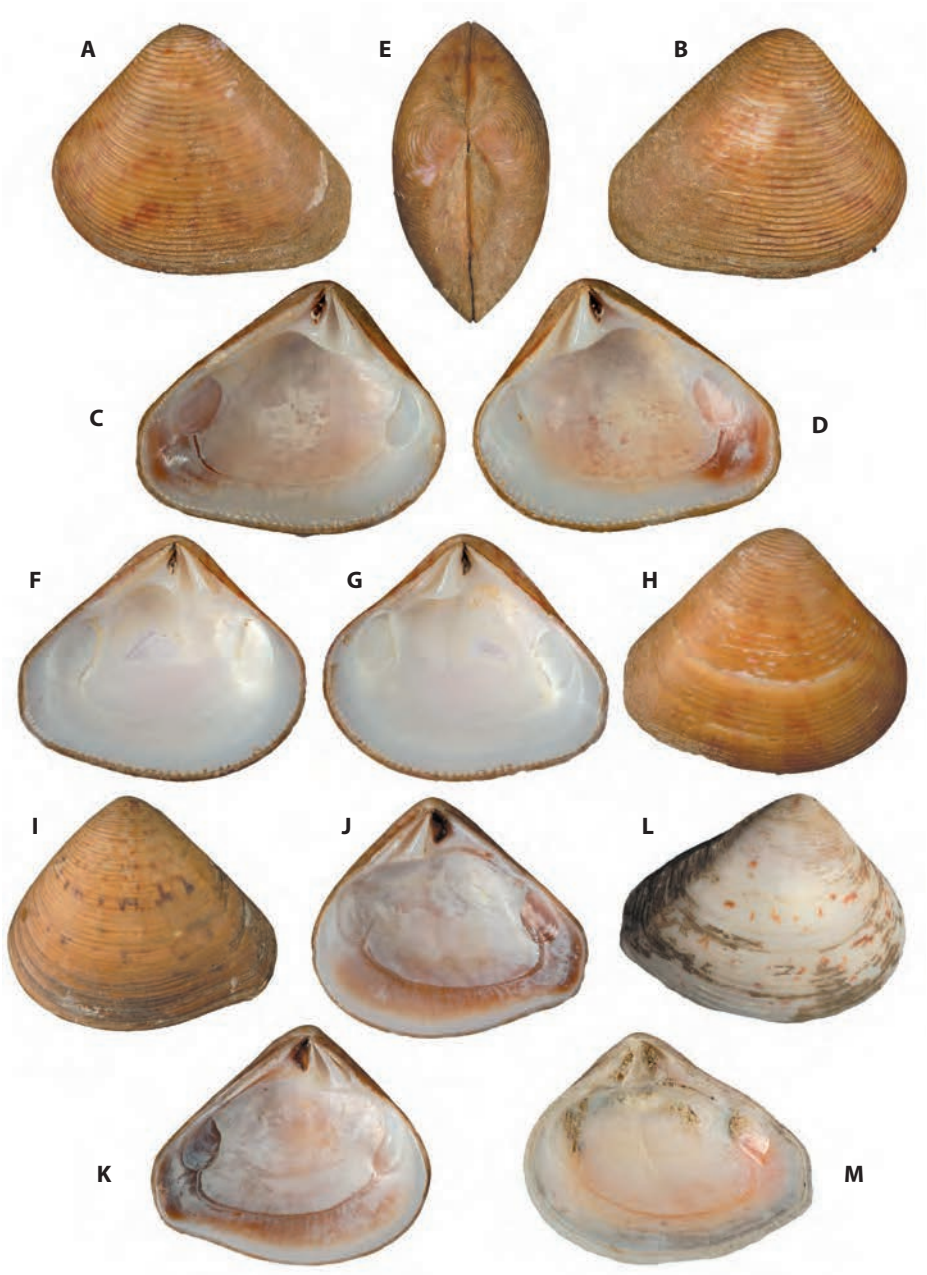
Shell up to 25 mm long, somewhat variable in outline, trigonal, more or less longer than high, with anterior margin narrowly rounded, posterior part tapering and posterior margin narrowly rounded-truncated, thick and solid, rather compressed. Beaks slightly in front of the vertical midline. Hinge plate strong and broad. Surface with numerous, close-set, slightly irregular, commarginal ridges which may be weaker or obsolete on the posterior part near the posterior angle. No oblique wrinkles on the posterior slope. Posterior angle rounded and indistinct. Lunule and escutcheon large, with slightly rounded delimitations. Periostracum light yellowish brown to dark brown, usually persistent on the whole shell. Inner margin finely crenulate. Outside whitish to pinkish white, with pinkish to red blotches and zigzag markings, arranged obliquely, radially or irregularly. Inside white with pinkish or light brownish hue. Specimens from Angola more brownish.



Distribution. Mauritania (20°N) to Guinea (9°30'N); southern Angola (Benguela).

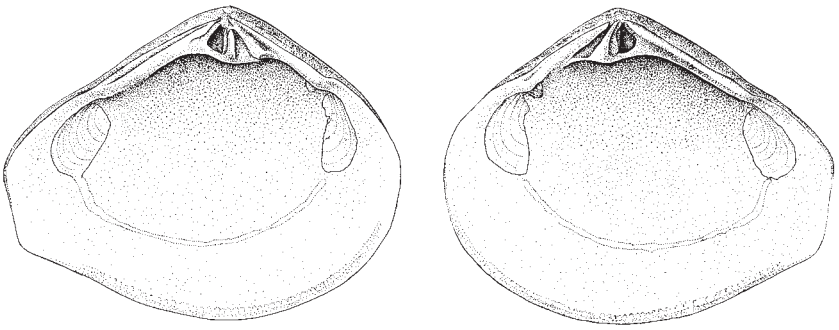
Biotope. In fine and mixed sand, partly with calcareous algae and shell debris, also in sand between rocks, from shallow water to about 40 m, locally not uncommon.

Remarks. This species is consistently separate from *C. ornata* but was frequently mistaken for it. However, it belongs to the subgenus *Crassatina s. str.*, with a commarginal sculpture throughout, and not to *Scissulatina* in which the posterior sculpture changes to oblique. It is distinguished by its slightly more compressed shell, the finer sculpture with always densely spaced commarginal ridges also on the earlier and umbonal part of the valves, the absence of oblique sculpture in the posterior slope and the colouration, which in most northern specimens has pinkish instead of chestnut brownish spots. The species is confined to the regions with seasonal upwelling, it is common in the north but rare in Angola where it has a slightly different appearance with a more brownish colouration like in *C. ornata*.



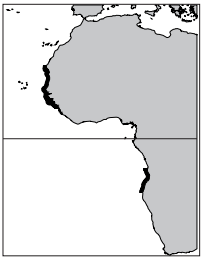
9.62. ***Crassatina guineensis*** **Cosel & Gofas, 2018. A-E**, W of Ile Kouffin, Guinea, 10°33'N, 15°44'W, 26 m (holotype, 24.2 mm). **F-H**, W of Ile Yomboya, Guinea, 10°27'N, 15°37.5'W, 39 m (24.1 mm). **I-K**, Baia dos Limagens, Benguela prov., S-Angola (27.3 mm). **L-M**, Baia Santa Maria, Benguela prov., S-Angola, intertidal (rv, 24.1 mm).

Crassatina (*Crassatina*) *paeteli* (Maltzan, 1885)



9.63. Baie de Gorée, Senegal (21.1 mm).

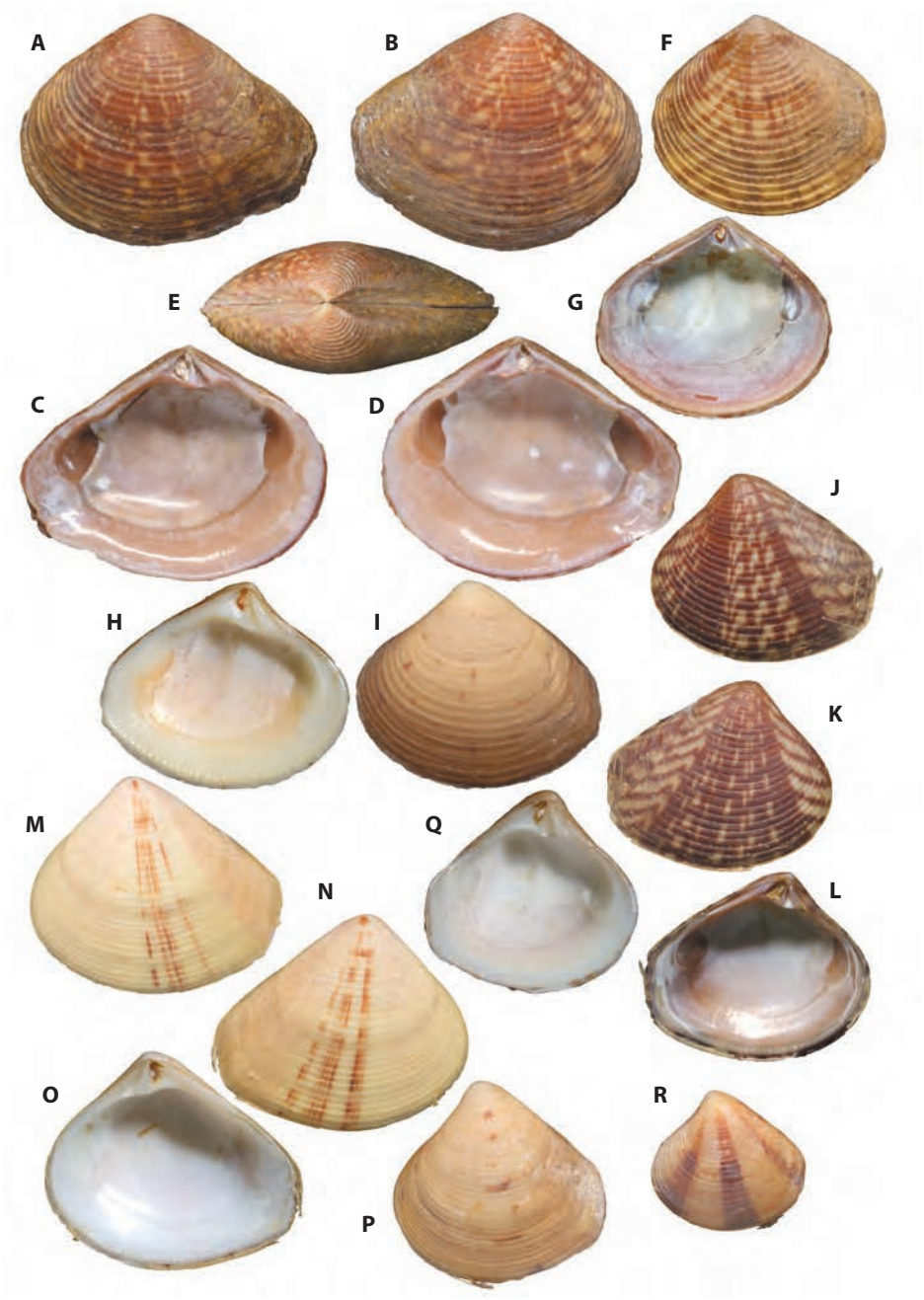
Shell up to 20 mm long, variable in outline, oval-subtrigonal, with more or less broadly rounded anterior margin, tapering posterior part and somewhat obliquely truncated posterior margin, thick and solid, compressed. Beaks very slightly anterior to the vertical midline or more or less median. Surface with numerous, regular, close-set, commarginal ridges, occasionally becoming obsolete on the marginal or ventral part. Posterior angle broad and rounded. Lunule and escutcheon rather long, narrow and impressed, but not sharply delimited. Periostracum rather thin, light yellowish brown to brown, on the marginal part of the valves becoming thicker. Inner margin finely crenulate. Outside yellowish white to yellowish brown, mostly with dark reddish brown rays and often irregular zigzag markings between them. Brown rays occasionally merging into nearly uniform dark brown, leaving only a few isolated yellowish spots. Inside white to brown.



Distribution. Mauritania (Cap Blanc) to Senegal (Casamance); empty shells recorded from Guinea-Bissau (Bissagos Islands) and Guinea (9°28'N); northern and southern Angola (Luanda to Moçâmedes, Namibe province); Ilha do Principe (?).

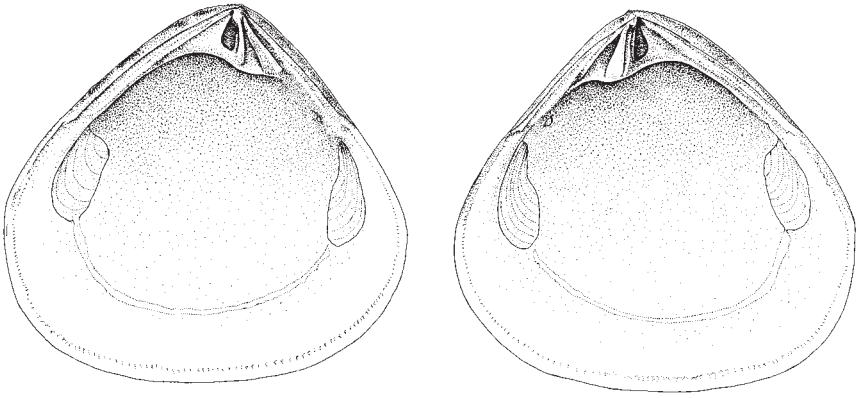
Biotope. In fine sand, also with seagrass, from shallow water (3 -4 m) to offshore (35-45 m), locally common.

Remarks. This species is closest to *C. guineensis*; however, it is smaller, has a broader anterior margin, more regular commarginal ridges, a narrower hinge plate and the typical dark radial rays. There exists no record between Sierra Leone and the Congo which indicates a distribution gap. Some specimens from Angola (Fig. 9.64P-R) have a slightly different outline and a broader hinge plate than the specimens from Senegal and might result not being conspecific. *Crassatina fusca* (Kobelt, 1886) is treated as a distinct species by Huber (2010: 244) but may fall into the variability of *C. paeteli*. Huber (2010) mentions *C. knockeri* Smith, 1881 as possible earlier name but this name is based on a juvenile specimen and, from the type locality (Ouidah, Benin), it could not be the present species and is here considered a *nomen dubium*.



9.64. ***Crassatina paeteli*** **(Maltzan, 1885).** **A**-**E**, Baie de Gorée, Senegal (20.7 mm). **F**-**G**, same locality (15.6 mm). **H**-**I**, Baia Santa Maria, Benguela prov., S-Angola, intertidal. (lv, 14.0 mm). **J**-**L**, Bissonga, Baia de Lucira, Namibe prov., S-Angola (11.5 mm). **M**-**O**, same locality (13.6 mm). **P**-**Q**, Praia Amelia, Namibe prov., S.-Angola, among rocks at shallow water (lv, 11.6 mm). **R**, same locality (lv, 8.2 mm).

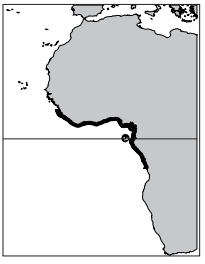
Crassatina (*Crassatina*) *triquetra* (Reeve, 1842)



9.65. SW of Takoradi, Ghana, 4°36.5'N, 1°31'W, 50 m (21.4 mm).

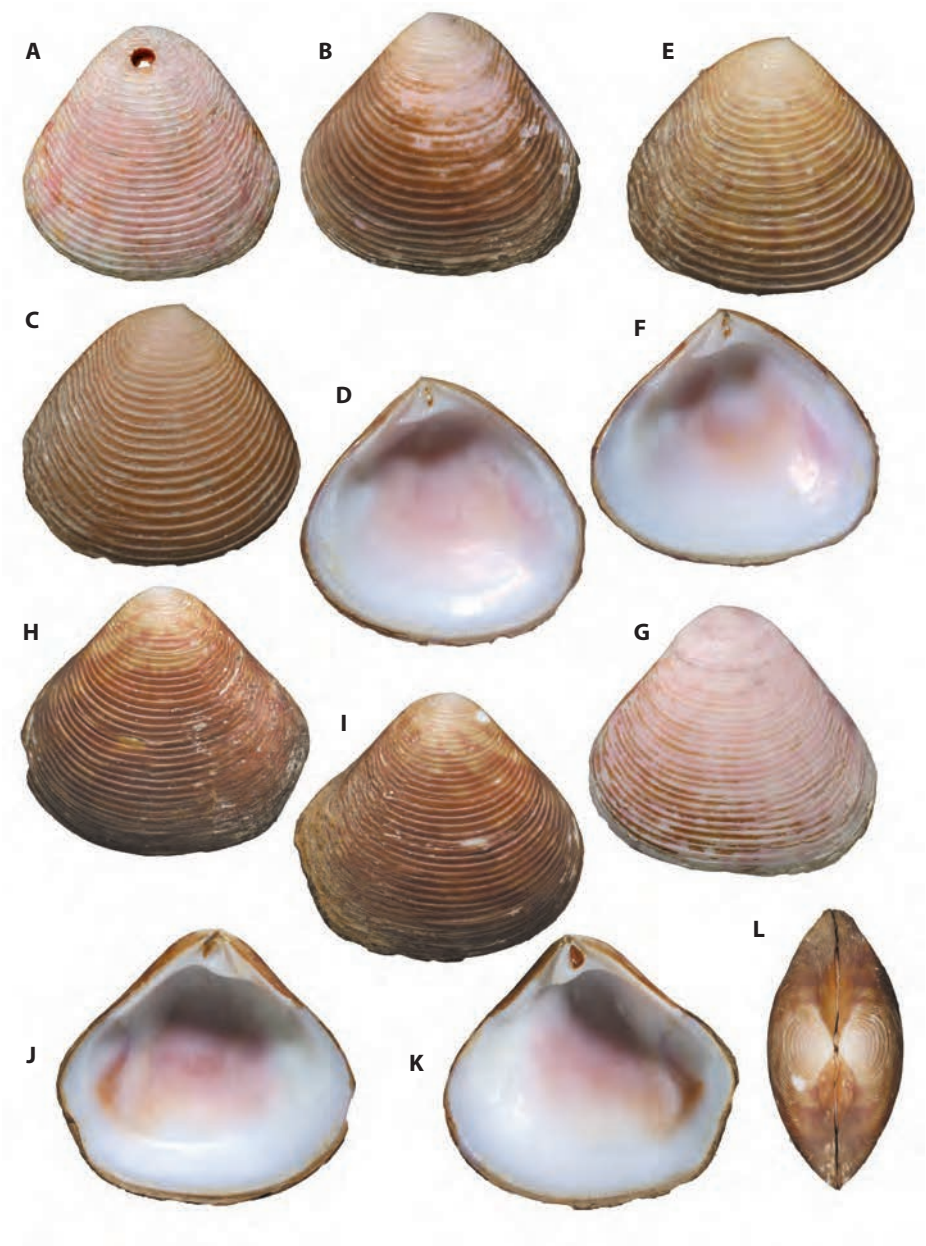
Shell up to 31 mm long, high-trigonal, slightly longer than high, with rather narrowly rounded anterior and posterior margin and very slightly convex to nearly straight ventral margin, thick and solid, compressed. Beaks small and flat, in front of the vertical midline. Surface with numerous, regular, close-set, commarginal ridges which on the posterior area are not parallel to the growth lines but are somewhat irregular and mostly slightly ascending. Posterior angle generally not well marked. Lunule and escutcheon very long and narrow. Periostracum brown to dark brown. Inner margin finely crenulate. Outside pale pink, with somewhat darker zones or zigzags. Inside white with pink, mostly on the umbonal part. The specimen from Ilha do Principe has a light brownish marginal zone on the inside.

Distribution. Guinea (Conakry) to northern Angola (Luanda), Ilha do Principe (one record).



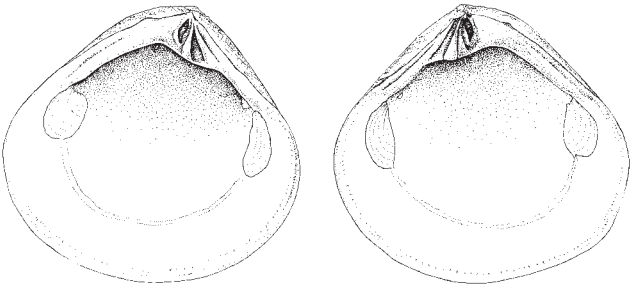
Biotope. In fine and mixed sand, also with calcareous algae, offshore from about 40 to 110 m, not common.

Remarks. This deeper water species is distinguished from other West African *Crassatina* by its nearly symmetric triangular shape with only slightly advanced beaks, nearly straight ventral margin and compressed valves. This is the type species of the genus *Crassatina*.



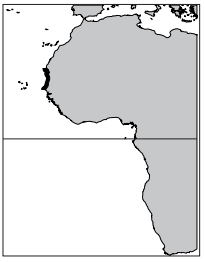
9.66. ***Crassatina triquetra*** **(Reeve, 1842). A**, Sierra Leone, 7°15.5'N, 12°51'W, 64 m (lv, 25.0 mm). **B**, Liberia, 6°40'N, 11°23'W, 51 m (lv, 22.0 mm). **C**-**D**, Tabou, Côte d'Ivoire, 4°27.5'N, 7°09'W, 50 m (rv, 19.3 mm). **E**-**F**, same locality (rv, 17.9 mm). **G**, Gabon, 0°25'N, 9°00'E, 73 m (lv, 28.0 mm). **H**-**L**, Ilha de Luanda, Luanda prov. N-Angola, 40-60 m (29.0 mm).

Crassatina (*Crassatina*) *alba* Cosel, 1995



9.67. Dakar region, Senegal, 95-98 m (14.9 mm).

Shell up to 18 mm long, slightly variable in outline, rounded-trigonal, slightly longer than high, with rounded anterior and posterior margin and markedly convex ventral margin, thick and solid, rather compressed. Beaks flat and slightly in front of the vertical midline; umbos somewhat globose. Surface with numerous, close-set, regular, commarginal ridges which become obsolete on the posterior part of the valves slightly behind the vertical midline. Lunule long and rather broad, escutcheon longer and narrower, not sharply delimited. Periostracum light greenish brown to darker brown, on the umbonal region often eroded. Inner margin very finely crenulate. Outside and inside entirely white.

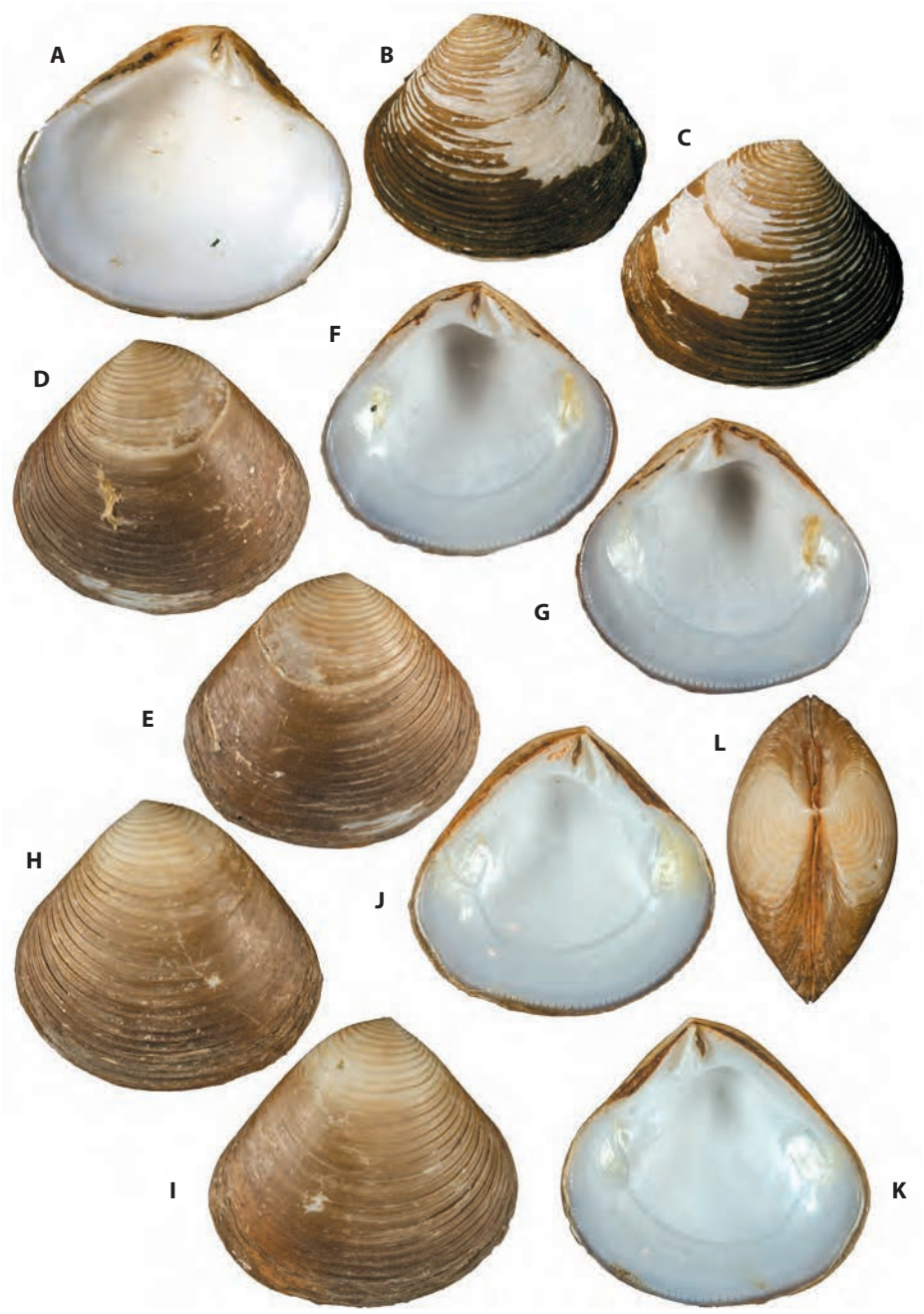


Distribution. Known only from Mauritania (20°34'N) to Senegal (Dakar region).

Biotope. In muddy sand and fine sand, well offshore, from 65 to 250 m, not common.

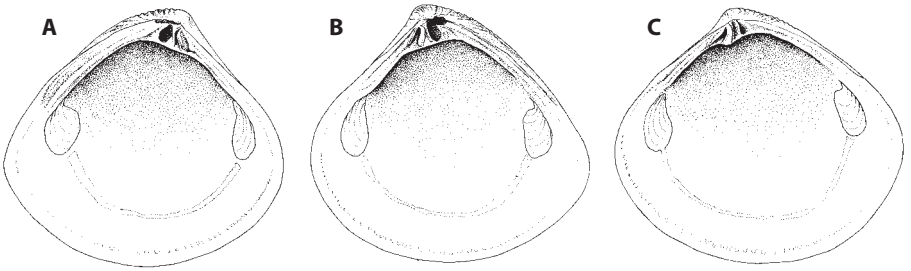
Remarks. This species, which is restricted to the deeper shelf and upper slope of the northern permanent and intermittent upwelling zone, is closest to *C. triquetra,* especially in the somewhat broad outline of the umbonal region; however, the species is much smaller, slightly more inflated and has a markedly convex ventral margin. It is also easily distinguished by its entirely white shell. *C. paeteli* is only slightly larger, and is characterized by the more trigonal outline, the straight anterior and posterior slope near the beaks and the radial colour pattern which may change from dark brownish to almost whitish with few darker rays .

Huber (2010: 646 and 2015: 382) placed this species in the synonymy of *C. paeteli*, which is not supported. If anything, *C. alba* is closer to *C. triquetra* from which it differs by the more rounded ventral margin, the smaller size and the pure white colour of the inside. Their distribution does not overlap and both are here kept as separate species. Moreover, tropical West Africa is considered as the distribution centre of the genus *Crassatina* with more short-range endemic species than thought, presumably with more or less slight differences in depth range and biotope preference. The probability of more new species of *Crassatina* in the region is still rather high, and a profound molecular study is the only way to untangle the different morphs.



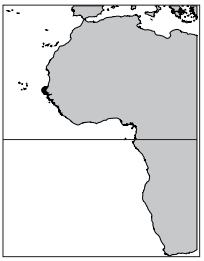
9.68. *Crassatina alba* Cosel, 1995. **A**, SW of Nouakchott, Mauritania, 17°44'N, 16°27'W, 100 m (18.3 mm). **B-C**, Dakar region, Senegal (15.5 mm). **D-G,** S of Gorée, Senegal, 95-98 m (holotype, 14.7 mm, photo Manuel Caballer/Recolnat). **H-L**, same locality (paratype, 12.8 mm).

Crassatina dakarensis Cosel, 1995



9.69. **A-B,** S of Gorée, 110-112 m (6.7 mm). **C,** Dakar region, Senegal, 50 m (lv, 8.2 mm).

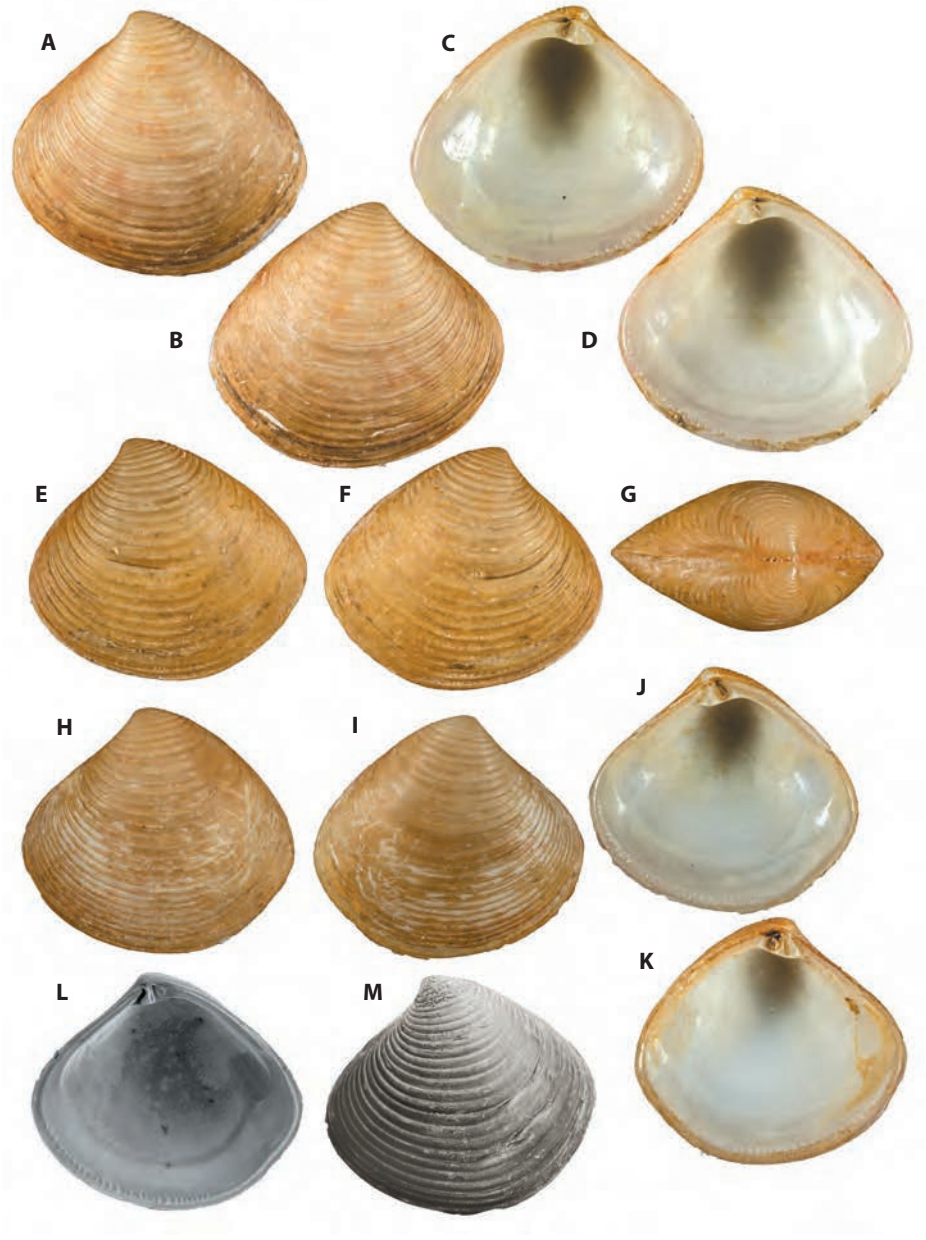
Shell small, 6-10.5 mm long, subtrigonal, slightly longer than high, with anterior margin narrowly rounded, posterior margin weakly angulate and ventral margin strongly convex, rather solid, inflated. Beaks small, slightly anterior to the vertical midline. Surface with numerous, regular, close-set, commarginal ridges which abruptly become obsolete on the posterior part, leaving only growth lines and growth stages, the limit being a short distance behind the vertical midline. The ridges may reappear on the rounded posterior angle. Lunule long, rather broad, somewhat heart-shaped, escutcheon long and narrow, neither well delimited. Periostracum rather thin, light greyish brown. Inner ventral margin finely crenulate on about two thirds of its length, on the last third smooth. Outside white, greyish white or pale pink, inside with the same colouration. Occasionally a few only slightly darker, ill-defined spots on the escutcheon, sometimes visible also on the interior.



Distribution. Known only from Senegal, at both sides of the Cape Verde Peninsula.

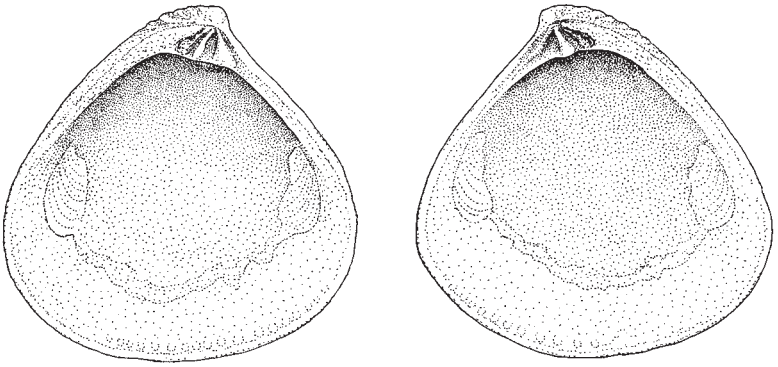
Biotope. Most probably fine sand with mud, well offshore from 80 to 250 m, rarely shallower, not common.

Remarks. In comparison to *C. alba*, this species is smaller, more trigonal, thinner and more inflated, with more prominent beaks and comparatively narrow hinge plate. An isolated record of a live specimen from Mauritania (19°24'N, 17 m) might refer to a different close, undescribed species. Huber (2010) used the genus *Salaputium* Iredale, 1924 for this and the next three species, but this is not followed here as it makes no sense biogeographically and the Australian type species *Salaputium fulvidum* (Angas, 1871) is much more inequilateral and with a markedly deflected pallial line. A new genus is possibly needed for this group of small west African species.



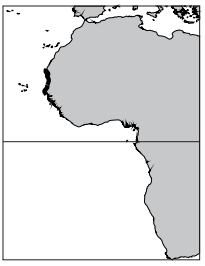
9.70. ***Crassatina dakarensis*** **Cosel, 1995.** **A**-**D**, Dakar region, Senegal, 129-150 m (holotype, 8.2 mm, photo Manuel Caballer/Recolnat). **E**-**G**, same locality (paratype, 7.7 mm). **H**-**K**, same locality (paratype, 8.0 mm). **L**-**M**, off Gorée, 145-170 m (7.4 mm, SEM micrographs courtesy C. Salas,).

Crassatina marchadi Cosel, 1995



9.71. Popenguine, Petite Côte, Senegal, 14°36'N, 17°27'W, 36 m (holotype, 4.2 mm).

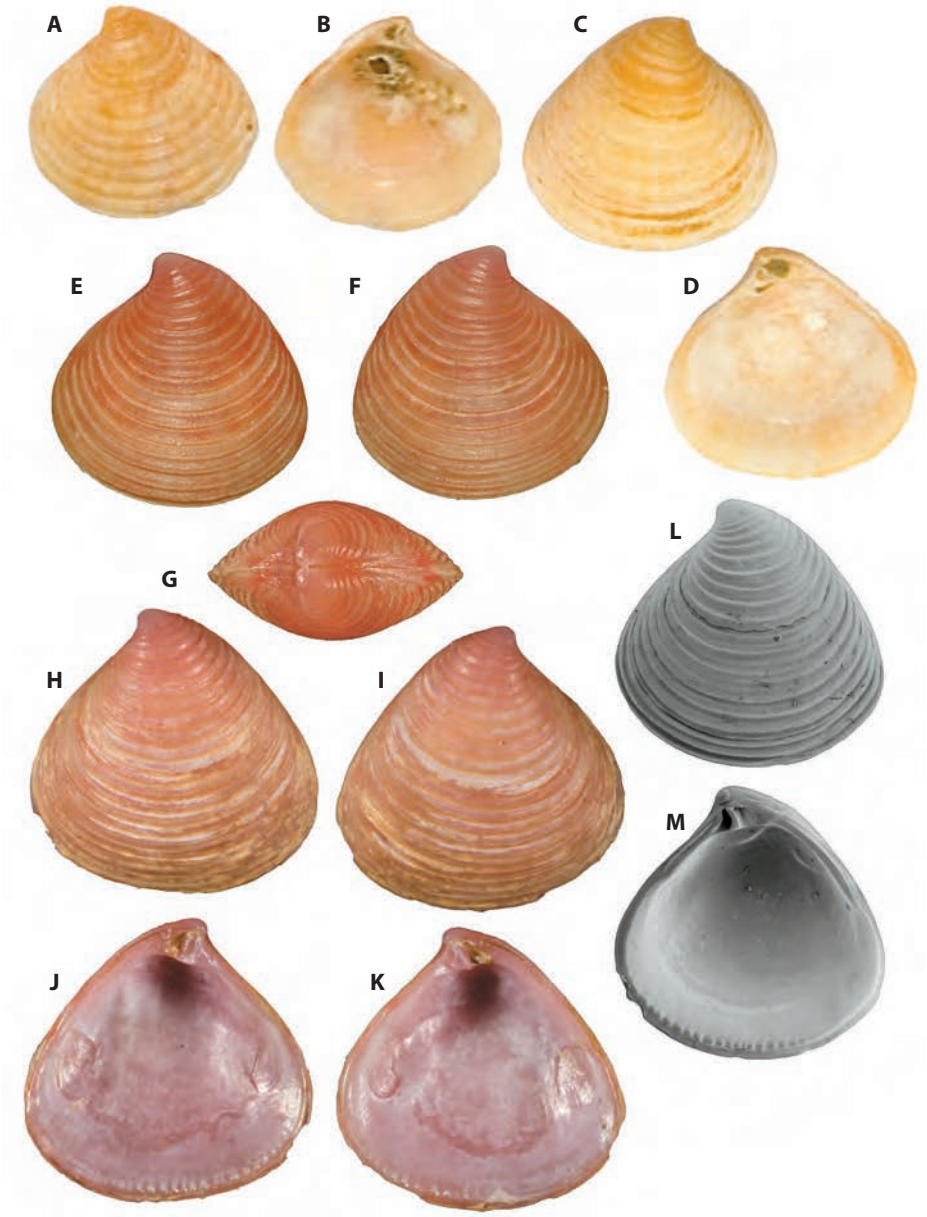
Shell very small, up to 4.5 mm long, somewhat variable, high-trigonal, as long as high, rather solid, inflated, with anterior margin narrowly rounded, posterior margin weakly angulate and ventral margin in its middle part often less convex. Beaks small, barely anterior to the vertical midline, markedly "hooked" towards anterior. Surface with numerous, regular, pronounced, close-set, commarginal ridges. Lunule rather broad, somewhat heart-shaped, escutcheon long and narrow, neither sharply delimited. Periostracum very thin, light straw coloured to nearly colourless, often eroded on the earlier part of the valves. Inner ventral margin finely crenulate, on the last third crenulations gradually disappearing. Outside greyish white, pale pink or light brownish, rarely white, inside with the same colouration, valves occasionally somewhat translucent.



Distribution. Known only from Mauritania (Banc d'Arguin) and from Senegal, both sides of the Cape Verde Peninsula.

Biotope. In fine sand from 7 to about 50 m, old valves also found deeper, to 180 m. Not common.

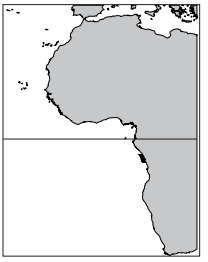
Remarks. This species somewhat resembles *C. dakarensis*, but is distinguished by its smaller size and more trigonal outline, the continuous commarginal striae and the small, typically forward-bent beaks. In contrast to *C. dakarensis*, the valves are mostly coloured. Huber (2010) used the genus *Salaputium* Iredale, 1924 for this species and synonymized *marchadi* and *congoensis* with *modesta*. This is not followed here taking into account that *C. marchadi* is clearly distinguished from *C. modesta* by the higher outline and the more markedly curved beaks, and that *C. congoensis* is separated by a very large gap.



9.72. ***Crassatina marchadi*** **Cosel, 1995. A-B**, Banc d'Arguin, Mauritania (5.2 mm). **C-D**, same locality (4.6 mm). **E-G**, Popenguine, Petite Côte, Senegal, 14°36'N, 17°27'W, 36 m (paratype ZMC, 2.9 mm, photo Manuel Caballer/ Recolnat). **H-K**, same locality (holotype, 4.2 mm). **L-M**, same locality (paratype, 3.2 mm, SEM micrographs courtesy C. Salas).

Crassatina congoensis (Jaeckel & Thiele, 1931)

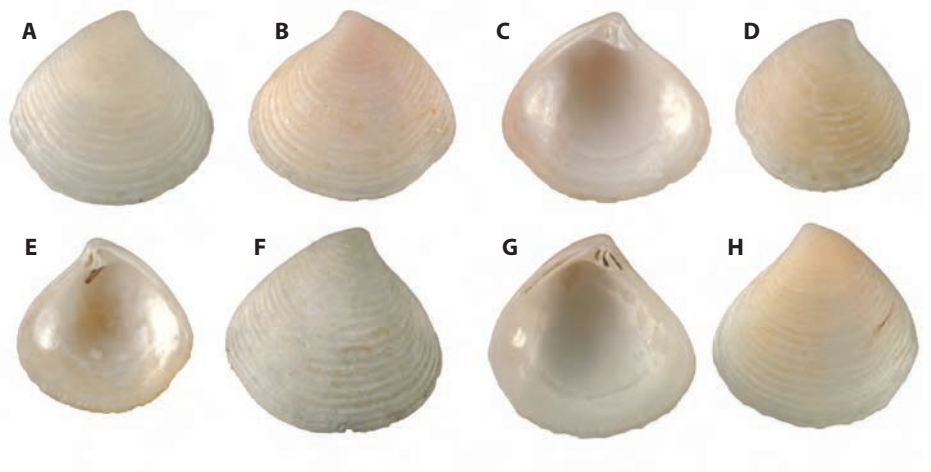
Shell very small, up to 4.5 mm long, somewhat variable, high-trigonal, as long as high, rather solid, inflated, with anterior margin narrowly rounded, posterior margin weakly angulate and ventral margin strongly convex. Beaks small, barely anterior to the vertical midline, "hooked" towards anterior. Surface with numerous, regular, close-set, commarginal ridges, becoming more or less obsolete on the postero-ventral part. Lunule rather broad, somewhat heart-shaped, escutcheon long and narrow, neither sharply delimited. Periostracum not seen. Inner ventral margin finely crenulate, on the last third crenulations gradually disappearing. Valves entirely white to pale brownish.



Distribution. Known only from the northern part of Congo Brazzaville southward to Ambrizete (northern Angola).

Biotope. In sandy bottom, known from about 30 to 60 m. Rare.

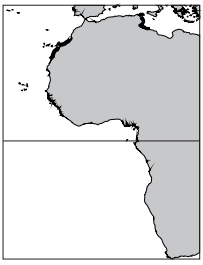
Remarks. This species is very close to *C. marchadi*, with which it forms an allopatric species pair. *Crassatina congoensis* has a slightly more convex ventral margin, and the sculpture is less pronounced than in the northern counterpart. The last three species and the following are distinguished from the other *Crassatina* by the small size, the more high-triangular outline, the narrower hinge plate and the more inflated shell; the "hooked" umbos are also characteristic. This group comprises at least four species, among them one more northern species, *C. modesta* (H. Adams, 1869) occurring from the Western Mediterranean (Tunisia) to Atlantic Morocco (Agadir) and most probably also off West Sahara (see next entry).



9.73. *Crassatina congoensis* (Jaeckel & Thiele, 1931). **A**, W of Panga, S-Gabon, 3°07'S, 10°04'E, 45 m (3.6 mm). **B-C**, same locality (3.6 mm). **D-E**, same locality (3.1 mm). **F**, same locality (3.8 mm). **G-H**, same locality (3.7 mm).

Crassatina modesta (H. Adams, 1869)

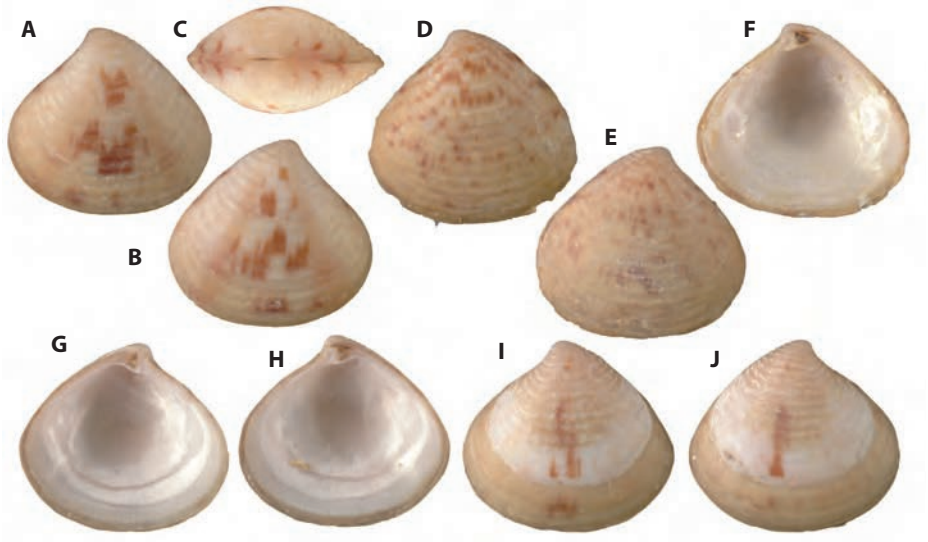
Shell small, 4-6.5 mm long, subtrigonal, slightly longer than high, almost equilateral, with anterior and posterior margin rounded and ventral margin convex, rather solid, inflated. Beaks small, in the vertical midline or slightly anterior to it. Surface with rather broad, regular, shallow commarginal waves which may become weaker on the posterior part. Lunule long, rather broad, escutcheon long and narrow, neither well delimited. Periostracum rather thin, light yellowish brown. Inner ventral margin finely crenulate on about two thirds of its length, on the last third smooth. Outside whitish, with brownish zigzags, speckles or rays, inside whitish with external pattern slightly showing through.



Distribution. Southwestern Mediterranean (Tunis, Pantelleria), southern Morocco (Agadir) and West Sahara (off Dakhla) (25°N), perhaps further southward but not known from Algeria nor from the Alboran Sea.

Biotope. Most probably in sandy bottom, about 50-60 m, rare.

Remarks. *Crassatina modesta* can be compared in form and size with the other three species of small "*Crassatina*" *s.l.* but is slightly thicker and is distinguished by the vivid colour pattern and the more triangular outline. These species are provisionally placed in the genus *Crassatina*, but may finally result belonging to a separate genus. *C. modesta* is the only species of this otherwise tropical genus which penetrates from the West African distribution centre northward into the Mediterranean. This is *Astarte planata* Calcara, 1840 (*non* J. Sowerby, 1820).



9.74. *Crassatina modesta* (H. Adams, 1869). A-C, off Dakhla [Villa Cisneros], West Sahara, 50-60 m (6.4 mm). D-F, same locality (6.7 mm). G-J, same locality (6.4 mm).

Superfamily **LUCINOIDEA**

Family **LUCINIDAE**

Subfamily **Lucininae**

- Genus ***Lucina*** Bruguière, 1797 – 1 species
- Genus ***Lamellolucina*** Taylor & Glover, 2002 – 1 species
- Genus ***Lamylucina*** Cosel, 2006 – 2 species
- Genus ***Falsolucinoma*** Cosel, 2006 – 1 species
- Genus ***Cardiolucina*** Sacco, 1901 – 1 species
- Genus ***Loripes*** Poli, 1791 – 1 species
- Genus ***Keletistes*** Oliver, 1986 – 4 species
- Genus ***Megaxinus*** Brugnone, 1880 – 2 species
- Genus ***Joellina*** Cosel, 2006 – 1 species
- Genus ***Divaricella*** Martens, 1880 – 1 species
- Genus ***Pompholigina*** Dall, 1901 – 1 species
- Genus *Cavilinga* Chavan, 1937 – 2 species (not treated)

Subfamily **Pegophyseminae**

- Genus ***Afrophysema*** Taylor & Glover, 2005 – 1 species
- Genus ***Bythosphaera*** Taylor & Glover, 2005 – 1 species
- Genus ***Loripinus*** Monterosato, 1883 – 2 species

Subfamily **Leucosphaerinae**

- Genus ***Afrolucina*** Cosel, 2006 – 1 species
- Genus ***Tinalucina*** Cosel, 2006 – 1 species

Subfamily **Myrteinae**

- Genus ***Myrtea*** Turton, 1822 – 2 species
- Genus ***Graecina*** Cosel, 2006 – 1 species

Subfamily **Codakiinae**

- Genus ***Ctena*** Mörch, 1861 – 1 species
- Genus ***Lucinoma*** Dall, 1901 – 5 species (3 treated)

Superfamily **THYASIROIDEA**

Family **THYASIRIDAE**

- Genus ***Thyasira*** Lamarck, 1818 – 7 species (1 treated)
- Genus ***Mendicula*** Iredale, 1924 – 5 species (1 treated)
- Genus *Axinus* J. Sowerby, 1821 – 1 species (not treated)
- Genus *Channelaxinus* Valentich-Scott & Coan, 2012 – 1 species (not treated)
- Genus *Axinulus* Verrill & Bush, 1898 – 4 species (not treated)
- Genus *Genaxinus* Iredale, 1930 – 1 species (not treated)

Superfamilies Lucinoidea and Thyasiroidea

These are the two superfamilies comprised in the order Lucinida, each one with only one Recent family. The hallmark of this group is the achievement of symbiosis with chemoautotrophic, sulphide-oxydizing bacteria which are situated in the gills. This symbiosis is obligate in the Lucinidae, facultative in the Thyasiridae. The predominantly deep-water Thyasiridae, although similar in appearance to Lucinidae, are now held in their own superfamily (Williams *et al.* 2004; Taylor *et al.* 2007a). Other families formerly placed in the Lucinoidea, such as the Ungulinidae and the Cyrenoididae, lack bacterial symbionts and not closely related despite their similar external aspect.

Superfamily LUCINOIDEA
Family LUCINIDAE

Shells small to large, equivalve, circular to oval or subtrigonal, thin and fragile to very thick. Beaks mostly in the middle or more or less anterior to, rarely behind the vertical midline. Anterior and posterior areas often well delimited. Surface smooth with growth lines or with weak to strong commarginal or radial sculpture or a combination of both. Lunule well developed and more or less asymmetrical, escutcheon often ill-defined or wanting, symmetrical or asymmetrical. Hinge with two cardinals in each valve which, however, may be partly or completely obsolete. Laterals present or obsolete. Ligament external or more or less deeply inset. Ventral margins smooth or crenulate. Anterior adductor scar characteristically elongate, with a very short to very long ventral extension separate from the pallial line and pointing downwards or more or less inwards. No pallial sinus.

The Lucinids are soft bottom dwellers, from soft mud to coarse sediment with shell and coral debris. They live preferently in reducing environments. For details, see Taylor & Glover (2000, 2006), Cosel & Bouchet (2008), Taylor *et al.* (2011). The worldwide species number was considerably underestimated for a long time, and currently 386 species are recognized. According to Taylor *et al.* (2011: 15), "there are estimated to be 330 documented living species of Lucinidae classified into 88 genera". However, as there are still many undescribed species, realistic estimates may go to a total of more than 500 living species (Williams *et al.* 2004; Cosel & Bouchet, 2008). Papers in view of a worldwide revision of the family were published by Glover & Taylor (1997, 2001, 2007, 2016); Taylor & Glover (1997, 2000, 2002, 2005, 2006, 2009); Glover *et al.* (2008), and more are in progress. The west African Lucinidae were revised by Cosel (1989 and 2006) and Taylor & Glover (2005), 29 species are presently known, which places this family in the third rank after Veneridae (46 species, including Petricolinae) and Tellinidae (41 species).

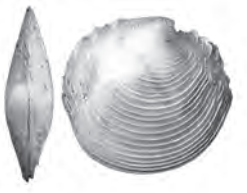
Herein, the lucinid chapter follows the classification proposed by Taylor *et al.* (2011). Based on a molecular analysis of 87 species, they recognize seven subfamilies, well supported by the sequence data but most of them hardly diagnosable morphologically. Characters such as divaricate or commarginal sculpture were shown to occur in different lineages and only the smooth and edentulous Pegophyseminae can be confidently diagnosed from shell only.

Subfamily Lucininae

Shells small to large, very divers, compressed to globose, rather thin-shelled to very thick, from strongly ornamented with commarginal or radial or (less common) divaricate sculpture to almost smooth. Hinge line variable, with cardinals and laterals or edentulous. Anterior adductor scar with ventral extension of different shape. 16 species are recorded from West Africa.

Genus *Lucina* Bruguière, 1797. Shells small to medium-sized, nearly circular, thick and solid, inflated to very inflated, with strongly separated anterior and posterior area. Surface with pronounced commarginal sculpture. Hinge with two cardinals in each valve, laterals well developed. *Linga* de Gregorio, 1884 is a synonym.

Genus *Lamellolucina* Taylor & Glover, 2002. Shells rather small, subcircular, solid, compressed. Surface with thin, prominent and regularly-spaced commarginal lamellae. Lamellae present also on the anterior and posterior area. Each valve with one or two cardinals, on a strong hinge plate, laterals strong and elongate. The genus is close to *Lepilucina* Olsson, 1964.



Genus *Lamylucina* Cosel, 2006. Shells up to 20 mm, subcircular to circular, very compressed. Beaks small, almost median or slightly in front of the vertical midline. Surface with fine, more or less widely spaced to contiguous commarginal ridges or lamellae, some of them becoming more or less lamellate on the antero- and postero-dorsal margin. Posterior area delimited by a shallow radial depression. Lunule very short and broad, escutcheon very long and narrow. Inner margin smooth. Hinge with one small cardinal tooth in the right valve and two in the left valve, often very weak to almost obsolete. No lateral teeth. Ventral prolongation of the anterior adductor scar rather long but small and narrow.

Genus *Falsolucinoma* Cosel, 2006. Shells large, compressed, with short and conspicuously rostrate anterior part and broad and longer posterior part, 10-15 conspicuous, thin, raised and

widely spaced commarginal lamellae and smooth interspaces. Lunule very small, escutcheon long and deep sunken. Left valve with two cardinal teeth, a strong anterior lateral and a smaller, narrower knob above it, and a narrow posterior lateral; right valve with two cardinals, two anterior laterals and two posterior laterals. Adductor scars small for the shell size, diverging part of anterior adductor scar very short and rather narrow. Inner margins smooth. This genus has an outline reminiscent of *Myrtea*; *Rostrilucina* Cosel & Bouchet, 2008 from the central Indo-Pacific also has a narrow anterior part and a very small anterior adductor scar but the anterior tapering part is situated more dorsally giving the dorsal margin an almost straight appearance, the valves are more elongate, and the sculpture is more dense.

Genus *Cardiolucina* Sacco, 1901. Shells small, circular, solid, very inflated, with strong commarginal ribs and smaller radial sculpture. Hinge with the two cardinals and fully developed laterals in each valve. The group has recently been revised by Taylor & Glover (1997). Ventral margin distinctly crenulated. A synonym is *Bellucina* Dall, 1901 (August).

Genus *Loripes* Poli, 1791. Shells small to medium-sized, circular to subcircular, solid, rather compressed. Surface smooth or with weak, mostly commarginal sculpture. Hinge with two cardinals in the left valve and one in the right valve, laterals present but feeble. Ligament deeply sunken, oblique. Inner ventral margin smooth.

Genus *Keletistes* Oliver, 1986. Shells very small to small, circular or subcircular becoming quadrate or triangular, anterior area with often more or less angulate outline. Outside with commarginal or subcommarginal to somewhat oblique sculpture and frequently very fine radial striae, especially anteriorly and posteriorly. Ligament deeply sunken, oblique. Inner ventral margin weakly crenulated.

Genus *Megaxinus* Brugnone, 1880. Shells small to medium-sized, subcircular to very irregularly oval or subquadrate, solid, compressed, with areas more or less marked. Surface smooth, only with growth lines. Hinge almost toothless. Inner margin smooth. For further information on the genus, see Glover & Taylor 1997.

Genus *Joellina* Cosel, 2006. Shells medium-sized, subcircular, almost as long as high, compressed, with a rather short and broad anterior part and a high, broad and oblique posterior part, without indentation. Beaks well in front of the vertical midline. Surface with irregular commarginal lamellae and growth lines. Lunule very short, narrow, asymmetrical and deeply sunken, escutcheon very narrow and completely filled by the ligament. Hinge plate very broad with long posterior part, with one very small and vestigial cardinal in the right valve and socket in the left valve; laterals small to indistinct. Diverging part of anterior adductor scar long and broad, with a length of about 2/3 the total length of the scar. Inner margins smooth.

Genus *Divaricella* Martens, 1880. Shells small to medium-sized, circular, inflated to very tumid, with areas usually not separated. Surface with characteristic divaricate sculpture. Hinge with two cardinals in each valve, laterals absent or incomplete. Inner margin smooth. For a review, see Chavan (1951).

Genus *Pompholigina* Dall, 1901. Shells medium-sized, circular, rather solid, very inflated, with prominent beaks and with coarse, more or less widely-spaced, diverging ribs.

Subfamily Pegophyseminae

Shells small to large, subcircular, rather thin but often quite strong, very inflated to almost spherical, with anterior area more or less marked, posterior area not differentiated. Surface mostly with growth lines only but occasionally with faint commarginal lamellae. Hinge without teeth. Inner margin smooth. Pallial line entire, sometimes with lobes along it dorsal margin, occasionally secondary pallial attachment scars dorsally to the pallial line. Anterior adductor scar variable from very short to rather long, pallial line inserting in the middle, the upper or the lower part of the scar. This subfamily largely corresponds to species formerly placed in genus *Anodontia* Link, 1807 (*s.l.*), which was revised by Taylor & Glover (2005). However, in the molecular phylogeny by Taylor *et al.* (2011), the species previously referred to the genus *Anodontia* were found to belong to two different and well separated subfamilies: Pegophyseminae and Leucosphaerinae. The four West African "*Anodontia*", however, all belong to, or are tentatively placed in Pegophyseminae.

Genus *Afrophysema* Taylor & Glover, 2005. Shells medium-sized to large, to 65 mm, anterior part somewhat tapering, with raised extension of the anterior dorsal margin, giving the dorsal margin an almost straight appearance. Surface with irregular commarginal ridges, or growth lines and growth waves. Internal ligament

deeply inset, on a strong nymph. Pallial line entire, sometimes with lobes on its dorsal margin but no secondary attachment scars of the mantle dorsally to it. One species in West Africa, two in the Indian Ocean.

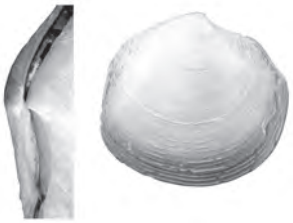
Genus *Bythosphaera* Taylor & Glover, 2005. Shells small, up to 20 mm long, subcircular, with typically tapering to rostrate anterior part, inflated. Surface with very fine commarginal ridges or lamellae. Ligament deeply inset, sometimes small oblique ridge or fold on the hinge line. Anterior adductor scar small, with very short diverging ventral part, at an angle of about 24° from the pallial line. Small secondary scars along the pallial line close to it on its dorsal side.

Genus *Loripinus* Monterosato, 1883. Shells small to medium-sized, circular, very inflated, with a deeply inset ligament, short anterior muscle scar and entire pallial line. Surface smooth, with some growth lines only. Colouration white, pale yellowish or pale pinkish in the umbonal region. Three species in the eastern Atlantic, one in the Indo-Pacific (Marianas).

Subfamily Leucosphaerinae

Shells small to large, compressed to very tumid, without radial sculpture on the exterior, but commarginal ridges or lamellae frequently present. Hinge with small or missing cardinals. Lunule well-marked, in some of the genera strongly asymmetrical. This subfamily was proposed by Taylor *et al.* (2011) for a well-supported and distinct clade in the molecular analysis, however, the species comprised there hardly share any morphological characters. Most species are Indo-Pacific, only two from West Africa.

Genus *Afrolucina* Cosel, 2006. Shells small, subcircular, compressed. Surface with numerous fine and more or less densely spaced commarginal lamellae, umbonal area appearing smooth. Lunule short, broad, markedly asymmetrical, in the right valve broad, in the left valve very narrow, sunken. Escutcheon long, narrow and sunken. Hinge with one small, well defined cardinal tooth in the right valve and two in the left valve. Anterior and posterior lateral teeth in the right valve indistinct, in the left valve almost obsolete. Anterior adductor scar rather elongate, with diverging part about half its length or slightly shorter. Inner margins smooth.



Genus *Tinalucina* Cosel, 2006. Shells mostly under 10 mm, variable in outline, subcircular, slightly longer than high to almost as

long as high, moderately tumid. Anterior margin more convex in its middle part. Surface with more or less developed, densely spaced fine commarginal lamellae. Lunule small, only slightly asymmetrical. Escutcheon entirely filled with the ligament. Hinge with slight vestiges of one or two cardinals. Diverging part of anterior adductor scar short and broad, with a length of about half the total length of the scar. Inner margins smooth.

Subfamily Myrteinae

Shells small to large, oval to quadrangular, more or less elongate, rather thin. Surface smooth or with regular commarginal lamellae, often ending in small spines or knobs along the delimitations of lunule and escutcheon. Posterior adductor scar small with very short ventral extension. Hinge line narrow, with cardinals and laterals. Three species are known from west Africa.

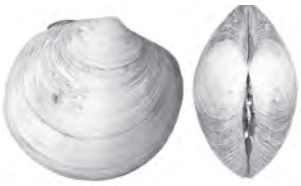
Genus *Myrtea* Turton, 1822. Shells mostly small, suboval to quadrangular, longer than high, solid, more or less compressed, with areas not differentiated. Surface with predominantly commarginal sculpture. Border of lunule and escutcheon elevated and often with tiny scales. Hinge with one cardinal in the right valve and two cardinals in the left valve, laterals present. Anterior adductor scar with short ventral diverging part. Ligament external. Inner margin smooth.

Genus *Graecina* Cosel, 2006. Shells medium-sized, subcircular, slightly longer than high, rather compressed, with thin commarginal lamellae or cords only on the earlier part, becoming obsolete and then absent ventrally. Lunule long, narrow, slightly asymmetrical, sunken. Escutcheon long, narrow and sunken, delimited by a sharp and prominent, narrowly laminate keel. Right valve with one well developed cardinal tooth and sometimes the vestiges of a posterior cardinal, and anterior and posterior laterals. Left valve with two cardinals and well marked anterior and posterior laterals. Anterior adductor scar rather elongate, with moderately long diverging part. Inner margins smooth.

Subfamily Codakiinae

Shells small to very large, very diverse, more or less circular, moderately thin to very thick and heavy, with radial and/or commarginal sculpture. Hinge line with cardinals and laterals. Anterior adductor scar long to very long. The subfamily consists of three subclades: the *Codakia*, *Ctena*- and *Lucinoma*-subclade. Only the two latter are present in West Africa with in total five species.

Genus *Ctena* Mörch, 1861. Shells rather small, subcircular to oval, solid, rather inflated, with the beaks at or slightly behind the vertical midline and without anterior and posterior areas. Surface with more or less reticulated sculpture. Hinge with two cardinals in each valve, laterals well developed. *Jagonia* Recluz, 1869 is a synonym.



Genus *Lucinoma* Dall, 1901. Shells medium-sized to large, subcircular to somewhat circular, solid, more or less compressed, with anterior and posterior areas more or less distinctly, often feebly differentiated. Surface with commarginal ribs or lamellae and often weaker intermediaries, on the earlier part of the valves frequently eroded, occasionally obsolete. Hinge with two well developed cardinals in each valve, laterals rudimentary. Inner margin smooth. Ventral extension of the anterior adductor scar long to very long. This is one of the most species-rich lucinid genera, the greater part of the species is known from the Indo-Pacific.

Species treated (29)

Lucina adansoni d'Orbigny, 1840; *Lamellolucina reyrei* (Nicklès, 1955); *Lamylucina gaini* (Lamy, 1920); *Lamylucina exgaini* Cosel, 2006; *Falsolucinoma leloeuffi* (Cosel, 1989); *Cardiolucina lamothei* (Dautzenberg, 1912); *Loripes orbiculatus* Poli, 1791; *Keletistes contrarius* (Dunker, 1846); *Keletistes aberrans* (Dautzenberg, 1910); *Keletistes rhizoecus* (Oliver, 1986); *Keletistes legouxi* (Nicklès, 1952); *Megaxinus appendiculatus* (Locard, 1898); *Megaxinus unguiculinus* Pallary, 1904; *Joellina dosiniformis* Cosel, 2006; *Divaricella chavani* Cosel, 2006; *Pompholigina gibba* (Gray, 1825); *Afrophysema chevalieri* (Cosel, 2005); *Bythosphaera subrostrata* (Cosel, 1989); *Loripinus senegalensis* (Cosel, 2005); *Loripinus subfragilis* (Dautzenberg, 1910); *Afrolucina discontinua* Cosel, 2006; *Tinalucina aequatorialis* Cosel, 2006; *Myrtea spinifera* (Montagu, 1803); *Myrtea pseudocorbis* (Nicklès, 1952); *Graecina karinae* Cosel, 2006; *Ctena eburnea* (Gmelin, 1791); *Lucinoma borealis* (Linnaeus, 1767); *Lucinoma myriamae* Cosel, 2006; *Lucinoma vestita* (Dautzenberg & Fischer, 1906).

Other species reported in the area (4)

Cavilinga inconspicua (E.A. Smith, 1890). St. Helena (Taylor & Glover 2016: 378)

Cavilinga compacta (E.A. Smith, 1890). St. Helena (Taylor & Glover 2016: 379)

Lucinoma atalantae Cosel, 2006. Off Mauritania, 20°30'N, 2000-2100 m (Cosel 2006).

Lucinoma capensis (Jaeckel & Thiele, 1931). Angola (Porto Alexandre - Baia dos Tigres) – South Africa.

Superfamily THYASIROIDEA
Family THYASIRIDAE

Shells small to medium-sized, equivalve, mostly subcircular, subquadrangular or more or less oblique-triangular, very thin and fragile to thin, inflated to very inflated. Surface smooth or with commarginal sculpture. Anterior depression and posterior area ill-defined to well developed. Beaks mostly more or less in front of the vertical midline, directed forward. Hinge line

without real teeth and only with small tubercles and a protruding lunular margin in the right valve. Adductor scars hardly visible, anterior scar elongate in some, both scars oval in others, no pallial sinus. There are 124 species known worldwide, two on the West African coast and 19 more offshore. For a review of the Northern Atlantic species, see Payne & Allen (1991) and Oliver & Killeen (2002).

Genus *Thyasira* Lamarck, 1818. Shells small, mostly oblique-subtriangular to subquadrangular with distinctly wavy posterior part, thin, inflated. Surface with commarginal sculpture or growth lines. Anterior adductor scar elongate. Synonyms are *Cryptodon* Turton, 1822 and *Ptychina* Philippi, 1836.

Genus *Mendicula* Iredale, 1924. Shells very small, rounded to subovate, with prosocline umbos, without posterior flexure, thin, inflated. Surface with commarginal sculpture or growth lines, in life covered by a thick ferruginous crust.

Species treated (2)

Thyasira biplicata (Philippi, 1836); *Mendicula ferruginosa* (Forbes, 1844).

Other species reported in the area (19)

Thyasira equalis (Verrill & Bush, 1898). Sierra Leone basin, 1624-2934 m; Angola basin, 527-2243 m; also North American, West European, Argentine and Cape basins (Payne & Allen 1991).

Thyasira minuta Payne & Allen, 1991. Angola basin and off Namibia, 439-631 m (Payne & Allen 1991).

Thyasira obsoleta (Verrill & Bush, 1898). Sierra Leone basin, 1624-2357 m; Angola basin, 1427-2031 m (Payne & Allen 1991).

Thyasira subcircularis Payne & Allen, 1991. Sierra Leone basin, 1624-2357 m; off Namibia, 1432 m; also West European basin (Payne & Allen 1991).

Thyasira subovata (Jeffreys, 1881). Cape Verde basin, 1624-2185 m; off Namibia, 1432 m; also North American, West European, Argentine and Cape basins (Payne & Allen 1991).

Thyasira succisa atlantica Payne & Allen, 1991. Sierra Leone basin, 1624-1796 m; Angola basin, 1427-1643 m; also North American, Guiana, Argentine and Cape basins (Payne & Allen 1991).

Thyasira tortuosa (Jeffreys, 1881). Cape Verde basin, 1624-2185 m; off Namibia, 1432 m; also North American, West European and Cape basins (Payne & Allen 1991).

Axinus grandis (Verrill & Smith, 1885). Off Senegal, 2924 m (Locard 1898, as *Schizothaerus grandis*).

Channelaxinus perplicatus (Salas, 1996). Off Angola, 2044 m; off Namibia, 1277 m; also North American and West European basins (Payne & Allen 1991, as *Thyasira excavata plicata*).

Mendicula bushae (Payne & Allen, 1991). Angola basin, 527-542 m (Payne & Allen, 1991).

Mendicula carrozzae (Payne & Allen, 1991). Cape Verde basin, 1624-1796 m; Angola basin, 527-2031 m; off Namibia, 1432 m; also North American, Argentine and Cape basins (Payne & Allen 1991).

Mendicula inflata (Payne & Allen, 1991). Angola basin, 4559-4597 m; also West European and Argentine basins (Payne & Allen 1991).

Mendicula transversa (Payne & Allen, 1991). Cape Verde basin, 2185-2934 m; Angola basin 527-4597 m; also Guiana, Brazil, Argentine and Cape basins (Payne & Allen 1991).

Mendicula ultima (Payne & Allen, 1991). Cape Verde basin, 1624-2357 m; Sierra Leone basin, 1261-1396 m; Angola basin, 1427-2031 m; also West European basin (Payne & Allen 1991).

Axinulus alleni (Carrozza, 1981). Angola basin, 527-542 m and off Namibia, 1432 m; also Mediterranean (Payne & Allen 1991).

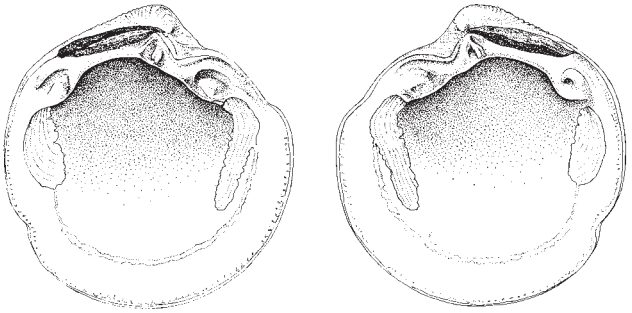
Axinulus brevis (Verrill & Bush, 1898). Sierra Leone basin, 1261-3025 m; Angola basin, 1787-4566 m; also North American, West European, Argentine and Cape basins (Payne & Allen 1991).

Axinulus croulinensis (Jeffreys, 1847). Cape Verde basin, 1624-3861 m; Angola basin 527-2754 m; also North American, West European, Guiana, Argentine and Cape basins (Payne & Allen 1991).

Axinulus subequatorius (Payne & Allen, 1991). Angola basin, 3797 m; also Argentine basin (Payne & Allen 1991).

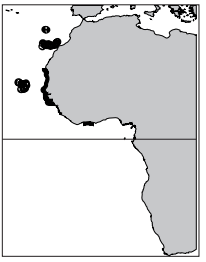
Genaxinus eumyarius (M. Sars, 1870). Cape Verde basin, 1624-1796 m; Sierra Leone basin, 1261 m; Angola basin, 1787 m; also West European and Cape basins (Payne & Allen 1991).

Lucina adansoni d'Orbigny, 1840



10.1. Dakar, Senegal (23.4 mm ht).

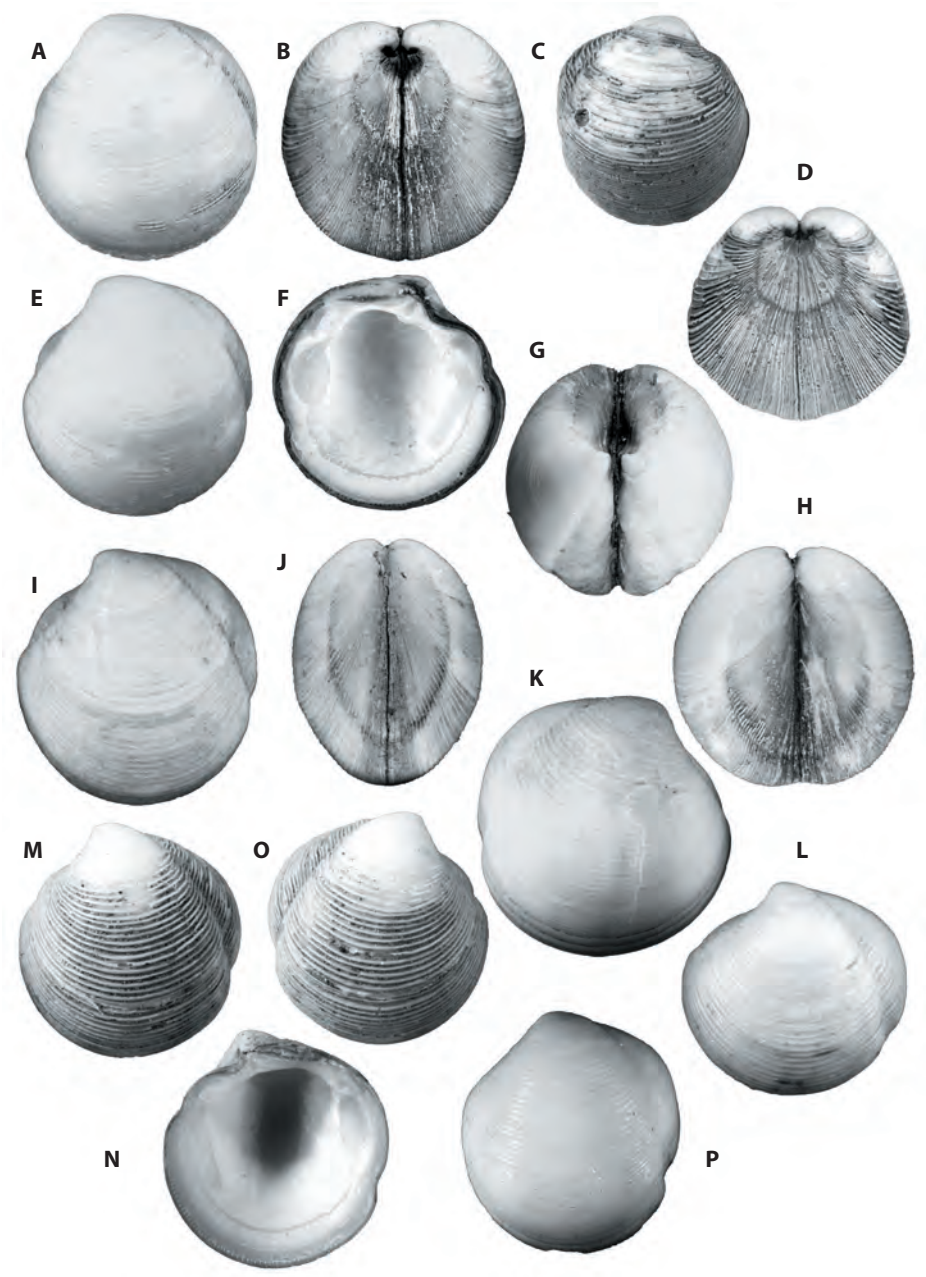
Shell up to 35 mm long, quite variable in shape, thickness and tumidity, circular to slightly higher than long, solid to extremely thick and heavy, very inflated to spherical. Beaks a little in front of the vertical midline. Surface with numerous fine, quite regular, close-set commarginal lamellae, slightly bent towards the margin when fully intact, but often more or less eroded. Anterior and posterior areas well delimited by sharp radial depressions. Lunule small, symmetrical, broad and heart-shaped; escutcheon very narrow and hardly visible, on the left valve only. Inner margin finely crenulate. Periostracum thin, light brownish to greyish, eroded in the umbonal area. Outside and inside white.



Distribution. Mauritania (Cap Blanc) to northern Guinea (10°27'N); Côte d'Ivoire; Canary Islands, Madeira, Cape Verde Islands.

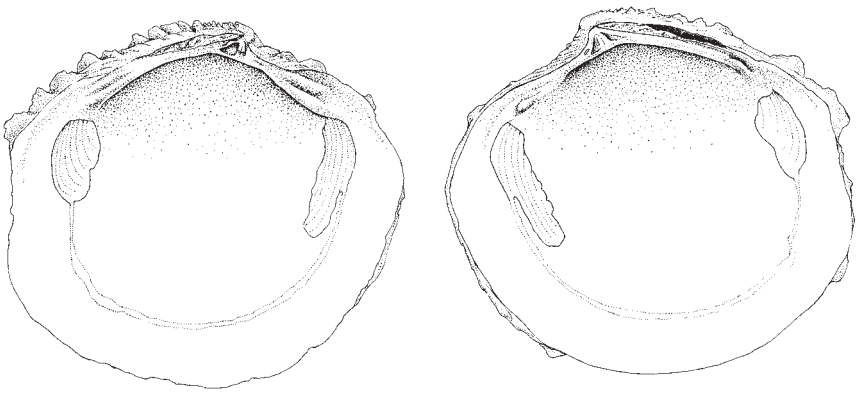
Biotope. Mostly in coarse sand, also with gravel and shell debris or on sandy areas among rocks, from low tide level to about 35 m and perhaps deeper. On the islands not uncommon, on the continental shelf common in the North only, becoming very rare towards the south.

Remarks. *Lucina adansoni* is mostly confined to the northern upwelling area; there are no records in the typical tropical regions; in the zone of intermittent upwelling (Côte d'Ivoire, one record only), it seems to be quite rare and occurs in more deeper water. The species is quite variable in thickness and tumidity, the most heavy specimens which resemble small balls, are found in the Dakar area. Empty valves and shells are commonly washed up on Cape Verde Island beaches. *L. adansoni* was long misidentified as *L. columbella* Lamarck, 1818 which is a similar, but smaller Miocene species from the Aquitaine Basin. A synonym is *Lucina dunkeri* Menke, 1859 (*fide* Huber 2015: 415). *Lucina adansoni* is not encountered Recent in Angola, but a very close species (if not the same) is occurring in the Miocene of Benguela, where it attains a slightly larger size. *Lucina goreensis* Jaeckel, 1927 is recognized by Huber (2015) as a second separate sympatric species of *Lucina* in West Africa (Canaries to Senegal, Cape Verde Islands. It is smaller, less globose, thinner and "more squarish", the lunule is somewhat longer, "heart-shaped and ventrally narrower". Only molecular data could reveal if a separate species is involved.



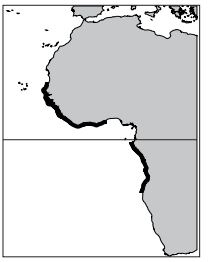
10.2. *Lucina adansoni* d'Orbigny, 1840. **A-B**, Baie de Hann, Dakar, Senegal (28.5 mm). **C-D**, SE of Gorée, Senegal, 14°41'N, 17°23.3'W, 19 m (23.7 mm). **E-H**, Baie de Gorée, Senegal (27.6 mm). **I-J**, Dakar region, Senegal (26.0 mm). **K**, Baia Mordeira, Cape Verde Islands, beach drift (28.4 mm). **L**, Baia das Gatas, São Vicente, Cape Verde Islands, beach drift (32.3 mm). **M-O**, W of Cap Verga, Guinea, 10°12'N, 15°39'W, 22 m (19.2 mm). **P**, Abidjan region, Côte d'Ivoire (23.3 mm).

Lamellolucina reyrei (Nicklès, 1955)



10.3. Casamance, 12°46.9'N, 17°29.9'W, 45 m (11.5 mm).

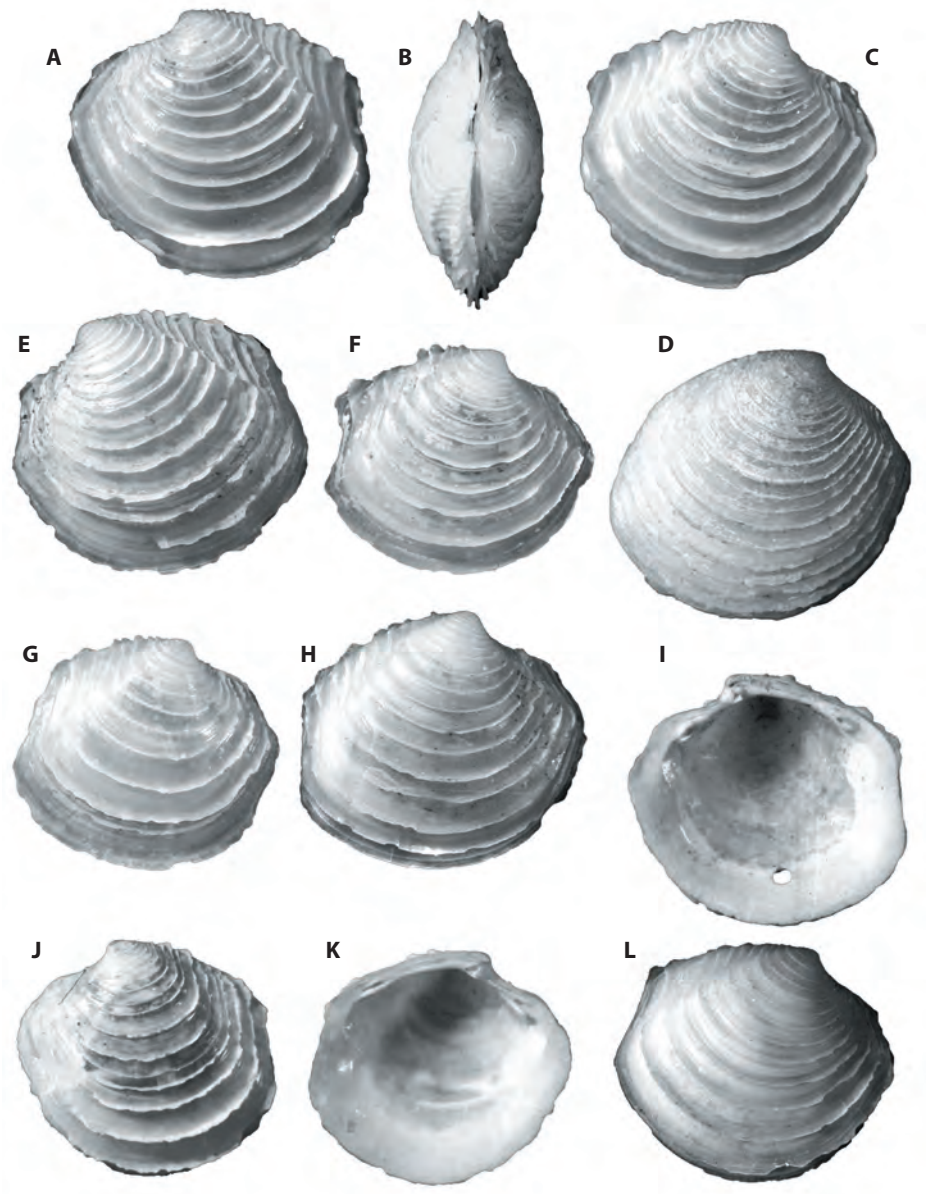
Shell up to 19 mm long, within certain limits variable in outline but considerably variable in size, oblique-subcircular, solid, compressed. Beaks well in front of the vertical midline. Surface in fully grown specimens with about 17-18 prominent commarginal lamellae, on the umbos smaller and crowded, on the disk less dense and more or less evenly spaced. Interspaces smooth. Anterior and posterior areas delimited by the commarginal lamellae abruptly diminishing in height but becoming elevated again on borders of lunule and escutcheon. Anterior and posterior angle rounded. Lunule and escutcheon narrow. Inner margin ventrally very faintly crenulate. Periostracum not seen. Outside and inside uniform white.



Distribution. Mauritania (17°30'N) to Ghana; Gabon (Port-Gentil) to southern Angola (Moçâmedes, Namibe province); São Tomé, Ilha do Principe.

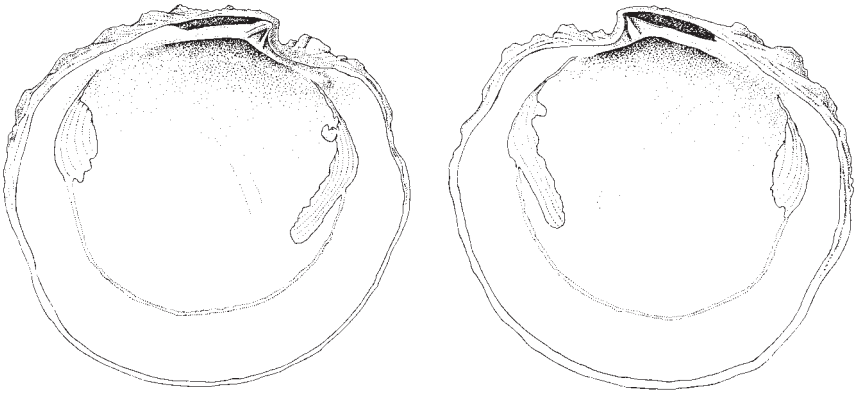
Biotope. In fine muddy sand and fine sand, often with large foraminifera, offshore from about 40 to 200 m, not common.

Remarks. All studied specimens from Côte d'Ivoire and São Tomé are exceptionally small (about 4 mm), Angolan specimens do not exceed 7.5 mm; the largest specimens come from Casamance. This species is very close to the North Italian Pliocene species *L. sublamellata* (Sacco, 1901), without doubt the ancestor. More material of both species may confirm the supposition that they are conspecific. The genus is otherwise distributed in the Indo-Pacific, from where six species are known (Taylor & Glover 2002); a very close species from the Red Sea is *L. dentifera* (Jonas, 1846).



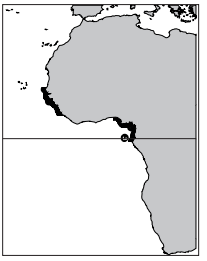
10.4. ***Lamellolucina reyrei*** **(Nicklès, 1955).** **A**-**C**, off Mauritania, 17°24'N, 16°18'W, 45 m (9.6 mm). **D**, off Kayar, Senegal, 110-120 m (19.0 mm). **E**, Kafountine, Casamance, Senegal, 12°46.9'N, 17°29.9'W, 45 m (12.3 mm). **F**, same locality (8.5 mm). **G**, same locality (8.3 mm). **H**, same locality (11.0 mm). **I**, Ilha de Luanda, Luanda prov., N-Angola, 120 m (8.3 mm). **J**-**K**, same locality (7.3 mm). **L**, Moçâmedes, Namibe province, S. Angola (15.1 mm).

Lamylucina gaini (Lamy, 1920)



10.5. W Baie de Sangarea, Guinea, 9°42'N, 14°05'W, 16 m (12.2 mm).

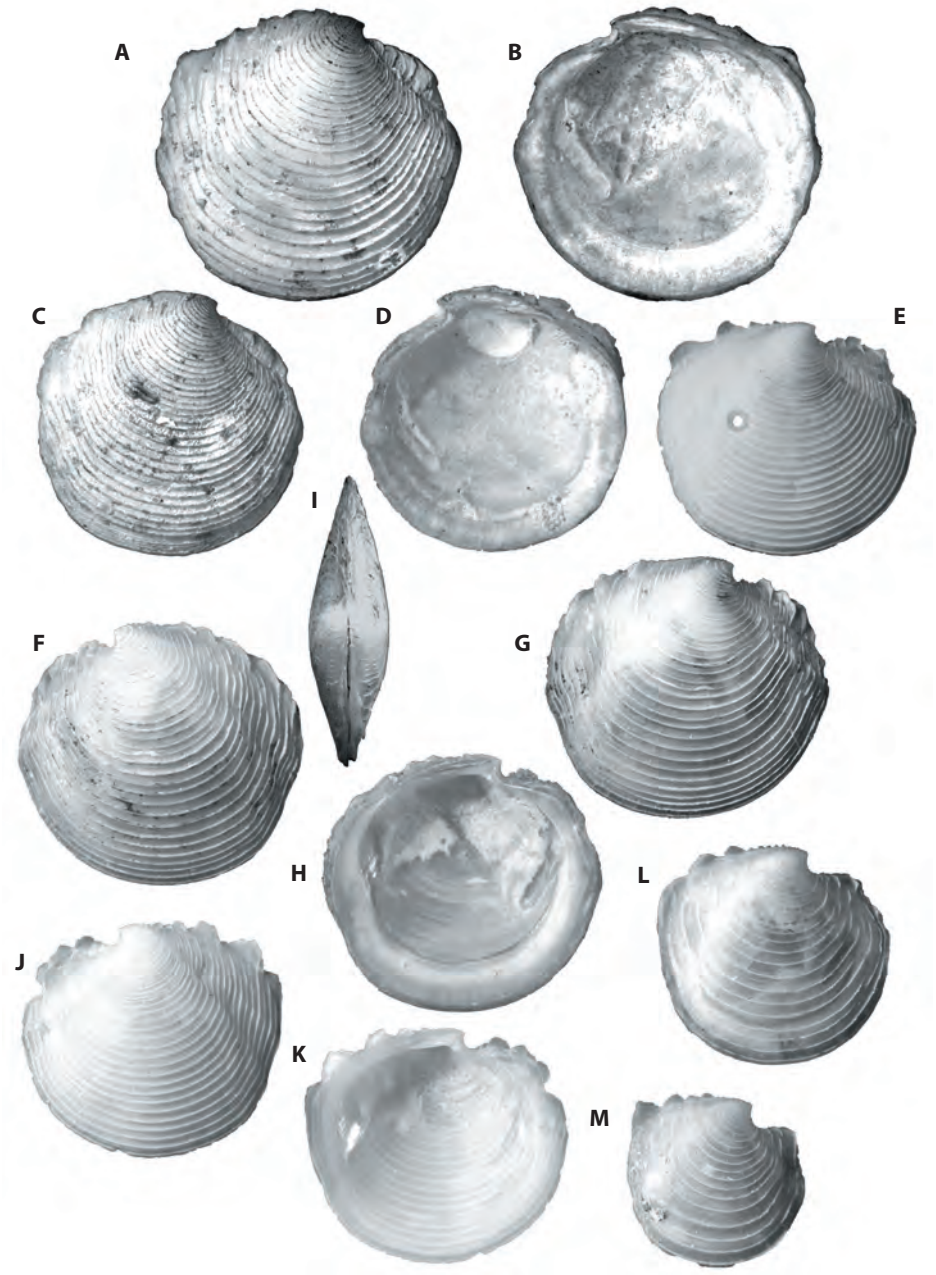
Shell up to 15 mm long, variable in outline and sculpture, circular, rather solid, very compressed. Beaks more or less median. Surface with numerous, fine, more or less close-set commarginal lamellae which near the antero- and postero-dorsal margin become more lamellate to even foliate. Posterior area delimited by a narrow and shallow radial depression, anterior area very small and delimited by a more or less sharp groove. Lunule very short, deep, broad, heart-shaped and symmetrical, escutcheon long, extremely narrow, more pronounced on the left valve. Inner margin smooth. Periostracum not seen. Outside and inside uniform white.



Distribution. Senegal (Dakar) to Gabon; São Tomé, Ilha do Principe. No records from Sierra Leone to Ghana.

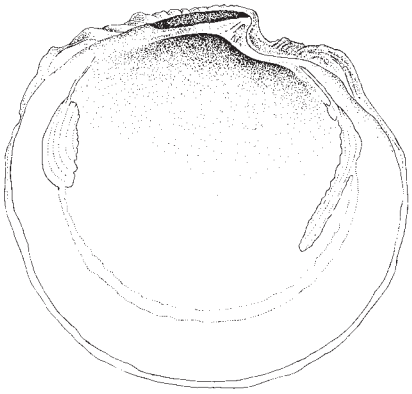
Biotope. In more or less muddy sand, also with shell debris, in shallow water, not uncommon in certain places, mostly between 6 and 25 m.

Remarks. This species is rather stable in shell form, the sculpture is slightly variable but the commarginal ridges are always more or less widely spaced. Specimens from more muddier sand in shallower water tend to have well developed and wider spaced commarginal ridges or lamellae. *L. exgaini* (see the following entry) has much more densely spaced commarginal ridges. Beached valves have been found occasionally in Gabon.



10.6. ***Lamylucina gaini*** **(Lamy, 1920).** **A**-**B**, Passage between Soga and Rouba, Bissagos Is., Guinea-Bissau (rv, lectotype, 15.2 mm). **C**-**D**, same locality (rv, paralectotype, 13.4 mm). **E**, W of Baie de Sangarea, Guinea, 9°42'N, 14.05'W, 16 m (12.1 mm). **F**-**I**, same locality (12.1 mm). **J**-**K**, W of Baie de Sangarea, Guinea, 9°42'N, 14.08'W, 17 m (12.1 mm). **L**-**M**, Baia de Santo Antonio, Ilha do Principe, 15 m (6.0 + 5.3 mm).

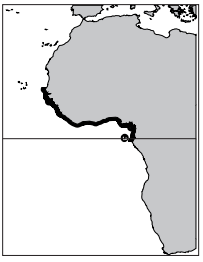
Lamylucina exgaini Cosel, 2006



10.7. W Baie de Sangarea, Guinea, 9°42'N, 15°24'W, 32 m (lv, 11.4 mm).

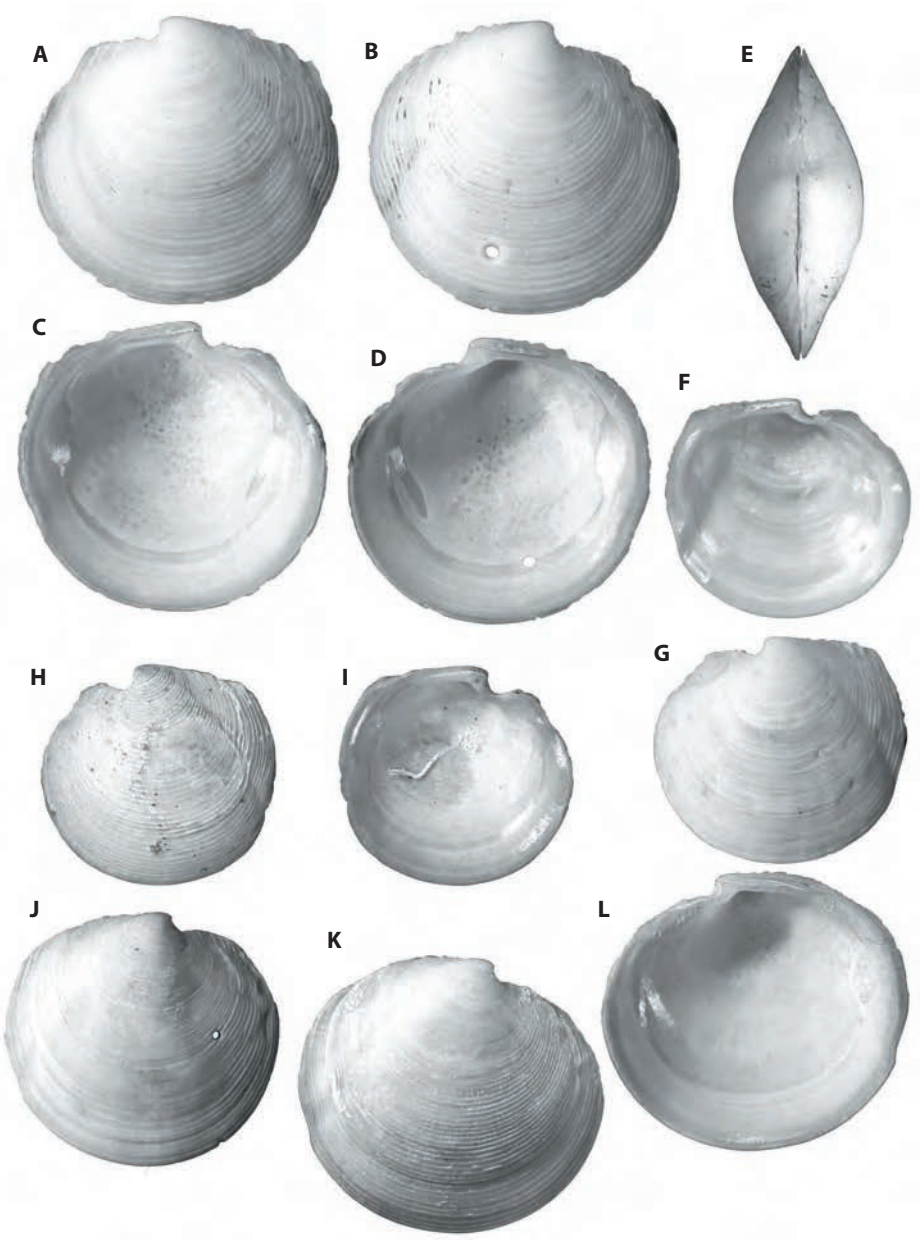
Shell growing slightly larger as the preceding, to 20 mm, somewhat variable in outline and sculpture, circular, rather solid, very compressed. Beaks more or less median. Surface with very numerous, fine, slightly irregular, close-set to nearly contiguous, commarginal ridges which near the antero- and postero-dorsal margin may become somewhat lamellate but on the disk are occasionally very faint or obsolete. Clear growth stages. Posterior area delimited by a narrow and shallow radial depression, anterior area very small and delimited by a more or less sharp groove. Lunule very short, deep, broad, heart-shaped and symmetrical, escutcheon long, extremely narrow, more pronounced on the left valve. Inner margin smooth. Periostracum not seen. Outside and inside uniform white.

Distribution. Senegal (Dakar) to southern Gabon.



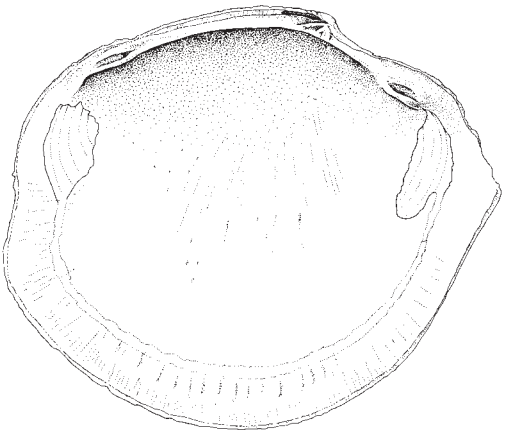
Biotope. In sand without mud, mostly with gravel and shell debris, offshore, mostly between 30 and 60 m.

Remarks. This species is very close to the preceding but inhabits a different biotope: clean sand with gravel, mostly in deeper water. In contrast to *L. gaini,* the shells have denser ridges which often are more or less obsolete; they have a more circular appearance, as they lack the foliate or scaly sculpture on the dorsal margins which is so typical for *L. gaini*. The ventral free part of the anterior adductor scar is narrower.



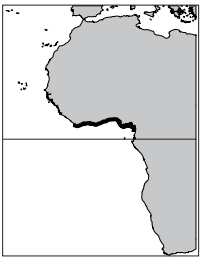
10.8. *Lamylucina exgaini* Cosel, 2006. **A-E**, W of Kaporo, Guinea, 9°42'N, 15°21'W, 30 m (holotype, 11.4 mm). **F-G**, same locality (lv, paratype, 13.1 mm). **H-I**, Conakry, Guinea (paralectotype of *L. gaini*, lv, 9.4 mm). **J**, W of Ile Kabak, Guinea, 9°19'N, 14°56.5'W, 49 m (17.0 mm). **K-L**, W of Ile Konebomby, Guinea, 9°48'N, 15°025'W, 33 m (16.4 mm).

Falsolucinoma leloeuffi (Cosel, 1989)



10.9. Off Cape Palmas, E-Liberia, 4°10'N, 7°40'W, 250 m (lv of holotype, 55.3 mm).

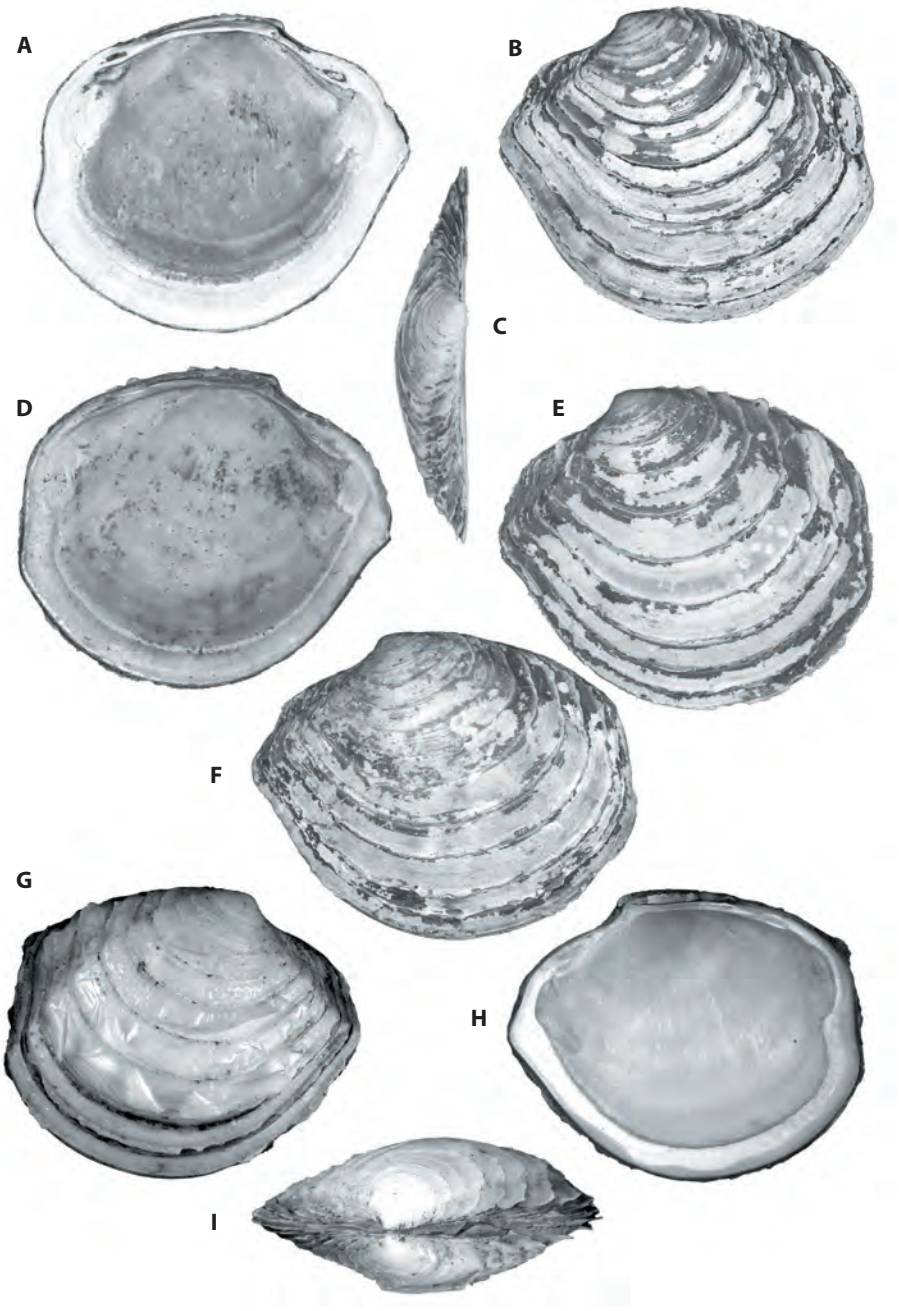
Shell medium-sized, about 56 mm long, subcircular-triangular-rostrate, rather thin-shelled but solid, compressed, inequilateral, anteriorly conspicuously pointed. Posterior part broad, posterior margin obliquely truncated. Beaks at or just behind the anterior third of the valve. Surface with 10-15 thin but conspicuous, prominent, raised and widely spaced commarginal lamellae. Interspaces smooth, with shallow commarginal growth markings. Anterior and posterior area delimited by rounded angles. Posterior area consisting of a broad, shallow radial depression. Anterior area with a sharper and well marked depression. Lunule short and small, deeply sunken, slightly asymmetric, escutcheon almost entirely filled by the ligament. Ventral margin not visibly crenulate. Periostracum thin, light brownish and peeling off over the greater part of the valve. Adductor scars very small, anterior scar short with a somewhat diverging part, pallial line meeting the scar about in its middle. Outside and inside white. Periostracum rather strong, almost white-translucent to pale straw-coloured, often peeling off in the interspaces of the lamellae.



Distribution. Known only from three left valves from the border between Liberia and Côte d'Ivoire and from a specimen taken by the R/V *Fridtjof Nansen* off Cameroon, with unknown data.

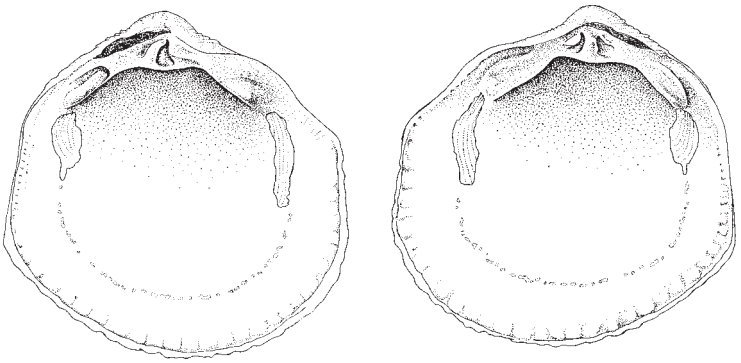
Biotope. Most probably muddy bottom on the shelf slope between 200 and 300 m and perhaps deeper, rare.

Remarks. This is one of the rather large and more spectacular, but still poorly known deep-water lucinids which are often found on reducing sediment bottoms. More such large lucinid species are known from the cold seeps in the Gulf of Guinea and from the tropical Indo-Pacific but none is close to *F. leloeuffi* (see Cosel & Bouchet 2008).



10.10. ***Falsolucinoma leloeuffi*** **(Cosel, 1989).** **A**-**C**, off Cape Palmas, E-Liberia, 4°10'N, 7°40'W, 250 m (holotype, lv, 55.3 mm). **D**-**E**, same locality (paratype, 54.2 mm). **F**, same locality (paratype, 56.5 mm). **G**-**I**, off Cameroon (48.3 mm).

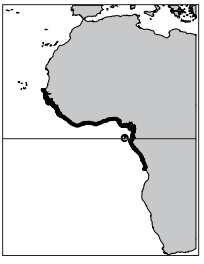
Cardiolucina lamothei (Dautzenberg, 1912)



10.11. Pointe-Noire, Congo (6.3 mm).

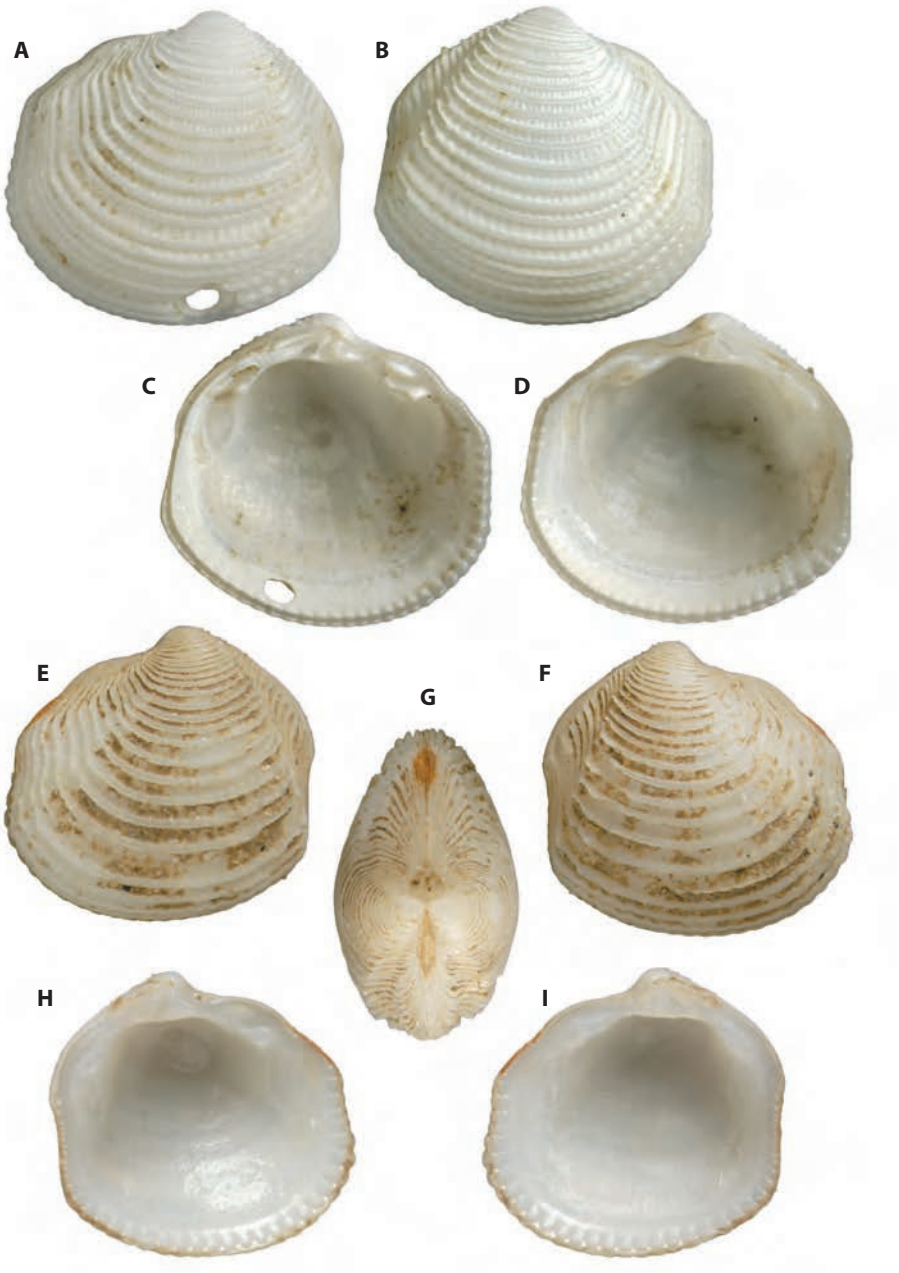
Shell very small, 4-6 mm long, slightly variable in outline and tumidity, subcircular with truncated, slightly sinuous anterior and posterior margin, thick and solid, very inflated. Beaks on or just behind the vertical midline. Surface with more or less close-set, strong commarginal lamellae whose crests arch over towards the margin and thus look like ribs. Interspaces with dense, radial ribs which continue onto the umbonal side of the commarginal lamellae but not onto the reflected part. Anterior and posterior angle rounded but rather sharp, in about the middle of each area another rounded radial angle. Lunule small, broad and deep, with ill-defined limits, escutcheon limited to the ligamental area, hardly visible. Inner margin denticulate, on the anterior and posterior margin finely crenulate. Periostracum normally not seen. Outside dirty grey to light grey, inside greyish white.

Distribution. Senegal (SE of Gorée, 1 valve only; more common in Casamance) to northern Angola (Luanda); São Tomé.



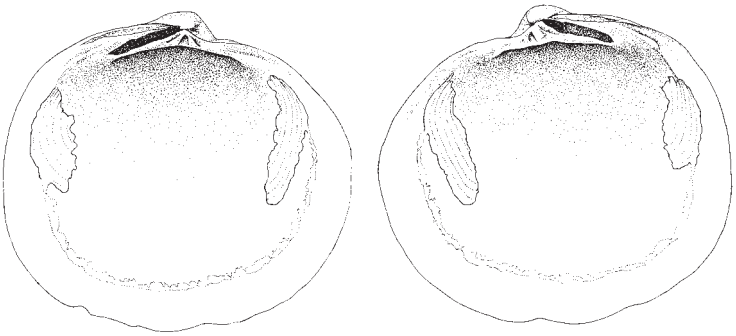
Biotope. In fine and more or less muddy sand, from shallow water (4-10 m) to further offshore, down to about 200 m, Rare in the North, common elsewhere.

Remarks. Empty valves may occasionally be found on certain beaches in shell grit. *Phacoides* (*Parvilucina*) *congoensis* Jaeckel & Thiele, 1931 is this species. A fossil ancestor is *C. agassizi* (Michelotti, 1839) from the Miocene of Italy and France (Aquitanian Basin). Close Indo-Pacific species are *C. semperiana* (Issel, 1869) (Red Sea and Indian Ocean to the Philippines) and *C. rugosa* (Hedley, 1909) from Hong Kong to N and NE-Australia. *Cardiolucina* is mainly an Indo-West-Pacific genus, only represented in the Atlantic by *C. rehderi* (Britton, 1972) from Brazil (Taylor & Glover 1997) and by the present species.



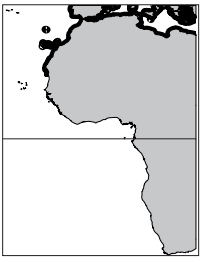
10.12. ***Cardiolucina lamothei*** **(Dautzenberg, 1912). A-D**, Casamance, 12°20.7'N, 16°53.1'W, 15 m (5.5 mm). **E-I**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 5-7 m (4.1 mm).

Loripes orbiculatus Poli, 1791



10.13. Baie de l'Etoile, Mauritania, low tide (9.9 mm).

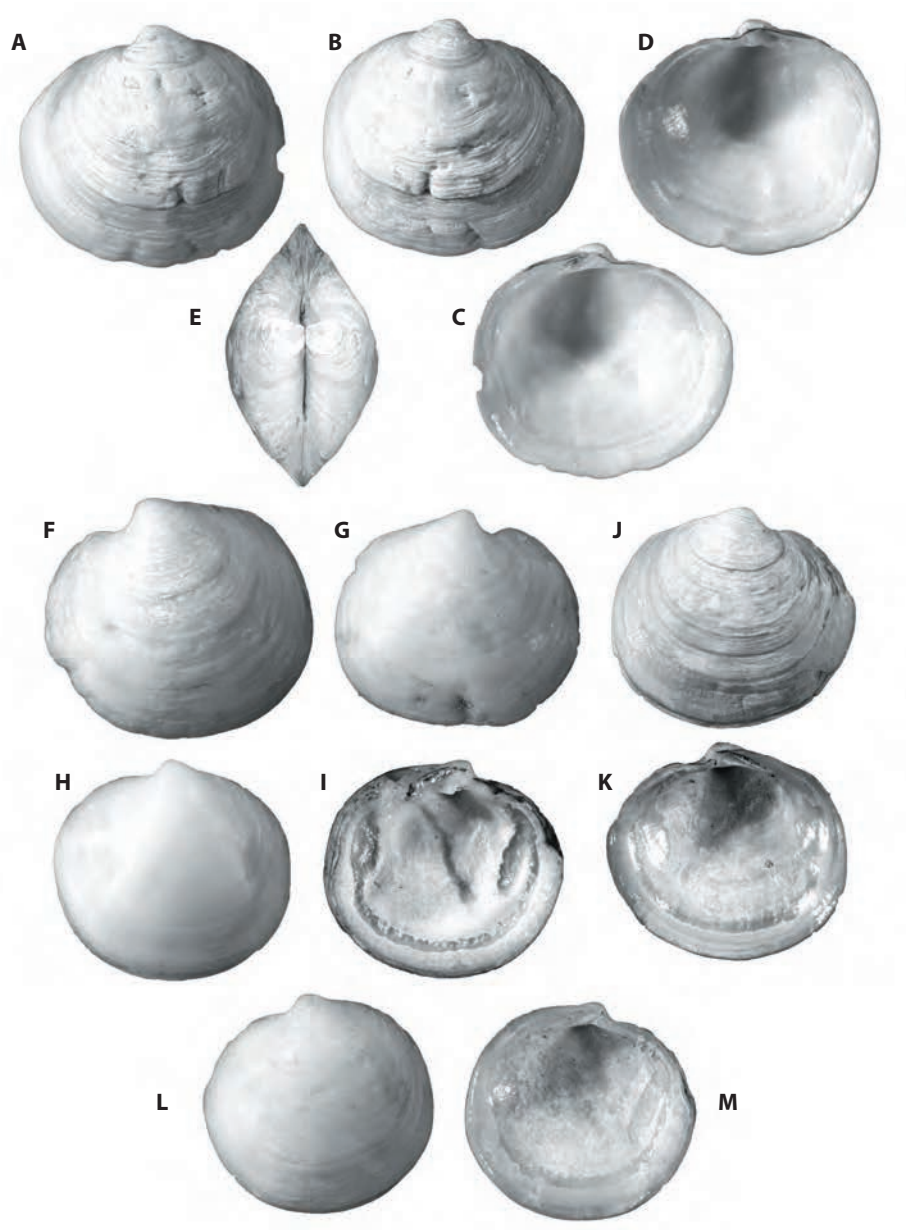
Shell up to 30 mm long, variable in shape, circular, rather solid, somewhat inflated. Beaks median. Surface often slightly gibbous, with irregular and rather coarse growth lines and several still coarser growth stages. Occasionally a few very faint radial striae are seen but only under a lens (x 20-40). Anterior area often visible, but always ill-defined and delimited by a rounded angle; posterior area frequently obsolete. Lunule short, rather broad, heart-shaped and slightly larger on the right valve. No escutcheon; ligament completely sunken and not seen from exterior. Periostracum thin, nearly colourless, eroded in the umbonal region. Inner margin smooth. Outside and inside white.



Distribution. Irish Sea, Southwest coast of Ireland and England, western part of the Channel southward to Mauritania (Cap Blanc; 17°30'N); Madeira, Canary Islands; throughout the Mediterranean; Black Sea.

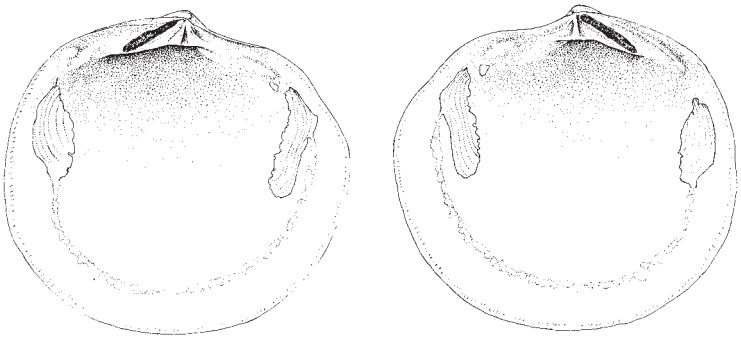
Biotope. In muddy sand and fine sand, also in muddy gravel, from low tide mark to about 150 m, common.

Remarks. This is a northern species which does not pass beyond the zone of permanent upwelling. The species is abundant on the tidal flats of Banc d'Arguin, Mauritania. Empty valves and shells are common on the beach. This species was long known under the name *L. lacteus* (Linnaeus, 1758), but Linnaeus's types of *Tellina lactea* belong to a different family (Huber 2015) and the name is best treated as a *nomen dubium*. Synonyms are *Loripes lucinalis* (Lamarck, 1818), *Lucina leucoma* Turton, 1822, *Lucina desmaresti* Payraudeau, 1826, and *Lucina elata* Locard, 1891. This is the only Eastern Atlantic *Loripes*; all other lucinids known as *Loripes* are now grouped in *Keletistes* (see next entry).



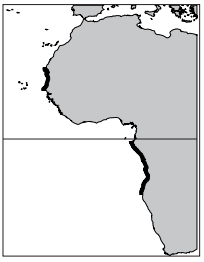
10.14. ***Loripes orbiculatus*** **Poli, 1791. A**-**E**, Baie de l'Etoile, Mauritania (9.7 mm). **F**, same locality (7.7 mm). **G**, same locality (7.4 mm). **H**-**I**, Cap St. Anne, Mauritania (11.5 mm). **J**-**K**, same locality (12.0 mm). **L**-**M**, same locality (11.1 mm).

Keletistes contrarius (Dunker, 1846)



10.15. Ponta de Mussulo, Luanda, N-Angola, on beach (12.6 mm).

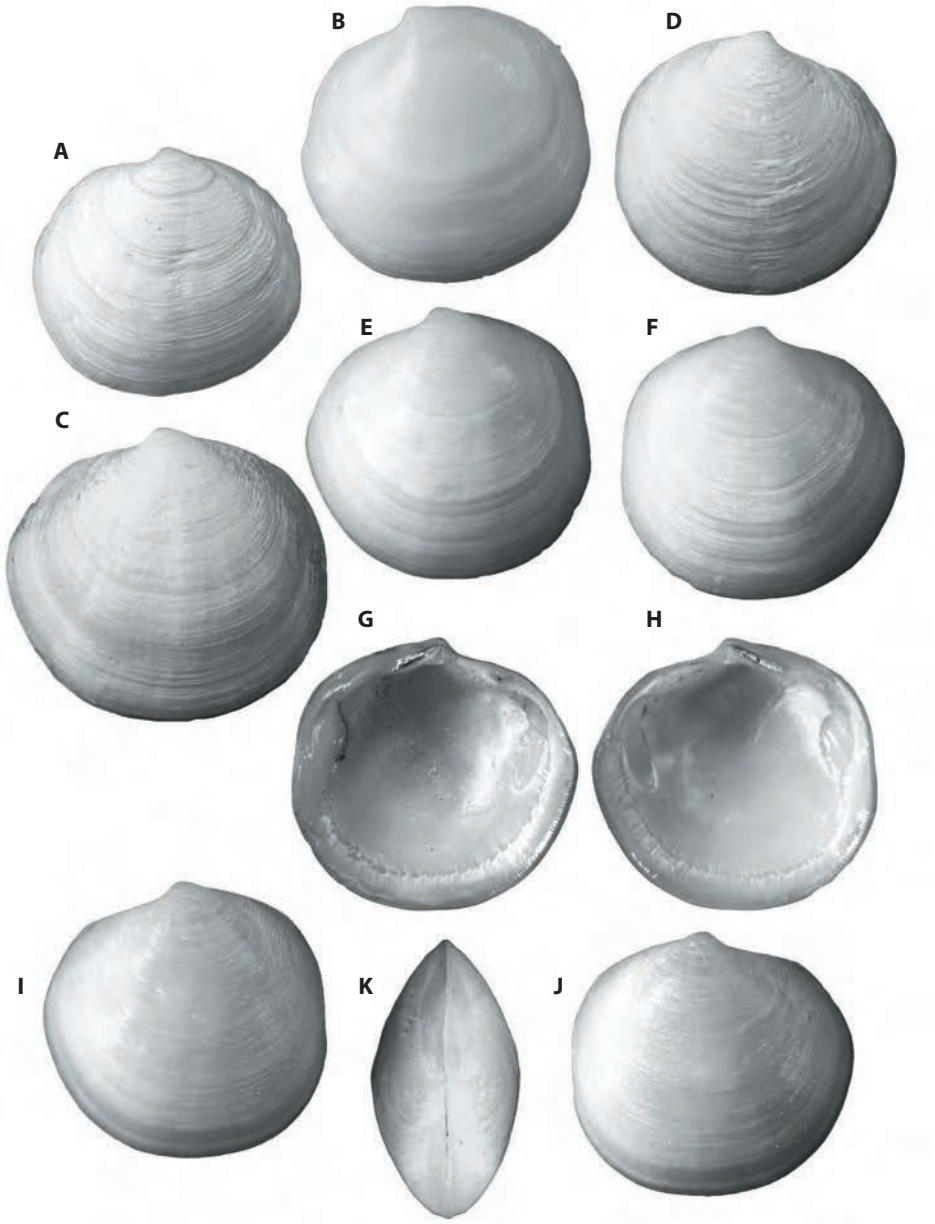
Shell up to 18 mm long, somewhat variable in shape and sculpture, more or less circular, rather solid, somewhat inflated, with median beaks. Surface with fine, close-set, irregular striae which are parallel to the growth lines only in a very small area radiating from the beaks to the ventral margin and slightly diverging from the vertical midline towards anterior. On the anterior and posterior part the striae are slightly wavy and cross the growth lines obliquely, in the central part often obsolete. There are also extremely fine, irregular radial lines, mostly on the posterior part of the valves, only visible under a lens (x 20-40). Anterior and posterior area ill-defined, but visible. Lunule rather long and wedge-shaped, broadest at the beaks and slightly larger on the right valve. Escutcheon extremely narrow, hardly developed; ligament deeply inset and not visible from exterior. Periostracum thin, nearly colourless to light brown, thicker and persistent only on growth stages in the marginal region. Inner margin finely crenulate. Outside whitish to cream, often with yellowish umbonal region or pale yellowish growth zones, inside white to light lemon yellow with narrow white rim.



Distribution. Mauritania (Cap Blanc) to Senegal (Dakar region, there rare but more often empty valves from Pleistocene strandlines); Gabon (Port-Gentil) to southern Angola (Baia dos Tigres).

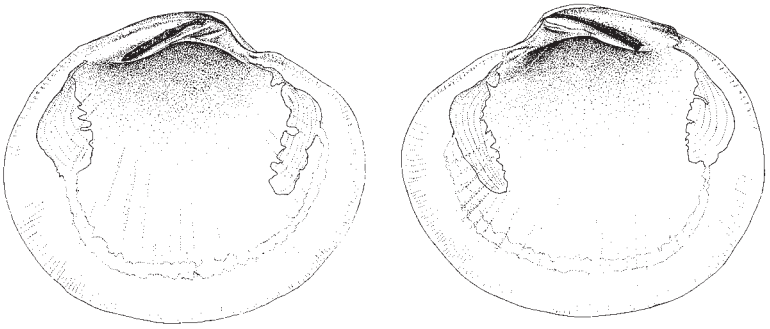
Biotope. In fine sand, also with shell debris, from low tide level to about 10 m, mostly in more or less protected bays, but under entirely marine conditions. Common, locally abundant.

Remarks. This species is very common in the northern and southern zone with seasonal upwelling, but is absent from the tropical zones. Specimens from southern Angola may grow quite large. Empty shells and even live specimens are commonly washed up on Angolan beaches.



10.16. *Keletistes contrarius* (Dunker, 1846). **A**, Pointe des Maures, Mauritania, tidal zone (lv, 10.4 mm). **B**, same locality (11.5 mm). **C**, Ile aux Pigeons, Port-Gentil, Gabon (17.1 mm). **D**, same locality (15.9 mm). **E-H**, Baia do Mussulo, Luanda prov., N-Angola (14.5 mm). **I-K**, same locality (14.6 mm).

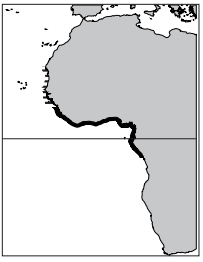
Keletistes aberrans (Dautzenberg, 1910)



10.17. Banana, Zaïre (16 mm).

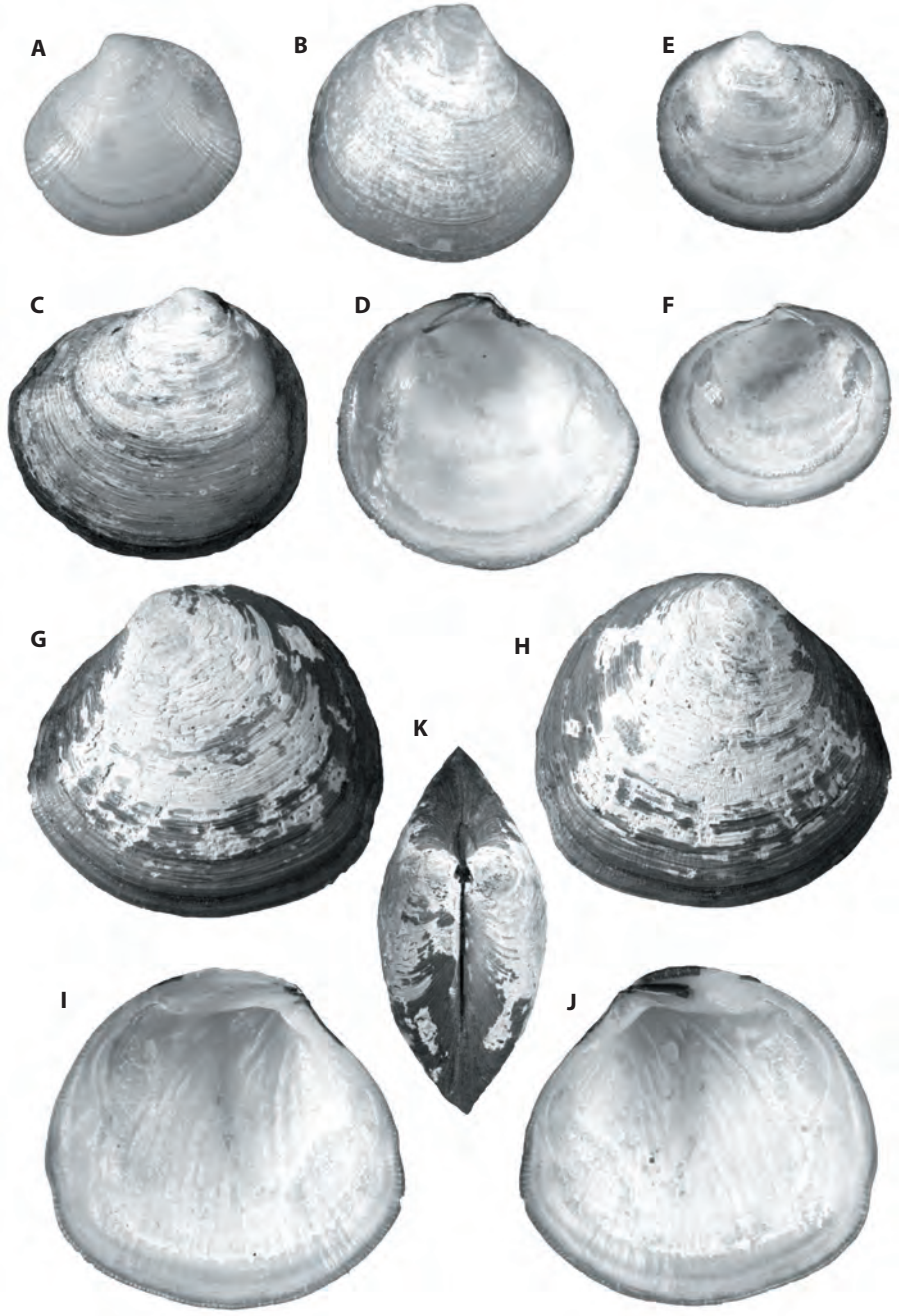
Shell up to 19.5 mm long, very variable in shape, from subcircular-trigonal and very slightly higher than long, to high-oval and longer than high, quite thick and solid, somewhat inflated to compressed. Beaks more or less median. Surface with dense, coarse growth lines and very faint, irregular, close-set radial striae, sometimes bifurcating and often more or less obsolete on the middle part of the valves. These striae are most clearly visible under a lens (x 10-20). Anterior area present but ill-defined, posterior area not distinguishable. Lunule small, short and lozenge-shaped, not sunken, broader on the right valve. Escutcheon extremely narrow; ligament rather long and completely sunken, not visible from exterior. Periostracum thin and light greyish to olive, eroded on the umbonal area, sometimes together with the outer shell layers. Inner margin crenulate. Inside with conspicuous, irregular, radial folds. Outside and inside dirty whitish to pale olive greenish or light brownish.

Distribution. Mauritania (only subfossil, Holocene); Guinea to Banana, Congo Kinshasa.



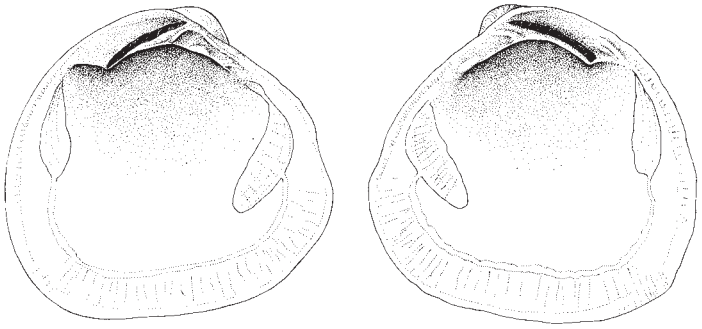
Biotope. In slightly sandy mud and muddy sand in shallow water of lagoons, inlets and estuaries with changing salinity. Locally common to abundant but the adequate biotopes must be searched for. In Guinea a few empty shells were dredged offshore, but these obviously originate from a Pleistocene strandline. At Banana (Congo Kinshasa), the species was found "living in the sandy beach near the shore at the mouth of the Congo River" (original label).

Remarks. This rather little-known estuarine species is distinguished from *K. contrarius* by the lack of subcommarginal sculpture, the longer ligament, the more irregular shell outline, the entirely white colouration and the inner radial folds. There are two forms known: one more high and trigonal form with inflated umbos (see also next entry) and one anteriorly more angulate and more compressed form with smaller umbos. Both forms might be ecological varieties.



10.18. ***Keletistes aberrans*** **(Dautzenberg, 1910).** **A**, Capken, Iles Tristão, Guinea (6.3 mm). **B**, same locality (7.7 mm). **C-D**, Azuretti Lagoon, Côte d'Ivoire (9.7 mm). **E-F**, same locality (7.5 mm). **G-K**, Banana, Congo Kinshasa (18.8 mm), ANSP 344483.

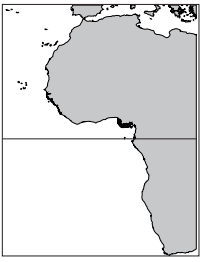
Keletistes rhizoecus (Oliver, 1986)



10.19. Odeama area of the Niger Delta, Nigeria, holotype NMW (lv completed from the contours of the rv, 10.1 mm), redrawn from Oliver (1986: 56).

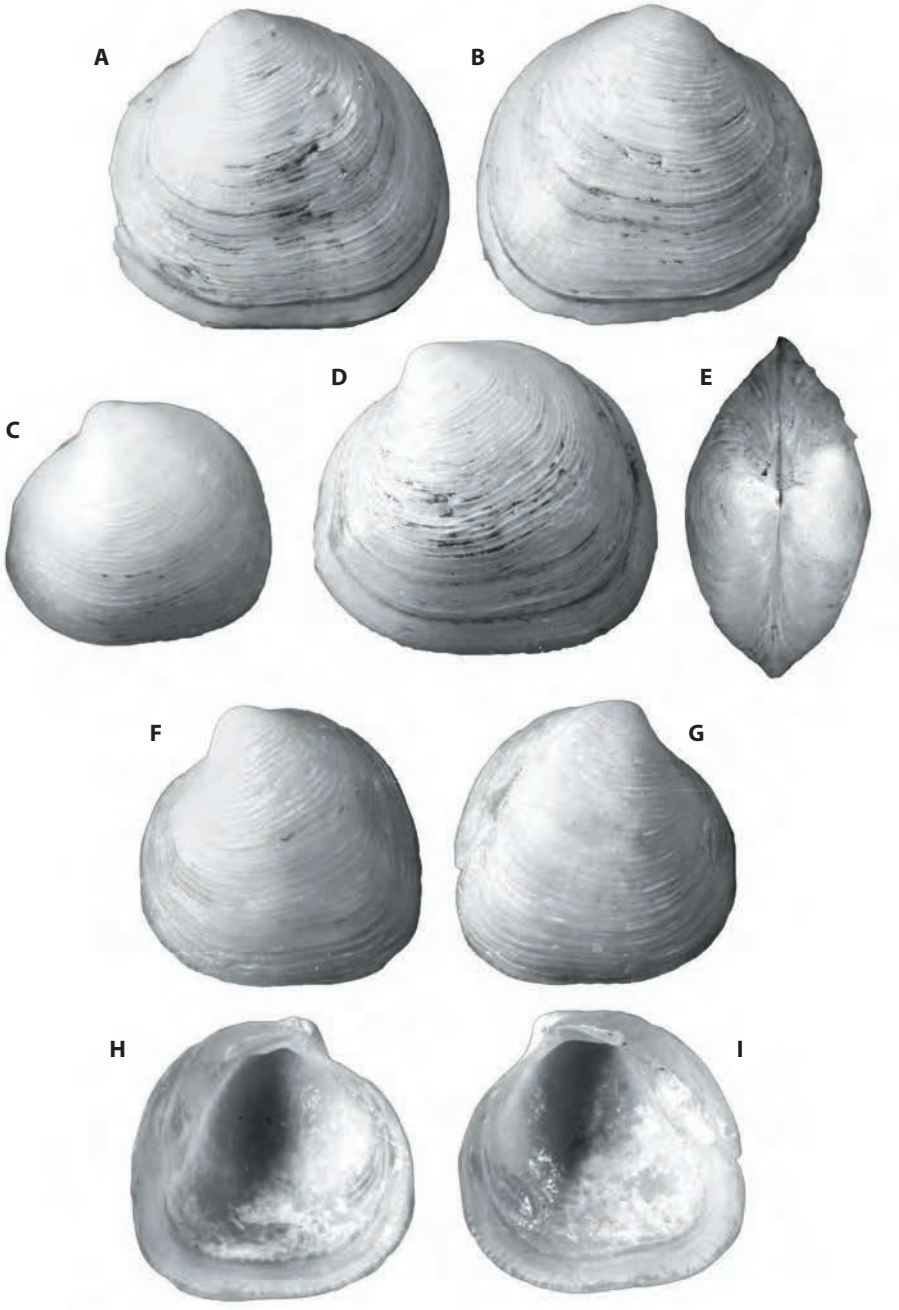
Shell very small, up to 10 mm long, quadrangular, solid, rather inflated to almost globose. Beaks in front of the vertical midline. Posterior margin gently convex, ventral margin nearly straight. Surface with irregular, close-set, slightly sinuous and occasionally bifurcating commarginal ridges and on the anterior and posterior part very faint radial striae, often more or less obsolete. Anterior area visible but ill-defined, marked by a sinuosity on the antero-dorsal margin. Lunule small, ovoid, longer than wide to heart-shaped. Escutcheon very narrow; ligament large and completely sunken. Periostracum very thin and pale straw-coloured to almost colourless. Beaks often heavily eroded. Inner margin crenulate. Outside and inside dirty white.

Distribution. Only known from Nigeria (Niger delta).



Biotope. Only found in mangrove root peat up to a distance of 80 m from the creek edge, within stands of *Rhizophora racemosa* Meyer, 1818 in the intertidal zone, buried in the top 3 cm of loose peat, locally in dense populations. Seems to prefer reduced salinities from 17 ppm. to 32 ppm. (see Oliver 1986).

Remarks. This species, which inhabits an extremely specialized biotope, has not yet been found elsewhere. It is distinguished from *K. aberrans* by its smaller size, its peculiar quadrate outline and the commarginal sculpture. However, it is possible that *K. rhizoecus* is an ecological or geographical variety of *K. aberrans*; to prove or exclude this, more material of both species and DNA analysis will be necessary. Provisionally, therefore *K. rhizoecus* will here be treated as a separate species. In contrast to the Indo-Pacific realm (see Glover *et al.* 2008), this is the only mangrove-dwelling lucinid in the eastern Atlantic.



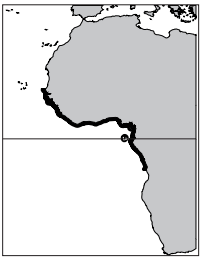
10.20. ***Keletistes rhizoecus*** **(Oliver, 1986). A-B**, Odeama area of the Niger Delta, Nigeria, 4°22'N 6°30'E, (paratype NMW, 8.7 mm). **C**, same locality (paratype NMW, 5.2 mm). **D-E**, same locality (paratype NMW, 9.8 mm) . **F-I**, same locality (paratype NMW, 4.9 mm).

Keletistes legouxi (Nicklès, 1952)

10.21. Abidjan region, Côte d'Ivoire (3.8 mm).

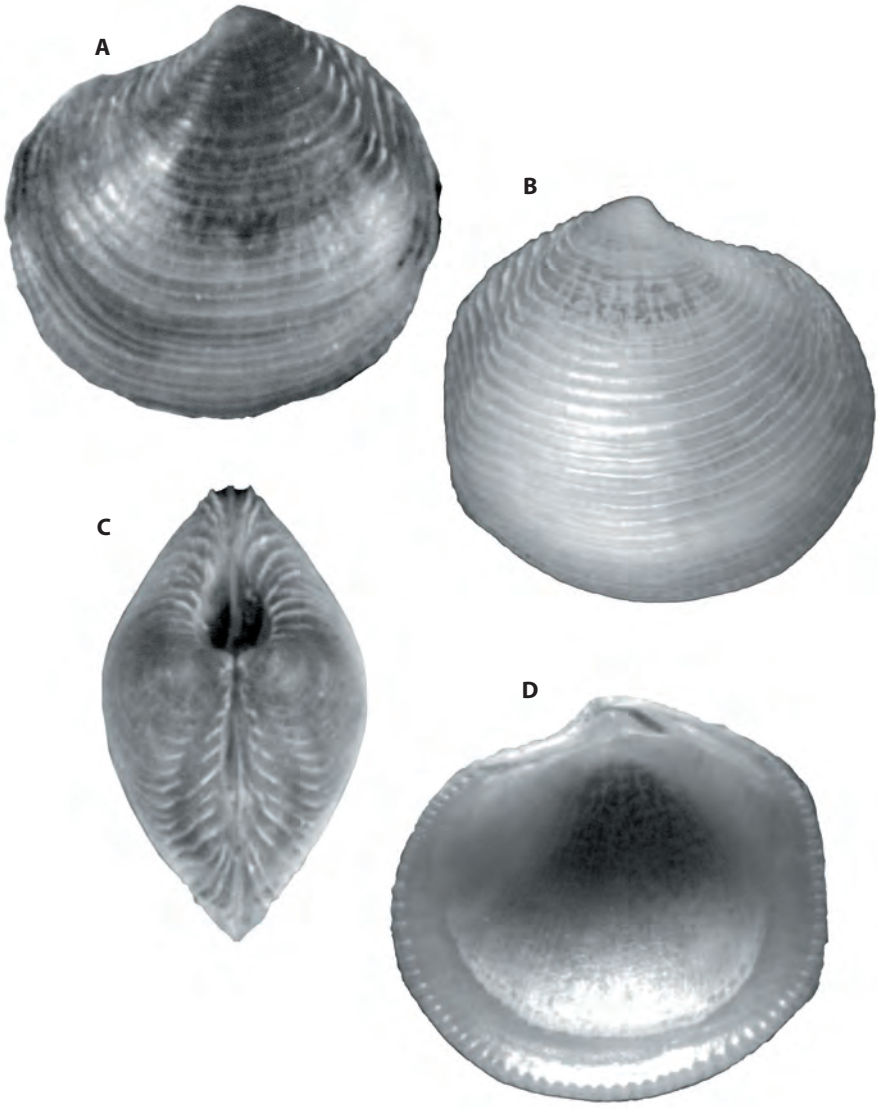
Shell very small, 2-5 mm long, quite variable in shape, more or less circular, solid, very inflated, with the beaks on or just behind the vertical midline. Surface with very fine, irregular, close-set, occasionally slightly wavy, subcommarginal ridges, which are parallel to the growth lines for a short distance in the middle of the valve only, but diverge on the anterior and posterior part in direction to the anterior and posterior margin. Anterior and posterior area ill-defined, marked on the anterior and posterior margin by very faint angles. Lunule rather large, more or less broad and heart-shaped, sunken. Escutcheon extremely narrow, ligament very short, deeply sunken and not visible from exterior. Periostracum very thin and colourless, seldom retained. Inner margin crenulate. Outside and inside whitish.

Distribution. Senegal (Dakar) to northern Angola (Luanda); São Tomé, Ilha do Principe.



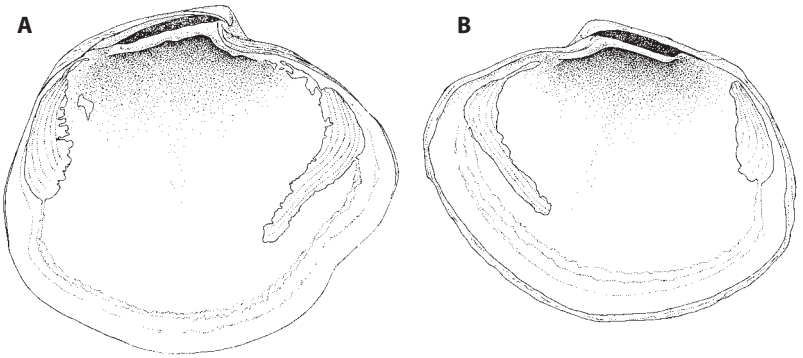
Biotope. In fine sand, from shallow water (5 m) to about 80 m, not uncommon.

Remarks. This species, the smallest lucinid in West Africa, clearly belongs to *Keletistes*, characterized by its crenulate margin and the subcommarginal sculpture. It differs from *K. contrarius* in being smaller, much more inflated and entirely white; sculpture is always present.



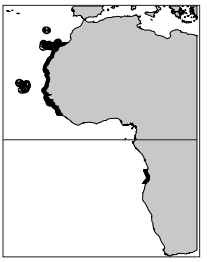
10.22. ***Keletistes legouxi*** **(Nicklès, 1952). A-B**, Roume Is., Iles de Los, Guinea, N-shore, 1.5-2 m (2.6 mm). **C-D**, same locality (3.8 mm).

Megaxinus appendiculatus (Locard, 1898)



10.23. A, lv, Ouidah, Benin, 6°10'N, 2°05'E, 200 m (26.4 mm). B, rv, Dakar, 95-98 m (25.4 mm).

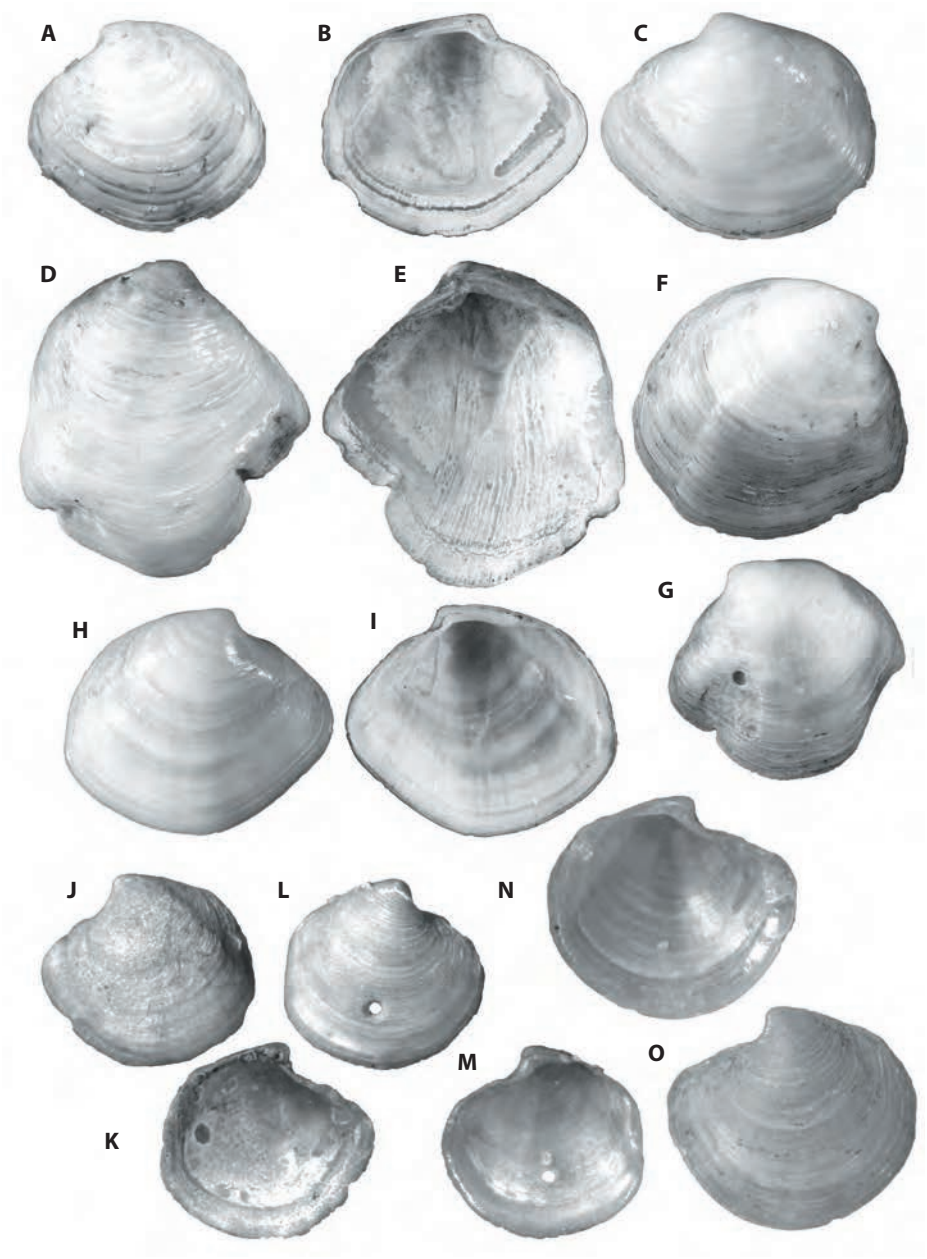
Shell up to 42 mm long, very variable in shape, somewhat subpentagonal with markedly pointed anterior margin and rounded-angulate ventral margin, higher than long to longer than high, rather solid, compressed. Beaks more or less anterior to the vertical midline. Surface with irregular commarginal waves, strong growth lines and coarser growth stages which are often quite dense on the marginal part. Anterior and posterior area ill-defined. Lunule very small, deep and heart-shaped, symmetrical. No escutcheon. Ligament sunken but visible from exterior. Periostracum yellowish brown, becoming rather strong towards the margins, often peeling off in fragments and remaining only in growth stages. Inner margin smooth. Outside and inside dirty whitish.



Distribution. Canary Islands (29°08'N) and Mauritania to Sierra Leone (7°29'N); Northern Angola (Luanda) to southern Angola (Porto Alexandre); Cape Verde Islands.

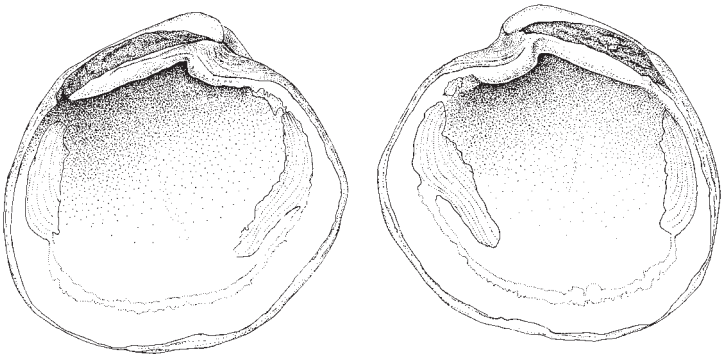
Biotope. In muddy sand and fine sand, from about 30 to 250 m, not common.

Remarks. This species has often been treated under the genus *Cavilucina* P. Fischer, 1887, which, however, differs considerably and is not present in the Eastern Atlantic. The species is restricted to the northern and southern zone of seasonal upwelling and is not recorded from the tropical latitudes, including the upwelling zone at Côte d'Ivoire and Ghana. Synonyms are *Cryptodon murchlandi* G.B. Sowerby III, 1907 and *Lucina semilirata* Odhner, 1923. *Megaxinus smithi* (Seguenza, 1880) from the Pleistocene of southern Italy is the fossil ancestor. Close Indian Ocean species are *M. omanensis* (E.A. Smith, 1906) and *M. arabicus* Glover & Taylor, 1997. The specimens from Guinea are much smaller than those from the other localities; furthermore they differ by the shorter ventral extension of the interior adductor scar. They may represent a separate species but because of lack of more, especially live collected material, they are just figured here without more comments.



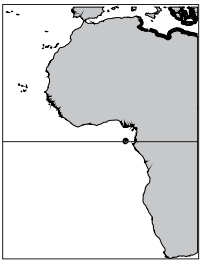
10.24. ***Megaxinus appendiculatus*** **(Locard, 1898). A**, Mauritania, 20°34'N, 17°47'W, 90 m (34.0 mm). **B-C**, Dakar, Senegal, 50 m (29.3 mm). **D-E**, off Mussulo, Luanda prov., N-Angola, 90-100 m (42.0 mm). **F**, same locality (34.5 mm). **G**, same locality (28.2 mm). **H-I**, Praia Amelia, Namibe prov., S-Angola (28.5 mm). **J-K**, Smaller and more irregular variety, W of Iles de Los, Guinea, 9°30'N, 15°48'W, 60 m (5.1 mm). **L-M**, same locality (4.7 mm). **N-O**, same locality (5.1 mm).

Megaxinus unguiculinus Pallary, 1904



10.25. Annobon, 1°27.5'S, 5°36.5'E, 35 m (20.5 mm).

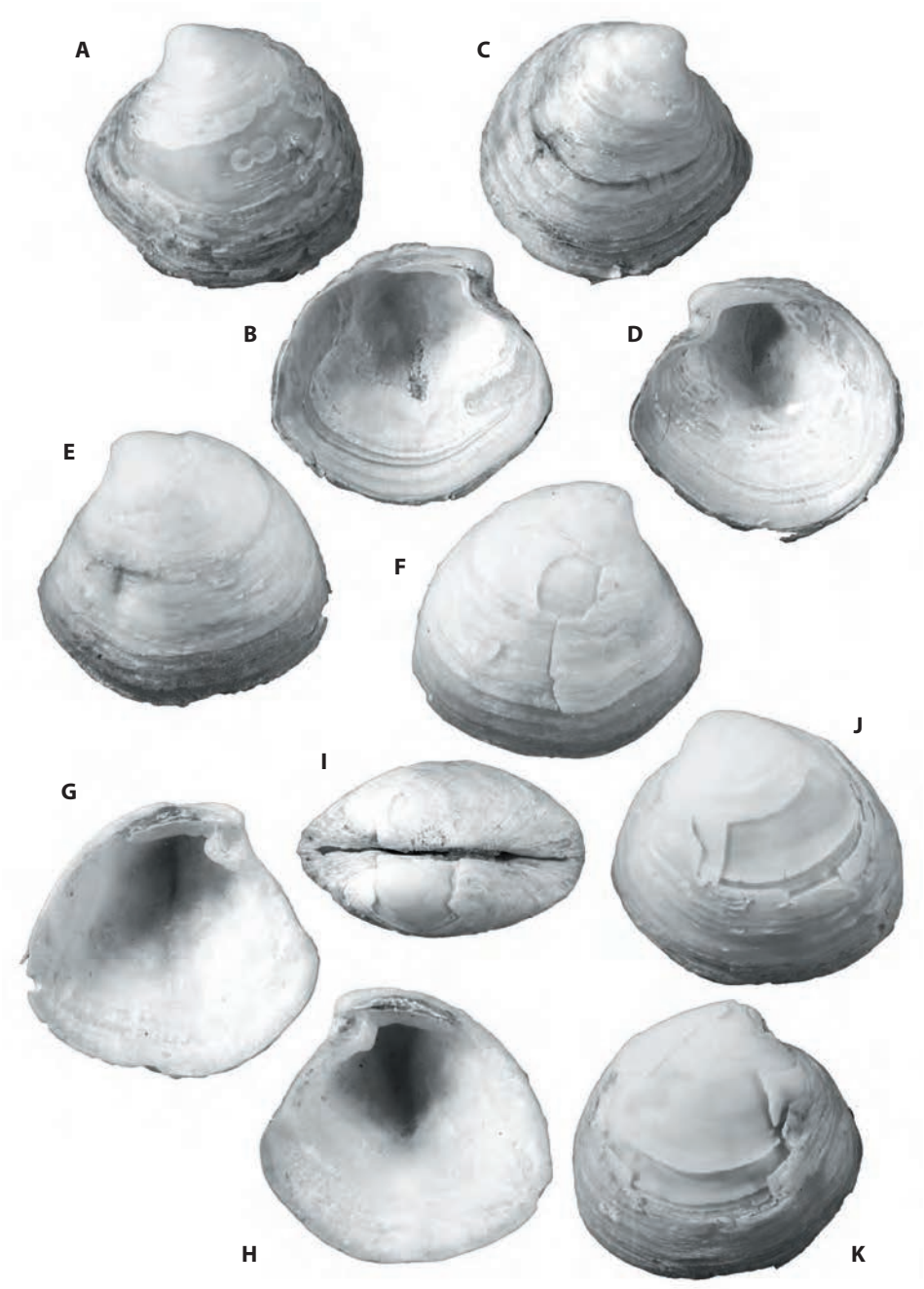
Shell up to 28 mm long, variable in shape, subcircular-trigonal with rounded ventral margin, generally very slightly longer than high, rather solid, more or less inflated. Beaks in front of the vertical midline. Surface with irregular growth lines and very coarse growth stages, rather crowded on the marginal part of the valves. Anterior area more or less ill-defined, posterior area mostly obsolete. Lunule very small and deep, heart-shaped, slightly broader on the right valve. No escutcheon. Ligament sunken but visible from exterior. Periostracum light brownish, strong, near the margins becoming foliate at the growth stages and peeling off in pieces, occasionally together with the outer shell layer. Inner margin smooth. Outside and inside white.



Distribution. Eastern Mediterranean from Gulf of Gabès (Tunisia) to Greece; in tropical West Africa only known from Annobon in the Gulf of Guinea.

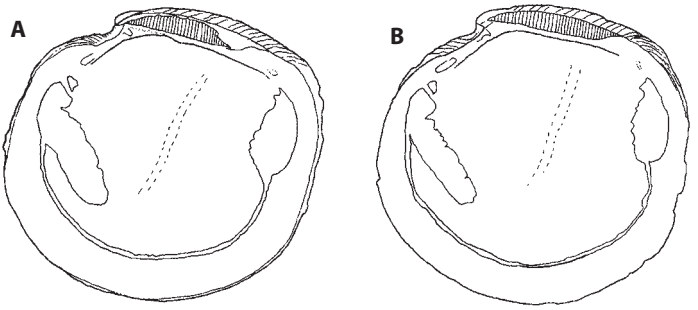
Biotope. In sandy bottom, also with gravel and shell debris, from shallow water to about 40 m and perhaps deeper, not common.

Remarks. This species is close to *M. appendiculatus* but smaller, higher, generally more tumid and more triangular with the anterior margin less or not pointed. Apart from their larger size, the two known West African specimens lie perfectly within the range of variability of Mediterranean specimens (from Tunisia). This makes no sense biogeographically, but more material and genetic analyses are needed to determine if a different species is present in the islands of the Gulf of Guinea. The species has often been cited as *M. transversus* (Bronn, 1831), however, this is a similar fossil species from the European Neogene (see Glover & Taylor 1997).



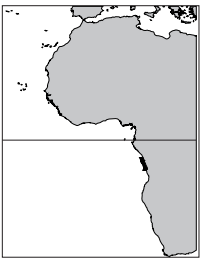
10.26. *Megaxinus unguiculinus* Pallary, 1904. A-B, Borj Djillidj, Djerba, Tunisia, Mediterranean (12.0 mm). C-D, same locality (11.6 mm). E-I, Annobon, 1°27.15'S, 5°36.15'E, 35 m (20.4 mm). J-K, same locality (19.7 mm).

Joellina dosiniformis Cosel, 2006



10.27. **A**, W of Ambrizete, N Angola, 7°18.4'S, 12°04.6'E, 360-367 m (holotype, rv, 29.4 mm). **B**, same locality (paratype, rv, 29.0 mm) (reproduced from Cosel 2006, fig. 24).

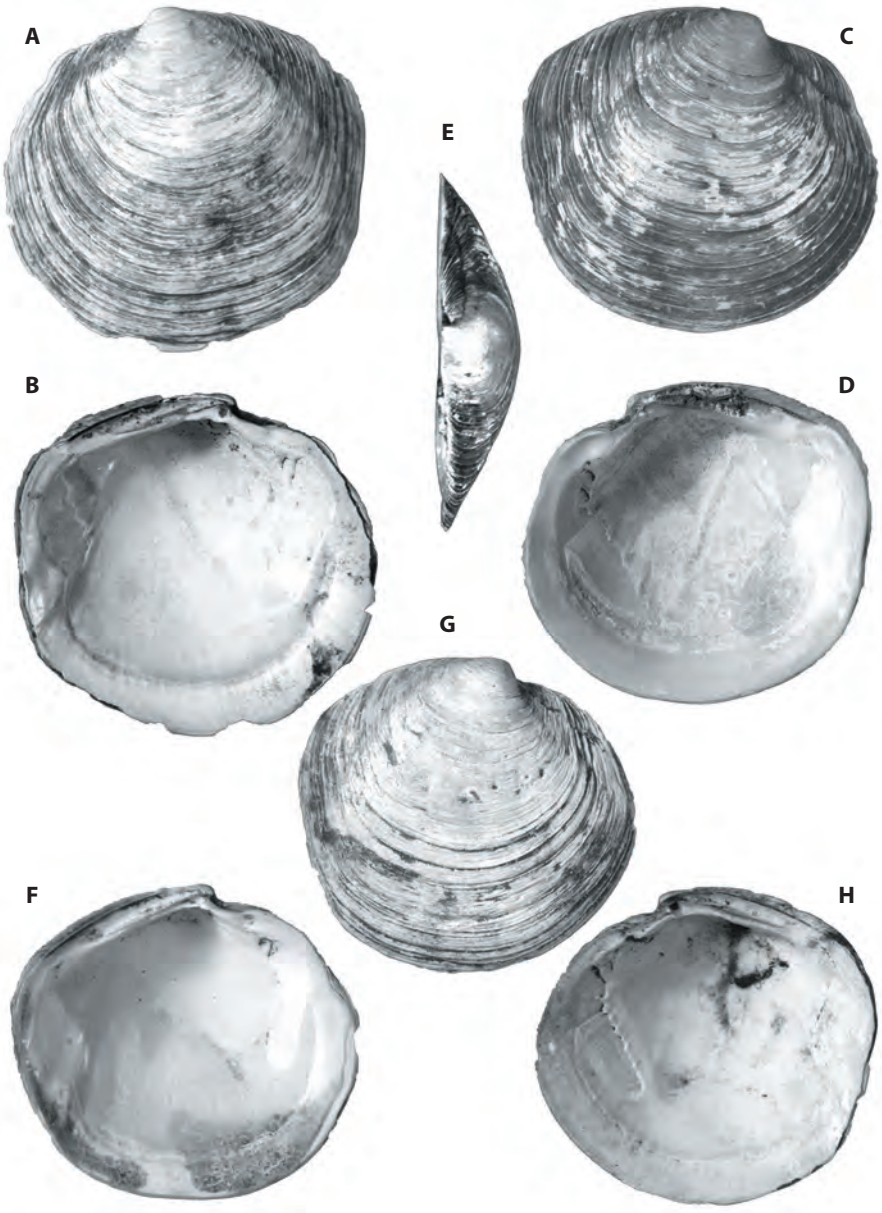
Shell up to 32 mm long, rather thick and solid, equivalve, compressed, oblique towards posterior, hardly longer than high to almost as long as high, beaks well in front of the vertical midline. Surface with irregularly and rather widely-spaced commarginal lamellae and dense and very irregular growth lines and wrinkles and coarser growth stages. Lunule small and very short, narrow, asymmetric, deep sunken; escutcheon very narrow, entirely filled by the ligament and delimited by a sharp keel. Hinge plate broad, strong, with long posterior part. Right valve with a very small single cardinal which may be reduced to a rudimentary knob and a small but well marked anterior lateral. Left valve with a socket for the cardinal knob of the right valve and the vestiges of anterior and posterior laterals. Anterior adductor scar large with long and broad diverging part. Inner margin smooth. Valves presumably white in life but the dead collected samples are light greyish. Periostracum thin, greenish brown, when still present.



Distribution. Only known from the Angolan Margin near Ambrizete, northern Angola.

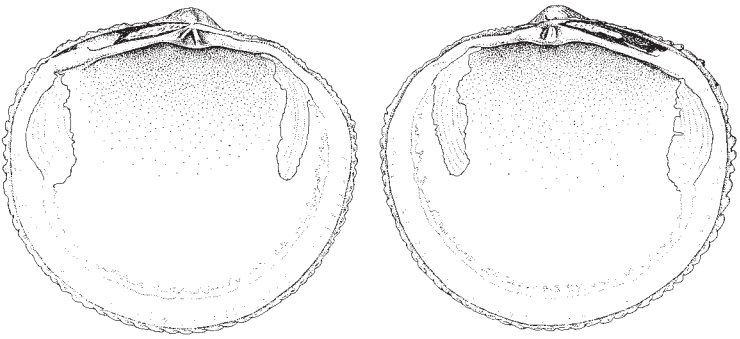
Biotope. Collected in sticky mud in a deep water coral zone with mounds of *Lophelia pertusa* (Linnaeus, 1758) at about 360 m, rare. No live specimens found so far.

Remarks. There is no Recent lucinid species with which this species can be compared. A rather similar-looking fossil genus is *Pterolucina* Chavan, 1942, from the Upper Cretaceous to Tertiary (Miocene) of Europe and the Middle East.



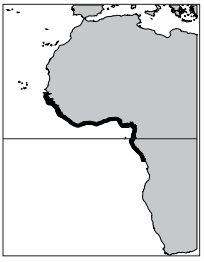
10.28. *Joellina dosiniformis* Cosel, 2006. **A**-**B**, W of Ambrizete, Zaire prov., N-Angola, 7°18.42'S, 12°04.60'E, 360-367 m (paratype, 31.2 mm). **C**-**E**, same locality (holotype, 29.4 mm). **F**, same locality (paratype, 32.3 mm). **G**-**H**, same locality (paratype, 28.8 mm).

Divaricella chavani Cosel, 2006



10.29. "Rade de Gabon" (no more details), old coll. MNHN (27 mm).

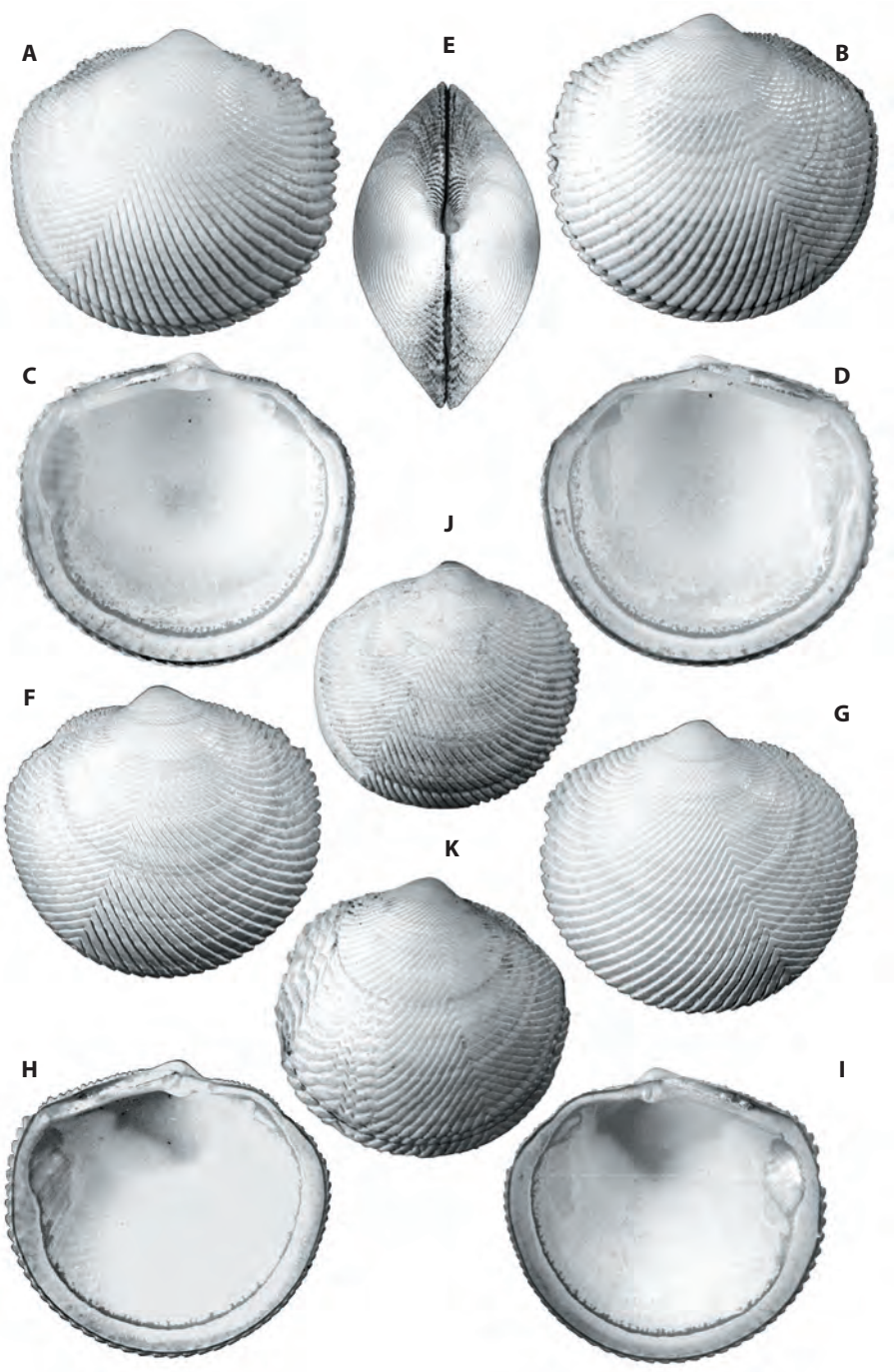
Shell up to 28 mm long, circular, rather solid, inflated. Beaks more or less median. Surface with fine, regular, dense, contiguous, divaricate ribs, with a sharp, V-shaped line of divarication from the beaks to the antero-ventral margin. Anterior area small and marked by a slight sinuosity on the antero-dorsal margin, posterior area not distinguished. Lunule very small and short, somewhat sunken, no escutcheon. Ligament deeply sunken, and only partly visible from exterior. Periostracum not seen. Inner margin crenulated by the external sculpture. Outside and inside uniform white.



Distribution. Mauritania, Quaternary only (Coulombel 1980); Senegal (Saloum to Casamance) to Sierra Leone (Sherbro) but most probably also southward; Côte d'Ivoire to Congo (Kinshasa). The species is common in Gabon and rare elsewhere.

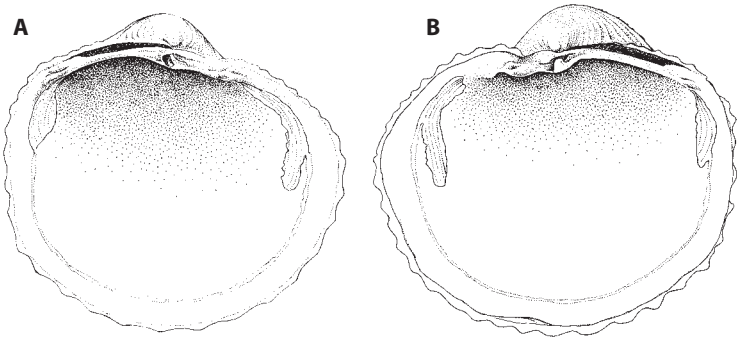
Biotope. In fine and mixed sand, in the North (Senegal) in 35-45 m, in the South (Gabon, Congo Kinshasa: Banana) in shallower water from about 3 m, not common except in Gabon where it is regularly found in the beach drift.

Remarks. This species has undergone some nomenclatural turmoil. It was long known as *Lucina ornata* Reeve, 1850, but this name is preoccupied by Agassiz, 1845, and C.B. Adams, 1847. Chavan (1951) named this species *Divaricella* (*Egracina*) *dentata* var. *collignoni*; however, in the type lot he mixed up the West African species with a close East African species and designated a specimen from Iles Glorieuses, Indian Ocean as holotype. Chavan's name is hence not appropriate for the West African species. One of Reeve's syntypes in BMNH (no locality) was selected as lectotype by Dekker & Goud (1994) but its identity is uncertain; moreover these authors synonymized *D. ornata* (Reeve, 1850) with *D. irpex* E.A. Smith, 1885, a different Australian species. To avoid confusion, the West African species was described anew by Cosel (2006), the holotype being taken from "modern" and well localized material. Empty valves are occasionally washed up on some beaches.



10.30. *Divaricella chavani* Cosel, 2006. **A**-**E**, Port-Gentil, Ile aux Pigeons, 9°40.5'S, 8°45.3'E (holotype, 27.4 mm). **F**-**I**, same locality (paratype, 25.1 mm). **J**, Port-Gentil, Gabon (26.2 mm). **K**, Banana, Congo Kinshasa (24.1 mm).

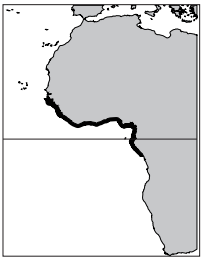
Pompholigina gibba (Gray, 1825)



10.31. A, lv, Victoria (Limbe), Morton Bay, Cameroon (17.3 mm). B, rv, Abidjan region, Côte d'Ivoire (25 mm).

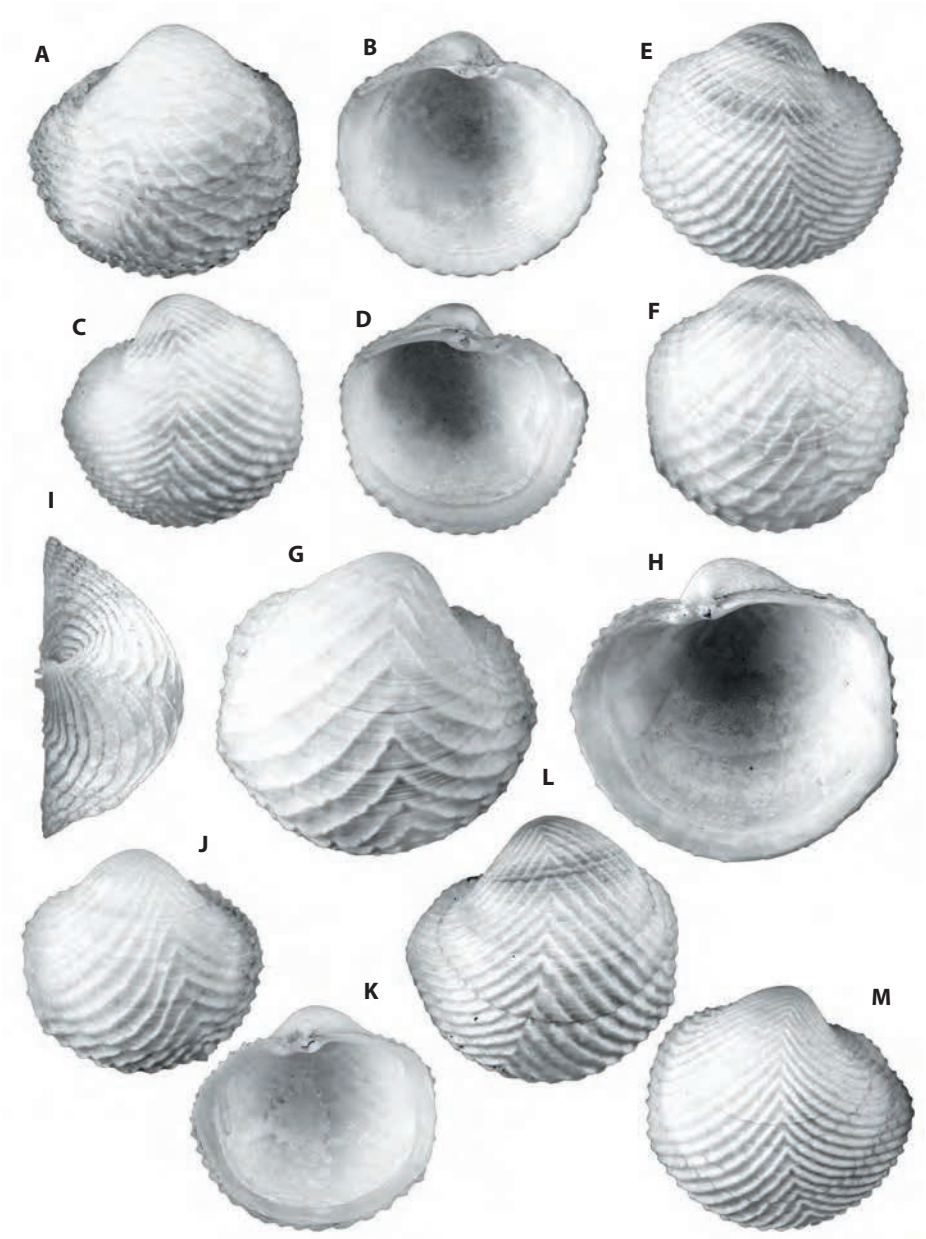
Shell up to 35 mm long, circular, rather solid, globose to nearly spherical. Beaks nearly median. Surface with prominent, strong, occasionally slightly irregular, divaricate acute ribs with rather narrow to conspicuously wide interspaces. Divaricate sculpture sharp and V-shaped along a line from the beaks to the ventral margin not very far from the vertical midline. Growth stages clear. Anterior area more or less ill-defined, with scarcely visible delimitation but marked by a somewhat rounded corner on the anterior margin. Posterior area well separated and delimited by a rounded angle. Lunule very small, rounded, nearly as broad as long, sunken, no escutcheon. Ligament very narrow and deeply inset. Periostracum very thin, greyish, mostly persistent on the marginal part of the valves. Inner margin denticulated by the external sculpture. Outside and inside uniform white.

Distribution. Senegal (Casamance) to the Congo (Pointe-Noire).



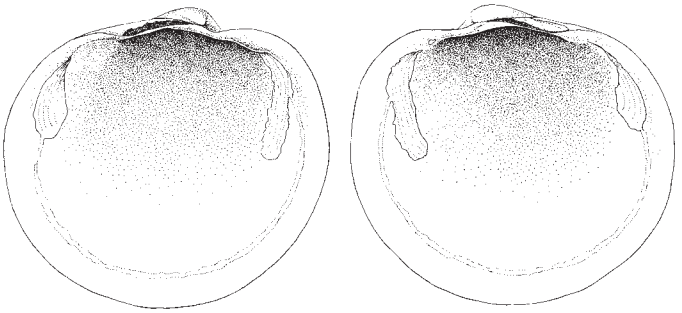
Biotope. In sandy mud and muddy sand, in rather shallow water (10-20 m), uncommon to rare and found only locally.

Remarks. Empty valves are rarely found, and only on a few beaches. This is the type species of the genus *Pompholigina*.



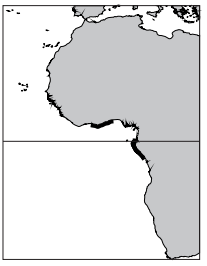
10.32. *Pompholigina gibba* (Gray, 1825). **A**-**B**, W of Rio Morébaya, Guinea, 9°24′ N, 13°42′W, 19 m (26.7 mm). **C**-**D**, W of Rio Koumba, Guinea, 10°22.6′N, 15°16′W, 10 m (24.8 mm). **E**, same locality (25.8 mm). **F**, same locality (27.1 mm). **G**-**I**, Abidjan region, Côte d'Ivoire (36.5 mm). **J**-**K**, same locality (24.6 mm). **L**, Port-Gentil, Gabon, Pointe du Phare (25.8 mm). **M**, same locality (25.2 mm).

Afrophysema chevalieri (Cosel, 2005)



10.33. Abidjan region, Côte d'Ivoire (25 mm).

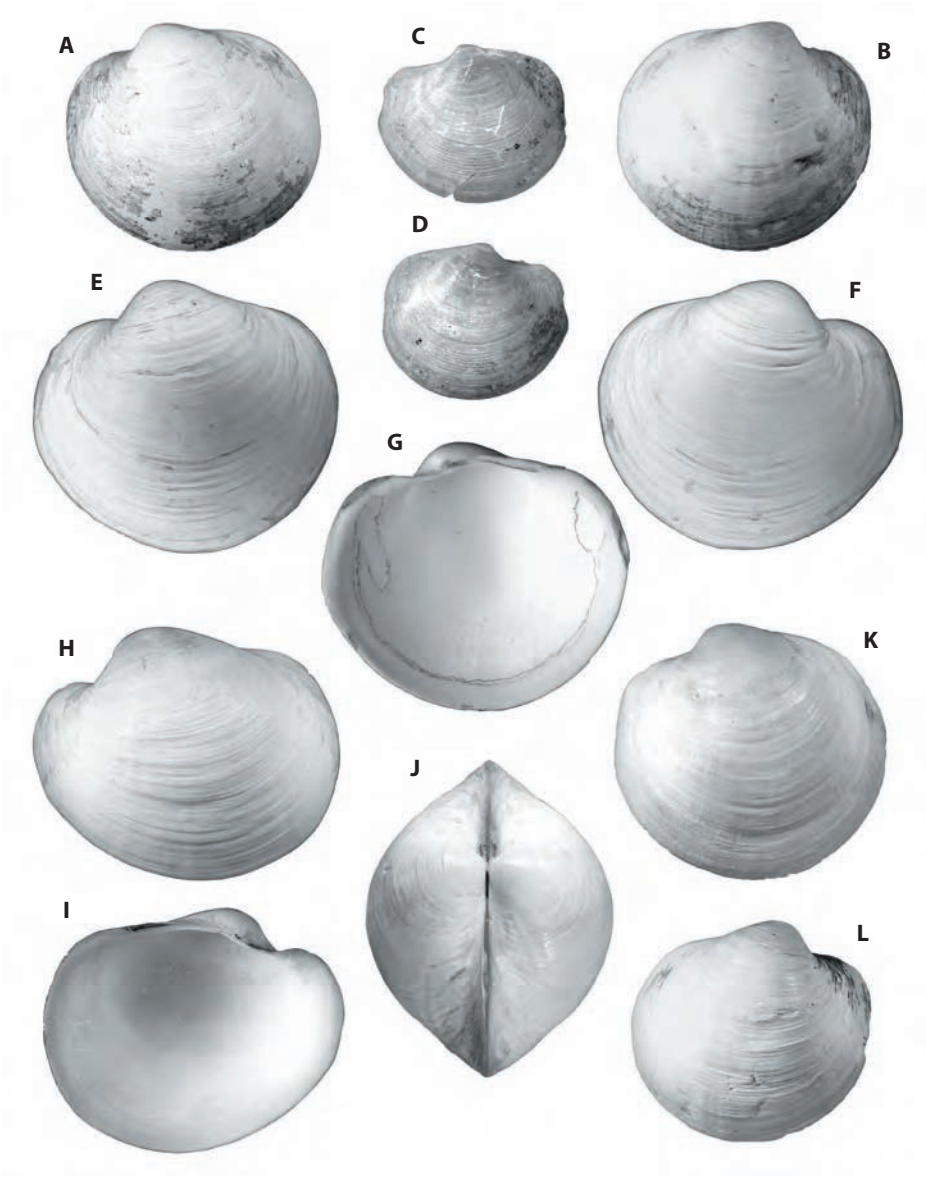
Shell to 42 mm long, rather thin but solid, very inflated, quite-variable in outline, subcircular to short-ovoid. Beaks well in front of the vertical midline. Surface without regular sculpture and only with coarse and very irregular growth lines and wrinkles and more pronounced growth stages. A few shallow, very broad and indistinct radial waves are also visible, especially under certain angle of view. Lunule small and short, more or less narrow, almost symmetric, not sunken; escutcheon absent. Ligament broad, partly hidden by the postero-dorsal margin but not very deeply sunken, on a broad nymph, almost "vertically" tilted towards the interior of the valves; therefore ligament and hinge plate appearing narrow at a horizontal view of the valve inside, full width of the ligament only visible from ventral view. Hinge plate toothless. Anterior adductor scar small, with a rather narrow diverging part, the pallial line meeting the scar above its middle, occasionally at one third the length of the scar. Posterior adductor scar very s:mall. Pallial line entire. Anterior, ventral and posterior margin on the inner side slightly, irregularly and very finely dentate, but on the very edge smooth. Valves pure white. Periostracum very thin, pale straw coloured and mostly eroded.



Distribution. Only known from Côte d'Ivoire, Bénin, Gabon and Congo Brazzaville.

Biotope. Most probably in sandy mud and muddy sand on the deeper shelf, apparently only in the Port-Gentil area of Gabon occurring shallower, from about 5 m downwards, and also the Congo, judging from two valves found on the beach of Pointe-Noire. Not common.

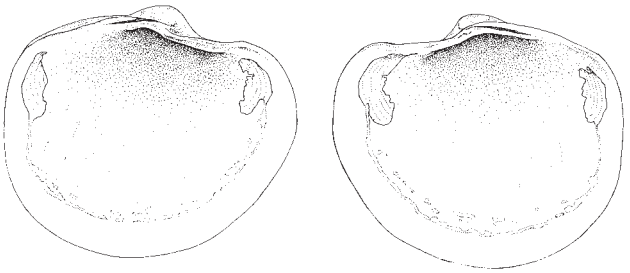
Remarks. This species is characterized by its very inflated shell, the broad ligamental nymph which is slanting towards the interior of the valve and the slightly dentate inner margin. A similar and possibly sibling species is *Afrophysema eutornus* (Tomlin, 1921) from the Indian Ocean coast of Africa, South Eastern Africa and SE-Madagascar, described as *Cryptodon eutornus* by Tomlin (1921: 215, pl. 8, fig. 5). It has the same shell form and exceptional tumidity as *A. chevalieri* but is still larger. Although that species had been well recognized by Barnard (1951: 181, pl. 28, fig. 5) with a figure of a typical specimen, in recent works on South African molluscs, it was always mistaken for or synonymized with *Anodontia edentula* (Linnaeus,



10.34. *Afrophysema chevalieri* (Cosel, 2005). **A**-**B**, off Côte d'Ivoire (25.2 mm). **C**-**D**, off Abidjan, Côte d'Ivoire (juvenile 7.7 mm). **E**-**G**, Port-Gentil, Gabon, Banc du Prince, 0°36.1'S, 8°48.1'E, 5-9 m (holotype, 42.1 mm). **H**-**J**, same locality (paratype, 41.3 mm). **K**, Pointe-Noire, Congo Brazzaville, Plage Raffinerie (35.7 mm). **L**, Pointe-Noire, Congo Brazzaville, Plage Mondaine (28.9 mm).

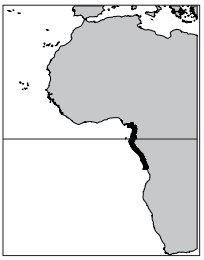
1758) (Barnard 1964; Kilburn & Rippey 1982; Steyn & Lussi 1998). This is another evidence for the close affinity of the West African marine molluscan fauna with the Indo-Pacific, especially with the Indian Ocean. For further details, see Taylor & Glover (2005).

Bythosphaera subrostrata (Cosel, 1989)



10.35. Libreville, Gabon, 0°25'N, 9°00'E, 73 m (lv, holotype, 11.8 mm; rv, paratype, 10 mm).

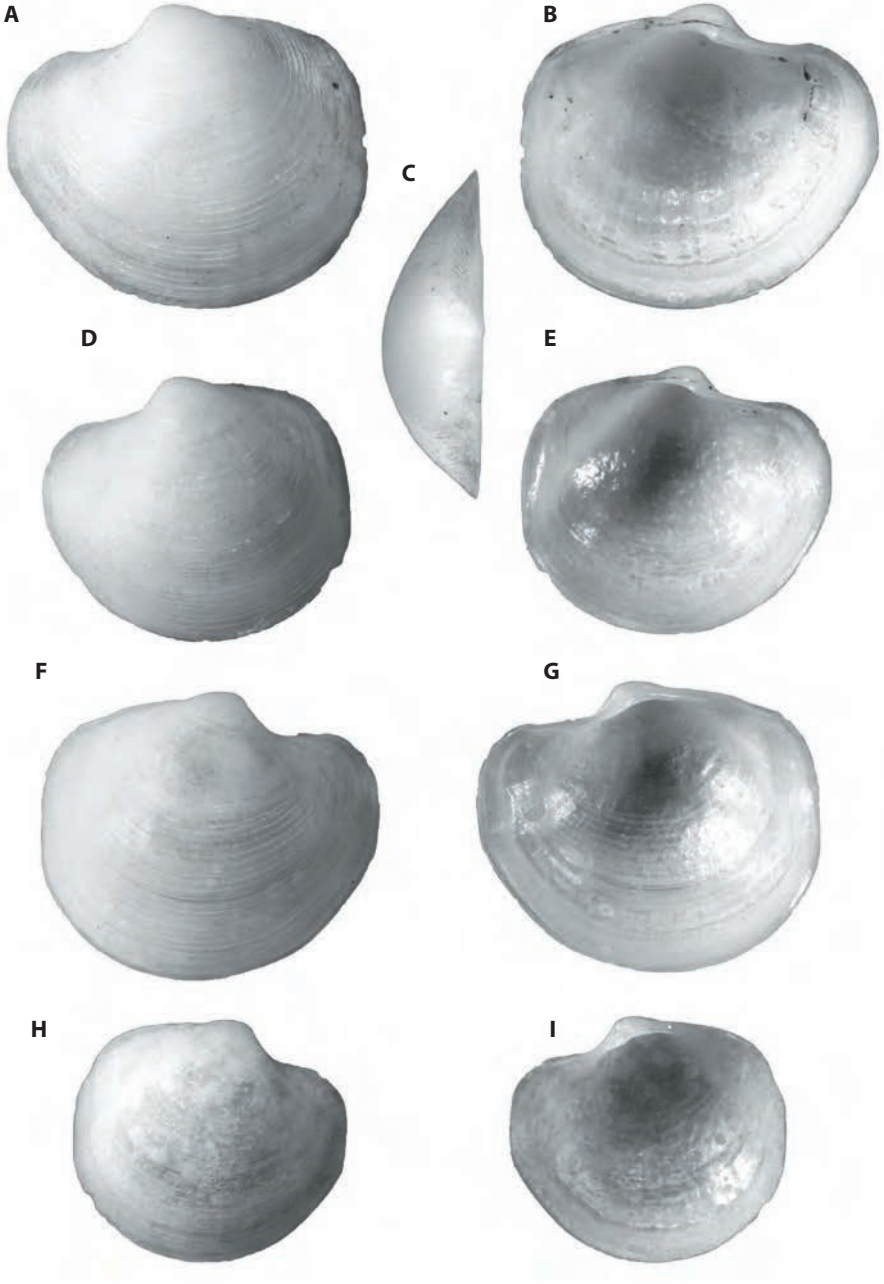
Shell up to 11 mm long, subcircular, with anterior part tapering, rather solid, inflated. Beaks just in front of the vertical midline. Surface with fine, commarginal threads at slightly irregular intervals, with smooth interspaces. Anterior area not differentiated, posterior area barely defined by a very shallow radial depression. Lunule very small and inconspicuous, better developed in the right than in the left valve. Ligament small and narrow, deeply inset. Inner margin smooth. Anterior adductor scar very short, the pallial line inserting about in the middle. Pallial line entire, with a few secondary pallial attachment points dorsal of it. Periostracum not seen. Outside and inside white.



Distribution. Known only from Cameroon, Equatorial Guinea, Gabon (Libreville) and northern Angola (Luanda).

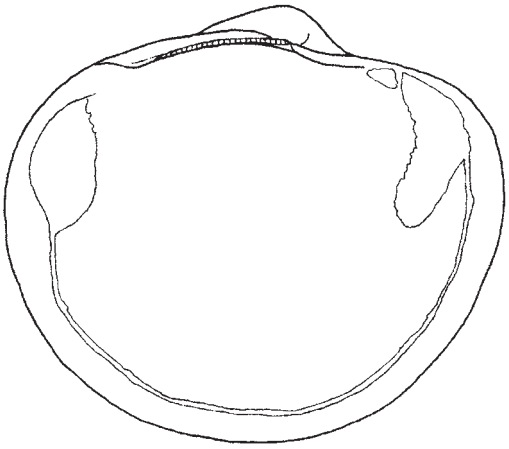
Biotope. Most probably in silty sand, well offshore (70-100 m and perhaps deeper).

Remarks. This little known species is distinguished from *Loripinus subfragilis* (see below) by its less inflated valves, white colour, the quite regular commarginal threads and the rostrate anterior part. With this rostrate anterior part in combination with the fine commarginal sculpture and the secondary scars along the pallial line, this species is quite unique; there is only one other species in the genus: *B. watsoni* (E.A. Smith, 1885) from the central Indo-Pacific (for details, see Taylor & Glover 2005).



10.36. *Bythosphaera subrostrata* (Cosel, 1989). **A-C**, Libreville, Gabon, 0°25'N, 9°00'E, 73 m (holotype, lv, 11.8 mm). **D-E**, same locality (paratype, lv, 8.5 mm). **F-G**, same locality (paratype, rv, 10.1 mm). **H-I**, Ilha de Luanda, Luanda prov., N-Angola, 60-80 m (7.1 mm).

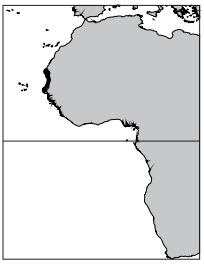
Loripinus senegalensis (Cosel, 2005)



10.37. Cap Blanc, 20°34'N, 17°47'W, 90 m (lv, 36.8 mm) (reproduced from Taylor & Glover 2005, fig. 43).

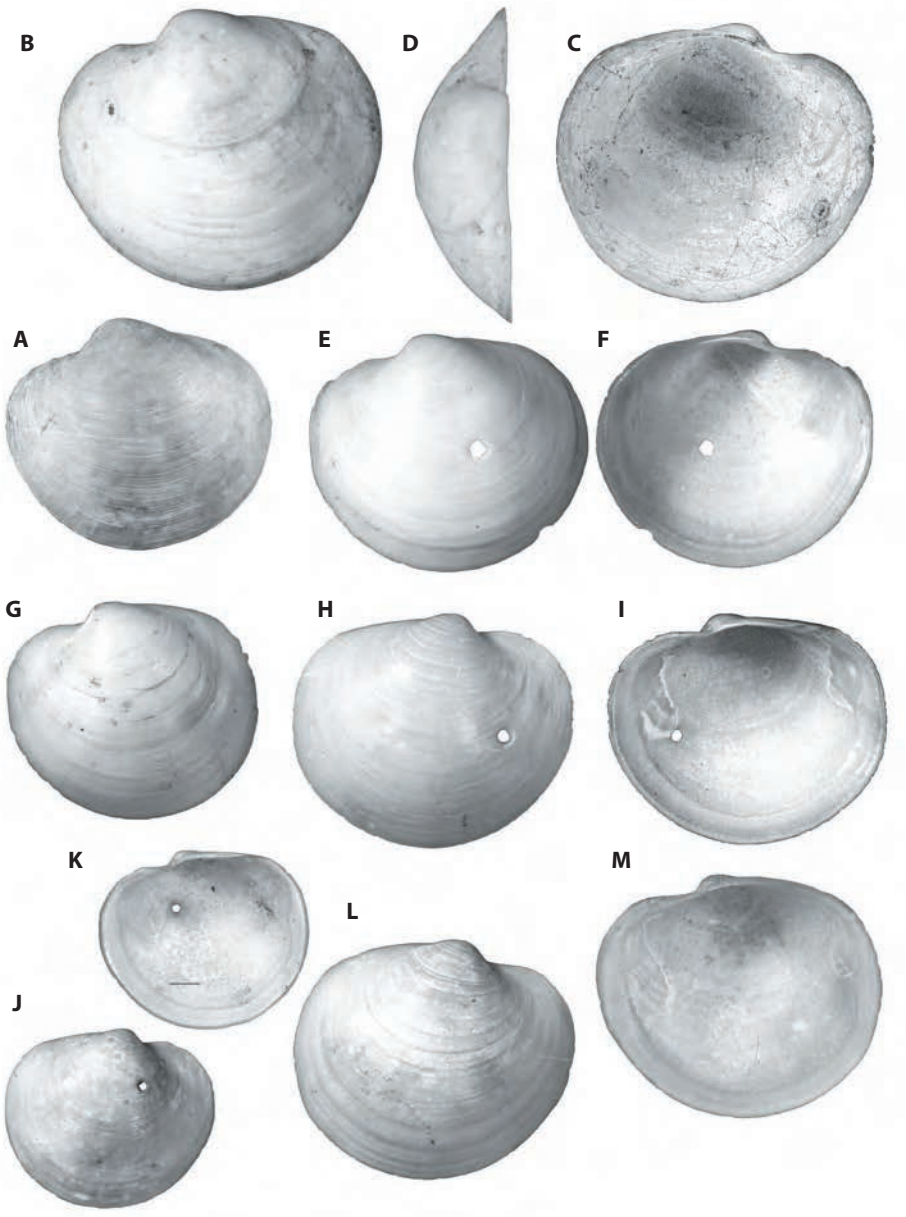
Shell to 37 mm long, thin but solid, very inflated, variable in outline, subcircular, somewhat longer than high, Umbos prominent, well protruding over the dorsal margin, beaks in front of the vertical midline. Exterior without regular sculpture and only with fine, irregular growth lines and coarser growth stages. Lunule very small and short, rather narrow, almost symmetric, not sunken; escutcheon absent. Ligament not sunken, on a narrow nymph, which is slanting towards the interior of the valves; therefore ligament and hinge plate appearing still narrower at a horizontal view of the valve inside, full width of the ligament only visible from ventral view. Hinge toothless. Anterior adductor scar with a short and rather broad diverging part, the pallial line meeting the scar above its middle. Anterior, ventral and posterior margin on the inner side almost smooth, occasionally the vestiges of inner crenulations are visible. Valves white, periostracum not observed.

Distribution. Off Mauritania (20°30'N) and Senegal (Dakar region).



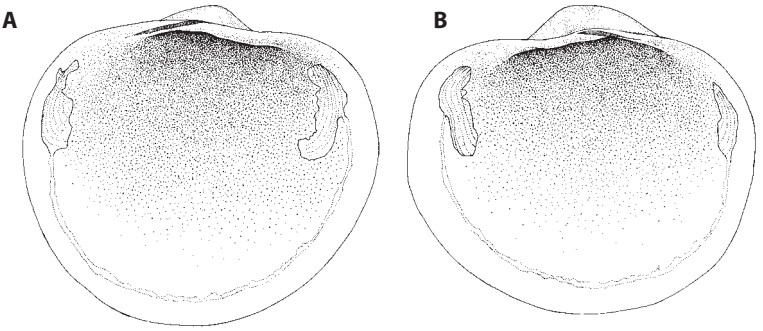
Biotope. Most probably muddy bottom, on the deeper shelf between about 60 and 230 m, rare.

Remarks. This species is distinguished from *Afrophysema chevalieri* by the smaller size, the shorter and broader diverging part of the anterior adductor scar and the narrower and shallower ligament, which is less slanting towards the interior of the valves. The inner margin is smooth (see also Taylor & Glover 2005).



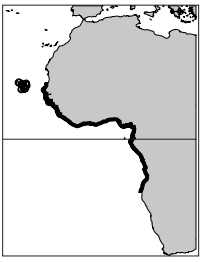
10.38. *Loripinus senegalensis* (Cosel, 2005). **A**, Mauritania, 20°34'N, 17°47'W, 90 m (36.8 mm). **B**-**D**, S of Gorée, Senegal, 110-112 m (holotype, 20.8 mm). **E**-**F**, Dakar region, Senegal, 14°50.1'N, 17°29.3'W, 150 m (paratype BMNH, 17.3 mm). **G**, Dakar region, 14°53.8'N, 17°30.8'W, 205-230 m (15.6 mm). **H**-**I**, same locality (16.5 mm). **J**-**K**, same locality (13.2 mm). **L**-**M**, same locality (15.0 mm).

Loripinus subfragilis (Dautzenberg, 1910)



10.39. **A**, lv, Boavista, Cape Verde Islands, 22 m (9.6 mm). **B**, rv, Casamance, 12°46.9'N, 17°29.9'W, 45 m (10 mm).

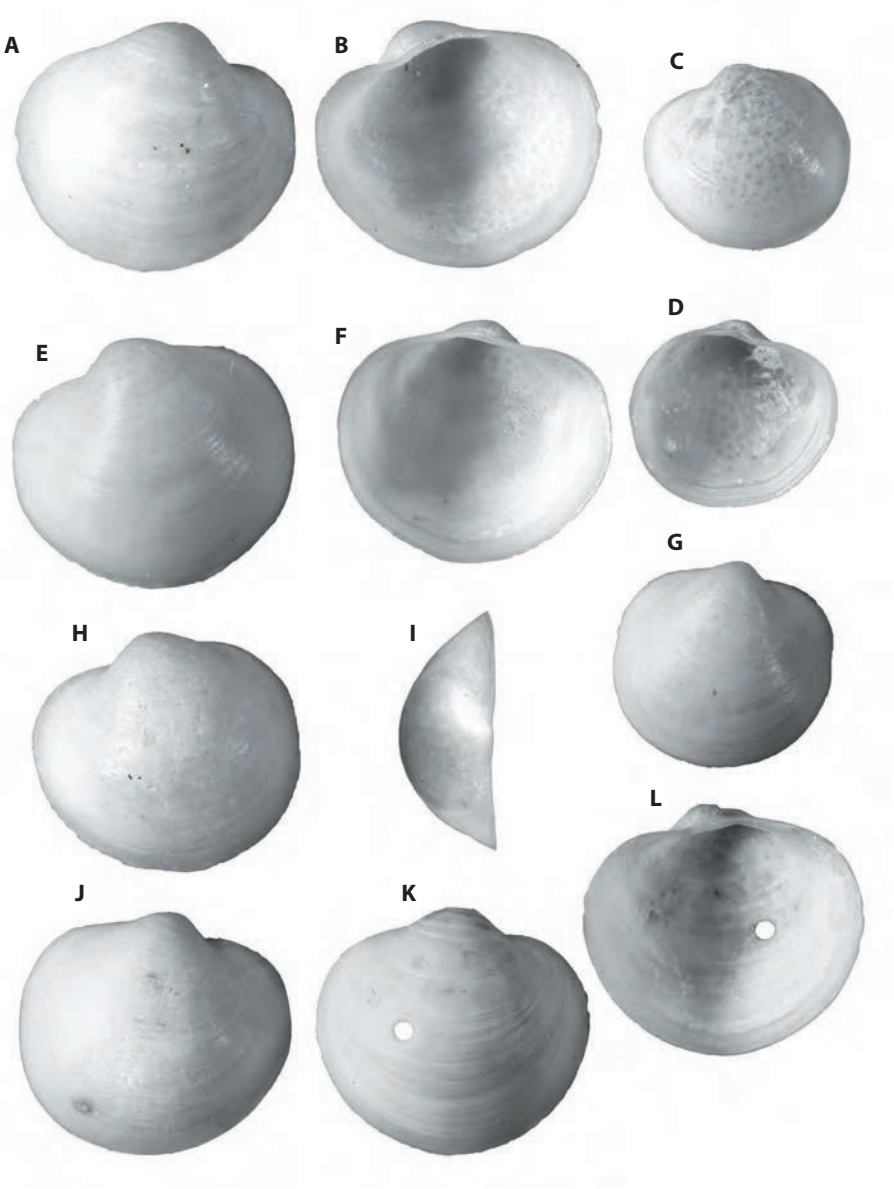
Shell very small, up to 10 mm long, in certain limits variable in size, shape and tumidity, more or less circular, rather thin, very inflated to globose. Beaks slightly in front of the vertical midline. Surface with irregular, coarse growth lines and very faint, irregular radial waves or striae, which are visible only under a lens (x 10-20). Anterior and posterior area not differentiated. Lunule very small, short and ill-defined, somewhat asymmetric with larger part in the right valve; no escutcheon. Ligament very thin, deeply sunken. Pallial line entire. Periostracum not seen. Outside whitish, cream or very pale salmon pinkish, inside with same colouration.



Distribution. Mauritania (19°N) and Senegal (Dakar region) to southern Angola (Lucira, Namibe province); Cape Verde Islands.

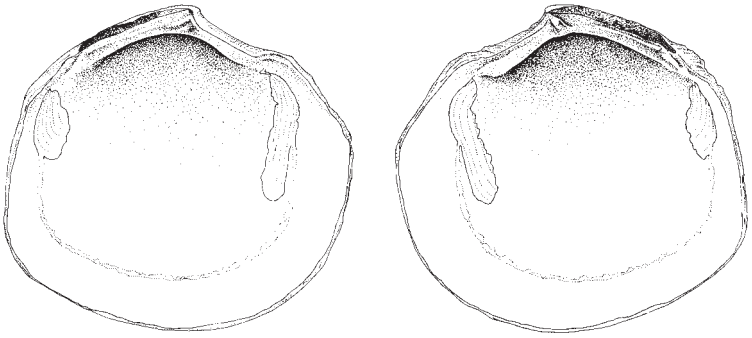
Biotope. In muddy sand and fine sand, from about 5 to 200 m, uncommon.

Remarks. This species is very close to the Mediterranean *Loripinus fragilis* (Philippi, 1836), from which it differs in being still more inflated to nearly spherical and slightly thicker-shelled. The record of *Loripinus fragilis* from the Cape Verde Islands (Cosel 1982) refers to the present species. This is one of the few species of "*Anodontia*" with a more or less coloured shell. Empty valves are occasionally found on Cape Verde Islands beaches.



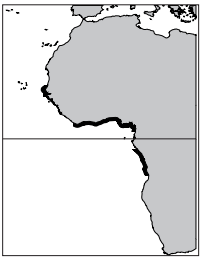
10.40. *Loripinus subfragilis* (Dautzenberg, 1910). **A**-**B**, Rufisque, Senegal, 18-20 m (figured syntype, rv, 10.0 mm). **C**-**D**, Kafountine, N-Casamance, Senegal, 12°46.9'N, 17°29.9'W, 45 m (6.2 mm). **E**-**F**, same locality (9.5 mm). **G**, same locality (6.9 mm). **H**-**I**, Casamance, Senegal, 12°44.5'N, 17°27.3'W, 40-41 m (10.7 mm). **J**, W of Konebomby, Guinea, 9°48'N, 15°36'W, 37 m (10.4 mm). **K**-**L**, Baia de Corimba, Luanda prov., N-Angola (11.3 mm).

Afrolucina discontinua Cosel, 2006



10.41. Grand Bassam, Côte d'Ivoire, 70 m (holotype, 17.4 mm).

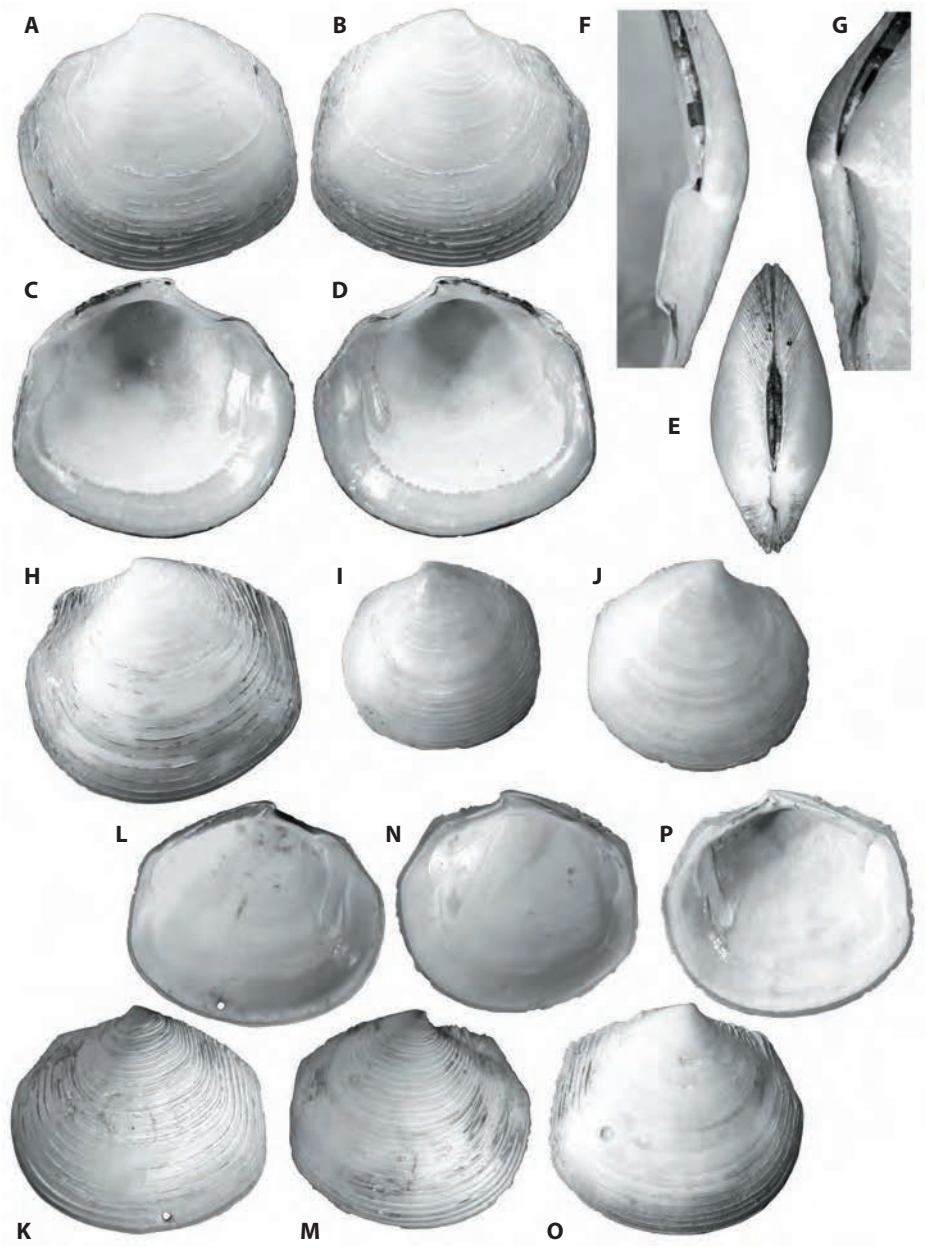
Shell up to 18 mm long, subcircular, with obliquely truncated posterior margin, solid, compressed. Beaks slightly in front of the vertical midline. Surface with numerous, fine and thin, slightly irregular, commarginal lamellae, more or less eroded or obsolete on the umbonal and middle part of the valves; interspaces with very fine growth lines. Posterior area delimited by a gently rounded posterior angle, anterior angle sharper, anterior area with a shallow, radial depression. Lunule rather long, highly asymmetrical, with the broader part on the left valve. Escutcheon rather narrow, ligament inset. Periostracum thin, nearly colourless, towards the growing edge in growth stages thicker and brownish. Inner margin smooth. Hinge with one small cardinal in the right and two cardinals in the left valve. Anterior adductor scar rather narrow, ventral extension short. Outside and inside entirely whitish.



Distribution. Senegal (Dakar); Côte d'Ivoire (western border) to Nigeria; Congo Brazzaville northern Angola (Luanda). Not recorded from Guinea-Bissau to Liberia and Cameroon to northern Gabon.

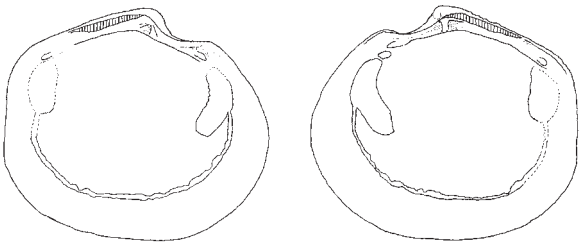
Biotope. In mud and muddy sand, from about 50 to about 230 m, not common.

Remarks. This deeper shelf species is distinguished from *Lucinoma vestita* (see there) by a much shorter ventral extension of the anterior adductor scar and the presence of a separated anterior area. *Afrolucina discontinua* seems to have a disjunct distribution and to be restricted to the different areas of seasonal upwelling but is not present in the two typical tropical zones. There are two different morphs: the "normal" morph with fine to indistinct and in the middle often eroded commarginal lamellae and a second morph with continuous and more regular commarginal lamellae; of this morph, only few valves coming from Bénin, Nigeria and northern Angola are known.



10.42. *Afrolucina discontinua* Cosel, 2006. **A**-**E**, Grand Bassam, Côte d'Ivoire, 70 m (holotype, 17.4 mm). **F**-**G**, close-up view of the asymmetrical lunule in the holotype. **H**, Abidjan region, Côte d'Ivoire (15.9 mm). **I**, Liberia, 4°34.5'N, 8°31'W, 64 m (12.3 mm). **J**, Palmeirinhas, Luanda prov., N-Angola, 60-80 m (12.7 mm). **K**-**L**, (morph 2) off the Niger Delta, Nigeria, 4°05'N, 5°28'E, 90-105 m (15.0 mm). **M**-**N**, (morph 2) off Ouidah, Bénin, 6°10N, 2°05'E, 200 m (14.1 mm). **O**-**P**, (morph 2) off Mussulo, Luanda prov., N-Angola, 90-100 m (14.7 mm).

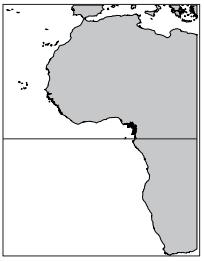
Tinalucina aequatorialis Cosel, 2006



10.43. W of Bioko Island [formerly Fernando Poo], Equatorial Guinea, 3°50'20"N, 8°21'40"E, 98 m (holotype BMNH, 6.8 mm) (reproduced from Cosel 2006, fig. 6).

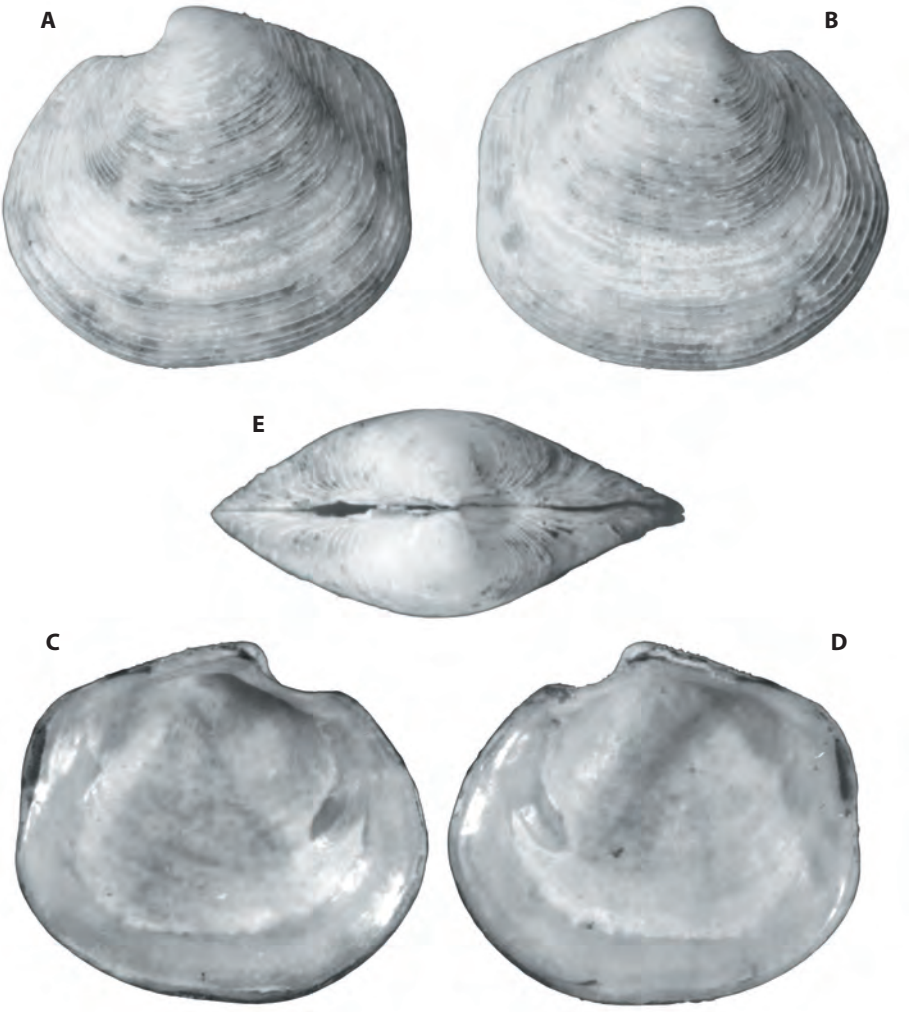
Shell to 6.8 mm long, equivalve, moderately inflated, subcircular but more tending to rectangular-polygonal, slightly longer than high. Antero-dorsal (lunular) margin markedly concave, antero-dorsal corner narrowly rounded, well marked. Anterior margin rounded, more so on its middle part, ventral margin rounded, less convex in its middle part. Posterior margin nearly vertically truncated, with a very slight sinuosity in the middle and with broadly rounded postero-dorsal and postero-ventral corners. Exterior somewhat irregular, with irregularly but mostly densely-spaced, shallow, commarginal lamellae and a few growth lines. Anterior angle almost absent, anterior radial depression obsolete, antero-dorsal area indistinct. Posterior angle rounded, posterior radial depression broad and well-defined, ending in a very shallow indentation of the posterior margin. Lunule small, moderately narrow, slightly asymmetric, longer than broad, a little sunken; escutcheon absent, ligament deeply sunken. Right valve with a rudimentary single cardinal, an anterior lateral and vestiges of a posterior lateral. Left valve with two small cardinals, an anterior lateral and the vestiges of a posterior lateral. Anterior adductor scar rather short, with short and broad diverging part, the pallial line meeting the scar slightly above its middle. Inner margin smooth. Valves entirely white, periostracum thin and almost colourless, eroded on large parts of the valves.

Distribution. Inner Gulf of Guinea, only known from the type locality and possibly restricted to the Cameroon deeper shelf and the adjacent islands.



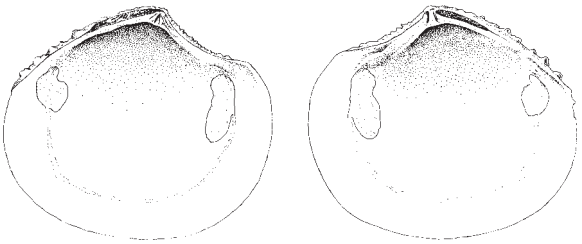
Biotope. In silty bottom, at about 100 m, rare.

Remarks. A similar Indo-Pacific species is *Jallenia inanis* (Prashad, 1932), placed previously in *Tinalucina* by Cosel & Bouchet (2008); it grows only slightly larger then *T. aequatorialis*, up to 10 mm; it is further distinguished by the smooth middle part of the valves, however, both species share the somewhat irregular valve surface, the general shell outline, the hinge dentition and the almost equal-sized adductor scars.



10.44. ***Tinalucina aequatorialis*** **Cosel, 2006. A-E**, W of Bioko Island [formerly Fernando Poo], Equatorial Guinea, 3°50′20″N, 8°21′40″E, 98 m (holotype BMNH, 6.8 mm).

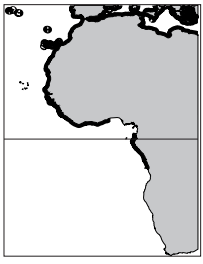
Myrtea spinifera (Montagu, 1803)



10.45. Casamance, 12°46.9'N, 17°29.9'W, 45 m (9.2 mm).

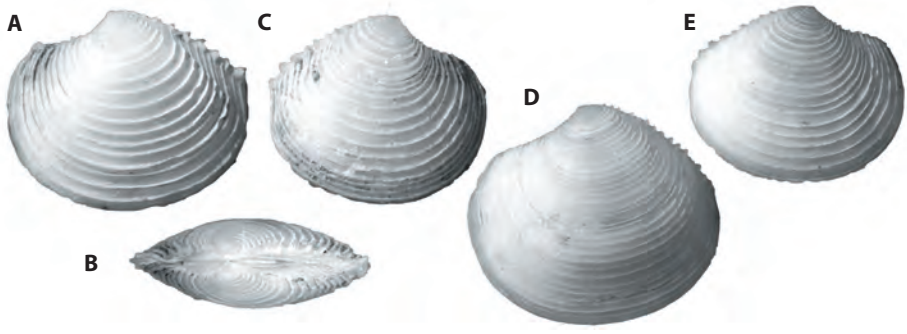
Shell up to 25 mm long (West African specimens not more than 12 mm), oval-quadrangular, solid, compressed. Beaks in front of the vertical midline. Surface with fine, prominent, regular, more or less evenly spaced, commarginal lamellae which are slightly less high on the otherwise not marked posterior area. Lunule long, broad and symmetrical, sharply delimited by the ends of the commarginal lamellae. Escutcheon long and broad, surrounded by tiny scales. Periostracum very thin and colourless. Inner margin smooth. Diverging part of the anterior adductor scar very short. Outside cream, often with light yellow on the umbonal area. Inside white to very pale yellowish with white rim.

Distribution. Norway (63°N) and Shetlands, British Isles to Sierra Leone (7°29'N), Côte d'Ivoire and Ghana; Equatorial Guinea (1°40'N) to northern Angola (Luanda); Madeira, Canary Islands; throughout the Mediterranean.



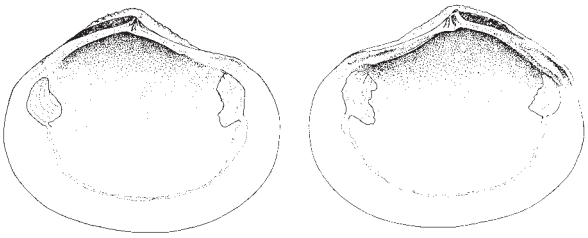
Biotope. In sandy mud, muddy sand or fine sand, also with gravel, offshore from about 35 to 250 m (in Europe also shallower, up to 10 m, in West Africa mostly deeper than 90-100 m), not common.

Remarks. The absence of more records from the two typical tropical zones does not necessarily indicate distribution gaps but more probably is due to insufficient samplings in the depths preferred by this species. This is the type species of the genus *Myrtea*.



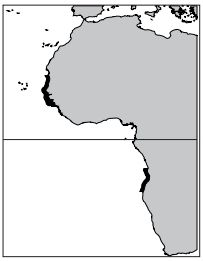
10.46. *Myrtea spinifera* (Montagu, 1803). A-B, Kafountine, Casamance, Senegal, 12°46.9'N, 17°29.9'W, 45 m (7.2 mm). C, same locality (6.5 mm). D, same locality (11.7 mm). E, same locality (10.5 mm).

Myrtea pseudocorbis (Nicklès, 1952)



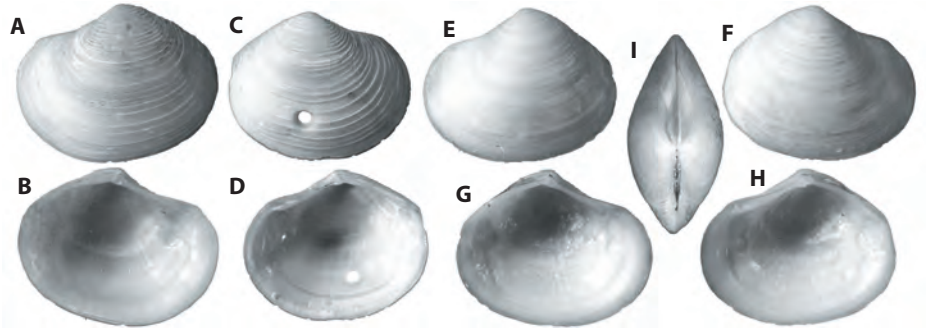
10.47. Baia de Corimba, Luanda, N-Angola, 10-20 m (9.8 mm).

Shell up to 12 mm long, somewhat variable in outline and size, rather elongate, oval, solid, compressed. Beaks more or less median. Surface with fine commarginal lamellae, often more or less evenly spaced but spacing occasionally very variable, even on the same valve. On older specimens lamellae often eroded. Interspaces with very faint, dense, radial striae, only visible under a lens (x 10-20) and often partly obsolete. Areas not defined except sometimes by very weakly angulate anterior and posterior margins. Both lunule and escutcheon long and rather narrow, delimited by angles but not by lamellae. Periostracum thin, very light yellowish to nearly colourless. Inner margin smooth. Diverging part of the anterior adductor scar extremely short. Outside white to cream, inside white, occasionally pale salmon red with white rim.



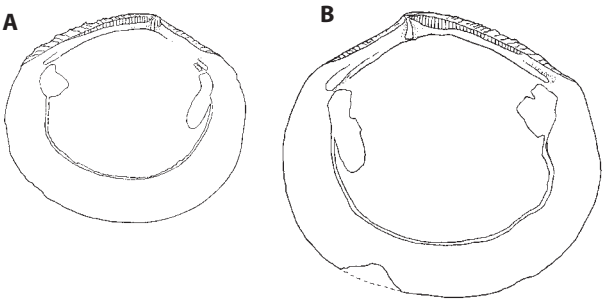
Distribution. Mauritania (19°N) to Senegal (Dakar area) and Guinea (10°49'N); northern Angola (Luanda area) to southern Angola (Lucira, Namibe province). Also in the Quaternary of Gabon but there not yet recorded as Recent species.

Remarks. *M. pseudocorbis* is distinguished from *M. spinifera* by its smaller size, the more backward placed beaks and the lack of the short spines which delimit the escutcheon. There are no records of this species from the typical tropical zones but also not from the better sampled atypical tropical zone at Côte d'Ivoire; this may indicate a distribution gap.



10.48. *Myrtea pseudocorbis* (Nicklès, 1952). A-B, Gorée, Senegal, 65 m (7.7 mm). C-D, same locality (7.7 mm). E-I, Baia da Corimba, Luanda prov., N- Angola, 10-20 m (9.7 mm).

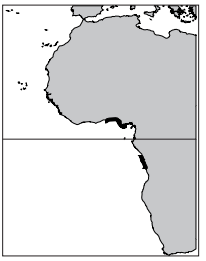
Graecina karinae Cosel, 2006



10.49. **A**, W of Ambrizete, Zaire prov., N-Angola, 7°18.4'S, 12°04.6'E, 360-367 m (holotype, lv, 31.2 mm). **B**, same locality (paratype, rv, 39.4 mm) (reproduced from Cosel 2006, fig. 13).

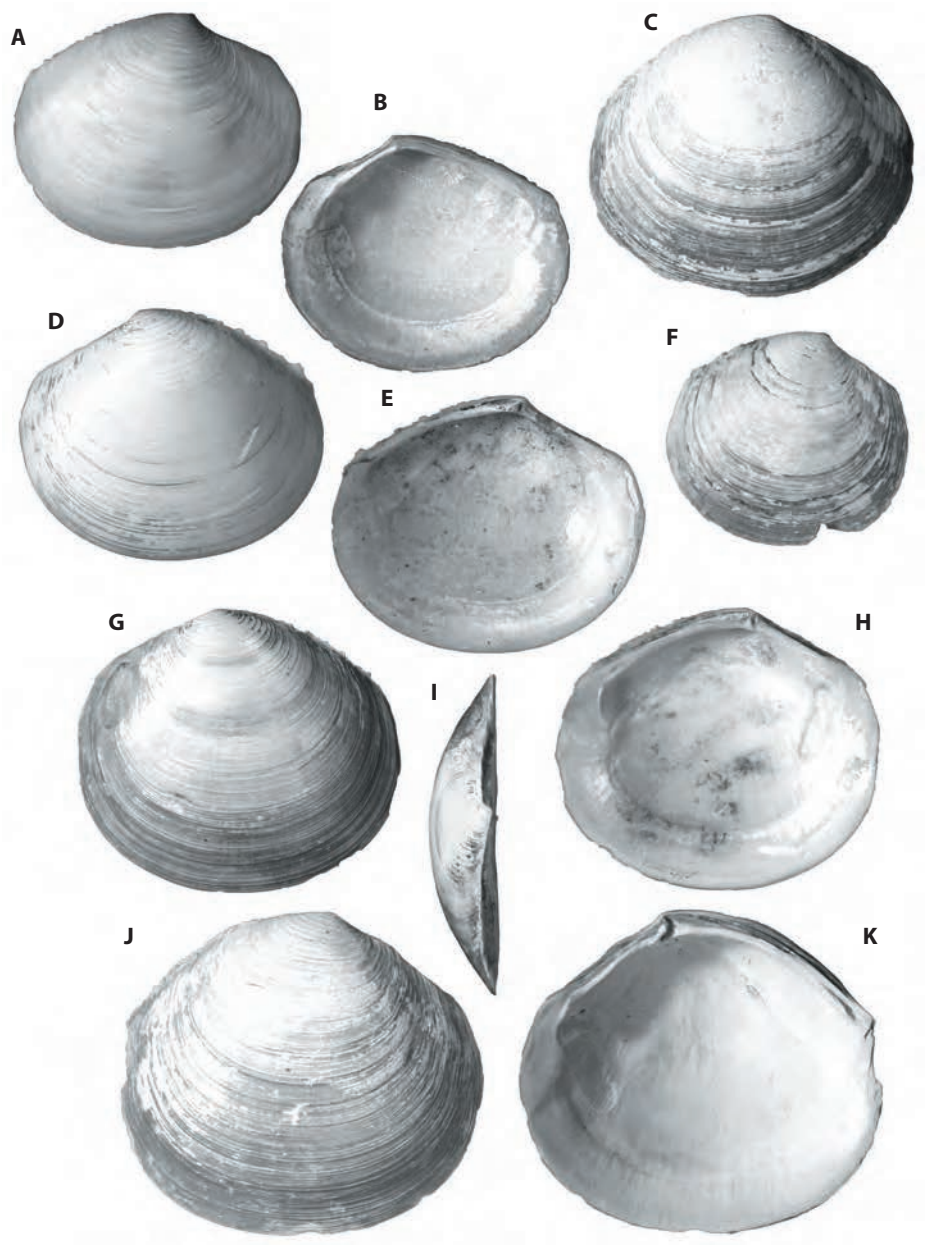
Shell up to about 40 mm long, rather thick, subcircular, inequilateral, equivalve, rather compressed. Beaks well in front of the vertical midline. Exterior with thin commarginal lamellae or cords, only on the earlier third or fourth or sometimes the very earliest part of the valves, becoming obsolete and then absent towards ventrally. Interspaces with very fine growth lines only. Rest of the valves with strong, dense and rather regular growth lines and some coarser growth stages. Right valve with one well developed cardinal tooth and sometimes the vestiges of a posterior cardinal, and long and narrow anterior and posterior laterals. Left valve with one well developed cardinal and a narrow and short anterior cardinal, and narrow, well marked anterior and posterior laterals. Lunule rather long, narrow, slightly asymmetrical, sunken. Escutcheon long, narrow and sunken, delimited by a sharp, raised and serrated keel. Anterior adductor scar rather small, long, with moderately long diverging part. Posterior scar small but rather broad. Inner margin of valves smooth. Valves presumably white in life but in the dead collected samples chalky or light greyish. Periostracum thin, light greenish brown, when present.

Distribution. Only known from off Nigeria and northern Angola (Ambrizete).



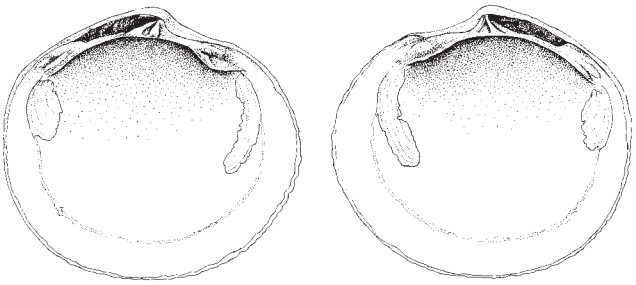
Biotope. Off Angola found in sticky mud in a zone with mounds of deep-water coral *Lophelia pertusa* (Linnaeus, 1758) at about 360 m, rare. No live specimens found so far.

Remarks. This genus and species is superficially looking close to the Indo-Pacific genus *Dulcina* Cosel & Bouchet, 2008, in that genus, however, the posterior part is more tapering and the lunule is shorter; the anterior adductor scar is longer.



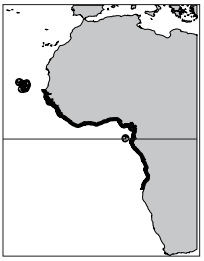
10.50. ***Graecina karinae*** **Cosel, 2006. A-B**, S of Port Harcourt, Nigeria, 3°42.3'N, 7°47.6'E, 425 m (rv, 23.1 mm). **C**, same locality (rv, 26.0 mm). **D-E**, W of Ambrizete, Zaire prov., N-Angola, 7°18.4'S, 12°04.6'E, 360-367 m (paratype, lv, 39.6 mm). **F**, same locality (paratype, rv, 29.7 mm). **G-I**, same locality (holotype, lv, 31.8 mm). **J-K**, same locality (paratype, rv, 36.0 mm).

Ctena eburnea (Gmelin, 1791)



10.51. Cap Esterias, Gabon, sand between rocks, 1-1.5 m (19.8 mm).

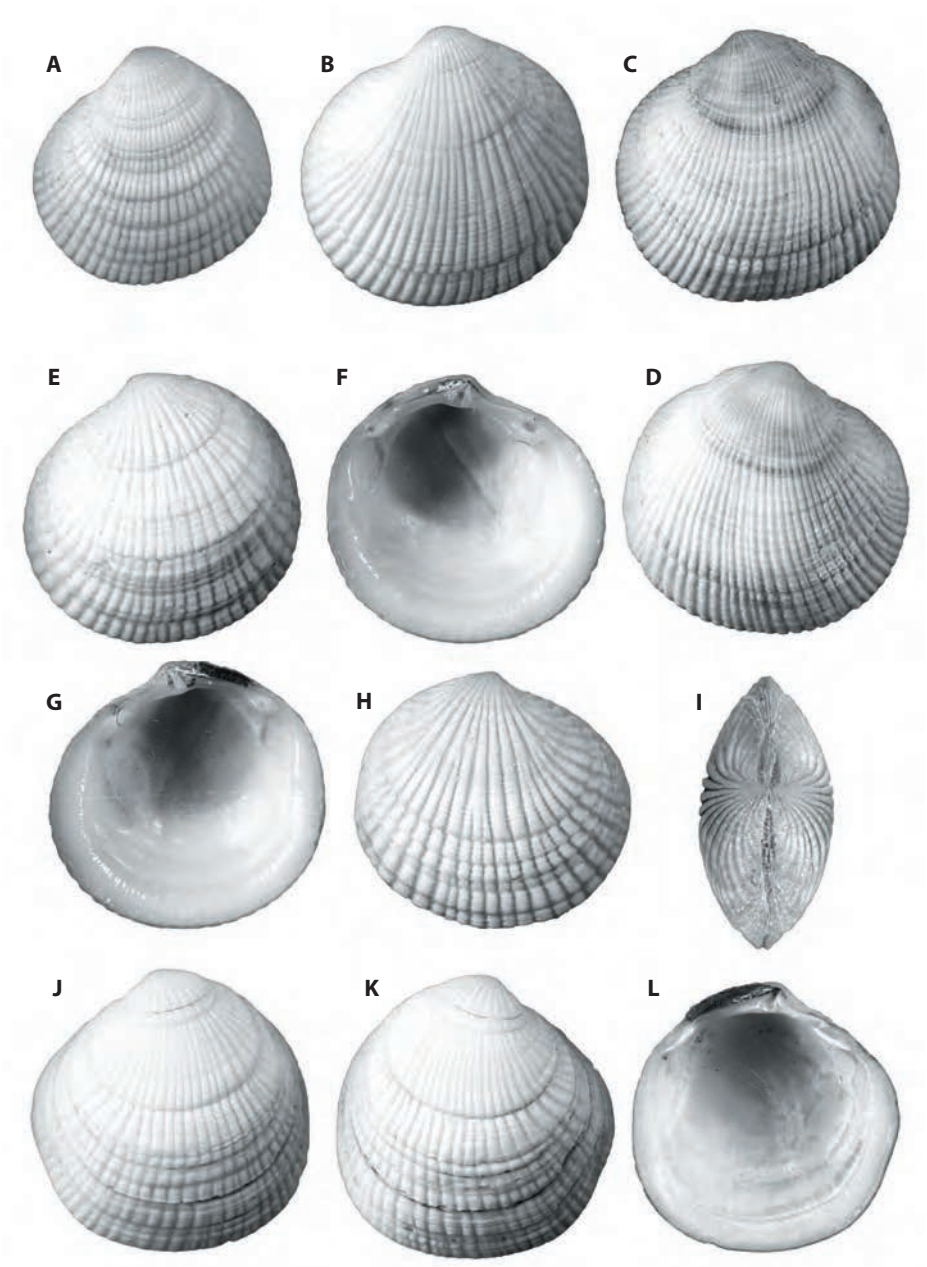
Shell up to 28 mm long, slightly variable in shape, high-oval to nearly circular, quite thick and solid, somewhat inflated. Beaks median or very slightly behind the vertical midline. Surface with numerous, strong, irregular radial ribs, diverging and some of them bifurcating, mostly on the anterior and posterior part. The ribs are crossed by a few strong growth stages and by more or less developed, fine, commarginal ridges, which occasionally are only visible under a lens. Lunule small, slightly asymmetrical, broader on the right valve; escutcheon narrow and ill-defined. Inner margin denticulate in reproduction of the external ribs. Periostracum very light brownish, usually persistent in the growth stages only. Outside whitish, ivory, cream or light brownish, inside white, cream or yellow.



Distribution. Senegal (Dakar) to southern Angola (Lucira, Namibe province); Cape Verde Islands, São Tomé, Principe, Annobon.

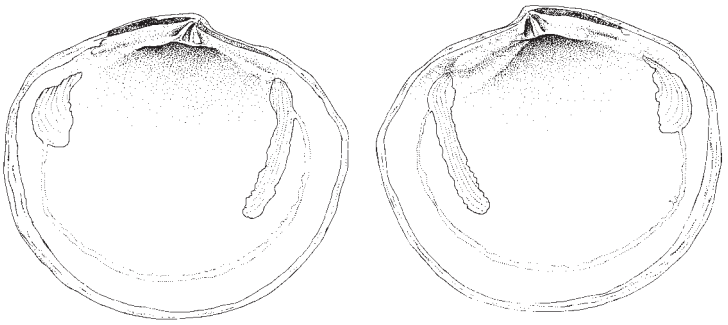
Biotope. In coarse sand and gravel, also in sand patches and sand-filled depressions on rocky coasts, from low tide level to about 20 m, abundant on the islands, on the continental coast locally common but rare in the tropical zone.

Remarks. This species is close to the European-Mediterranean *C. decussata* (O.G. Costa, 1829) which is also present in Madeira and the Canary Islands. However, in contrast to *C. eburnea*, the European species has more numerous and much finer radial ribs which are crossed by nearly equally prominent commarginal ridges. Cape Verde Islands records of *C. decussata* (*in* Saunders 1977 and Cosel 1982) refer to the present species. The commarginal sculpture is rather well developed in specimens of *C. eburnea* from the Cape Verde Islands, which are otherwise well characterised by their coarser radial ribs. Commonly found on the beaches of the islands. Huber (2010: 70, 2015: 436) restored the unused Linnean name *Cardium pectinatum* Linnaeus, 1758 as an earlier name for this species, based on a type specimen in Uppsala. However this contradicts the Mediterranean type locality of *Cardium pectinatum*, and the reference to Gualtieri, so is not followed here. Synonyms are *C. pecten* (Lamarck, 1818) and *C. jagon* (Récluz, 1869). This is "Le Jagon" of Adanson. A close Indo-Pacific species is *C. divergens* (Philippi, 1850) from the Red Sea and Indian Ocean.



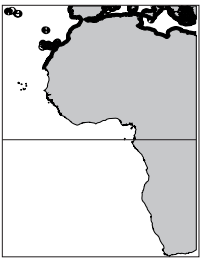
10.52. ***Ctena eburnea*** **(Gmelin, 1791). A**, W of Ile Yomboya, Guinea, 10°27'N, 15°37.5'W, 39 m (15.2 mm). **B**, Same locality (18.0 mm). **C-D**, Canal de Vridi, Abidjan, Côte d'Ivoire, 7 m (27.8 mm). **E-G**, Caotinha, Benguela prov., S-Angola (15.4 + 16.1 mm). **H-I**, same locality (16.1 mm). **J-L**, São Nicolau, Namibe prov., S-Angola (20.4 mm).

Lucinoma borealis (Linnaeus, 1767)



10.53. West Sahara, 21°15'N, 17°38'W, 400 m (23 mm).

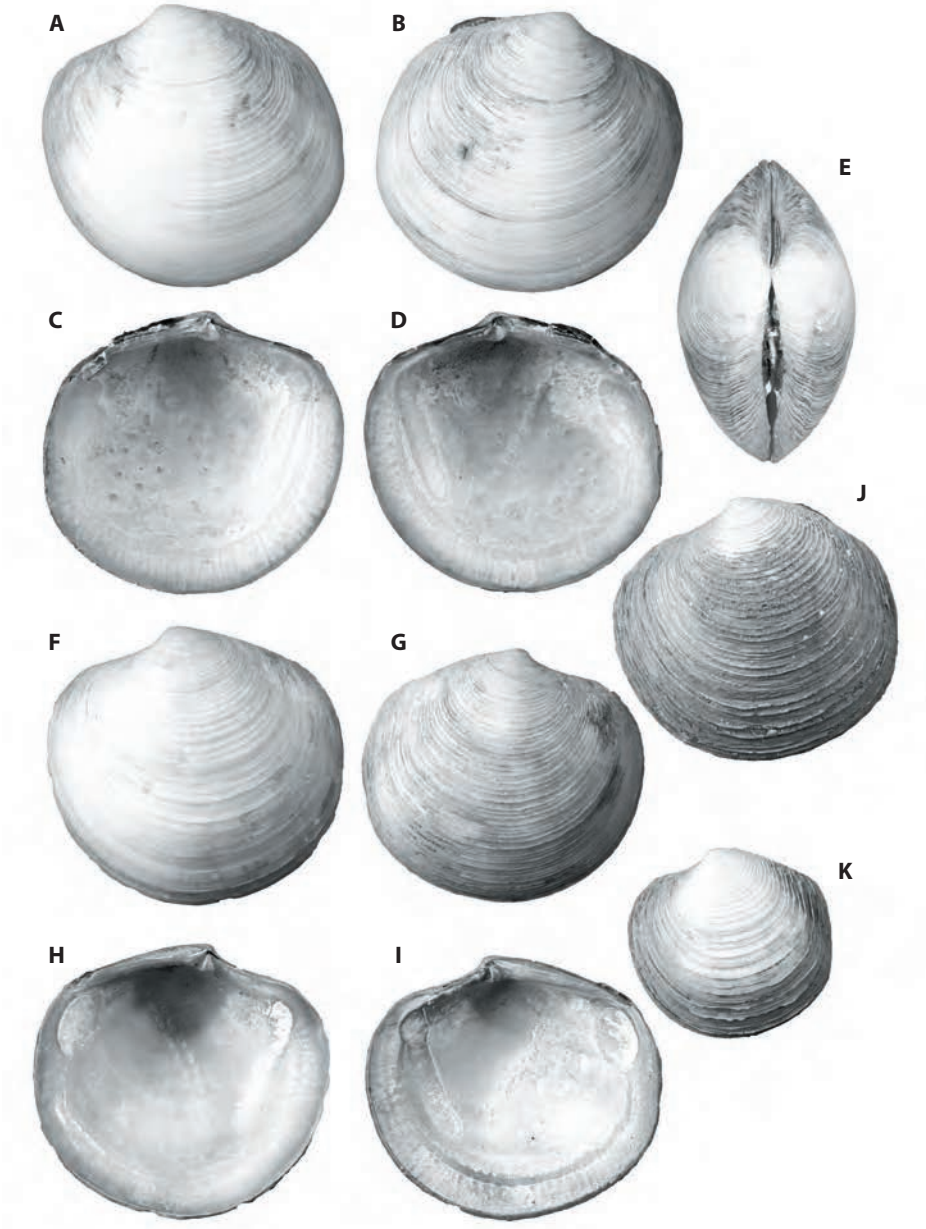
Shell up to 40 mm long, subcircular, rather thick and solid, more or less inflated. Beaks slightly anterior to the vertical midline. Surface with numerous, fine, often somewhat irregularly spaced, commarginal ridges or lamellae. Posterior area delimited by a very faint, radial depression or only marked by the less convex posterior margin. Lunule long and narrow, lens-shaped, with slightly broader part on the left valve. No escutcheon. Anterior adductor scar with small upper part and long and broad ventral extension. Ligament long and not sunken. Periostracum thin, dull, greyish yellow to light brown, often partly eroded in adult specimens. Inner margin smooth. Outside and inside white.



Distribution. Northern Norway, Faroe, Shetlands, British Isles to Mauritania (20°30'N); Azores, Madeira, Canary Islands; throughout the Mediterranean.

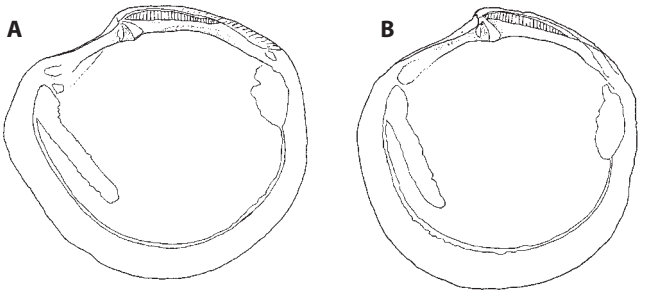
Biotope. In sandy mud, muddy sand and muddy gravel, from about 50 to 500 m, in northern Europe also shallower, up to extreme low tide mark, common in Europe, uncommon in Mauritania.

Remarks. The southern limit of the range of this northern species coincides with the zone of permanent upwelling. Specimens are occasionally taken in trawls. Empty valves are not uncommon on northern European beaches, but absent towards the south.



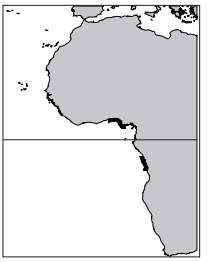
10.54. ***Lucinoma borealis*** **(Linnaeus, 1767). A**-**E**, Mauritania, 20°34′N, 17°47′W, 90 m (38.0 mm). **F**-**G**, same locality (33.3 mm). **H**-**I**, same locality (33.2 mm). **J**, off Mauritania, 21°15′N, 17°41′W, about 450 m (lv, 24.6 mm). **K**, off Mauritania, 21°15′N, 17°38′W, 450 m (lv, 19.2 mm).

Lucinoma myriamae Cosel, 2006



10.55. W of Ambrizete, Zaire prov., N-Angola, 7°18.4′S, 12°04.6′E, 360-367 m. **A**, holotype (rv, 51.2 mm). **B**, second morph (rv, 48.6 mm) (reproduced from Cosel 2006, fig. 18).

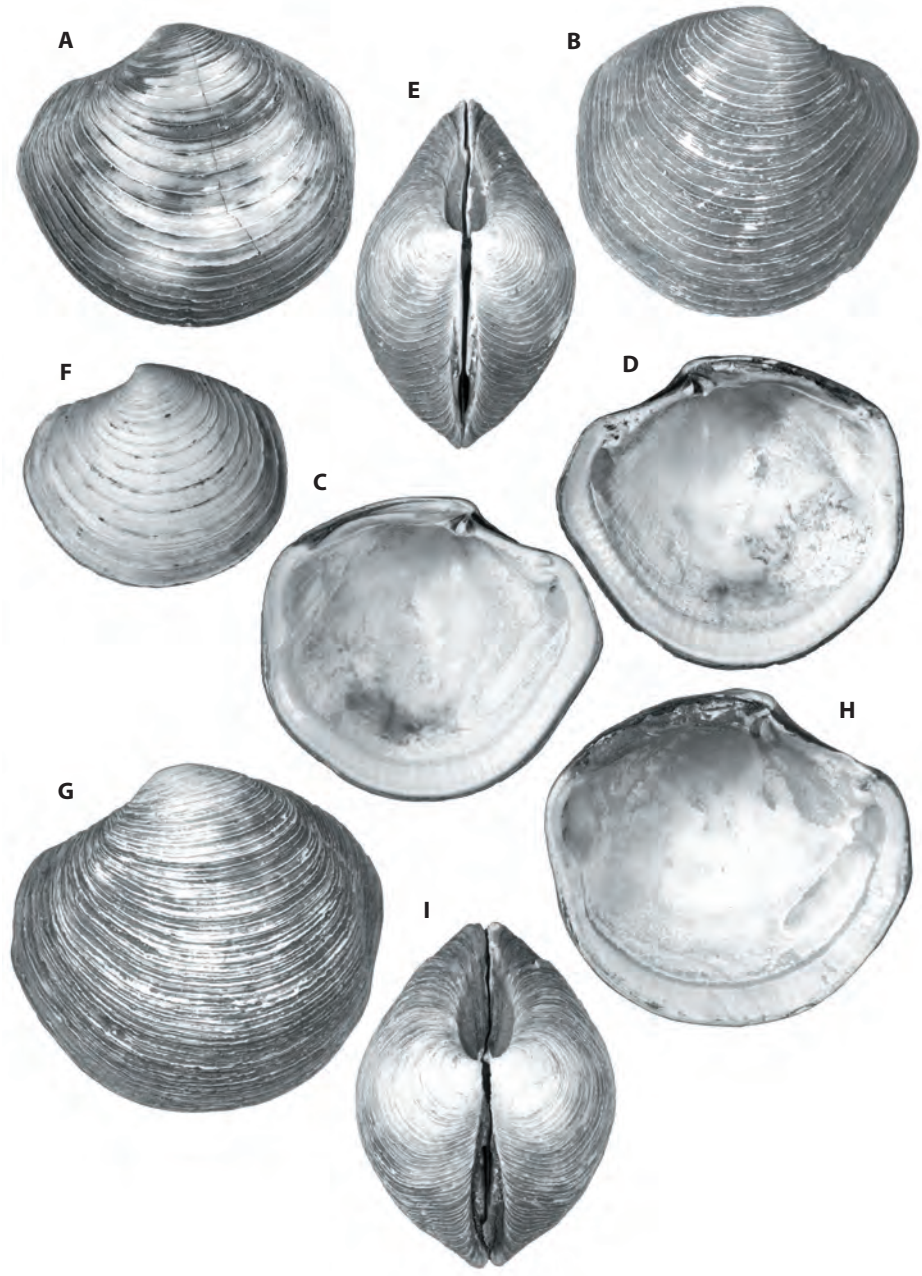
Shell to about 53 mm long, thick and solid, variable in outline, subcircular-triangular, rather inflated. Anterior part tapering, anterior margin narrowly and obliquely truncated, antero-ventral margin almost straight to straight. Posterior margin broadly rounded-truncated, with rounded corners. Beaks in front of the vertical midline. Surface with strong, rather regularly and widely spaced commarginal lamellae which on the earlier parts of the valves are finer and closer-set and which are obsolete on the anterior area. Interspaces with numerous, densely spaced, somewhat irregular commarginal cords. Posterior area by a rounded and indistinct posterior angle. Lunule rather long and broad, sunken, with rather thick layer of periostracum on it. Escutcheon long and very narrow, delimited by a sharp keel, ligament sunken. Hinge with two cardinals in each valve; diverging part of the anterior adductor scar long and moderately narrow. Inner margin smooth but ventral part of the inner surface, especially between mantle line and margin, with strong radial undulations. Valves whitish in life, periostracum rather thin and dirty brownish.



Distribution. Only known from off Nigeria and northern Angola (Angola shelf margin near Ambrizete).

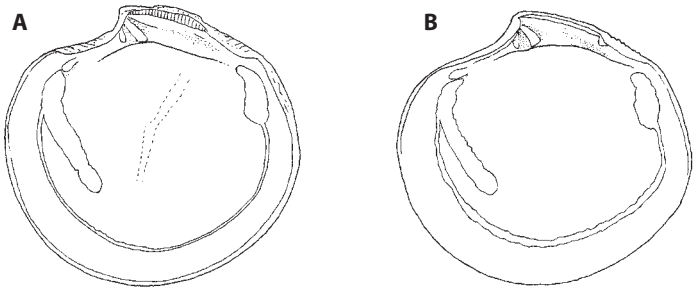
Biotope. In sticky mud in a deepwater coral zone with *Lophelia pertusa* (Linnaeus, 1758) at about 360 m, rare. Rather fresh specimens are known, but no live specimens were found so far.

Remarks. This is the largest *Lucinoma* in the eastern Atlantic. It is considerably variable in outline, tumidity and sculpture, however, between the different "morphs" all kinds of intergrades exist.



10.56. ***Lucinoma myriamae*** **Cosel, 2006. A**, S of Port Harcourt, Nigeria, 3°42.3'N, 7°47.6'E, 435 m (42.5 mm). **B-E**, W of Ambrizete, Zaire prov., N-Angola, 7°18.42'S, 12°04.60'E, 360-367 m (holotype, 51.2 mm). **F**, same locality (juvenile specimen, 20.5 mm). **G-I**, same locality, second morph (47.1 mm).

Lucinoma vestita (Dautzenberg & Fischer, 1906)

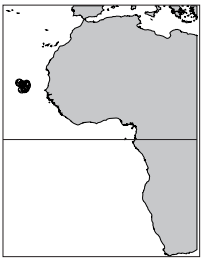


10.57. Off Maio, Cape Verde Islands, 15°14'N, 23°04.1'W, 628 m, muddy sand. **A**, rv (figured syntype MOM, 15.8 mm). **B**, rv (syntype MOM, 14.7 mm) (reproduced from Cosel 2006, fig. 15).

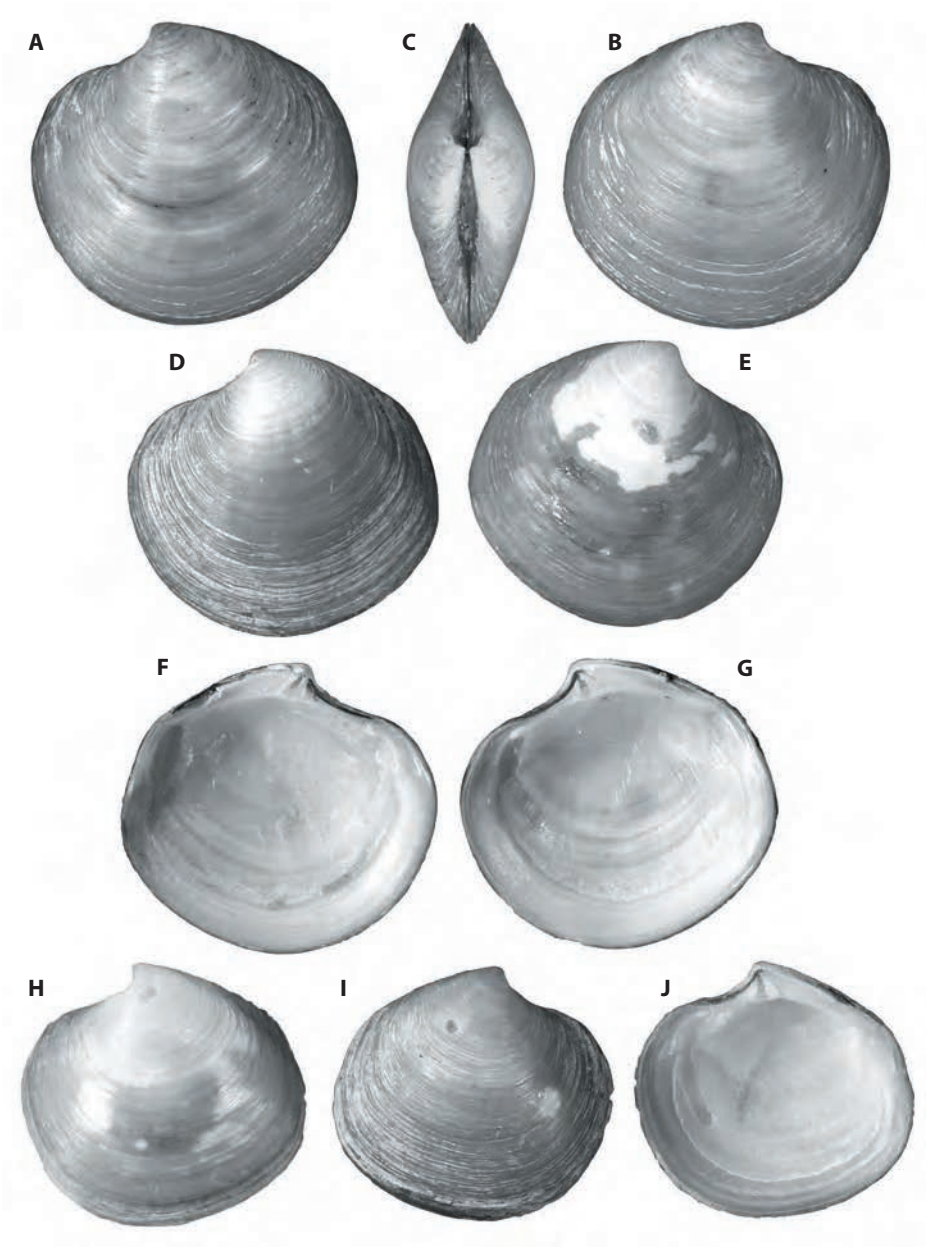
Shell up to 16 mm long, thick and solid with thin margin, subcircular, compressed. Anterior margin rounded, posterior margin obliquely truncated with rounded corners. Beaks slightly in front of the vertical midline. Surface with numerous, very fine, irregular growth lines, occasionally more or less eroded on the umbonal part of the valves; the vestiges of commarginal lamellae only visible in the region of the posterior angle, if at all. Posterior area delimited by gently rounded posterior angle, anterior angle absent. Lunule quite broad with thick layer of periostracum. Escutcheon long and very narrow, ligament deeply inset. Periostracum yellowish brown, on the earliest parts of the valve thinner to obsolete. Hinge with two cardinals in each valve. ventral extension of anterior adductor scar long and rather narrow. Inner margin smooth. Outside and inside entirely whitish.

Distribution. Only known from Cape Verde Islands.

Biotope. In muddy bottom, dredged at 628 m.

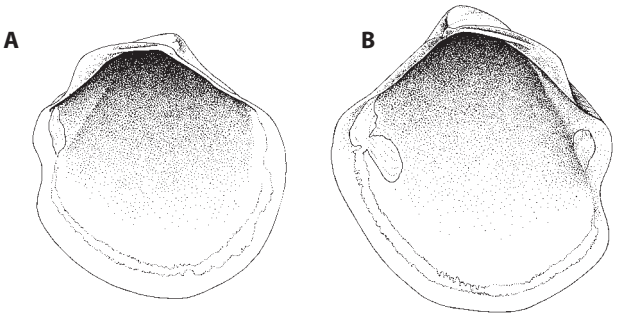


Remarks. This is one of the few tropical Eastern Atlantic representatives of typical deep-water Lucinidae, of which several species are found in areas with reducing sediments in the tropical Indo-Pacific (see Cosel & Bouchet 2008). A close but much larger species, *Lucinoma atalantae* Cosel, 2006 has been taken in the Cape Verde Basin at a depth of 2000-2100 m and is one of the deepest Lucinidae.



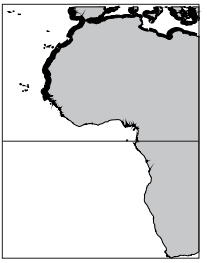
10.58. *Lucinoma vestita* (Dautzenberg & Fischer, 1906). **A**-**C**, Maio, Cape Verde Islands, 15°14'N, 23°94.1'W, 628 m (figured syntype MOM, 16.1 mm). **D**-**G**, same locality (syntype MOM, 15.0 mm). **H**-**J**, same locality (syntype MOM, 13.2 mm).

Thyasira biplicata (Philippi, 1836)



10.59. A, off Gorée, Senegal, 145-170 m (lv, 3.8 mm). B, West Sahara, 21°15'N, 17°41'W, 505 m (rv, 9.7 mm).

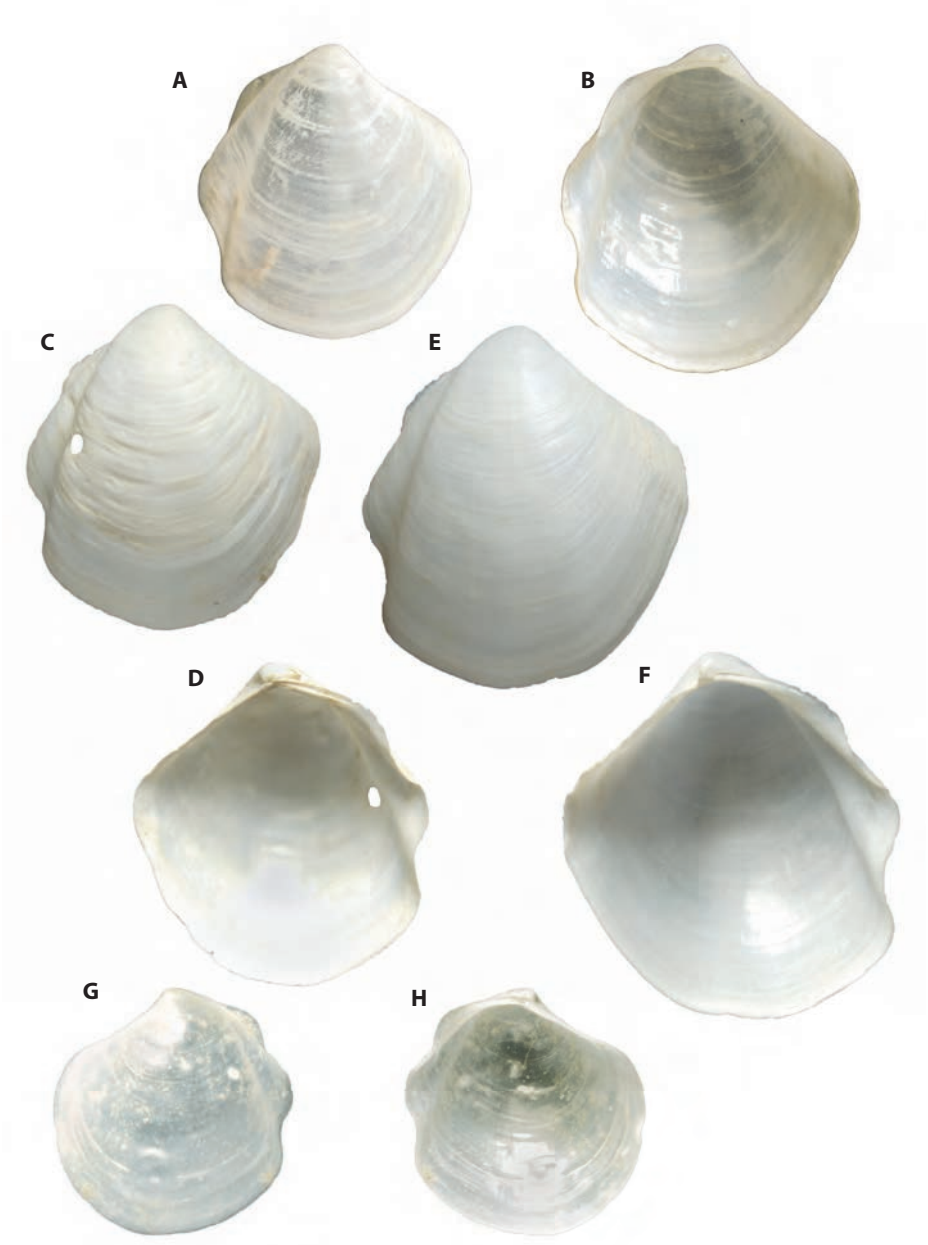
Shell up to 10 mm long, oblique, irregular-quadrangular, very slightly higher than long, thin but rather solid, inflated. Beaks just in front of the vertical midline. Antero-dorsal margin faintly concave, anterior margin narrowly rounded, ventral margin rounded in the middle. Postero-dorsal margin with two deep sinuosities. Surface with irregular commarginal growth lines and growth waves. Posterior area well defined by a pronounced sulcus, delimited by a prominent but rounded angle. Lunule long and rather broad but ill-defined, escutcheon long, well-marked with raised auricle supporting the ligament. Ligament narrow and long, deeply sunken, close to the margins. Periostracum very thin, translucent and nearly colourless, often persistent near the margins only. Inner margin smooth. Valves uniform white



Distribution. British Isles southward to Senegal (Dakar); throughout the Mediterranean; distribution otherwise uncertain due to confusion with *T. flexuosa* but possibly also in the Western Atlantic.

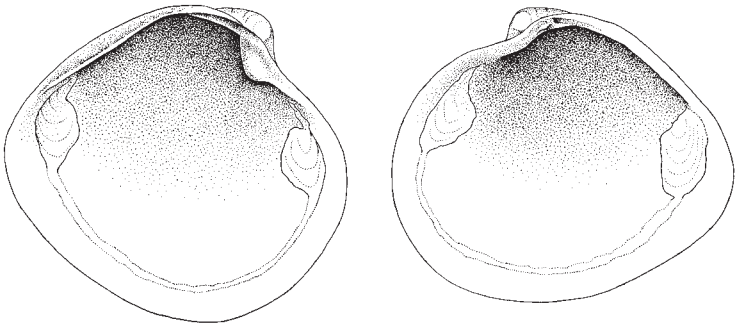
Biotope. In sandy mud, from about 100 m to 500 m, in West Africa found only from about 140 m downward, not common.

Remarks. This is a northern temperate species, originally described from the Mediterranean, which differs from *T. flexuosa* (Montagu, 1803), the type species of the genus, in having much more marked posterior folds. It is also found deeper than *T. flexuosa*, usually deeper than 100 m. *Thyasira polygona* (Jeffreys, 1864) may be the same species (see Killeen & Oliver 2002).



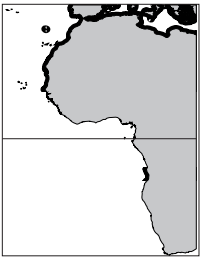
10.60. ***Thyasira biplicata*** **(Philippi, 1836). A**, Djibouti Banks, Alboran Sea, 36º21' N, 03º58' W, 350-365 m (rv, 5.9 mm). **B**, same locality (lv, 6.5 mm). **C-D**, West Sahara, 21°15'N, 17°41'W, 505 m (rv, 8.6 mm). **E-F**, same locality (rv, 9.7 mm). **G-H**, off Gorée, Senegal, 145-170 m (3.8 mm).

Mendicula ferruginosa (Forbes, 1844)



10.61. SW of Gorée, Senegal, 150-250 m (1 mm).

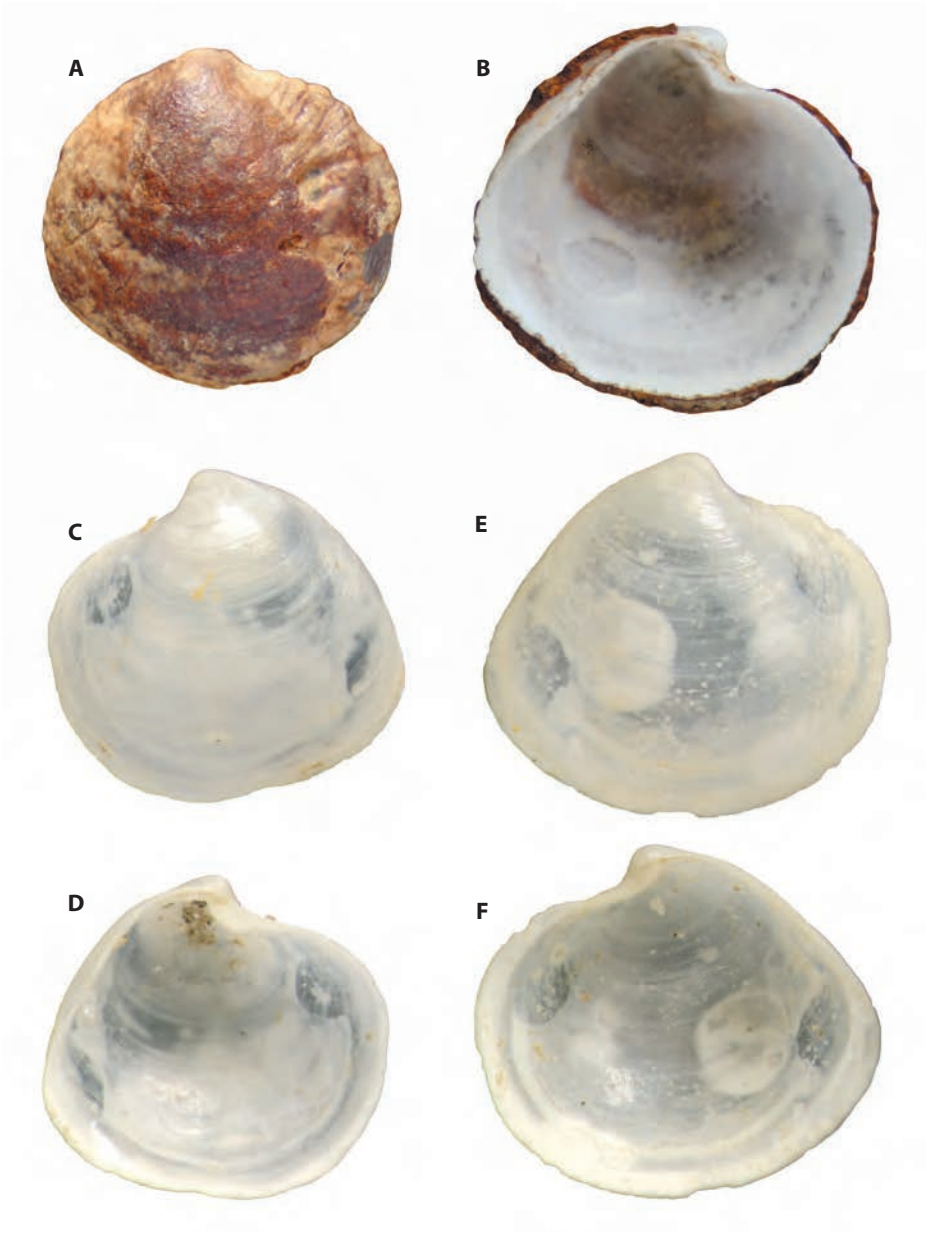
Shell very small, 1.5-3 mm long, almost circular to rounded-triangular, thin but solid, very inflated. Anterior margin broadly rounded, posterior part more or less tapering, posterior margin more or less narrowly rounded. Beaks more or less median or just in front of the vertical midline. Surface with fine irregular growth lines and occasional growth stages. Posterior area hardly visible, marked only by a very shallow broad depression. Lunule very small and short, escutcheon long and narrow. Periostracum thin, translucent and nearly colourless. Hinge line with a small tooth-like structure next to the lunule on the lv, otherwise toothless. Inner margin smooth. Valves entirely white.



Distribution. Norway (68°N) and British Isles southward to Senegal (Dakar); Madeira, throughout the Mediterranean. There is one record from northern Angola (off Luanda). The species occurs also in the northwestern Atlantic, and has been reported from the eastern Pacific and the north-western Pacific (Coan *et al.* 2000).

Biotope. In mud and sandy mud, from 20 to about 250 m (West African specimens found from 120 m downward), not common.

Remarks. Like other temperate species *M. ferruginea* exhibits a discontinuity in its distribution in the whole tropical zone of West Africa. This species has a rather complicated nomenclatural history. It was described as *Kellia ferruginosa* by Forbes (1844). In the same period, Morris (1843) placed *Mya ferruginosa* Montagu, 1808 (a galeommatoidean) in the genus *Kellia*, thus creating at the time a secondary homonym. Montagu's species, however, does not belong to *Kellia* and Forbes' name can be held as valid. *Axinus ferrugineus* Locard, 1886 and *Thyasira ferruginea* Winckworth, 1932 are synonyms (see also Coan *et al.* 2000).



10.62. ***Mendicula ferruginosa*** **(Forbes, 1844). A**, Djibouti Banks, Alboran sea, 36º21' N, 03º58' W, 350-365 m (rv, 2.0 mm, live taken specimen with the characteristic oxide crust covering completely the shell). **B**, same locality, inside of lv, 2.4 mm). **C-D**, SW of Gorée, Senegal, 150-250 m (2.1 mm). **E-F**, same locality (2.5 mm).

Superfamily **GALEOMMATOIDEA**

Family **GALEOMMATIDAE**
- Genus ***Galeomma*** Turton, 1825 – 3 species
- Genus ***Ephippodonta*** Tate, 1889 – 1 species

Family **LASAEIDAE**
- Genus ***Lasaea*** Brown, 1827 – 1 species
- Genus ***Scacchia*** Philippi, 1844 – 4 species
- Genus ***Kellia*** Turton, 1822 – 1 species
- Genus ***Bornia*** Philippi, 1836 – 2 species
- Genus ***Lepton*** Turton, 1822 – 1 species
- Genus ***Lozouetia*** Cosel, 1995 – 1 species
- Genus ***Melliteryx*** Iredale, 1924 – 1 species
- Genus ***Pseudopythina*** P. Fischer, 1878 – 4 species
- Genus ***Kurtiella*** Gofas & Salas, 2008 – 5 species (2 treated)
- Genus ***Planktomya*** Simroth, 1896 – 3 species (1 treated)

Family **BASTEROTIIDAE**
- Genus ***Basterotia*** Hörnes, 1859 – 1 species
- Genus ***Paramya*** Conrad, 1860 – 1 species

Superfamily Galeommatoidea

The Galeommatoidea, better known under their synonym Leptonoidea (or "Leptonacea"), include minute bivalves which live on several types of substrates and are often very specialized. They may at times be byssally attached, or crawl around with their long foot. Many are commensal with different invertebrates such as sponges, sea anemones, corals, annelids, echinoderms, crustaceans and other molluscs. They are attached to the host animals or live nearby, for example in boreholes and tubes, and benefit from the water current produced by the filter feeding, of from secretions of the animal with which they live. The entire pallial line distinguishes the Galeommatoidea from juvenile specimens of other, larger eulamellibranchiate bivalves such as tellinids. An unusual feature in this group is the water circulation within the mantle cavity: the exhalant opening is posterior like in most bivalves but the inhalant opening of the mantle is anterior.

Four families (Galeommatidae, Lasaeidae, Kelliidae, Montacutidae) are traditionnally recognized in this taxonomically extremely difficult group, and the Basterotiidae have been recently demonstrated to belong here (Goto *et al.* 2011, 2012; Oliver 2013). There is no agreement on the family-level arrangement of the genera, although some rather consistent support is found for the family Galeommatidae (Goto *et al.* 2011). Some authors regard only one or two families as really justified (e.g. Ponder 1998; Huber 2015). Herein, following Bieler *et al.* (2010), the families Galeommatidae and Lasaeidae are recognized. A pictorial overview and compilation of subfamilies was published by Huber (2015) who counts more than 153 genera and more than 620 species worldwide. However, a thorough exhaustive scientific revision taking into account soft parts and also habitats, commensalism as well as molecular work does not yet exist and would need the lifetime of more than one bivalve researcher. The total number of species amounts to 670 in the World Register of Marine Species, but the total species number should be estimated much higher, maybe double of this figure.

The West African Galeommatoidea are estimated at least to be more than 35-40 species, most of them undescribed. About 10-15 species of galeommatoidean bivalves known to us during the preparation of this book and most probably undescribed were omitted. They are small species, of which mostly shells or single valves are present in the studied samples but which can only be treated within a general revision of the group including the higher categories. As the definitive identification and supraspecific grouping of these and also of the European species can only be carried out in the frame of a broader revision, only a few, mostly larger or more spectacular species are treated herein as examples, and some of these are only tentatively placed in the respective genera. Moreover, in case of European species cited for West Africa (e.g. *Lepton squamosum, Kellia suborbicularis*), it is currently impossible to say if West African specimens really belong to the same species or if they are more or less similar but different (sibling) species.

Family GALEOMMATIDAE

Shells small (maximum length about 20 mm), equivalve, elongate-oval or irregular, usually gaping ventrally, thin and fragile, equilateral or inequilateral, with somewhat inflated to nearly flat valves. Surface smooth or with radial, commarginal or irregular sculpture. Hinge without any teeth or with very small tubercular cardinals and marginal, hardly visible laterals. Resilifer very small. Exterior of the valves generally covered by the mantle which bears numerous papillae or tentacles. - Galeommatids are free living or commensals of other invertebrates. Some species are able to crawl like a snail with their extensible foot, carrying the opened valves (open at an angle of 110° -130°) like the shell of a patelliform gastropod on their back. They are either hermaphrodites or the sexes are separate, with dwarf males. Larvae are often brooded in the pallial cavity. For more details on galeommatid life history, see Mikkelsen & Bieler (1989) and Gofas (1991). Four species are known from West Africa.

Genus *Galeomma* Turton, 1825. Shells small, elongate, irregularly oval to rectangular, somewhat distorted, somewhat inequilateral, ventrally gaping. Surface smooth or with fine radial striae. Hinge line almost straight, hinge with very small cardinals and a small resilifer.

Genus *Ephippodonta* Tate, 1889. Valves very small, semielliptical to almost semicircular, flat or nearly flat, with straight dorsal margin which is shorter or as long as the valves. Ventral margin well rounded. Surface with commarginal striae, radial threads or papillae. Hinge with very small cardinals and long laterals. The animals creep like snails, with the valves opened at an angle of about 110°.

Species treated (4)
Galeomma turtoni Turton, 1825; *Galeomma tripartita* Cosel, 1995; *Galeomma coalita* Gofas, 1991; *Ephippodonta gregaria* Gofas, 1991.

Family LASAEIDAE

Shells small to minute, equivalve, shape varying from nearly circular to oval, oblong or more or less triangular, thin and fragile to rather solid, very compressed to quite inflated, almost equilateral to inequilateral. Surface smooth or with radial or commarginal, occasionally with irregular sculpture. Margins smooth, valves closed or occasionally gaping. Hinge dentation variable, in general as for the superfamily, anterior lateral occasionally present. Ligament internal, in a small resilifer. There is occasionally also a small external ligament behind the beaks.

Genus *Lasaea* Brown, 1827. Shells very small, rounded, short-oval, inflated, equivalve, slightly inequilateral with beaks slightly posterior to the midline. Surface smooth, with growth lines only. Hinge with very small cardinals and a strong anterior and posterior lateral in both valves. Internal ligament, on a narrow resilifer.

Genus *Scacchia* Philippi, 1844. Shells small, high, oval-trigonal, somewhat compressed, inequilateral with beaks behind the vertical midline. Surface smooth. Hinge line with two (sometimes only one) small anterior cardinals, an anterior and posterior lateral in each valve and a narrow, sunken resilifer behind the beak. Some species such as *S. zorni* or *S. maura* have only one cardinal anterior to the beaks, and therefore were placed by Ardovini & Cossignani (2004) in the genus *Isorobitella* Keen, 1962 but this is not followed here. The latter has a quite different shape, more solid and subtrigonal, and conversely a transitional condition with a rudimentary second cardinal tooth has been seen (van der Linden 1996a, b; Huber 2015) in *S. zorni*.

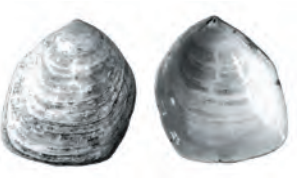
Genus *Kellia* Turton, 1822. Shells very small, rounded, inflated, equivalve, with beaks median. Surface smooth and glossy, with growth lines only. Hinge with small cardinals (two in lv, one in rv) and one elongate posterior lateral in both valves. Internal ligament, on a narrow resilifer.

Genus *Bornia* Philippi, 1836. Shells more or less triangular or suboval, compressed to very compressed, with umbos in the middle or slightly in front of the vertical midline. Hinge with well marked cardinals (two on lv, one on rv) and with posterior laterals. Internal ligament, small, situated beneath the umbo. Probably neither of the two West African species treated here are true *Bornia*, but current usage is conserved as no better placement is available without a thorough generic revision.

Genus *Lepton* Turton, 1822. Valves very small, rounded to subquadrangular, flat or nearly flat, with straight dorsal margin shorter than the valves. Ventral margin well rounded. Surface with commarginal striae, radial threads and a characteristic microsculpture of minute pits. Hinge with very small cardinals and long laterals. The animals creep like snails, the valves are opened at an angle of about 110°.

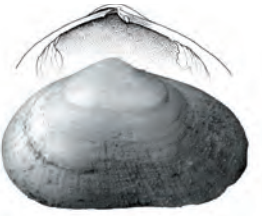
Genus *Lozouetia* Cosel, 1995. Shells small, inequilateral, more or less inequivalve and distorted, oblique-quadrate, slightly

higher than long, antero-ventrally and postero-ventrally somewhat angular, rather compressed. Surface with fine radial threads, partly bifurcating. Umbos low, behind the vertical midline. Hinge in each valve with one tubercle-like cardinal and strong anterior and posterior laterals. Ventral pallial line rather broad.



Genus *Melliteryx* Iredale, 1924. Shells small, transverse, somewhat triangular with more or less narrowly rounded anterior and posterior margin, rather compressed. Surface with commarginal growth lines and dense pits which are visible only under a lens and give the shells a punctate appearance. Umbos in the middle or just in front of the vertical midline. Hinge with one small tubercle-like cardinal and strong anterior and posterior laterals.

Genus *Pseudopythina* P. Fischer, 1878. Shells small, transverse, somewhat triangular to oval, with rounded anterior and posterior margin, more or less compressed. Surface smooth, with growth lines and coarser growth stages. Umbos behind the vertical midline, but still in front of the posterior third. Hinge with a strong anterior cardinal in each valve and a more or less weak anterior lateral in the right valve. Posterior laterals hardly visible.



Genus *Kurtiella* Gofas & Salas, 2008. Shells small, about 5-9 mm long, more or less elongate-oblong, equivalve, inequilateral, umbos situated within the posterior half. Margins smooth and tightly closing. Protoconch small, subcircular, convex. Surface with fine commarginal striae. Hinge in the left valve with one anterior and one posterior lateral, both indistinct, in the right valve with small but well visible laterals. Pallial line broad, entire.

Genus *Planktomya* Simroth, 1896. Shells small, about 6-10 mm long, more or less elongate-oblong, equivalve, inequilateral, umbos situated within the posterior half. Margins smooth and tightly closing. Protoconch unusually large, over 1 mm, not calcified and dissolved in the adult shells, leaving an internal mould characteristically cleft behind the beaks (this being the cast of an internal buttress of the larval shell). Surface with fine to rough commarginal striae. Hinge with one large cardinal tooth on each valve, and posterior to it a broad resilifer, open through the entire hinge plate beneath the umbo. Pallial line broad, entire, with a ragged inner edge.

Species treated (18)
Lasaea adansoni (Gmelin, 1791); *Scacchia oblonga* (Philippi, 1836); *Scacchia exserta* van der Linden, 1996; *Scacchia maura* van der Linden, 1996; *Scacchia zorni* van Aartsen & Fehr-de Wal, 1985; *Kellia suborbicularis* (Montagu, 1803); *Bornia geoffroyi* (Payraudeau, 1826); *Bornia balalaika* Cosel, 1995; *Lepton squamosum* (Montagu, 1803); *Lozouetia distorta* Cosel, 1995; *Melliteryx mactroides* (Hanley, 1857); *Pseudopythina nicklesi* (Rosso, 1975); *Pseudopythina solida* (Cosel, 1995); *Pseudopythina ndarensis* (Rosso, 1975); *Pseudopythina marchadi* (Nicklès, 1955); *Kurtiella africana* Gofas & Salas, 2016; *Kurtiella zabii* Gofas & Cosel, 2018; *Planktomya magna* Gofas, 2000.

Other species reported in the area (5)
Kurtiella bidentata (Montagu, 1803). Senegal and Angola (Gofas & Salas 2016)
Kurtiella piscatorum Gofas & Salas, 2016. N. Angola.
Kurtiella tertia Gofas & Salas, 2016. N. Angola.
Planktomya prima (Locard, 1899). Senegal and Guinea (Gofas 2000)
Planktomya vanderlindeni van Aartsen & Engl, 2001. Cape Verde Islands (Huber 2015).

Family BASTEROTIIDAE

Shells small, mostly rounded-oval, suboval or elongate, more or less inflated, with beaks more or less median or in front of the vertical midline. Surface smooth or granulated, chalky. Hinge with a single cardinal tooth in each valve. Ligament mostly external, with a small internal part. There are 41 species worldwide, two of them in West Africa. Goto *et al.* (2012) have shown that this family belongs to the Galeommatoidea.

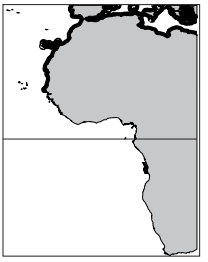
Genus *Basterotia* Hörnes, 1859. Shells small, short-suboval, with higher posterior part, very inflated, inequilateral with umbos well in front of the vertical midline and directed forward. Surface granulated. Posterior area separated by a rounded or sharp posterior angle. Hinge with one strong cardinal in each valve.

Genus *Paramya* Conrad, 1860. Shells very small, oblong, equivalve, subrectangular, posteriorly higher than anteriorly, rather thin, moderately inflated. Surface with more or less strong irregular growth lines and growth stages, otherwise pustulose or smooth. Posterior angle rounded and ill-defined. Hinge line with a small triangular chondrophore in each valve. No external ligament. Pallial sinus absent but posterior pallial line vertical; pallial line often more or less broken up. The species live close to the burrows of echiurid worms into which they protrude their siphons. The genus has been found so far in the Atlantic and in the Eastern Pacific. Goto *et al.* (2017) transferred this genus from Myoidea to family Basterotiidae.

Species treated (2)
Basterotia clancula Cosel, 1995; *Paramya africana* Cosel, 1995.

Galeomma turtoni Turton, 1825

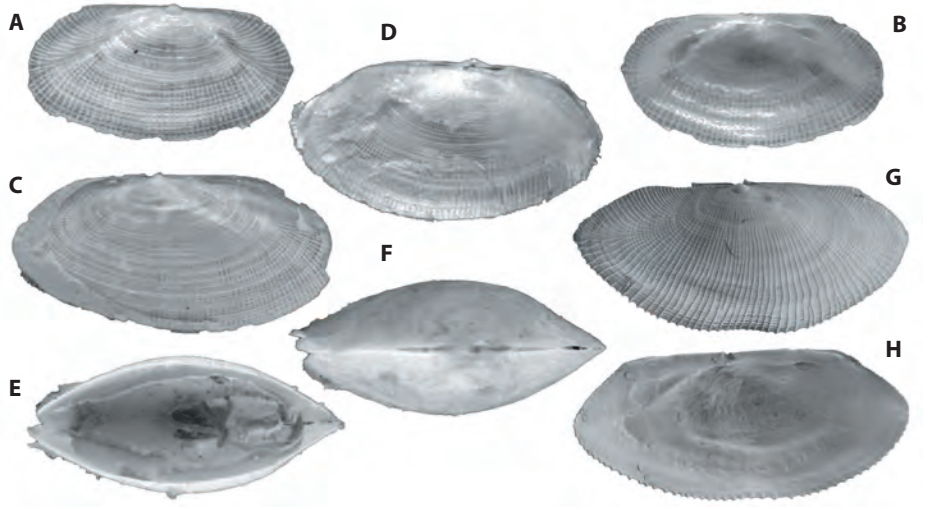
Shell up to 12 mm long (West African specimens not longer than 8 mm), somewhat variable in shape, oval-oblong, thin and fragile, with slightly inflated valves but widely gaping ventrally, weakly inequilateral with beaks just in front of the vertical midline. Dorsal margin straight, anterior and posterior margin more or less narrowly rounded to nearly angled, ventral margin convex and often somewhat irregular. Surface with fine but rather prominent, dense, slightly irregular radial riblets which bifurcate on the anterior and posterior slope and which are much narrower than the intervals. They are crossed by very fine commarginal threads, resulting in a cancellate pattern. Periostracum not seen. Hinge without visible teeth, resilifer small, triangular, just behind the beaks. Valves entirely white, although European specimens might have a slight yellowish hue.



Distribution. Southwestern Cornwall and Channel Islands southward to Senegal (Ouaran, Petite Côte) and the Canary Is. (Hernández *et al.* 2011); northern Angola (Cabo Ledo). There are no known records between these localities.

Biotope. On hard bottoms under rocks, from shallow water to about 40 m, byssally attached or free; rare in West Africa. Sexes are separate, dwarf males being attached to the female (Gofas 1991).

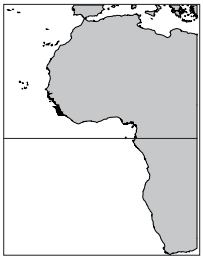
Remarks. This species is distinguished from *G. coalita* (see that entry) by its wide ventral gape and more elongate shell. A distribution discontinuity between Senegal or Guinea-Bissau and northern Angola is probable.



11.1. *Galeomma turtoni* Turton, 1825. **A**-**B**, Rabat, Lahlou, Atlantic Morocco, intertidal hard bottom (4.2 mm). **C**, Ouaran, Petite Côte, Sénégal, between stones (8.1 mm). **D**-**F**, same locality, 8.3 mm). **G**-**H**, Cabo Ledo, N-Angola, 10-40 m (SEM micrographs, 5.6 mm).

Galeomma tripartita Cosel, 1995

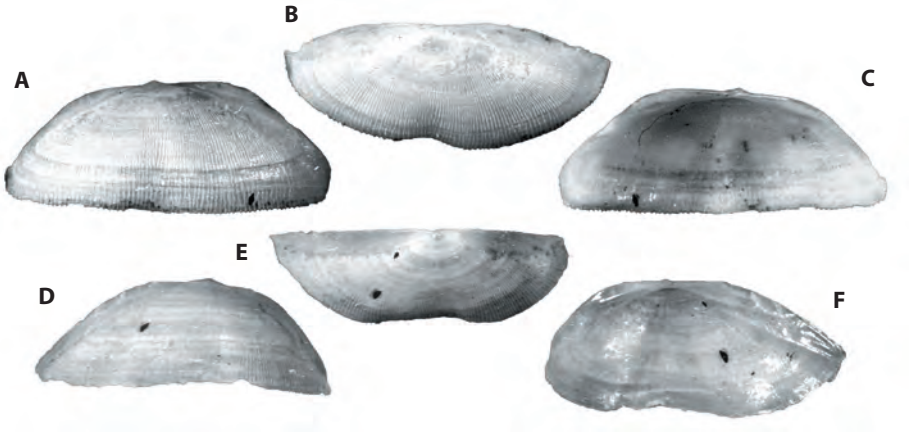
Shell up to 8.7 mm long, elongate, rather thin and fragile, very widely gaping ventrally, weakly inequilateral with beaks just in front of the vertical midline. Valves looking like a rather inflated near-circle from which the lower two thirds have been cut off. Dorsal margin straight immediately adjacent to the beaks, then curving gently downwards., antero- and postero-ventral corner sharp, ventral margin nearly straight. Surface with very fine but rather prominent, dense, slightly irregular radial riblets which are much narrower than the interspaces and which are not really bifurcating but which increase in number by occasional new riblets developing in the intervals. They are crossed by very fine commarginal threads, resulting in a cancellate pattern. A deep and rather sharply marked depression on each side goes from the umbonal region straight to the antero- and postero-ventral corner and divides the surface into three parts. In the depressions radial riblets are strongly bifurcating and much finer on the antero-and postero-dorsal area, being separated by the depressions from the rest of the shell. Periostracum not seen. Hinge without visible teeth, resilifer small, triangular, just behind the beaks. Valves entirely white.



Distribution. Only known from off the southern part of Guinea (9°06'N-9°30'N, Iles de Los), in 2-24 m.

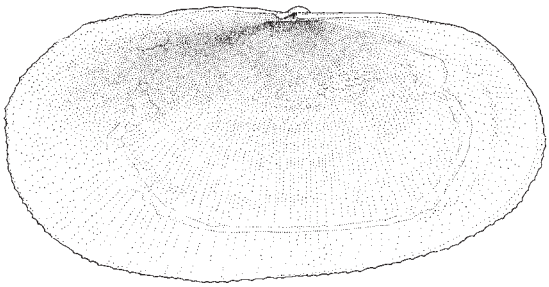
Biotope. Unknown but most probably like *G. turtoni* on hard substrate under rocks; rare. Nothing is known on its life history.

Remarks. This species is characterized by the extremely wide ventral gape which give the conjoined valves the aspect of a long inverted boat. It cannot be confounded with any other *Galeomma*. It is distinguished by its broadly-triangular valves with markedly sharp antero-and postero-ventral corners and the spectacular division of the surface into three parts.



11.2. *Galeomma tripartita* Cosel, 1995. **A-C**, W of Ile Tannah, Guinea, 9°12'N, 13°43.5'W, 24 m (holotype, 8.7 mm). **D-F**, W of Sierra Leone border, 9°06'N, 13°32'W, 16 m (paratype, 7.2 mm).

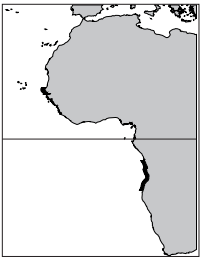
Galeomma coalita Gofas, 1991



11.3. Senegal-Baie de Gorée, south of "Tacoma" shipwreck, 25 m (lv, 9.2 mm).

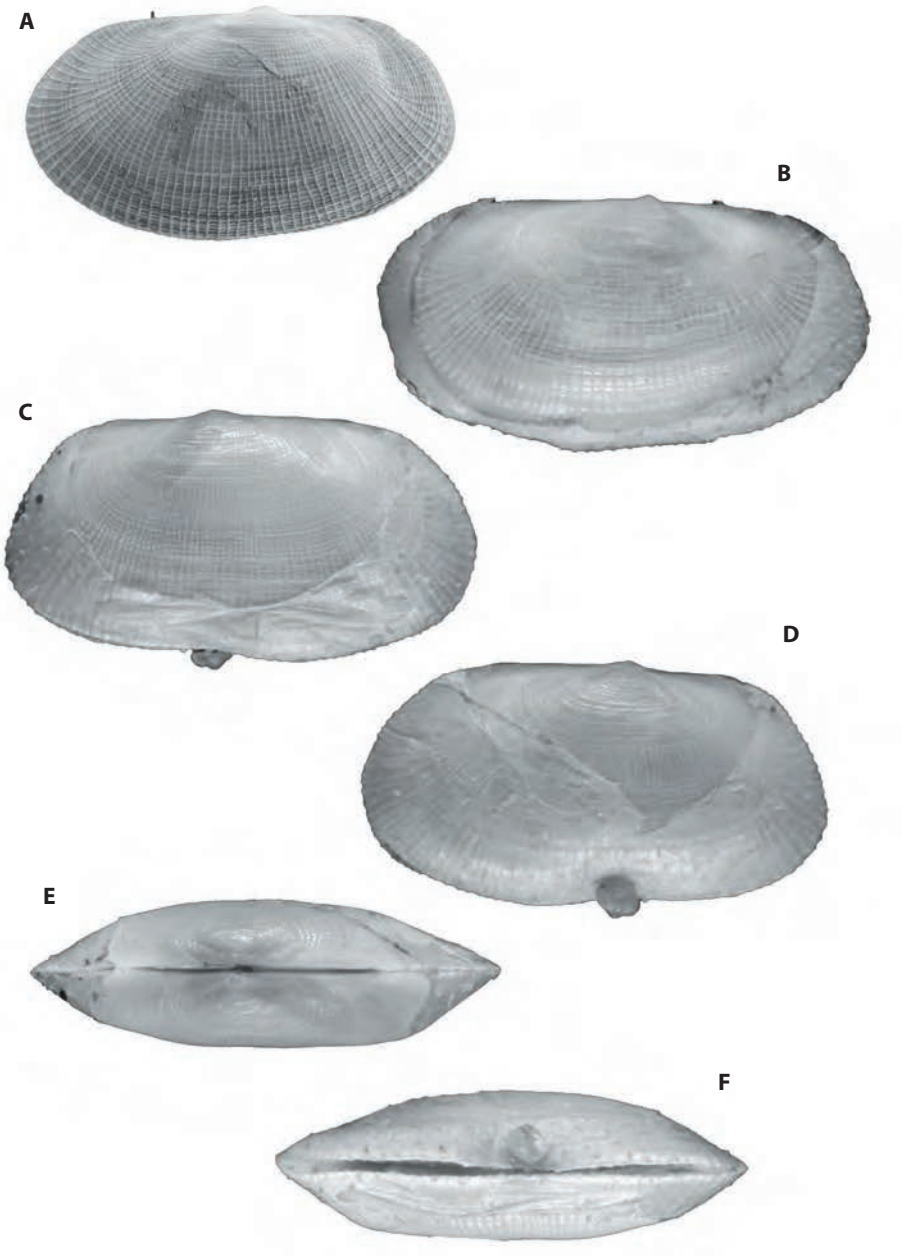
Shell up to 10 mm long, slightly variable in shape, oblong-oval, thin and fragile, somewhat inflated, weakly inequilateral with beaks in front of the vertical midline, ventrally only slightly gaping. Dorsal margin straight in the middle part, towards the ends slightly convex, anterior and posterior margin well rounded, ventral margin convex, under the umbos nearly straight. Surface with numerous thin and fine, irregular to very irregular radial riblets which are partly bifurcating, mostly on the anterior and posterior slope, and which have broader interspaces. They are crossed by fine, irregular commarginal threads, resulting in a cancellate sculpture. Periostracum not seen. Hinge with extremely fine, hardly discernible cardinals and a small, rather short, oblique resilifer. Valves entirely white.

Distribution. Senegal (Dakar); northern and southern Angola (Ambrizete, Zaïre province to São Nicolau, Namibe province).



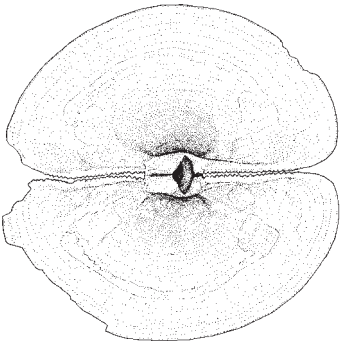
Biotope. In Angola found on rocky bottom from the intertidal zone to 2 m, under rocks, isolated, in Senegal only two empty valves in 17 and 25 m; rare. Dwarf males are attached to the adult female on the outside close to the ventral margin (Gofas 1991).

Remarks. This species is distinguished from *G. turtoni* by its more elliptical valves with rounded anterior and posterior margin and the much narrower ventral gaping. The lack of material from the coast between Senegal and northern Angola might be due to a disjunct distribution, but may also have its reason in the rarity of the species.



11.4. ***Galeomma coalita*** **Gofas, 1991. A**, Ambrizete, N-Angola, 6°57'S, 12°23'E, 45 m (SEM micrograph, 7.3 mm). **B**, São Nicolau, Namibe prov., S-Angola, intertidally (paratype, 10.0 mm). **C-F**, Caotinha, Benguela prov., S-Angola, 12°36'S, 13°15'E, under stone at low tide (holotype, 10.6 mm, lateral, dorsal and ventral view, note the dwarf male attached to the ventral margin of the female; photo Manuel Caballer/Recolnat).

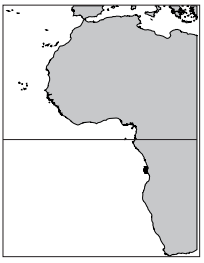
Ephippodonta gregaria Gofas, 1991



11.5. Cape Palmeirinhas, Angola (paratype, 5.0 mm).

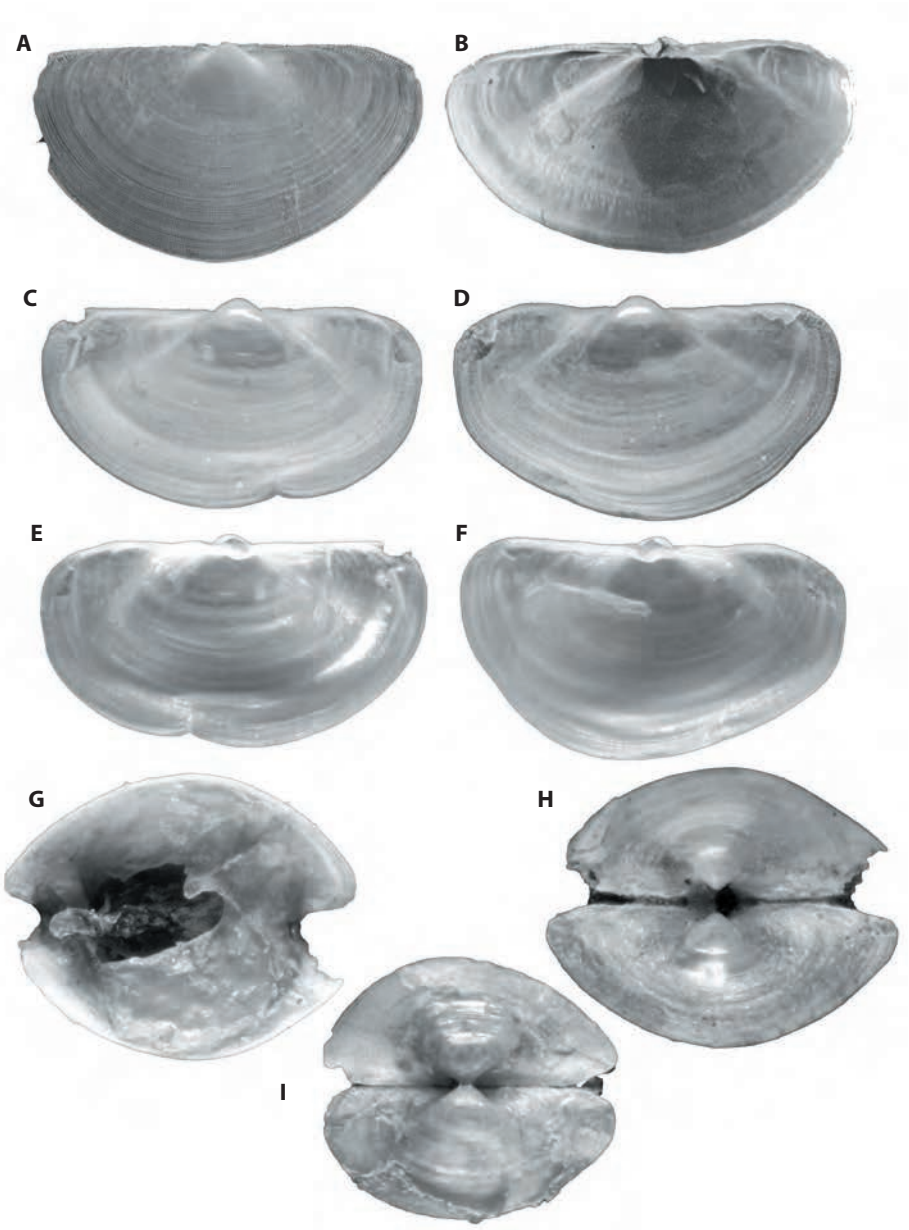
Shell very small, 4-6.5 mm long, variable in shape, oblong, with the outline of an irregular half-circle, thin and fragile, nearly equilateral, with compressed valves which gape horizontally forming a disk. Dorsal margin straight, anterior and posterior margin more or less narrowly rounded, ventral margin semicircular. Surface with fine, irregular growth lines and on the anterior and posterior part with tiny nodules arranged in radial lines and only visible under a lens (x 10-30). Periostracum absent, the shell being covered by the mantle of the live animal. Hinge with two symmetrically opposite and non-interlocking tooth-like structures, one in front of and one behind the internal ligament. Dorsal margin on both sides of the hinge finely serrated. Because of the permanent horizontal gape the resilifers are bent dorsally towards the beaks. Valves entirely white.

Distribution. Northern Angola, only known from the type locality (Palmeirinhas, Luanda prov.).



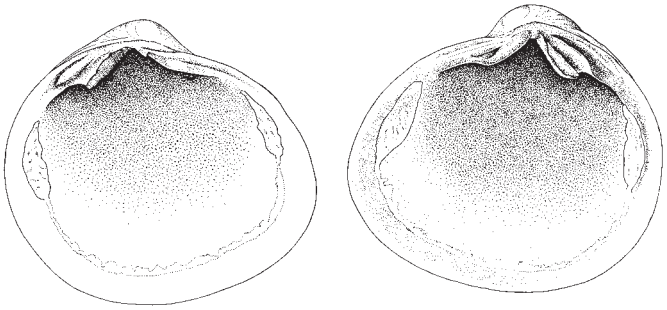
Biotope. The known specimens were found in cavities and crevices under large living oysters (*Striostrea denticulata*) in about 2-3 m, flocking together in large numbers (10-100). As the shell is completely internal the rock surface with the *Ephippodonta* on it can give the rock the appearance of being covered with a fleshy layer.

Remarks. The genus *Ephippodonta* was hitherto known only from the Indo-Pacific and also the southern part of Australia. This is the first record of the genus from the Atlantic. The closest species is *Ephippodonta lunata* (Tate, 1887) from southern Australia. The species is hermaphroditic (Gofas 1991).



11.6. *Ephippodonta gregaria* Gofas, 1991. **A**-**B**, N of Buraco inlet, near Palmeirinhas, Luanda prov., N-Angola, 9°95′S, 12°58′E, 1-2 m (SEM micrograph, holotype, 6.9 mm). **C**-**F**, same locality (6.2 mm). **G**-**H**, same locality (6.0 mm). **I**, same locality (4.0 mm).

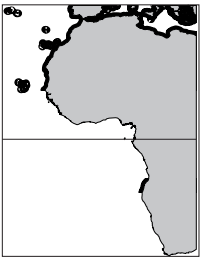
Lasaea adansoni (Gmelin, 1791)



11.7. Baia de Santa Maria, Benguela, S-Angola, platform with vermetids, low tide, two different specimens (lv, 5.2 mm; rv, 5 mm).

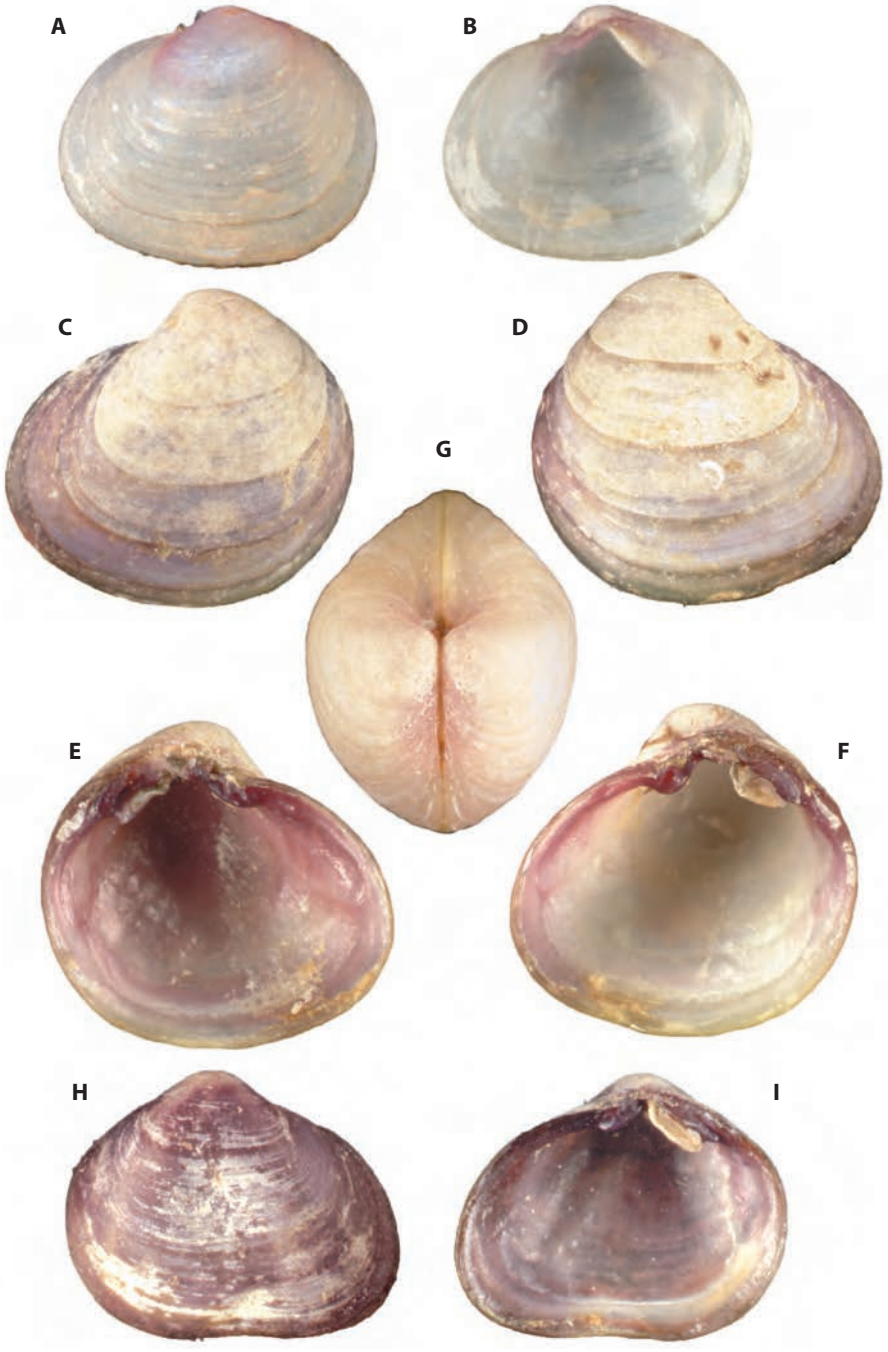
Shell up to 4 mm long (specimens from southern Angola up to 6 mm), quite variable in shape, tumidity and size, short-oval, thin but rather solid, inflated to very inflated. Beaks more or less median or just behind the vertical midline. Posterior part higher than anterior part. Surface smooth, with fine, commarginal growth lines and coarser growth stages. Periostracum thin, colourless to pale greenish, somewhat glossy, usually persistent near the margins only. Hinge with rather strong laterals and a long internal ligament. Outside whitish to cream, often tinged with pinkish to purple, especially on both sides of the umbos; occasional specimens can be entirely pink. Inside whitish, often with pinkish, purplish or dark wine red to reddish-brown. Hinge line nearly always pink.

Distribution. Norway (59 to 63°N) southward to Mauritania (Cap Timiris), Senegal (Dakar), Guinea (1 fresh valve from Iles de Los); southern Angola (Baia de Santa Maria, Benguela, to Moçâmedes); Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean. Also reported in the Western Atlantic (Ó Foighil & Jozefowicz 1999).



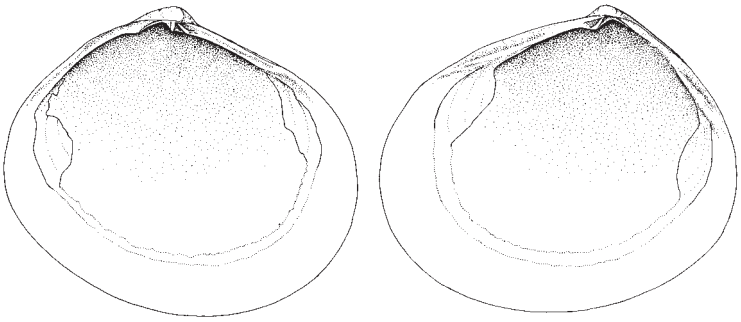
Biotope. On rocky shores byssally attached to hard substrates such as barnacles, bases of algae, also in the byssus of mytilids or in crevices, in the intertidal zone, locally common to abundant. In Angola it was found on rock platforms among vermetids.

Remarks. This species seems to have a pronounced distribution gap in the tropical part of West Africa and is restricted to the northern and southern upwelling zones. Angolan specimens are larger and in average lighter coloured but otherwise not distinguishable from the northern population. Segers *et al.* (2009) and Huber (2015) treated *L. rubra* (Montagu, 1803) and *L. adansoni* as separate species but this is not supported. Existing studies (Ó Foighil & Jozefowicz 1999) involving DNA analysis indicate a complex setting with possibly more cryptic species, and both taxa remain here united under the older name until a clear delimitation of taxa becomes available. In any case name *adansoni* would remain appropriate for West African populations. This is "Le Poron" of Adanson.



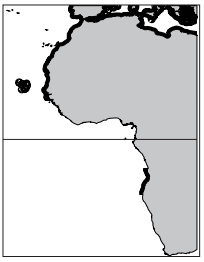
11.8. *Lasaea adansoni* (Gmelin, 1791). **A-B,** Cap Blanc, Mauritania, high tide on surf-beaten rocks (3.7 mm). **C-G,** Baia de Santa Maria, S-Benguela prov., S-Angola, intertidally among Vermetidae (5.0 mm). **H-I,** same locality (4.0 mm).

Scacchia oblonga (Philippi, 1836)



11.9. Corimba, Luanda, N-Angola, 10-20 m (8.0 mm).

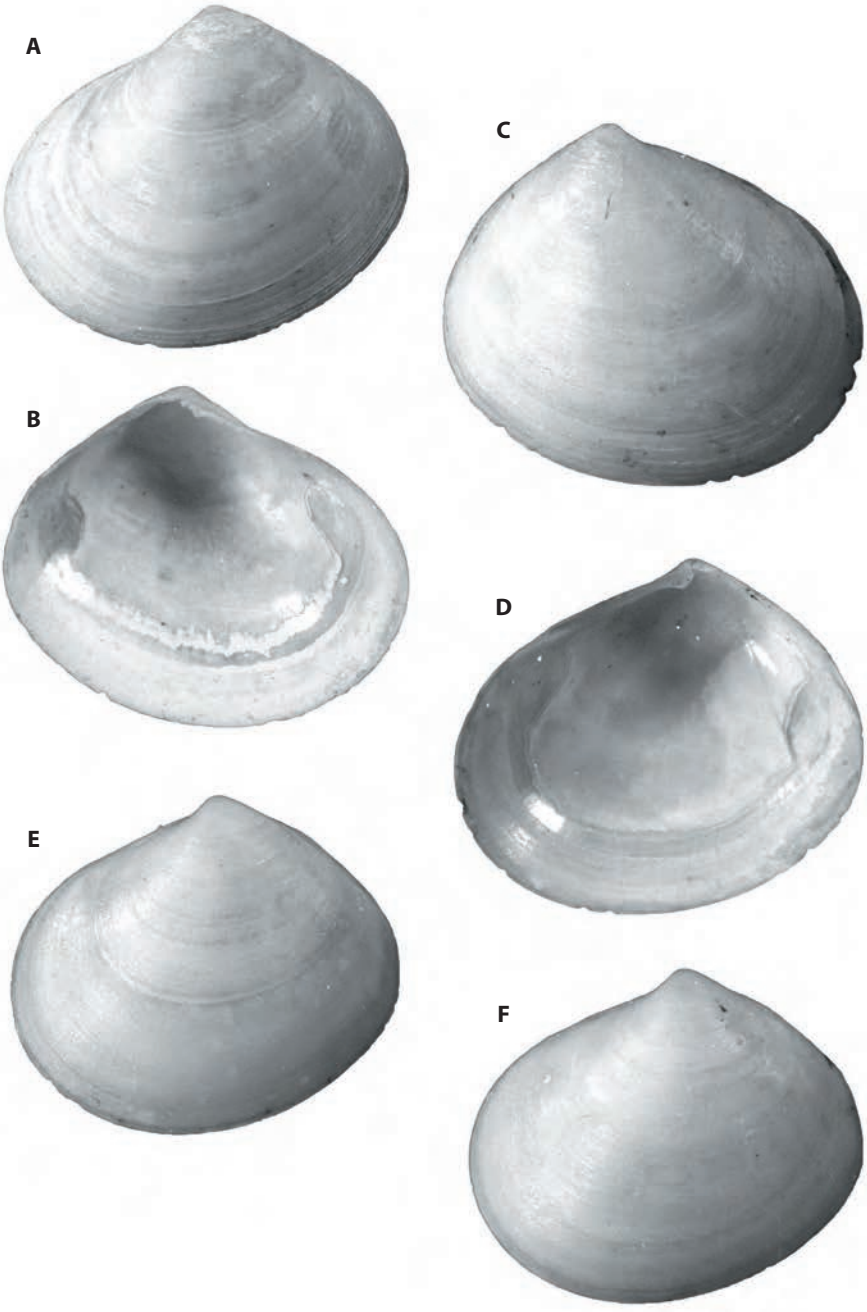
Shell up to 8 mm long, quite variable in size but varying little in outline, short-oval-trigonal with well rounded anterior and ventral margin and somewhat rounded-truncated posterior margin, thin, rather inflated. Umbos well behind the vertical midline. Antero- and postero-dorsal margin with a slight flexure reflecting the lateral hinge teeth. Surface smooth, with irregular growth lines and coarser growth stages. Periostracum thin, light grey to pale brownish or nearly colourless, slightly wrinkly near the anterior and posterior margin. Hinge line of the right valve with a minute to obsolete upper and a very small but well developed lower cardinal, both directed anteriorly. Left valve with two small but well developed cardinals, also anterior to the resilifer. Valves entirely white.



Distribution. Mediterranean southward to Casamance (12°47'N); northern and southern Angola (Luanda to Baia dos Tigres); Madeira (Segers *et al.* 2009), Cape Verde Islands (no details, *fide* van der Linden 1996a). Also found in the Quaternary of Port Gentil, Gabon.

Biotope. In fine sand from 5 to about 45 m, locally common.

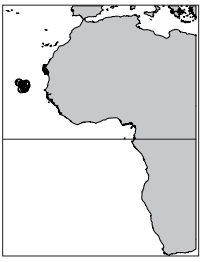
Remarks. This species seems to be restricted to the temperate zones; no record is known from the part of the coast with entirely tropical conditions, a wide distribution discontinuity is hence very probable. This is *Tellina elliptica* Scacchi, 1833 (*non* T. Brown, 1827, *nec* Lamarck, 1818, *nec* Brocchi, 1814) and the type species of the genus *Scacchia*.



11.10. *Scacchia oblonga* (Philippi, 1836). A-B, Corimba, Luanda prov., N-Angola, 10-20 m (9.4 mm). C-D, same locality (9.7 mm). E, same locality (7.6 mm). F, same locality (8.0 mm).

Scacchia exserta van der Linden, 1996

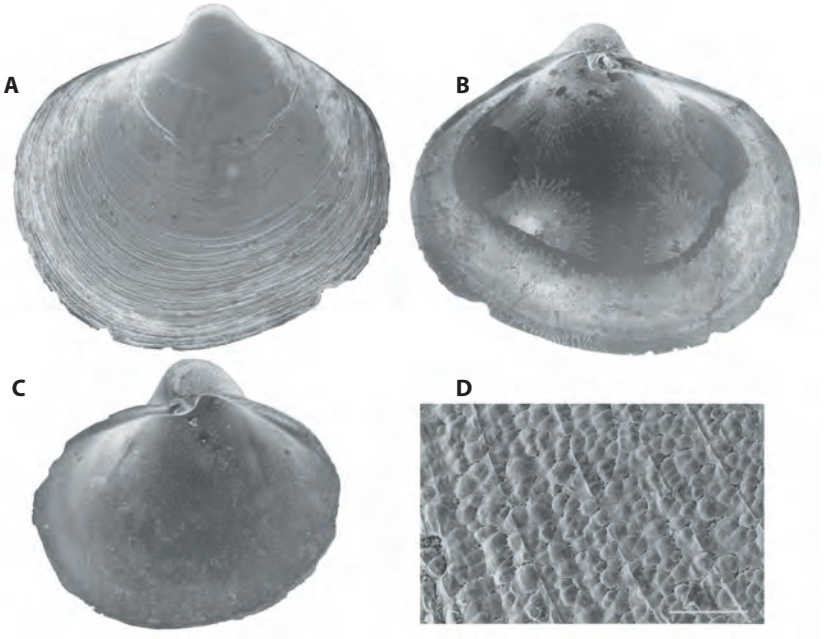
Shell small, up to 5.4 mm long, somewhat variable in outline, equivalve, very slightly inequilateral, short-oval-trigonal with well rounded anterior and ventral margin and somewhat truncated posterior margin, thin, inflated. Umbos markedly prominent, touching the vertical midline but mostly behind it. Antero- and postero-dorsal margin almost straight. Surface finely granulated (visible only under a lens) and therefore dull, with faint, irregular growth lines and a few coarser growth stages, umbos smooth. Periostracum not seen. Hinge line of the right valve with a minute to obsolete upper cardinal and a small lower anterior cardinal, laterals obsolete. Left valve with two small diverging cardinals, also anterior to the resilifer. Pallial line broad, in a rather large distance from the margin. Valves entirely white.



Distribution. Mauritania (Cap Blanc area, 20°00-19°04'N); Cape Verde Islands (Ilha do Sal, Boavista, Maio).

Biotope. In soft bottom, 30-90 m, rare.

Remarks. This species is easily distinguished from *S. oblonga* by its globose, protruding umbo and the unusually inwards placed pallial line.

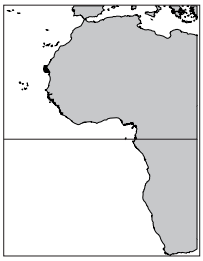


11.11. *Scacchia exserta* van der Linden, 1996 (SEM micrographs by J. Goud (RMNH), courtesy J. van der Linden). **A**-**B**, W of Boavista, Cape Verde Islands, 16°10'N, 22°59'W, 46 m (holotype RMNH 57195, 5.1 mm), Cancap Expedition 1986, sta. 7.066. **C**, same locality (paratype RMNH 57196, 3.2 mm). **D**, microsculpture (granulation) of the surface, scale: 0.1 mm.

Scacchia maura van der Linden, 1996

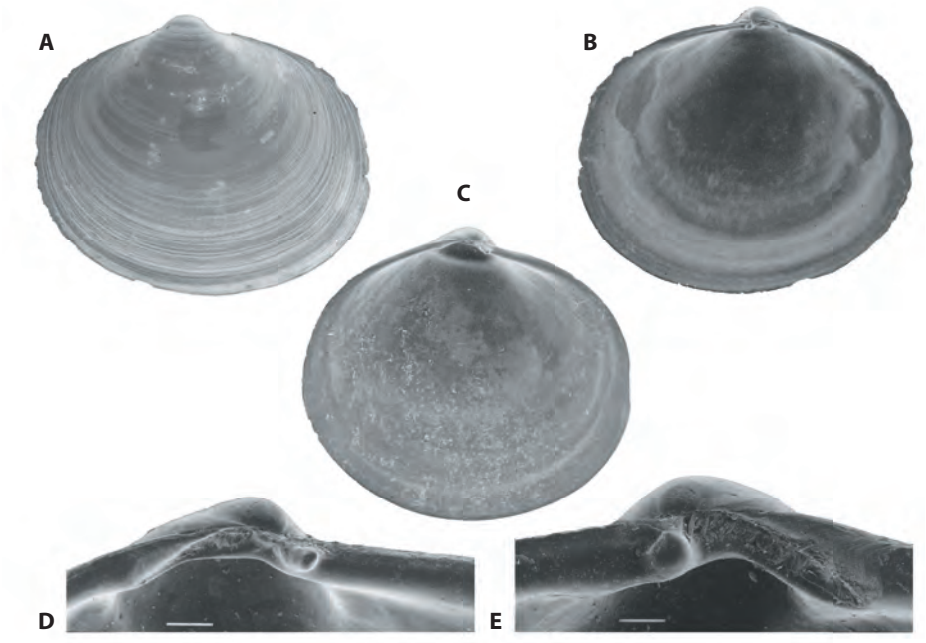
Shell very small, 1.8-4.6 mm long, short-oval, nearly equilateral with well rounded anterior and posterior margin and gently convex ventral margin, thin and rather fragile, somewhat inflated. Umbos small, situated in the middle. Surface glossy, with fine, irregular growth lines and with extremely fine, divaricating radial lines, which sometimes are only present near the anterior and posterior margin, only visible under a lens (x 30-40). Periostracum not seen. Hinge line with one very small anterior cardinal in both valves; no laterals. Resilifer rather small, on an inclined socket, hardly visible in a lateral inside view. Ventral pallial line uninterrupted. Valves yellowish white, semitransparent.

Distribution. Only known from Mauritania (Cap Blanc region, 20°47'-19°33'N).



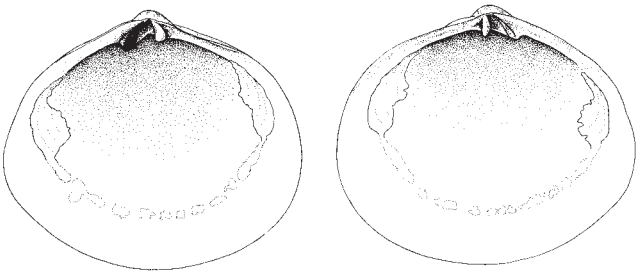
Biotope. Most probably soft bottom, 15-64 m, not common.

Remarks. This species is close to *S. zorni* and shares with it the fine divaricating lines but is smaller and has a more delicate hinge line and smaller teeth; the ventral pallial line is continuous.



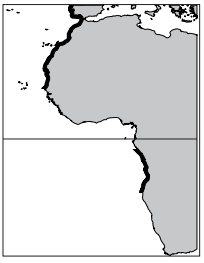
11.12. *Scacchia maura* van der Linden, 1996 (SEM micrographs by J. Goud, RMNH, courtesy J. van der Linden). **A**-**B**, Banc d'Arguin, Mauritania, 41 m (paratype RMNH 57188, 4.3 mm), R/V *Tyro*, MAU II Expedition sta. 078, 1988. **C**, same locality (paratype RMNH 57188, 2.8 mm). **D**-**E**, hinges rv and lv, scale: 0.1 mm, same valves as above.

Scacchia zorni van Aartsen & Fehr-de Wal, 1985



11.13. S of M'Bao, Senegal, 30 m (5.4 mm).

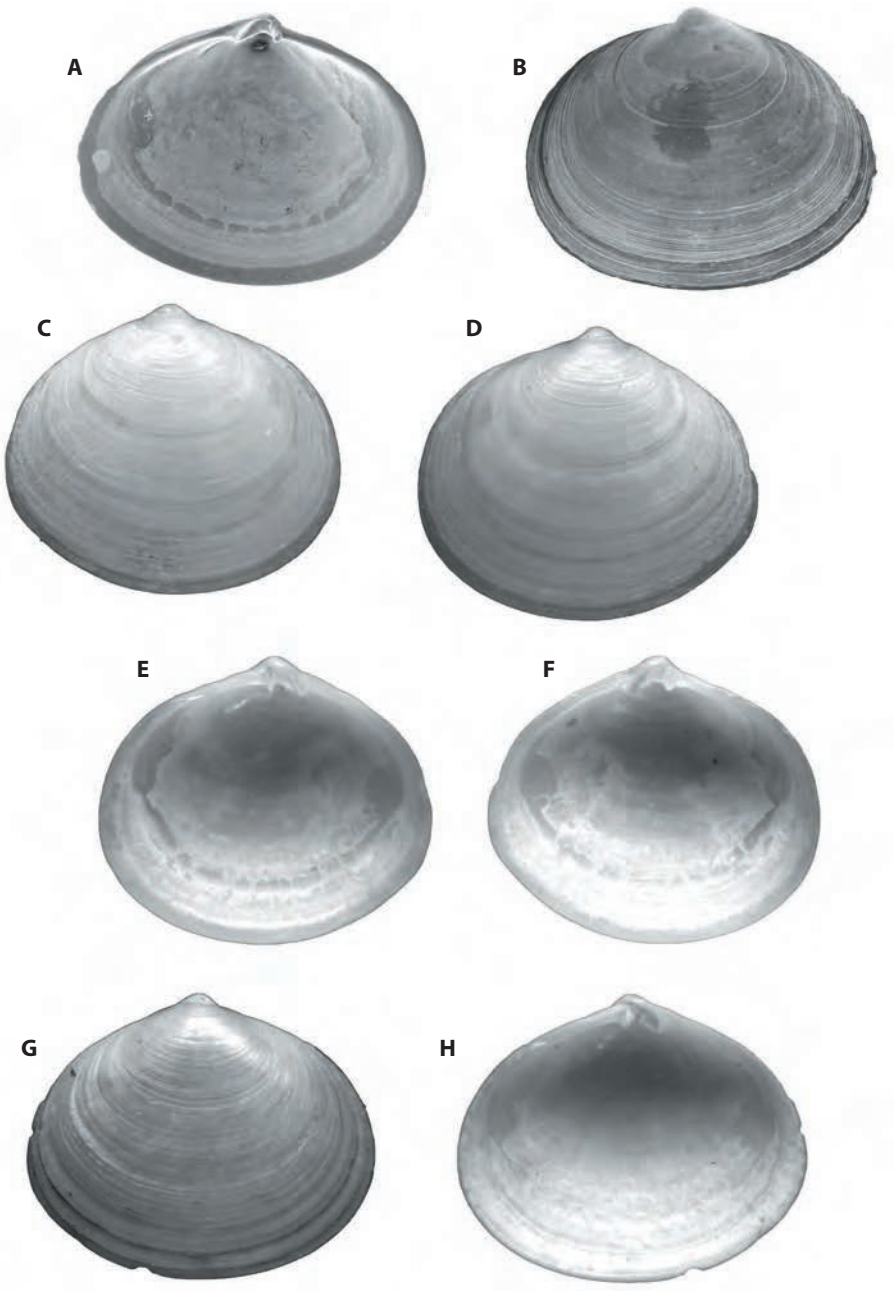
Shell very small, up to 11 mm long, slightly variable in outline, oval, equilateral with well rounded anterior and posterior margin and gently convex ventral margin, thin and rather fragile, somewhat inflated. Umbos situated in the middle. Surface with fine, irregular growth lines and occasional coarser growth stages and with extremely fine, close-set, divaricating radial lines near the anterior and posterior margin, visible only under a lens (x 20-40). Periostracum not seen in the examined specimens. Hinge line with one rather strong, vertical anterior cardinal in both valves; no laterals. Resilifer rather large, in an inclined socket. Ventral pallial line typically interrupted. Valves entirely white.



Distribution. Portugal (Algarve) to Senegal (Dakar); Congo (Pointe-Noire) to northern and southern Angola (Baia dos Tigres).

Biotope. Most probably muddy sand, down to 15 m, not common.

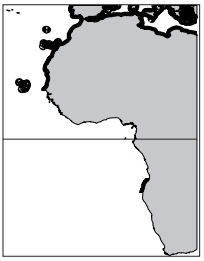
Remarks. This and the preceding species were originally described in the genus *Scacchia* in the original description, however, they differ in several characters from *Scacchia* as established by Philippi, especially in the lack of the second cardinal and the laterals, as well as the equilateral shell and the peculiar external microsculpture, a fact which was admitted by the describers of the species. It was placed in the genus *Isorobitella* Keen, 1962 by Ardovini & Cossignani (2004) but this is not more appropriate and the original combination is here conserved (see remarks under the genus heading). The species is easily distinguished from other "look-alike" Galeommatoidea by its interrupted ventral pallial line (For details, see also Rodriguez-Babio *et al.* 1991). Like the preceding species, *S. zorni* is not present in the tropical zone proper and shows a discontinuous distribution.



11.14. ***Scacchia zorni*** **van Aartsen & Fehr-de-Wal, 1985. A-B** (SEM micrograph by J. Goud, RMNH, courtesy J. van der Linden): Mauritania, 18°50'N, 16°21'W, 21 m, RMNH (5.0 mm). **C-F**, S of M'Bao, Senegal, 30 m (5.4 mm). **G-H**, same locality (6.0 mm).

Kellia suborbicularis (Montagu, 1803)

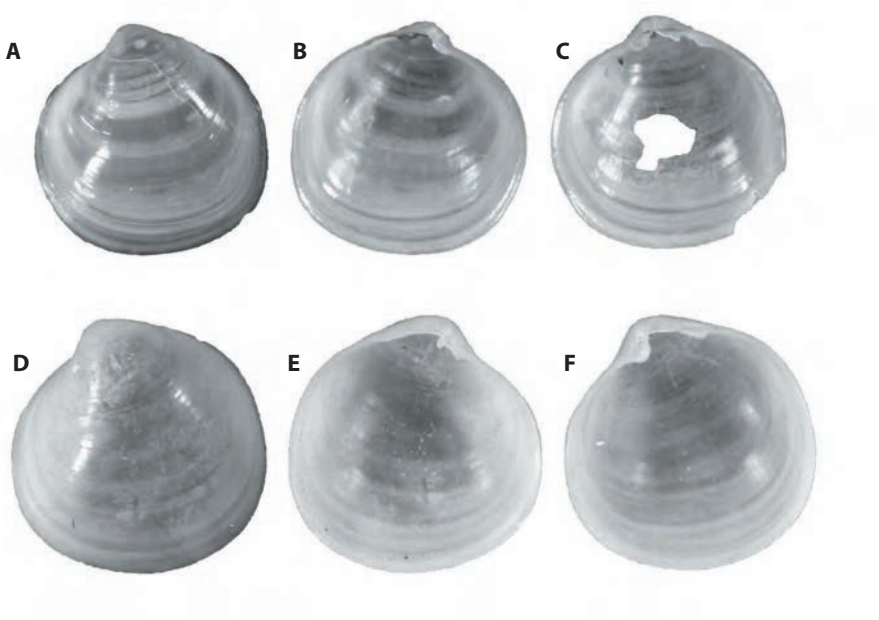
Shell very small, 5-6 mm long, very convex, globose, subcircular, only slightly longer than high, equivalve, little variable, very thin and translucent. Surface smooth and glossy, with fine but well visible growth lines and occasionally some coarser growth stages. Umbos rounded and rather prominent, situated almost in the middle. Hinge with two cardinals in the left valve and a stronger one in the right valve. Each valve with a large posterior lateral. Internal ligament fitting into a large pit posterior of the cardinals. Muscle impressions often hardly visible. Valves entirely white.



Distribution. Atlantic coast from the British Isles southward to Senegal (Cap de Naze); Canary Is., Azores and Cape Verde Islands; Angola (Gofas *et al.* [1985]); throughout the Mediterranean.

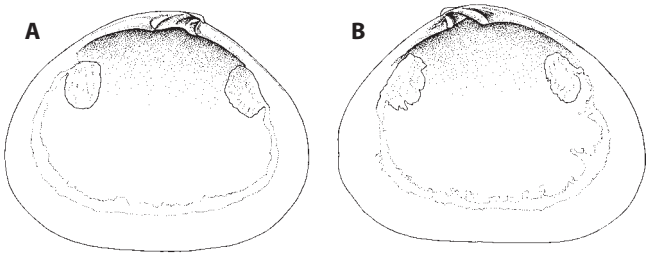
Biotope. On hard bottom and mixed bottom with shells, shell grit and cold water corals, also in crevices and empty boreholes of *Hiatella* and other boring bivalves, from the low water line to 300 m and deeper, rare in West Africa. Also reported from the Western Atlantic.

Remarks. This species has received several synonyms, among the most frequent are *Bornia inflata* Philippi, 1836 and *Erycina pisum* Scacchi, 1836.



11.15. *Kellia suborbicularis* (Montagu, 1803). A-C, SW Sta Encarnação, Fogo, Cape Verde Islands, 20-25 m (5.3 mm). D-F, Cap de Naze, Senegal, 50 m (7.4 mm).

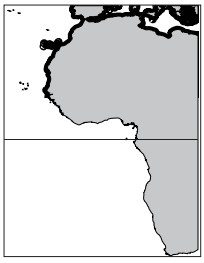
Bornia geoffroyi (Payraudeau, 1826)



11.16. **A**, lv, Mazagan (now El Jadida), Atlantic Morocco. **B**, rv, Dakar region, 129-150 m (both 13.4 mm).

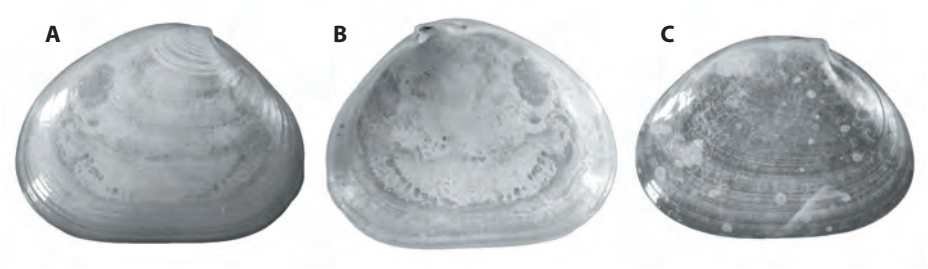
Shell up to 14 mm long, varying little in outline, somewhat triangular-oval with broadly rounded anterior and posterior margin and straight or nearly straight ventral margin, thin and fragile, extremely compressed. Antero-dorsal margin weakly convex to almost straight, postero-dorsal margin curved behind the beak, then only slightly convex to straight. Highest point of the valve frequently behind the very small and forward-directed umbos which are situated in front of the vertical midline. Surface smooth and glossy, with fine irregular growth lines only. Periostracum thin and colourless, not seem in most examined specimens. Hinge line with one anterior and one posterior cardinal and one posterior lateral in the right valve and two small anterior and one large posterior cardinals in the left valve. Interior with faint irregular radial striae. Adductor scars small, pallial line often disintegrated into close-set scars or points. Valves entirely white.

Distribution. Inner Bay of Biscay (Hendaye) southward to Senegal (Casamance, 12°46'N), Canary Is. (Hernández *et al.* 2011); throughout the Mediterranean.



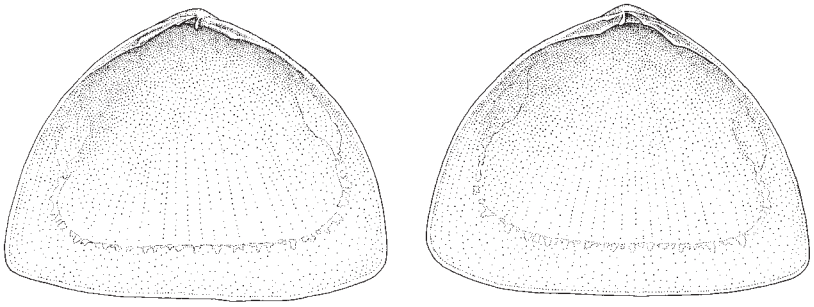
Biotope. Unknown, most probably fine sand, from 10 to 150 m, uncommon in Europe, rare in West Africa.

Remarks. This species, which is easily distinguished by its very compressed shell with tiny, forward-bent beaks, has been cited under the genera *Kellia*, *Pseudopythina*, *Erycina, Semeloidea* and *Bornia*. The last, in which Philippi (1836) also had included this species, seems the most appropriate genus, but Huber (2015) suggested that a new genus is needed.



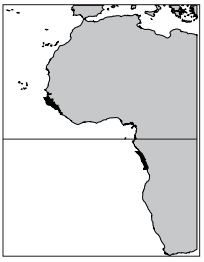
11.17. *Bornia geoffroyi* (Payraudeau, 1826). **A-B**, Dakar region, 129-150 m (13.6 mm). **C**, Kafountine, N-Casamance, 12°46.9'N, 17°29.9'W, 45 m (8.0 mm).

Bornia balalaika Cosel, 1995



11.18. Cabo Ledo, N-Angola, 10-40 m (holotype, 5.5 mm).

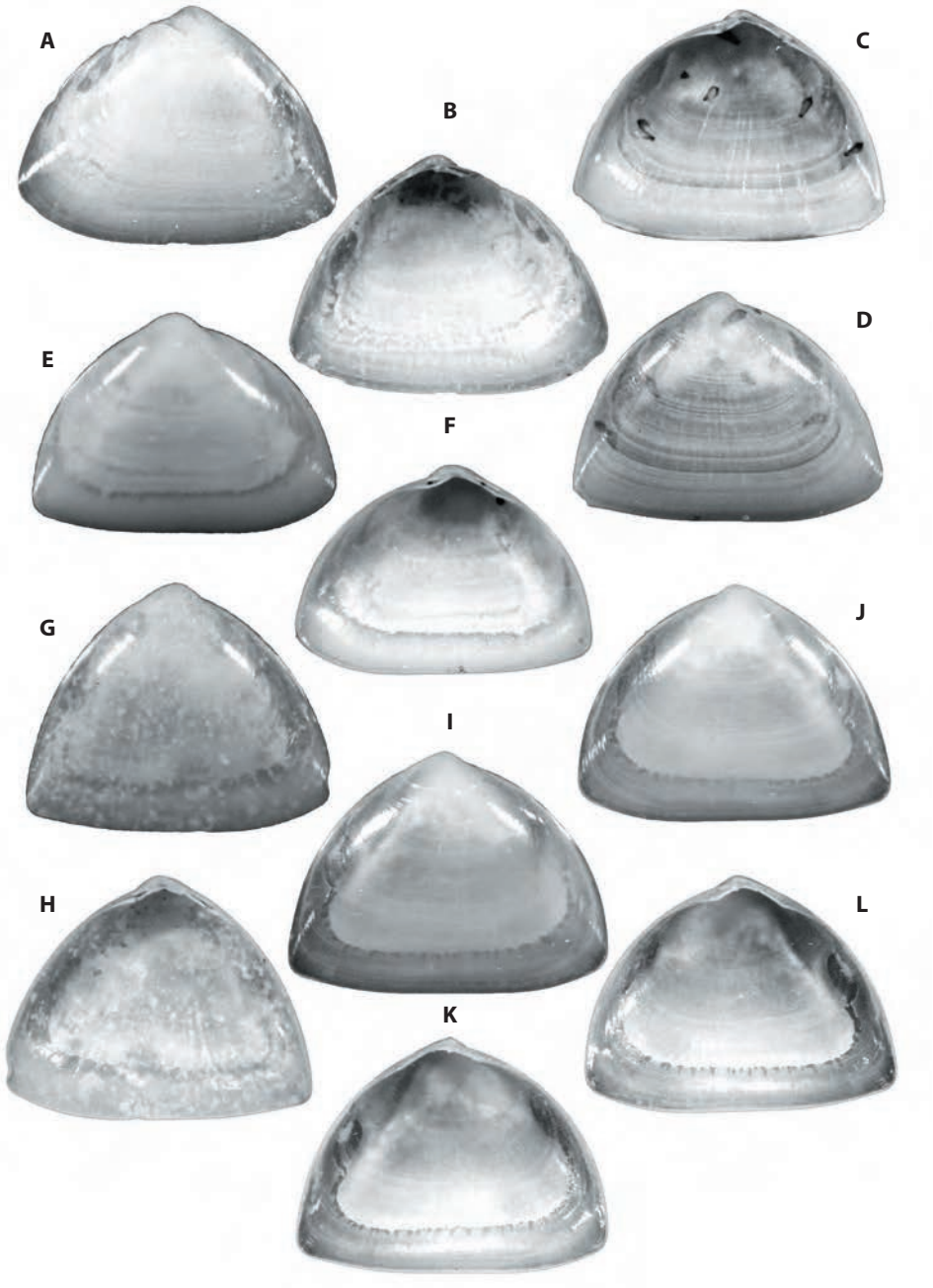
Shell very small, 4-5 mm long, varying little in outline, regularly triangular with sharp angled anterior and posterior margin and nearly straight ventral margin, thin but rather solid, very compressed. Antero- and postero-dorsal margin evenly but not very convex. Umbos more or less median. Surface smooth and glossy, with very fine, irregular growth lines. Periostracum very thin, transparent and colourless. Inside with faint, irregular radial striae. Hinge line of both valves with one inclined and one vertical cardinal, both in front of the resilifer, and a long posterior lateral. Valves entirely white.



Distribution. Senegal (Casamance, Cap Roxo, 12°20'N) to Guinea (9°06'N); Pointe-Noire, Congo Brazzaville to northern Angola (Cabo Ledo, S of Luanda).

Biotope. Most probably in fine, muddy sand, from a few metres to about 40 m, very rare.

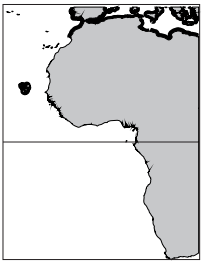
Remarks. This peculiar species is distinguished from all other West African Galeommatoidea by its distinctive triangular form reminiscent of a Russian balalaika (hence the name). The species has not yet been recorded from the typical tropical zones and the atypical tropical zone which may indicate a rather large distribution discontinuity; moreover, the northern population shows slight differences from the southern population (more rounded corners and a continuous pallial line). The type locality of *B. balalaika* being Cabo Ledo, N-Angola, only DNA analysis could reveal if a separate undescribed "northern" sibling species is involved. The species was originally described in *Bornia*, which has a similar triangular outline and glossy surface, but the hinge with well developed anterior and posterior laterals and tiny cardinals is discrepant. It was transferred to *Ceratobornia* Dall, 1899 by Huber (2015) on the grounds of similarity with *Ceratobornia chiclaya* Olsson, 1961 from NW-Peru, but that species does not have anterior laterals. As no convincing generic placement is available, it is left under its original binomen.



11.19. ***Bornia balalaika*** **Cosel, 1995. A-B**, W of Sierra Leone border, 9°06'N, 13°25.7'W, 7 m (4.8 mm). **C-D**, same locality (4.7 mm). **E-F**, Conakry, Guinea, "Conakry sands" (4.6 mm). **G-H**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift, N of lighthouse (paratype, 4.7 mm). **I-L**, Cabo Ledo, Bengo prov., N-Angola, 10-40 m (holotype, 5.5 mm).

Lepton squamosum (Montagu, 1803)

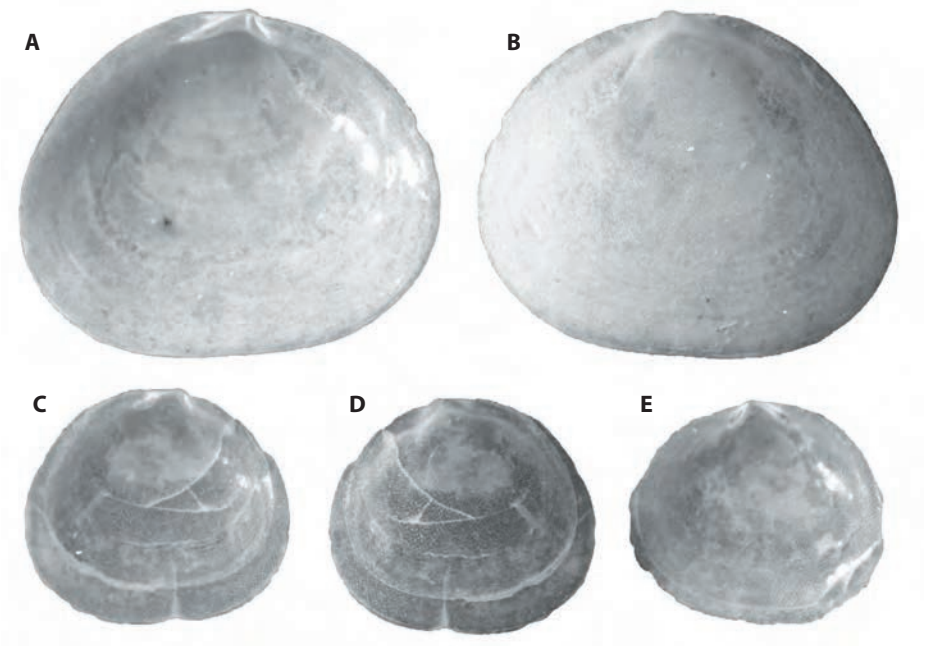
Shell very small, up to10 mm long, short-oval subquadrangular, almost equilateral, somewhat variable, with broadly rounded anterior and posterior margin and almost straight or in the middle even somewhat concave ventral margin, thin and fragile, very flat. Umbos situated just in front of the vertical midline Surface with minute and regularly distributed and densely spaced punctate sculpture and with few irregular growth lines. Protoconch small, glossy and almost not or very little protruding. Periostracum very thin and transparent. Hinge plate rather broad, with a small cardinal in each valve, one anterior lateral and posterior lateral in the left valve and two anterior and two posterior laterals un the right valve. Inside with well visible muscle impressions. Valves entirely white.



Distribution. Norway, British Islands and Brittany southward to Morocco; Mediterranean; Cape Verde Islands (Cosel, 1982).

Biotope. Muddy or sandy-muddy bottom in the infralittoral zone, from about 15 to 120 m, found on the underside of crustaceans of the genus *Upogebia* with which it lives as a commensal (Tebble 1966); rare.

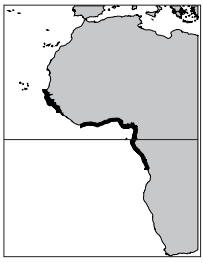
Remarks. This species is easily recognized by its very flat valves, the peculiar subrectangular outline, the finely punctate sculpture and the rather broad hinge plate.



11.20. *Lepton squamosum* (Montagu, 1803). A-B, Baia Mordeira, Ilha do Sal, Cape Verde Islands (lv, 7.0 mm). C-D, Baia Matiota, São Vicente, Cape Verde Islands (4.5 mm). E, same locality (4.2 mm).

Lozouetia distorta Cosel, 1995

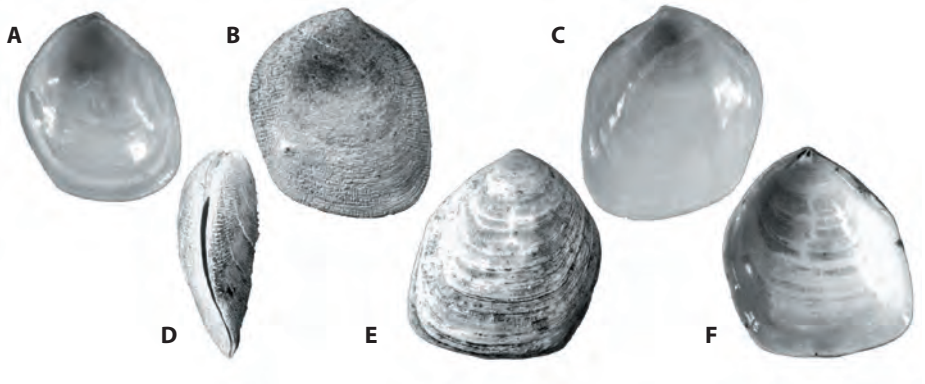
Shell up to 5 mm long and 5-6 mm high, quite variable in shape, markedly oblique, rather solid, from nearly equivalve to more or less inequivalve: one valve (mostly the left) more or less inflated, the other valve compressed to nearly flat. Anterior margin slightly curved, its lower part nearly straight; antero- and postero-ventral corners narrowly rounded to rounded-angular; ventral margin short and only slightly arched. Posterior margin in its lower part hardly convex to nearly straight, in the middle well convex, in the upper part only slightly curved. Beaks slightly behind the vertical midline. Surface with extremely fine, dense, finely lamellate commarginal threads, the tiny lamellae arranged to form dense radial "riblets" which are more pronounced on the anterior and posterior slope; they bifurcate on the rounded anterior and posterior angle and end nearly perpendicular to the margin all around the valve disk. There are also coarser, irregular growth lines and stages. Periostracum thin, light straw coloured to brown, dull, often eroded on the older parts of the valves. Hinge in the left valve with a small cardinal and a long and rather thin but strong lateral on each side; these fit between equally sized laterals and a corresponding enlargement of the dorsal margins in the left valve, which has one small but prominent cardinal. Internal ligament strong but short, resilifer deep. Valves entirely white.



Distribution. Recorded from Senegal (Dakar and Casamance), Guinea (9°28'N), Côte d'Ivoire, Cameroon, Congo Brazzaville and northern Angola (Luanda)

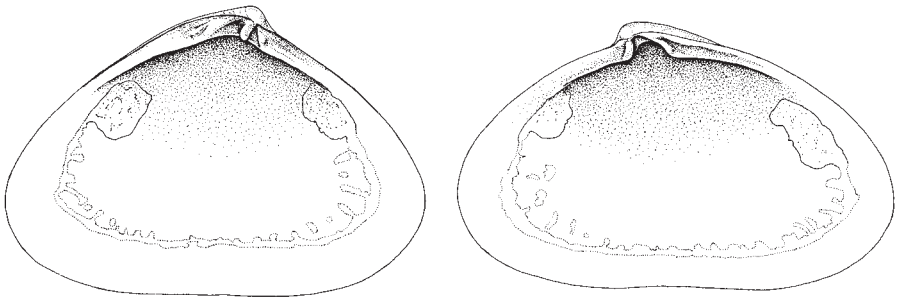
Biotope. Commensal or parasitic (found on tube of the polychaete *Panthalis bicolor* (Augener, 1918) by Marche-Marchad), on soft bottom, from 35 to about 120 m, uncommon.

Remarks. This peculiar galeommatoidean does not resemble any other species; it is characterized by being inequivalve, by the oblique-quadrangular form and by the surface sculpture. The hinge and the broad pallial line place it near the genus *Litigiella*, but the latter is oval and does not at all resemble our shells.



11.21. *Lozouetia distorta* Cosel, 1995. **A**, Dakar, Senegal, entrance of port, obtained by industrial dredge, 10 m, among debris of bones (5.6 mm ht). **B-C**, Abidjan region (rv of holotype, 6.1 mm ht). **D**, Grand Bassam, Côte d'Ivoire, 35 m (paratype, 5.7 mm ht). **E-F**, Wouri-Limbe region, Cameroon, 3°27.4'N, 9°22.6'E, 46 m (paratype, 5.3 mm ht).

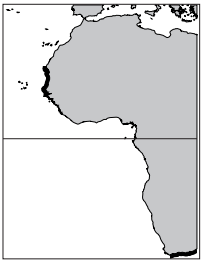
Melliteryx mactroides (Hanley, 1857)



11.22. Gorée, Senegal, 19-20 m two different specimens (lv, 6.2 mm; rv, 7.5 mm).

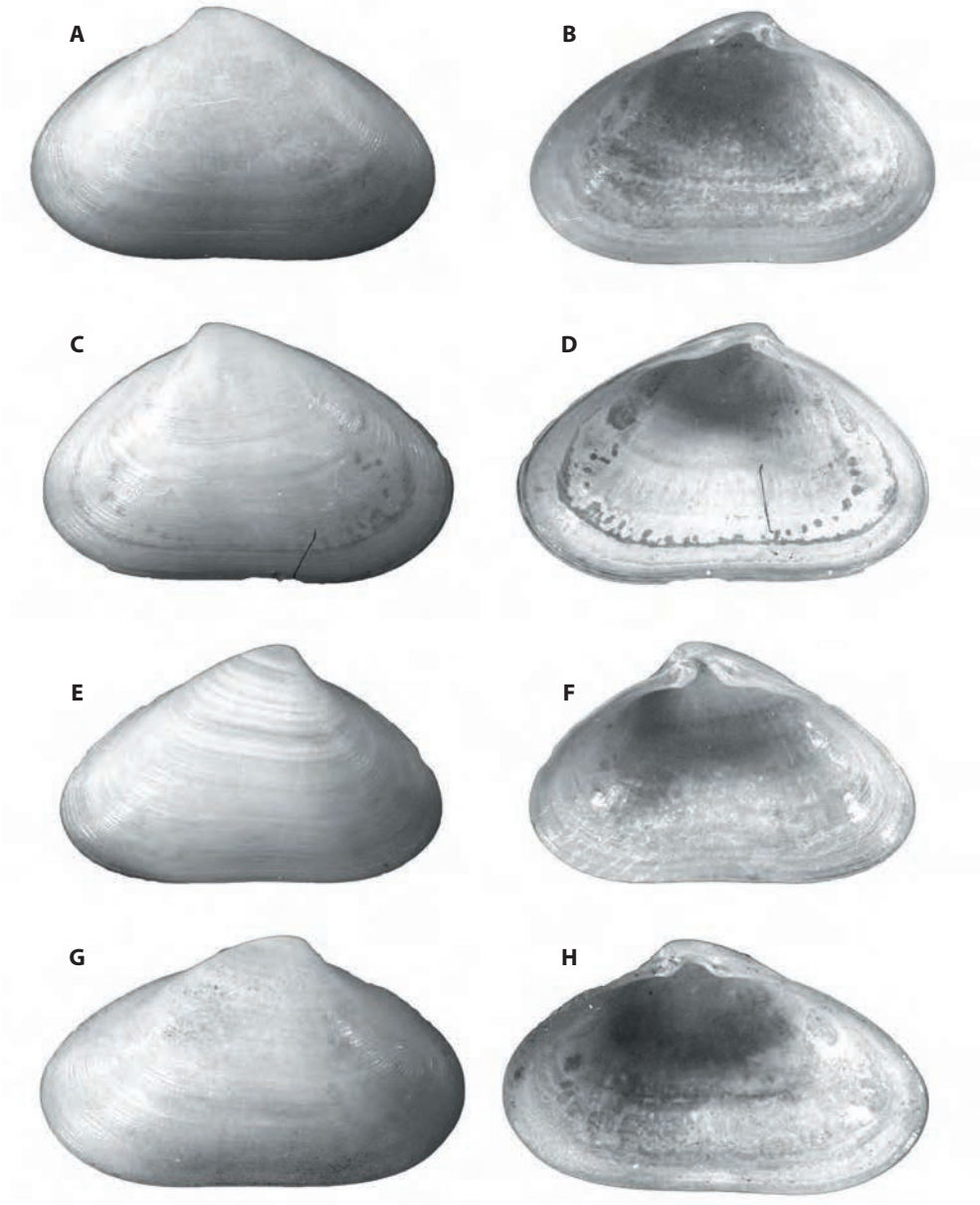
Shell up to 12 mm long, variable in outline, especially between growth stages, triangular-oblong, with rather narrowly rounded anterior and posterior margin and somewhat concave middle part of the ventral margin, quite thin and fragile, compressed. Beaks slightly in front of the vertical midline. Surface rather glossy, with fine, slightly irregular commarginal ridges, more pronounced on the anterior and posterior slope and becoming obsolete in the middle. There are also irregular growth stages and extremely fine, dense pits which are visible only under a lens (x 20-40) and which become obsolete on the marginal part of fully grown specimens. Periostracum thin and colourless, in the studied material mostly eroded. Hinge line with a narrow, deep resilifer, a rather strong cardinal and strong laterals. Valves entirely white.

Distribution. Mauritania (Cap Blanc) to Senegal (Casamance, 12°30'N); also recorded from South Africa (False Bay, Cap Agulhas).



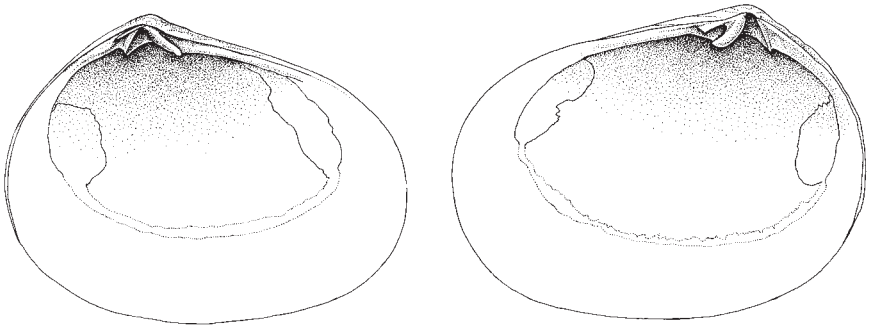
Biotope. Most probably on sandy bottom, from 10 to about 25 m, not common.

Remarks. This species had been referred to as *Pythina* or *Kellia mactroides* (Nicklès 1955 and references therein). The pitted surface characterizes it as a *Melliteryx*, a genus which otherwise has an Indo-Pacific, Australian, New Zealand and South African distribution.



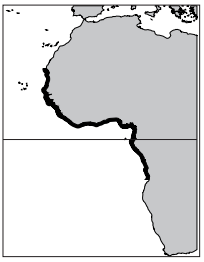
11.23. ***Melliteryx mactroides*** **(Hanley, 1857).** **A**-**B**, Port-Etienne (now Nouadhibou), Mauritania, 20°20′N, 16°22′W, 10 m (9.9 mm). **C**-**D**, SE of fortress of Gorée, Senegal, 15 m (10.8 mm). **E**-**F**, S of Ilha do Mel, Guinea-Bissau, 10°41′N, 15°44.5′W, 25 m (8.1 mm). **G**-**H**, same locality (9.5 mm).

Pseudopythina nicklesi (Rosso, 1975)



11.24. St. Louis area, Senegal, Nouakchottian, subfossil (lv, paratype, 17.1 mm; rv, holotype, 20 mm).

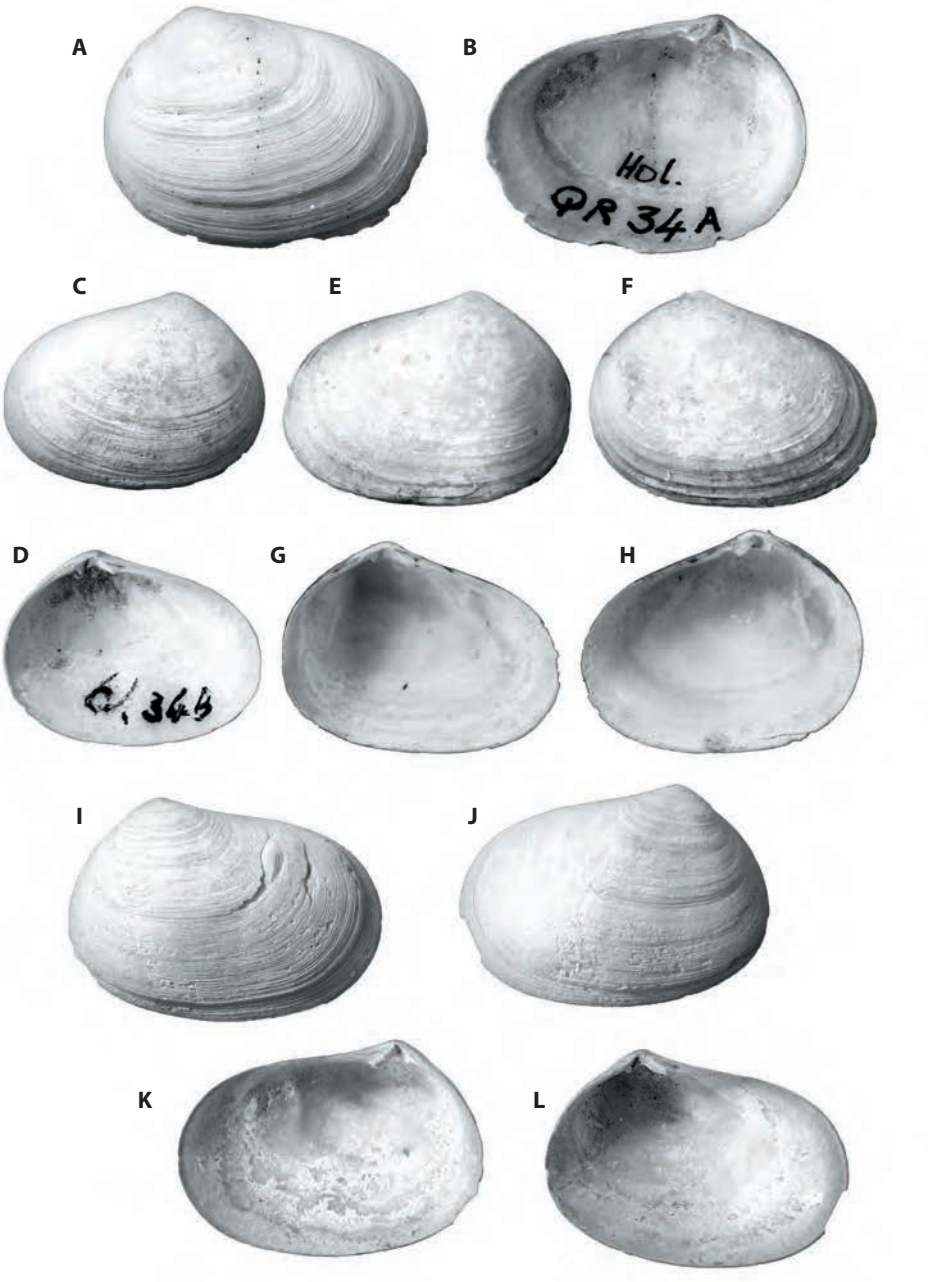
Shell up to 20 mm long, somewhat variable in shape, oblong, oval, with broadly rounded anterior, broadly rounded-truncated posterior margin and slightly convex ventral margin, thin but rather solid, compressed. Beaks well behind the vertical midline, at the beginning of the median third of the valve. Surface with dense, strong, irregular growth lines and coarser growth stages. Periostracum thin and light greenish grey, nearly colourless, often eroded on the earlier part of the valves. Hinge in the right valve with a strong oblique anterior cardinal, a lamellar lateral above it and parallel to it, and a weak posterior lateral. Left valve with a strong anterior cardinal and a weak posterior lateral. Valves entirely white.



Distribution. Mauritania (Cap Blanc) to southern Angola (Benguela Province).

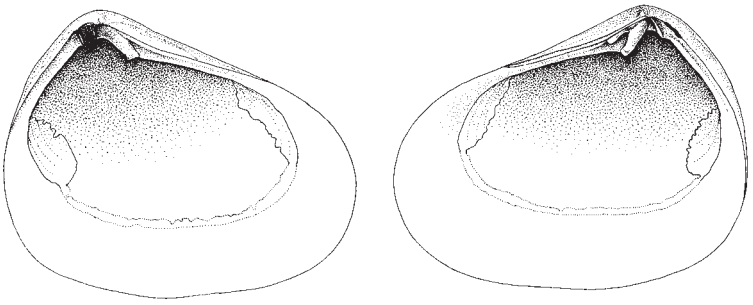
Biotope. Most probably on fine or muddy sand, from about 10 to 20 m, not common. It might tolerate salinity changes: in Casamance, empty valves were found in the creeks and the Casamance River up to Ziguinchor.

Remarks. This species was described from the Nouakchottien (Mauritanian-Senegalese Quaternary) as a *Tellimya*; it was placed in *Orobitella* Dall, 1900 by Ardovini & Cossignani (2004) but Huber (2015) argued that the hinge configuration does not agree with that American genus and transferred it to *Pseudopythina*.



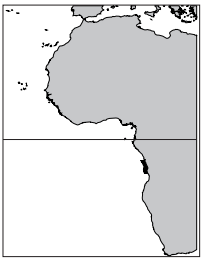
11.25. *Pseudopythina nicklesi* (Rosso, 1975). **A**-**B**, St. Louis area, Senegal, Nouakchottian, subfossil (holotype, 20.3 mm). **C**-**D**, same locality (paratype, 17.2 mm). **E**-**H**, Ziguinchor, Casamance River, Senegal, 3-5 m (18.4 mm). **I**-**L**, Abidjan region, Côte d'Ivoire (19.6 mm).

Pseudopythina solida (Cosel, 1995)



11.26. Cacuaco, N Angola, rocks at low tide (holotype, 11.2 mm).

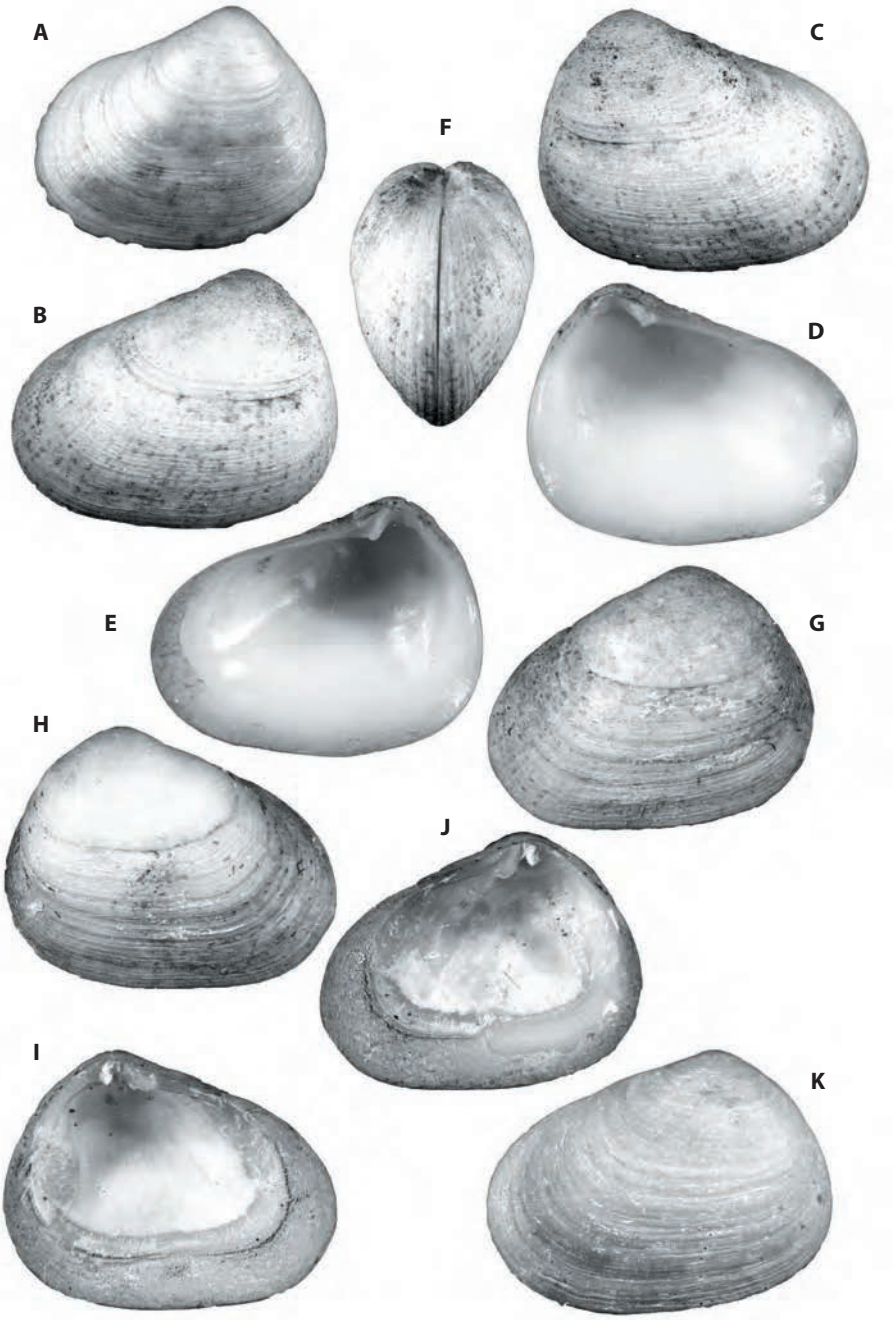
Shell up to 12 mm long, oblong, oblique-oval, superficially resembling a small *Donax*, solid, compressed, with a rather broadly rounded anterior margin and truncated, somewhat curved posterior margin which is joined to the very short postero-dorsal margin. Antero-dorsal margin weakly concave in its upper part, ventral margin only slightly convex. Beaks between the third and the posterior fourth of the valves. Surface with very strong and irregular growth lines and still coarser growth stages. Periostracum rather thin, dull, pale yellowish grey, folding broadly over the margin to the interior and bearing small, scattered, radially arranged tufts which are occasionally obsolete. Hinge in the right valve with a strong, oblique anterior cardinal and a very small lateral parallel to it directly at the dorsal margin. Left valve with one strong cardinal only. Resilifer deep and not much inclined. Valves entirely white.



Distribution. Known from isolated valves in Senegal and Guinea, and mostly from northern Angola (Zaïre province and Luanda).

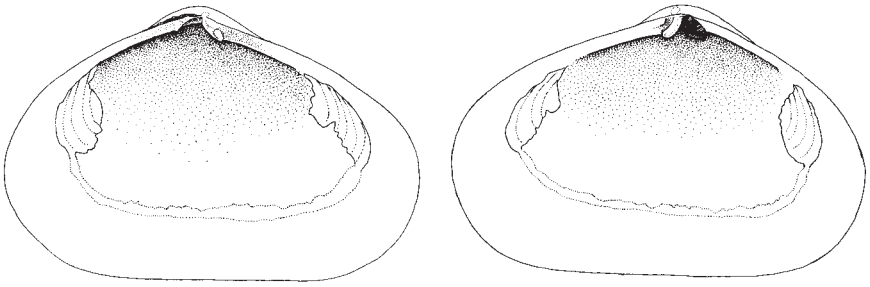
Biotope. Between rocks in shallow water, rare.

Remarks. This species was transferred to *Pseudopythina* by Huber (2015). It superficially resembles *P. nicklesi*, however, it is more truncated posteriorly, thicker and has stronger cardinals but no visible laterals. The radially arranged tufts periostracal hairs are strongly reminiscent of the European type species of the genus, *P. macandrewi* (P. Fischer, 1867). In Senegal, two valves of a very similar species have been found, whose hinge is slightly different with a more inclined resilifer.



11.27. ***Pseudopythina solida*** **(Cosel, 1995). A**, Sierra Leone border, 9°03'N, 13°22.4'W, 4 m (11.8 mm). **B-F**, Cacuaco, Bengo prov., N-Angola, between rocks at extreme low tide (holotype, 11.2 mm). **G-J**, same locality (paratype, 11.0 mm). **K**, Baia de Corimba, Luanda prov., 10-20 m (paratype, 13.1 mm).

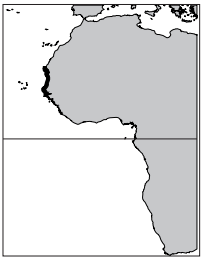
Pseudopythina ndarensis (Rosso, 1975)



11.28. Gorée, Senegal, in the harbour, 6 m (13.6 mm).

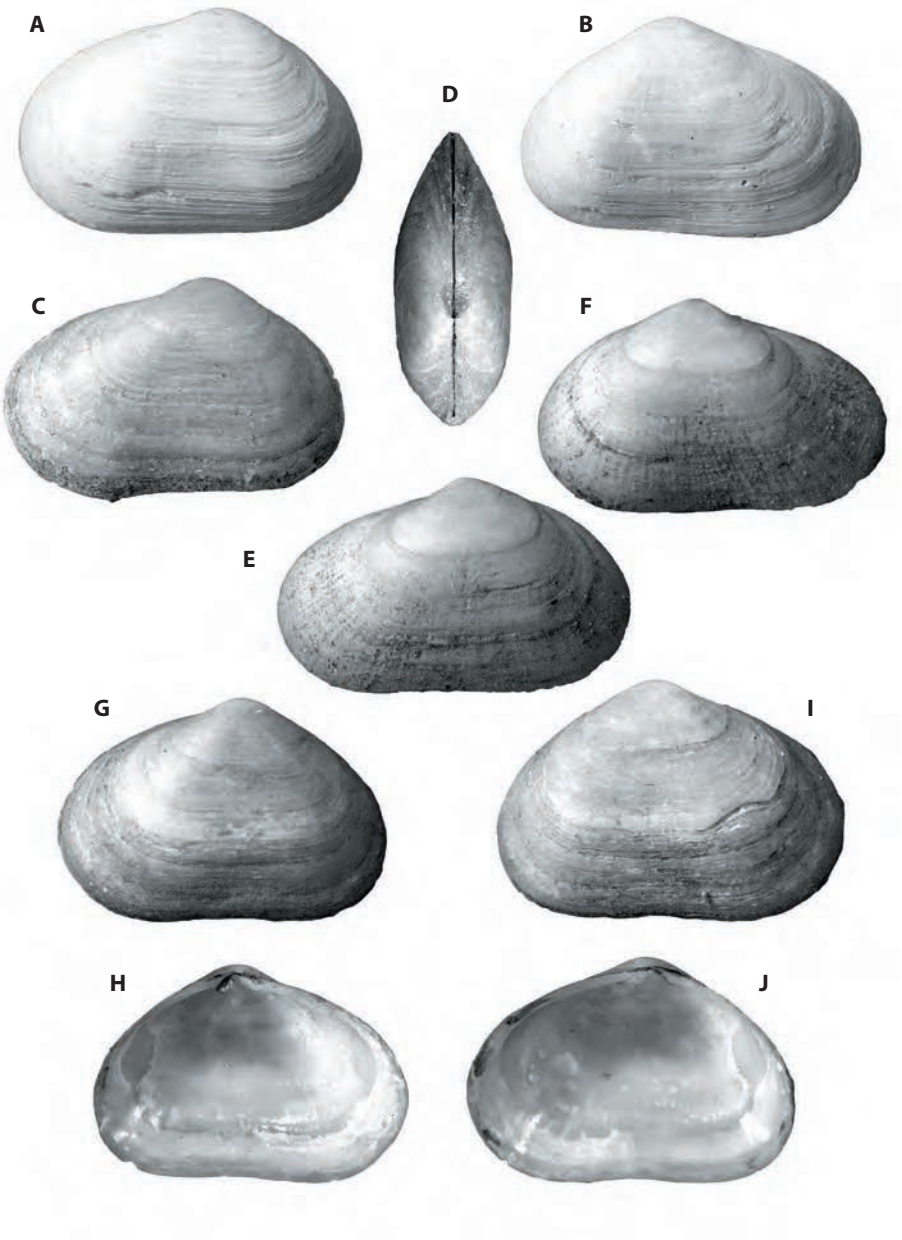
Shell up to 21 mm long, thin but solid, rather compressed, somewhat variable in outline, oblong, triangular-oval, with well rounded anterior and posterior margin, ventral margin straight or in the middle often slightly concave. Beaks slightly in front of the vertical midline. Surface smooth, with irregular growth lines and coarser growth stages. Periostracum thin, light yellowish brown, dull, folding over the margin to the interior and near the margins bearing irregular tufts. Hinge with a strong, only slightly inclined cardinal and a weak anterior lateral in the right valve and a rather strong cardinal in the left valve. Valves entirely white.

Distribution. Mauritania (Cap Blanc) to Senegal (Casamance).



Biotope. On sandy bottom, most probably attached to secondary hard substrate, from about 5 to 20 m, not common.

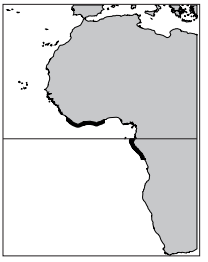
Remarks. This species was originally described from the Quaternary of Mauritania (Nouakchottien). It is distinguished from the European *P. macandrewi* (P. Fischer, 1867), the type species of *Pseudopythina*, by its larger and slightly longer shell. In *P. macandrewi*, the periostracal tufts are mostly arranged radially.



11.29. ***Pseudopythina ndarensis*** **(Rosso, 1975). A**, St.Louis area, Senegal, Nouakchottian (subfossil) (holotype, 18.0 mm). **B**, same locality (paratype, 18.2 mm). **C**-**D**, Dakar, Senegal, entrance of port, obtained by industrial dredge, 10 m, among debris of bones (16.2 mm). **E**-**F**, same locality (11.7 mm). **G**-**J**, same locality (16.2 mm).

Pseudopythina marchadi (Nicklès, 1955)

Shell 4.7 mm long, oblong, triangular-oval, slightly inequivalve with the right valve weakly more convex than the left valve, well rounded anterior and posterior margin and in the middle markedly concave ventral margin, thin and fragile, rather inflated. Beaks slightly in front of the vertical midline. Surface smooth, with irregular growth lines and coarser growth stages. Periostracum thin, light brown. Hinge with a strong cardinal and a posterior lateral in the right valve and a small cardinal, a weak anterior lateral and a strong and long posterior cardinal nearly parallel to the postero-dorsal margin in the left valve. Valves entirely white.



Distribution. Liberia (9°34'W); Ghana (0°38'E) (Nicklès 1955); southern Gabon and Congo Brazzaville.

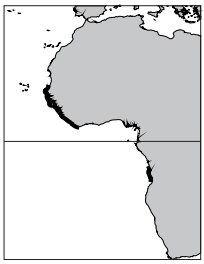
Biotope. Apparently sandy bottom, found in 50 and 78 m, rare.

Remarks. Apart from the two specimens dredged by the R/V *Atlantide* (of which the holotype is figured here), only few valves from Congo Brazzaville are known. The generic placement of this species is unsettled; the placement in *Kelliopsis* by Huber (2015) is unwarranted, and the concave ventral edge is strongly reminiscent of some galeommatoideans associated with burrowing shrimps, e.g. *"Pseudopythina" rugifera* (Carpenter, 1864) from the Eastern Pacific.

11.30. *Pseudopythina marchadi* (Nicklès, 1955). Ghana, 5°37'N, 0°38'E, 50 m (holotype ZMC, 4.7 mm).

Kurtiella africana Gofas & Salas, 2016

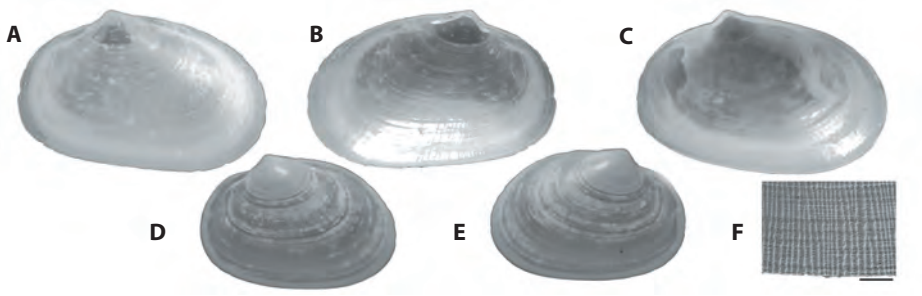
Shell up to 6 mm long, suboval-rectangular, thin and fragile, equivalve, inequilateral. Beaks well behind the vertical midline, situated towards the posterior 1/3rd, slightly opisthogyrate. Anterior part of dorsal margin at first gently curved, then gradually merging into the evenly rounded anterior margin. Ventral margin slightly convex. Postero-dorsal margin at first forming a distinct embayment just behind the umbo, then becoming evenly convex. Posterior margin slightly convex, less so than the transitions to postero-dorsal and to ventral margins, so as to make it appear indistinctly truncated. Protoconch 520-580 µm in maximum diameter, rounded and slightly bulging, smooth. remainder of surface with very fine growth lines and with a microsculpture of antimarginal threads, grossly parallel to each other but occasionally converging or diverging. Hinge plate with lateral teeth narrow and thin but well-marked on the right valve, diverging *ca.* 130º and slightly bent so as to be even more divergent in their distal part; hardly more than a swelling of hinge plate on the left valve. Lunule and escutcheon indistinct. Adductor scars subequal, irregularly shaped, dorsoventrally elongate; pallial line moderately thick, continuous, descending sharply from the posterior muscle scar, then becoming parallel to the ventral margin. Inner edges of valves smooth, tightly appressed ventrally. Shell colour generally white on teleoconch; on fresh shells the protoconch has a yellowish hue.



Distribution. Known from Senegal, Liberia and northern Angola (Luanda) but possibly more widespread.

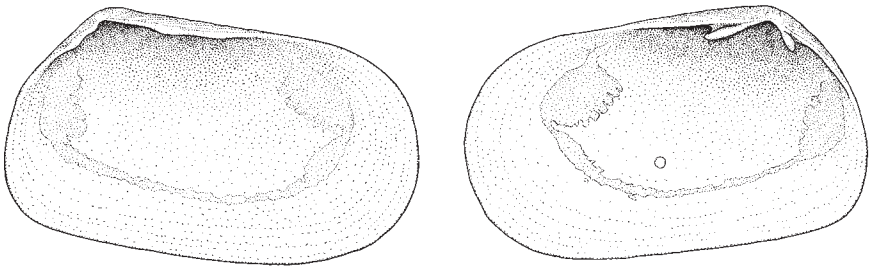
Biotope. On soft bottom, from mud to coarse sand, 20 m to about 100 m, locally common. Possibly a facultative commensal of benthic invertebrates as other species in the genus.

Remarks. This species and the following were misidentified by Nicklès (1955) as the widespread *Kurtiella bidentata* (Montagu, 1803). It differs in being proportionally more elongate and in having a thinner shell and almost always a distinct antimarginal microsculpture. The teeth of the right valve are more bulging, definitely thicker distally in *K. bidentata*, and are not bent as in *K. africana*. Another conspicuous difference is seen in the protoconch, which is larger than that of *K. bidentata* and has yellowish hue in the fresh shells, whereas in *K. bidentata* it is invariably white.



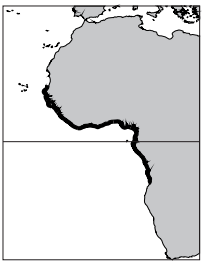
11.31. *Kurtiella africana* Gofas & Salas, 2016. A-B, Baia de Corimba, Luanda prov., N- Angola, 10-20 m (rv, paratype, 2.50 mm). C, same locality (lv, paratype, 2.85 mm). D-E, same locality (paratype, 1.80 mm). F, same locality, detail of the microsculpture of the edge of a rv (SEM micrograph, scale bar 0.1 mm).

Kurtiella zabii Cosel & Gofas, 2018



11.32. Grand Bassam, Côte d'Ivoire, 5°09.2'N, 3°47.2'W, 30 m (holotype, 8.1 mm).

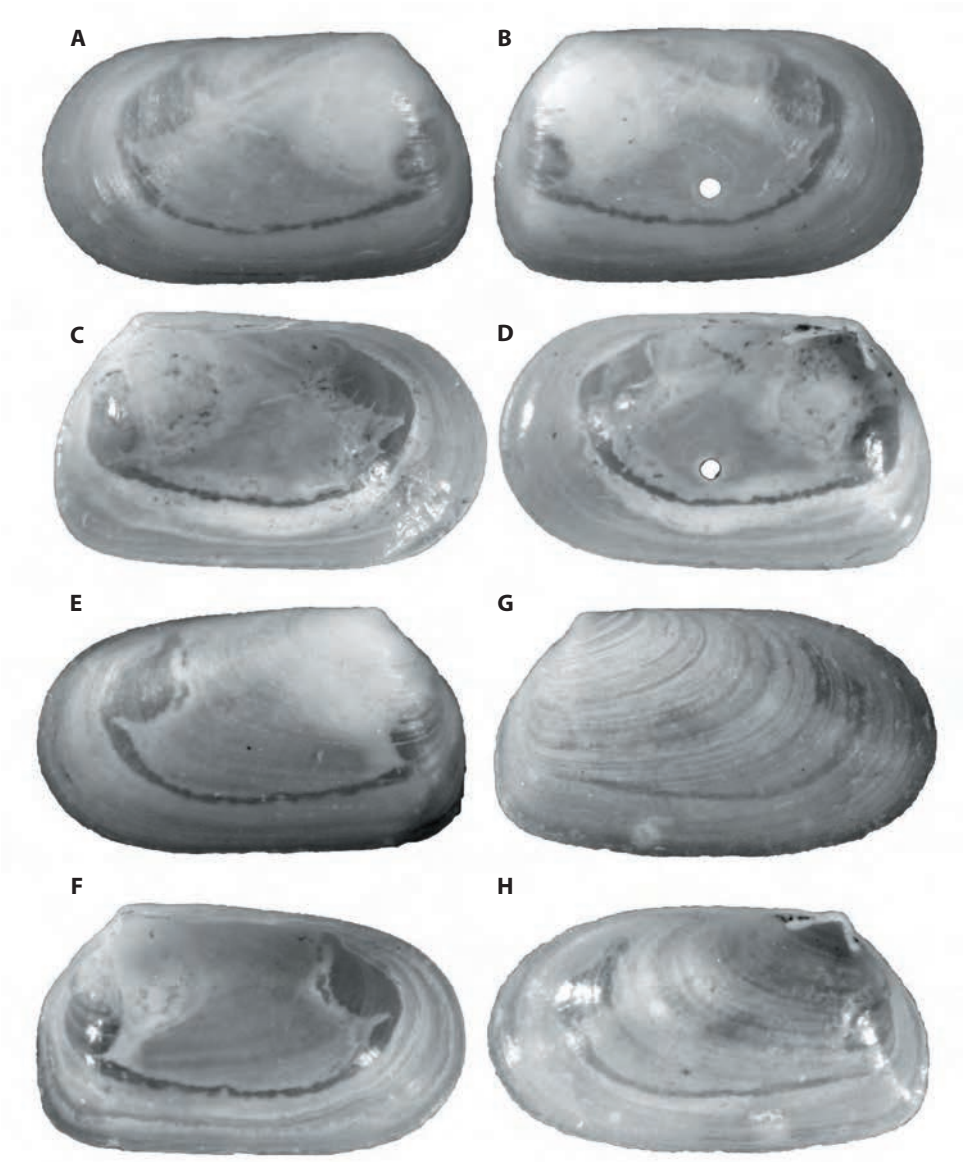
Shell up to 10.5 mm long, suboval-rectangular, moderately thin, equivalve, strongly inequilateral. Beaks well behind the vertical midline, situated towards the posterior fifth. Anterior part of dorsal margin mostly straight, then gradually merging into the evenly rounded anterior margin. Ventral margin also mostly straight and nearly parallel to the dorsal margin. Postero-dorsal margin at first abruptly sloping behind the umbo, then becoming slightly convex. Posterior margin convex, with maximum convexity at the transition to ventral margin. Inner edges of valves smooth, tightly appressed ventrally. Protoconch 470 µm in maximum diameter, subcircular, convex. Remainder of surface with very fine growth lines. Hinge plate with lateral teeth narrow and elongate, straight, thin but well-marked on the left valve, diverging *ca.* 130°; strong and short, distinctly offset from the hinge plate, diverging *ca.* 100° on the right valve. Lunule and escutcheon indistinct. Adductor scars subequal, irregularly shaped, the anterior one sometimes slightly larger; pallial line very thick, continuous, departing from the posterior scar nearly parallel to the ventral margin. Valves entirely white.



Distribution. Mauritania (17°44'N), Senegal (Dakar region, Casamance), Guinea (9°28'N), Sierra Leone, Côte d'Ivoire, Bénin (Ouidah), Nigeria, Cameroon, Gabon (Cap Lopez region), Congo Brazzaville and northern Angola (Luanda).

Biotope. On soft bottom, from mud to coarse sand, 20 m to about 120 m, occasionally deeper, to 200 m, uncommon but locally apparently more common: in a dredge haul at Côte d'Ivoire on a transect off Grand Bassam, empty fresh shells were found abundant at 30 m and also somewhat more frequent at other stations situated in the same region. Possibly a commensal of benthic invertebrates as other species in the genus.

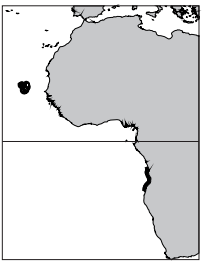
Remarks. This widespread species differs from the European *Kurtiella bidentata* (Montagu, 1803) in being much more elongate anteriorly, also grows much larger and has more rectangular shell outline.



11.33. ***Kurtiella zabii*** **Cosel & Gofas, 2018. A-D**, Côte d'Ivoire, Grand Bassam, 5°09.2'N, 3°47.2'W, 30 m (holotype, 8.1 mm). **E-F**, same locality (paratype, 8.1 mm). **G-H**, Cape Palmeirinhas, Luanda prov., N-Angola, dredged 60-80 m (7.5 mm).

Planktomya magna Gofas, 2000

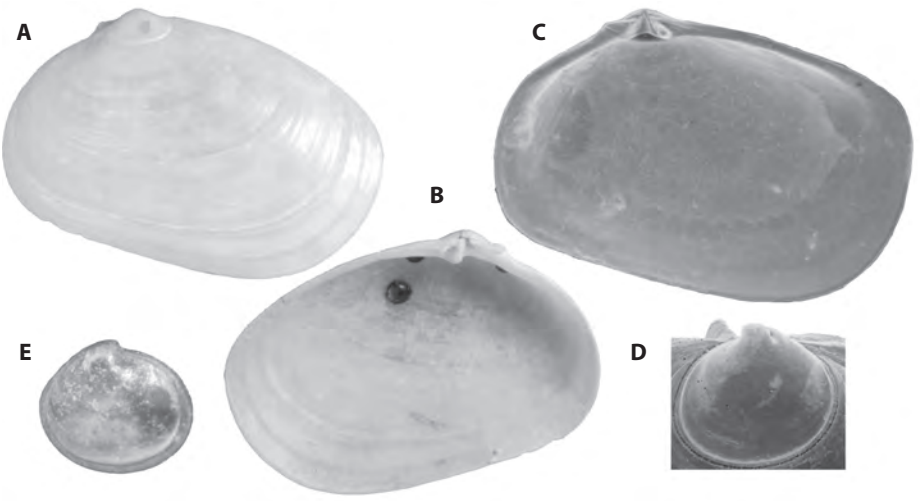
Shell up to 12 mm long, elongate ovate in outline, inequilateral, with slightly convex valves. Beaks posterior to midline, situated at about 2/3 of shell length. Internal cast of the protoconch 1.2 mm long and deeply cleft posteriorly. Anterior part of dorsal margin gently curved on most of its extension, then abruptly curved to meet the anterior margin. Ventral margin gradually meeting the anterior margin, swollen in its anterior section, then rather straight until it meets the posterior margin at an abrupt curve. Posterior margin somewhat truncated, then meeting the sloping postero-dorsal margin. A small projecting flap on postero-dorsal margin just behind the umbo. Outer surface smooth, with only growth lines apparent. Hinge line with one large cardinal on each valve, and posterior to it a broad resilifer, open through the entire hinge plate beneath the umbo. Pallial line clearly visible, entire, with a very ragged inner edge. Adductor muscle scars equal in size, the anterior tapering toward the umbo, the posterior rounded. Colour entirely white.



Distribution. So far known from the Cape Verde Islands and Angola.

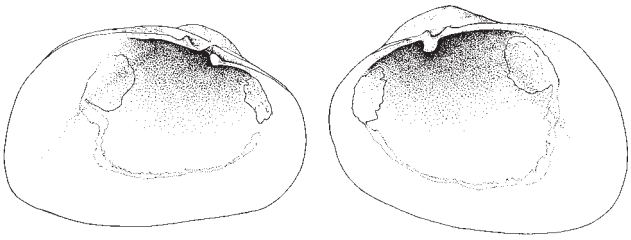
Biotope. The few known shells have been found on bottoms with coralline algae in 10-20 m depth, rare.

Remarks. This species resembles the European *P. prima* (Locard, 1899) in having a smooth external surface. It differs is reaching a slightly larger size, having a flatter anterior portion of the valves and a different outline with broader anterior part of the ventral margin, and more angular posterior profile.



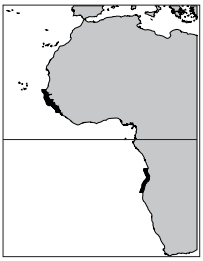
11.34. *Planktomya magna* Gofas, 2000. **A**-**B**, Doca, Baia da Lucira, Namibe prov. S-Angola, 10-20 m (12.7 mm), calcareous algal debris. **C**, Praia do Cesar, Baia da Lucira, 13°52.5'S, 12°30.0'E, 10–20 m in coralline algae (holotype, 9.3 mm). **D**, Bissonga, Baia da Lucira, 13°51'S, 12°31.5'E, 10–20 m in coralline algae, internal cast of protoconch showing posterior cleft (scanning electron micrograph, 1.2 mm). **E**, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (larval shell, 1.2 mm).

Basterotia clancula Cosel, 1995



11.35. Punta de Mussulo, N-Angola, on beach two different specimens (lv, 9.5 mm; rv, 11.4 mm).

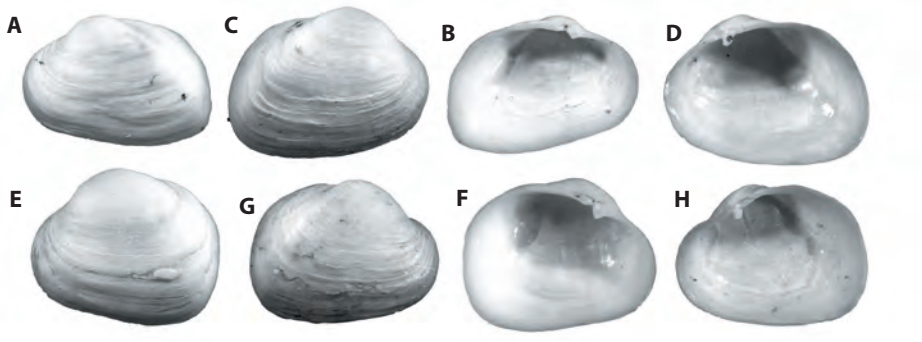
Shell up to 13 mm long, quite variable in shape, transverse-oval to somewhat trapezoidal, thin but rather solid, very inflated. Anterior margin rather narrowly to broadly rounded, posterior margin broadly rounded or obliquely rounded-truncated. Ventral margin slightly convex, occasionally straight. Maximum height of the valve often at the posterior part, behind the beaks. Umbos large and well in front of the vertical midline. Surface with dense, strong irregular growth lines, coarser growth stages and fine granules which are often obsolete. Posterior angle sharp on the early growth stage, later becoming rounded. Periostracum thin, dull, nearly colourless to pale brownish grey, frequently eroded on the earlier parts of the valve. Hinge line with one strong, projecting anterior cardinal and a thickened posterior part, resilifer very small. Valves entirely white.



Distribution. Senegal (Dakar) to Guinea (Iles de Los); northern Angola (Luanda) to southern Angola (Lucira, Namibe province).

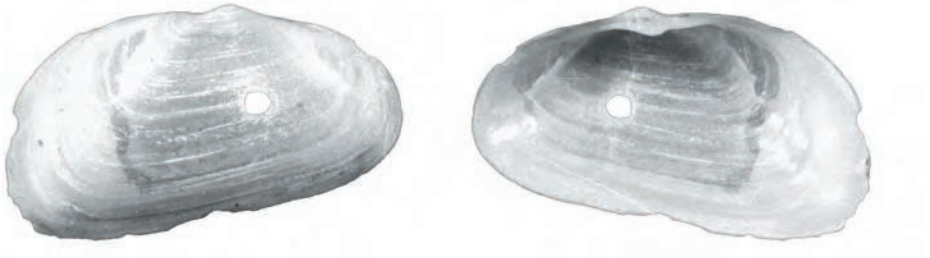
Biotope. Most probably on coarse sand and maërl, from 1 to about 20 m, locally not uncommon.

Remarks. This species is distinguished from the Caribbean *B. quadrata* (Hinds, 1843) by its more rounded posterior angle and less tumid valves. *B. oblonga* E.A. Smith, 1890 from the Azores and St. Helena is even less tumid than *B. clancula* and has an entirely rounded posterior angle.



11.36. *Basterotia clancula* Cosel, 1995. A-B, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (paratype, 9.4 mm). C-D, same locality (holotype, 11.2 mm). E-F, same locality (paratype, 9.1 mm). G-H, same locality (8.5 mm).

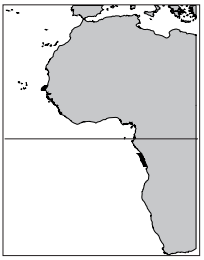
Paramya africana Cosel, 1995



11.37. Kayar, N of Dakar, Senegal, 110-112 m (holotype, rv, 6.1 mm).

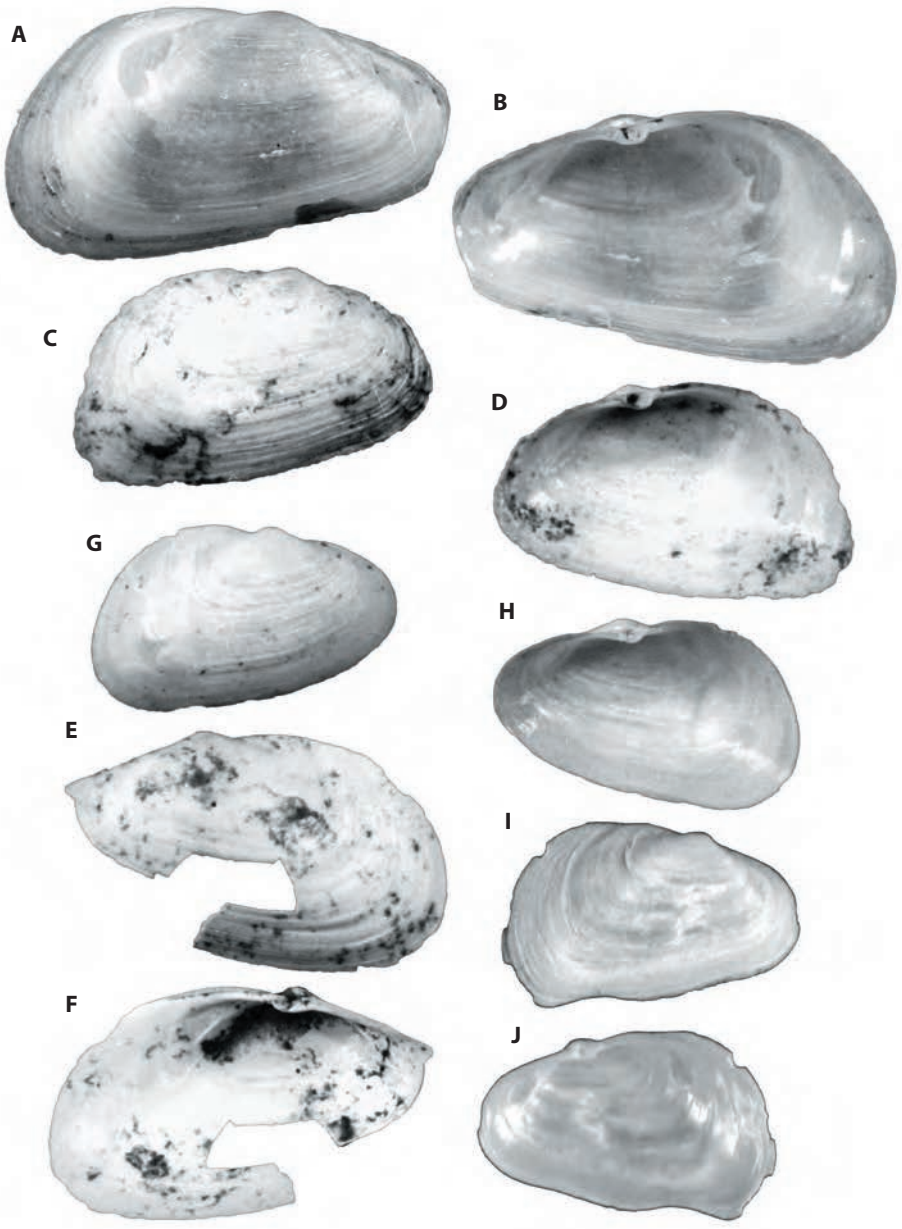
Shell very small, 3-6 mm long, somewhat variable in outline, oblong-subtrapezoidal, somewhat inflated, thin, probably slightly gaping posteriorly. Posterior part higher than anterior part. Anterior margin well rounded, posterior margin slightly obliquely truncated. Postero-ventral corner well rounded. Beaks just in front of the vertical midline. Surface with strong, irregular growth lines and growth stages, visible on the interior of the valves. Posterior angle broad, rounded. Periostracum thin, light straw-coloured to nearly colourless, more persistent on the later part of the valves. Inner margin smooth. Protoconch I and II well set off and distinguishable, smooth. Hinge line in both valves with a small, triangular resilifer which is only slightly protruding. Valves entirely white.

Distribution. Senegal (Kayar, 110-120 m); off the mouth of the Congo river (6°14'S) to N-Angola (Ambrizete).



Biotope. Well offshore (100-237 m) in soft sediments, very rare. Probably also commensal with echiurid worms, like the western Atlantic *P. subovata* (Conrad, 1845) (see Jenner & McCrary 1969) and the Indo-Pacific *Paramya recluzi* (A. Adams, 1864)(see Goto *et al.* 2017).

Remarks. This species differs from *P. subovata* mostly by its smaller size and the more elongate shape. Its general shape recalls the genus *Saxicavella* P. Fischer, 1878, now in the same family. Unlike the Myidae in which it was formerly placed, *Paramya* has equal resilifers in each valve in a symmetric position.



11.38. ***Paramya africana*** **Cosel, 1995. A-B**, off the mouth of Congo River, Congo Kinshasa, 5°41.9'S, 11°42.6E, 105 m (paratype SMF, rv, 6.1 mm). **C-D,** off the mouth of Congo River (4.4 mm). **E-F**, same locality (lv, 5.2 mm), "Meteor" sta. 1005-2B. **G-H**, same locality (3.6 mm). **I-J**, Ambrizete, N-Angola, 6°57'S, 12°23'E, 45 m (3.9 mm).

Family CARDIIDAE

- Genus ***Cardium*** Linnaeus, 1758 – 2 species
- Genus ***Procardium*** ter Poorten & La Perna, 2017 – 1 species
- Genus ***Bucardium*** Gray, 1853 – 1 species
- Genus ***Papillicardium*** Sacco, 1899 – 1 species
- Genus ***Europicardium*** Popov, 1977 – 4 species
- Genus ***Papyridea*** Swainson, 1840 – 1 species
- Genus ***Laevicardium*** Swainson, 1840 – 2 species
- Genus ***Lyrocardium*** Meek, 1876 – 1 species
- Genus ***Fulvia*** Gray, 1853 – 1 species
- Genus ***Cerastoderma*** Poli, 1795 – 2 species

Superfamily Cardioidea

This large superfamily contains the sole extant family Cardiidae, distributed worldwide.

Family CARDIIDAE

Shells small to very large (to over 130 mm in subfamily Cardiinae, to over 1 metre in the giant clams of the genus *Tridacna*), thin to thick and solid, equivalve, rounded or suboval to subtriangular, higher than long to longer than high, usually inflated to very inflated. Beaks mostly close to the vertical midline or slightly anterior to it. Surface with predominantly radial sculptures the ribs smooth or ornamented with nodules, knobs, spines, scales or longitudinal keels; occasionally surface nearly smooth or with oblique sculpture. Hinge with two generally non-bifid cardinals in each valve, left valve with one anterior and one posterior lateral, right valve with two anterior and one posterior laterals; laterals generally situated at some distance anteriorly and posteriorly to the cardinals. Ligament external, short. No pallial sinus, pallial line and muscle impressions are often hardly visible. The worldwide species number, including Tridacninae, is 273. Sixteen species are known from West Africa, of which two are amphiatlantic. The systematic arrangement of the family was addressed, based on morphological characters, by Popov (1977), Kafanov & Popov (1977) and Schneider (1998), but a comprehensive phylogenetic reappraisal using molecular characters (Herrera *et al.* 2015) found little agreement with previous cardiid classifications.

Genus *Cardium* Linnaeus, 1758. Shells large (to over 130 mm), rounded to suboval, rather thin but strong, very inflated. Surface with strong, radial ribs, each rib smooth, bearing a smooth longitudinal keel. Hinge with two equally developed cardinals on each valve, arranged horizontally on the right valve, the anterior tooth situated ventrally to the posterior on the left valve; laterals well developed and elongate. Anterior and ventral margin of the valves undulate according to the ribs, posterior margin more or less digitate. After the unexpected discovery of an additional species (ter Poorten 2007), 2 species are known, both from West Africa.

Genus *Procardium* ter Poorten & La Perna, 2017. Shells large (to over 110 mm), slightly longer than high, relatively thin, inflated, gaping posteriorly. Surface with strong radial ribs, bearing scales on the anterior part of the shell and spines on the posterior part. The hinge differs from *Cardium* in that the posterior cardinal of the left valve is markedly smaller than the anterior. This genus is believed to be ancestral to *Cardium s. str.* and has only recently been separated (ter Poorten & La Perna, 2017).

Genus *Bucardium* Gray, 1853. Shells medium-sized (to 50 mm), rounded, thick and solid, very inflated, not gaping, but with long, interlocking projections of the ribs on the posterior margin. Radial ribs smooth. Both cardinals in the right valve fused with a lamella between them, upper (posterior) cardinal in the left valve reduced to a small knob.

Genus *Papillicardium* Sacco, 1899. Shells small (to 20 mm), nearly rounded, equilateral, more or less solid, inflated. Surface with radial ribs bearing bead-like nodules. Dorsal margin rather convex, hinge plate narrow. The genus *Papillicardium* is often synonymized with *Parvicardium* Monterosato, 1884, which differs in having scales rather than nodules on the ribs, or to *Plagiocardium* Cossmann, 1886, based on a fossil species from the European Eocene. Only two Recent species are known, one in Europe and West Africa and one in South Africa.

Genus *Europicardium* Popov, 1977. Shells medium-sized to rather large, oval, higher than long, occasionally slightly oblique, rather solid but not very thick, inflated to very inflated. Beaks in or slightly anterior to the middle. Surface with numerous, fine radial ribs, asymmetrical in cross-section and bearing spines or scales. Tubercles or spines attached to the anterior part of the most anterior ribs, forming a thin crest attached to the posterior part of the ribs on the rest of the shell, more developed when approaching the shell margin. Hinge with two cardinals in each valve, of unequal size, those in the right valve partly fused. The four West African species have long been neglected and lacked an appropriate placement until Popov (1977) established the genus *Europicardium*. This genus resembles the American genus *Dallocardia* Stewart, 1930 and the Indo-Pacific genus *Vepricardium* Iredale, 1929, but the West African species can certainly not be placed in *Fulvia* as proposed by Voskuil & Onverwagt (1989). The Neogene species were revised by La Perna (2017), the type species is *Cardium multicostatum* Brocchi, 1814 from the Northern Italian Pliocene, which may be an ancestor of the Recent *E. caparti*.

Genus *Papyridea* Swainson, 1840. Shells medium-sized, oval, rather elongate for a cardiid, quite thin and fragile to more solid, somewhat compressed, gaping at both ends. Beaks well in front of the vertical midline. Surface with numerous, commarginal ribs which can bear short scales or spines. Posterior margin more or less digitate. Hinge short; ligament on a nymphal plate. A

brief overview of the genus (both recent and fossil) is given by Kafanov (1997).

Genus *Laevicardium* Swainson, 1840. Shells small to very large, high-oval to rounded-oval, thin to moderately, higher than long to as long as high, mostly oblique, more or less inflated. Surface smooth or with very faintly developed radial ribs on the median part. Dorsal margin arched. Hinge generally with strong laterals.

Genus *Lyrocardium* Meek, 1876. Shells medium-sized, rounded, slightly oblique, solid, inflated, with narrow fine, radial ribs and evenly spaced, oblique secondary sculpture on the anterior part of the valves. Beaks nearly in the middle.

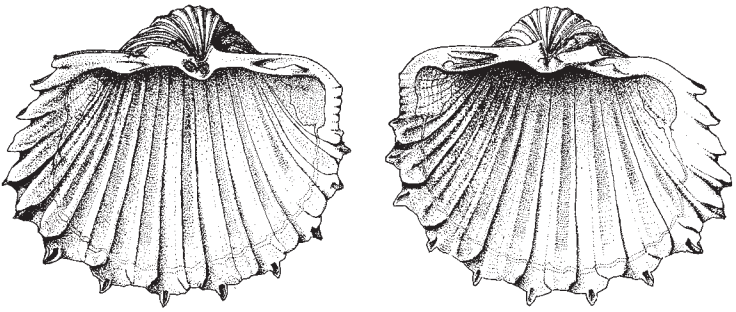
Genus *Fulvia* Gray, 1853. Shells medium-sized, rounded to oval, more or less longer than high, thin and rather fragile, quite inflated, at the posterior end slightly gaping. Surface smooth or with more or less low radial ribs without tubercles, and shallow interspaces. For a review of the Indo-Pacific species, see Vidal (1994).

Genus *Cerastoderma* Poli, 1795. Shells medium-sized, broadly suboval to oblique-oval, longer than high, more or less thick and solid, inflated. Surface with low radial ribs with transverse threads on them and narrow interspaces. Dorsal margin slightly convex.

Species treated (16)

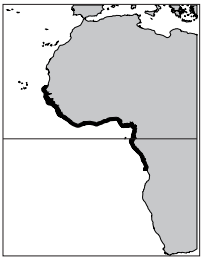
Cardium costatum Linnaeus, 1758; *Cardium maxicostatum* ter Poorten, 2007; *Procardium indicum* (Lamarck, 1819); *Bucardium ringens* (Bruguière, 1789); *Papillicardium papillosum* (Poli, 1791); *Europicardium caparti* (Nicklès, 1955); *Europicardium nolfi* Swinnen, 2010; *Europicardium serrulatum* (Deshayes, 1855); *Europicardium vepris* (Vidal & Kirkendale, 2007); *Papyridea soleniformis* (Bruguière, 1789); *Lyrocardium aeolicum* (Born, 1778); *Laevicardium crassum senegalense* Dautzenberg, 1891; *Laevicardium sybariticum* (Dall, 1886); *Fulvia fragilis congoensis* Cosel 1995; *Cerastoderma edule* (Linnaeus, 1758); *Cerastoderma glaucum* (Poiret, 1789).

Cardium costatum Linnaeus, 1758



12.1. Cacuaco, Bengo, N-Angola, on beach (80 mm).

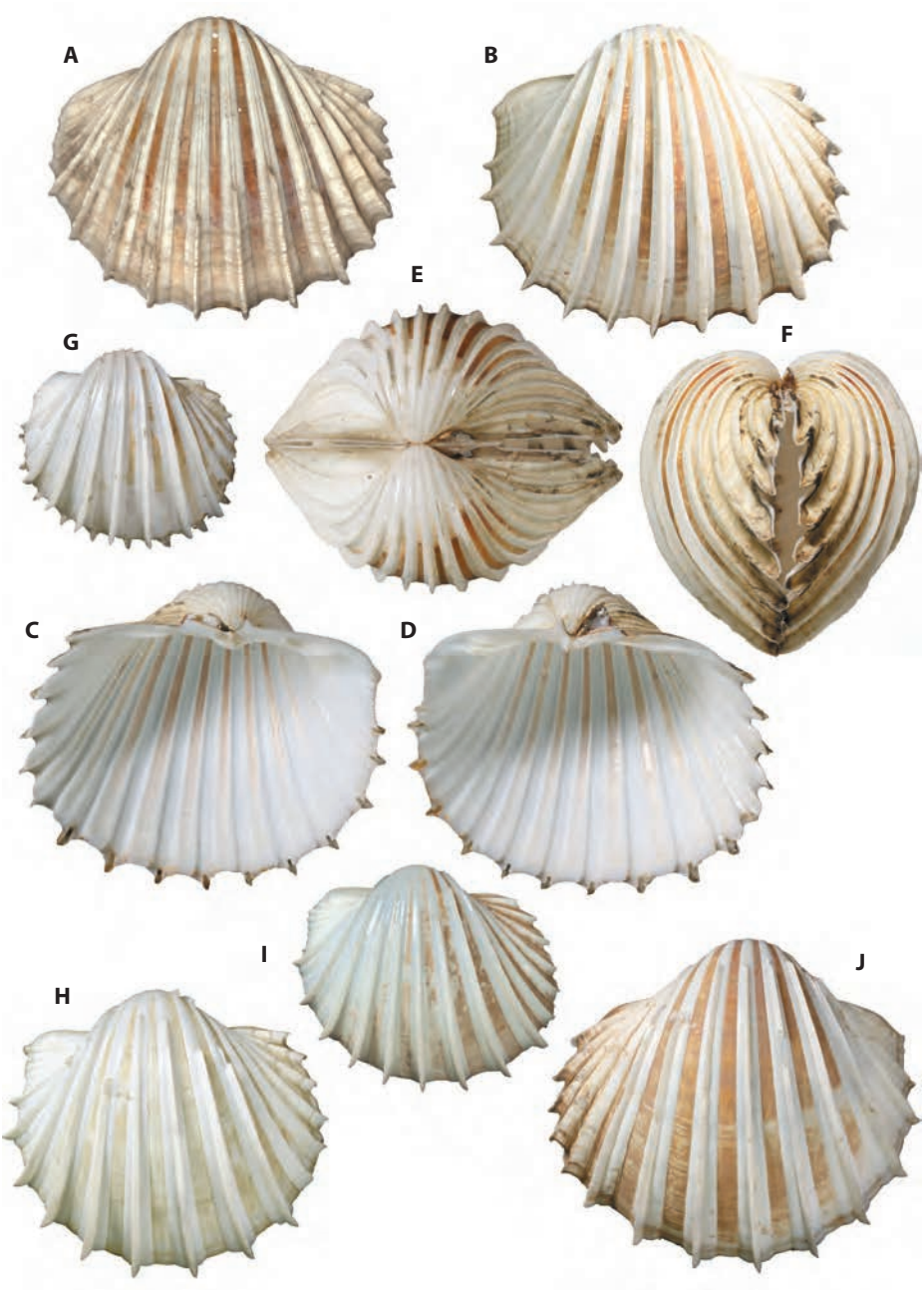
Shell up to 95 mm long, somewhat variable in outline, suboval, longer than high, with nearly straight dorsal margin, younger specimens thin and fragile, fully grown specimens still rather thin, very inflated. Beaks more or less median or very slightly anterior to the vertical midline. Surface with 13-17 broad, radial ribs, the 7-10 middle ribs bearing strong longitudinal keels or "flanges" (ter Poorten 2007) and having broad, flat interspaces, the 5-6 posterior ribs closer-set and slightly keeled on their posterior side. Antero-dorsal slope with 4-6 fine, close-set riblets. Periostracum thin and light greyish to nearly colourless. Inner margin corresponding to the outer sculpture, posteriorly well digitate. Outside and inside white, interspaces of the middle ribs stained with brown.



Distribution. Senegal (Kayar, *fide* ter Poorten 2007) to northern Angola (Luanda); records from Cape Verde Islands are unconfirmed.

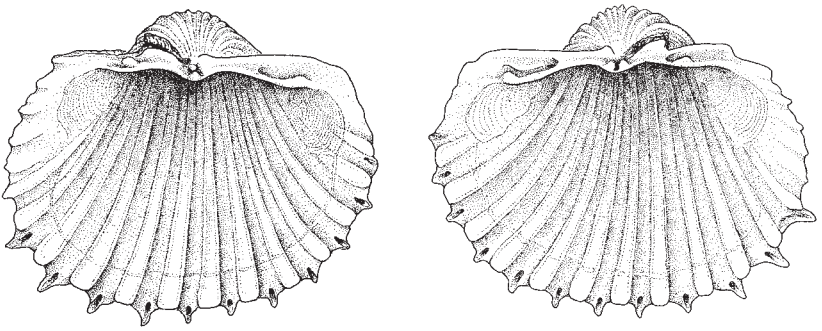
Biotope. In fine, muddy sand and fine sand, in semi-sheltered bays as well as on open coasts, from low tide mark (rare) to about 20 m, common. Often found together with *Tellina* (*Senegona*) *senegambiensis*, *Scissodesma acutissima* and the gastropod *Turritella ungulina* (Linnaeus, 1758).

Remarks. This species, one of the most emblematic of the West African coast, is regularly taken by shrimp and fish trawlers working in the shallower part of the West African continental shelf. Empty shells and valves are frequently found in the driftline of certain beaches. This is the type species of the genus *Cardium*.



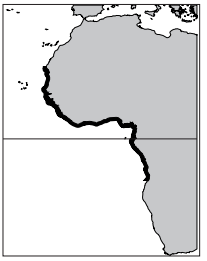
12.2. *Cardium costatum* Linnaeus, 1758. **A**, Lectotype, Linnean Society, London (72 mm, photograph courtesy J.J. ter Poorten). **B**-**F**, Chenal Caravela, Guinea-Bissau, 11°42'N, 16°23'W, 22 m (95.3 mm). **G**, Cap Skirring, S-Casamance, Senegal, beach drift (29.8 mm). **H**, W of Rio Morébaya, Guinea, 9°21.5'N, 13°33'W, 6 m (66.3 mm). **I**, Kouilou, Congo Brazzaville, 4°30'N, 11°38'E, 7-9 m (45.8 mm). **J**, Pointe-Indienne, Congo Brazzaville, 4°44'S, 11°44'E, 30 m (94.6 mm).

Cardium maxicostatum ter Poorten, 2007



12.3. Joal, Senegal (84.3 mm).

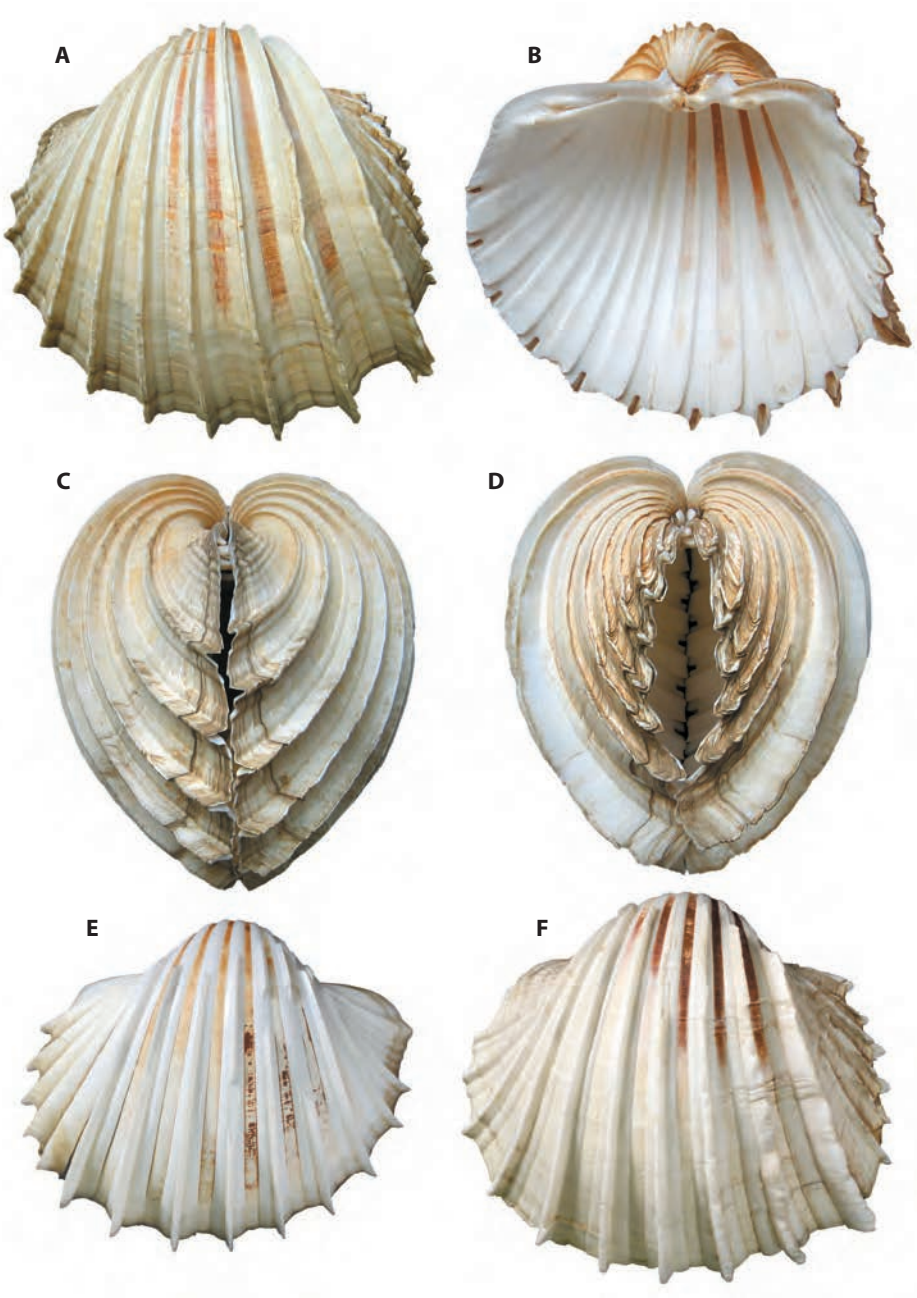
Shell up to 130 mm long, somewhat variable in outline, suboval, slightly longer than high, with nearly straight dorsal margin, quite thick and solid, very inflated. Beaks more or less median or very slightly anterior to the vertical midline. Surface with 13-17 broad, radial ribs, the 9-13 middle ribs bearing strong and very high longitudinal keels and having broad, flat interspaces, the 5-6 posterior ribs closer-set and slightly keeled on their posterior side. Anterio-dorsal slope with 4-8 fine, close-set riblets. Periostracum thin and light greyish to nearly colourless. Inner margin corresponding to the outer sculpture, posteriorly slightly digitate. Outside and inside white, interspaces of the middle ribs stained with brown.



Distribution. Mauritania (Banc d'Arguin, 20°00'N) to southern Angola (Lobito).

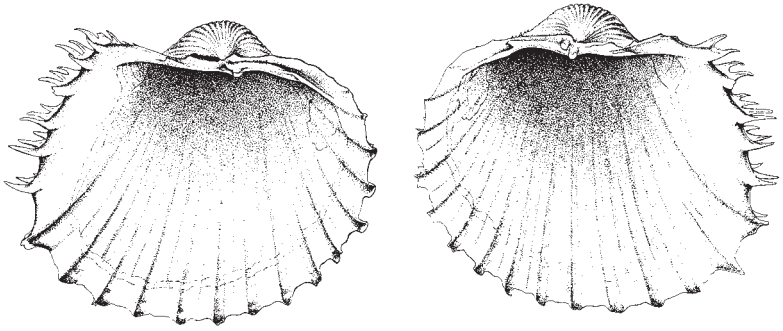
Biotope. In fine, muddy sand and fine sand, from low tide mark to about 20 m, common. Often found together with the sister species *Cardium costatum*.

Remarks. This species was until recently confounded with *Cardium costatum*, however, it is distinguished by its larger size, the higher number of middle ribs (9-13 *vs.* 7-10 in *C. costatum*), the slightly more gaping posterior end, the less strongly digitate posterior margin, the much stronger keels (flanges) on the middle ribs, especially on the more posteriorly situated ribs, and the often thicker and heavier valves (ter Poorten 2007). Intermediates between the two species are almost not existing. - Empty shells and valves are common on many beaches. This is "Le Kaman" of Adanson.



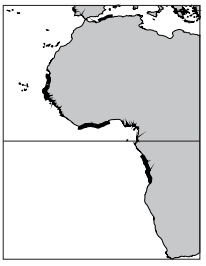
12.4. ***Cardium maxicostatum*** **ter Poorten, 2007. A**-**D**, Pointe-Indienne, Congo Brazzaville (holotype RMNH, 117 mm, photo courtesy J.-J. ter Poorten). **E**, Takoradi, Ghana (73.6 mm). **F**, Cacuaco, Bengo prov., N-Angola, beach drift (84.0 mm).

Procardium indicum (Lamarck, 1819)



12.5. M'Bour (Petite Côte), Senegal, 40-45 m (94 mm with spines).

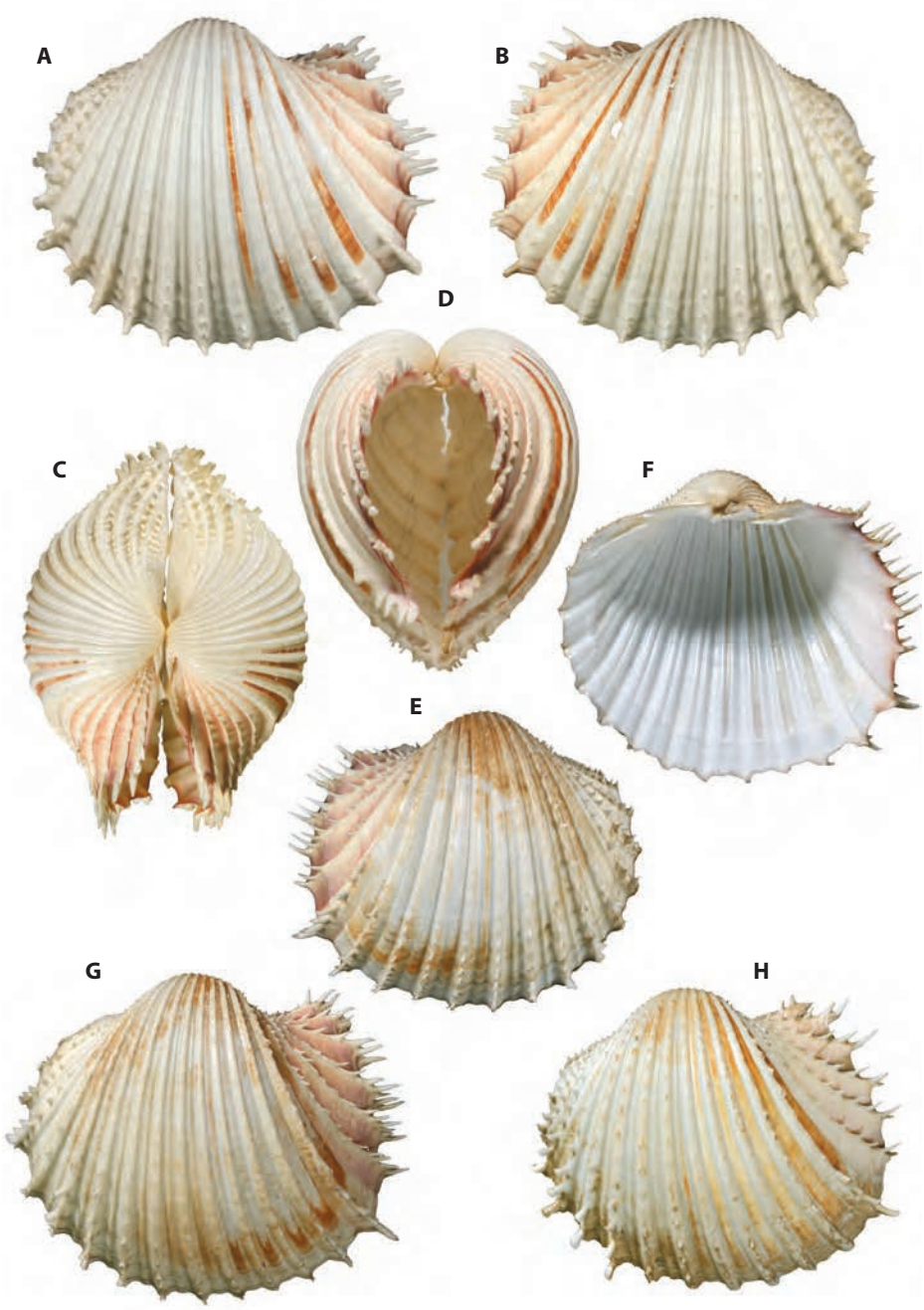
Shell up to 100 mm long, suboval, somewhat longer than high, with slightly curved antero-dorsal margin, rounded anterior margin and weakly convex, obliquely truncated posterior margin, thin and rather fragile, inflated. Beaks more or less median or somewhat anterior to the vertical midline. Surface with 19-22 radial ribs, the 14-16 anterior ribs bearing scaly spines, mostly on their lower part, the 5-6 posterior ribs with rather long, slender and closed spines which are situated on a keel on the posterior side of the shallow ribs. Interspaces broad, on the anterior half of the valves with a shallow rib in the middle. Periostracum very thin and nearly colourless. Inner margin corresponding to the external sculpture, posterior margin digitate. Outside white, posterior ribs reddish, with white keel. Interspaces on the posterior half of the valves stained with brown. Inside white, directly along the posterior margin with a pinkish hue.



Distribution. Mauritania to Senegal (Casamance, Diembéring); Côte d'Ivoire to Ghana; Congo Brazzaville (Pointe-Noire) to northern Angola (Luanda); extreme south-western Mediterranean (Algeria).

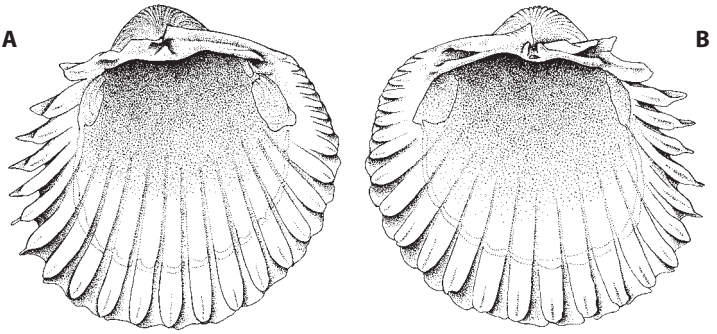
Biotope. In fine and mixed sand, often with shell debris, calcareous algae and stones, offshore at about 40-50 m, not common, rare in the Mediterranean.

Remarks. This species is distinguished from the preceding two *Cardium* species by its narrower and spine-bearing ribs, especially the long posterior spines, the small ribs within the anterior and median interspaces and the cardinal teeth which are separate and equally-sized in both valves of *C. costatum*. *Procardium indicum* has a wider posterior gape than *C. costatum*. The genus was recently distinguished from *Cardium* by ter Poorten & La Perna (2017) on the grounds of distinct evolutionary and biogeographic histories but their statement that it is "putatively ancestral to *Cardium*" is at odds with the principles of phylogenetic systematics, according to which a taxon should include the ancestor and all of its descendants. Empty shells and valves are occasionally taken in trawls. This is *C. hians* Brocchi, 1814 (*non* Spengler, 1799).



12.6. *Procardium indicum* (Lamarck, 1819). **A**-**D**, M'Bour, Petite Côte, Senegal, 40-45 m (82.5 mm). **E**-**F**, Kafountine, N-Casamance, Senegal, 12°49'N, 17°31.7'W, 48-50 m (79.8 mm). **G**, Diembéring, S-Casamance, 12°32'N, 17°28.8'W, 45-47 m (84.2 mm). **H**, Ilha de Luanda, Luanda prov., N-Angola, dredged, 40-60 m (69 mm).

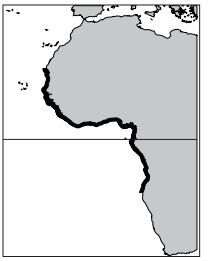
Bucardium ringens (Bruguière, 1789)



12.7. **A**, Casamance, 12°50.4'N, 16°58.8'W, 13-14 m (lv, 32.3 mm). **B**, Karabane Bôlon, Casamance, sand, 3-4 m (rv, 28.9 mm).

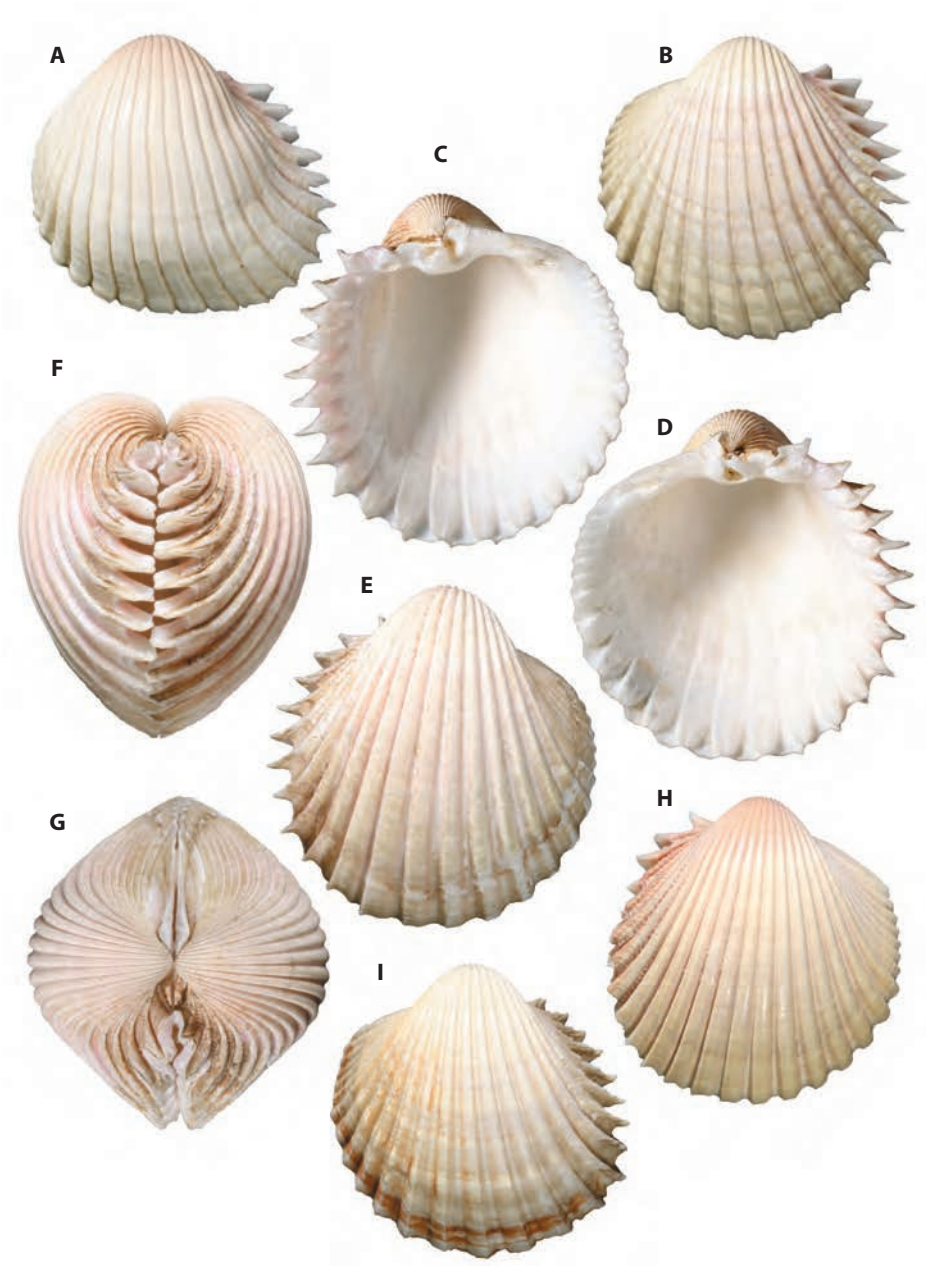
Shell up to 48 mm long, subcircular, as high as long, with slightly convex dorsal margin, thick and solid, very inflated. Beaks more or less median. Surface with 25-28 radial ribs, the anterior 6-8 ribs small, narrow, rounded and smooth with very narrow or without interspaces, the following ribs broad, rather low and smooth with a keel on the posterior side and with narrow, flat interspaces. The last 7-8 ribs have small undulations on the anterior side and sharp posterior keels which continue on the long posterior digitations. Periostracum very thin, transparent and nearly colourless. Inner margin anteriorly and ventrally dentate, posterior margin strongly digitate. Outside yellowish to light greyish white, with reddish-pinkish umbonal area and posterior margin or only a pinkish hue. Inside white or pale pinkish, with pink to light brownish red under the umbos.

Distribution. Mauritania (Cap Blanc) to southern Angola (Moçâmedes, Namibe province).



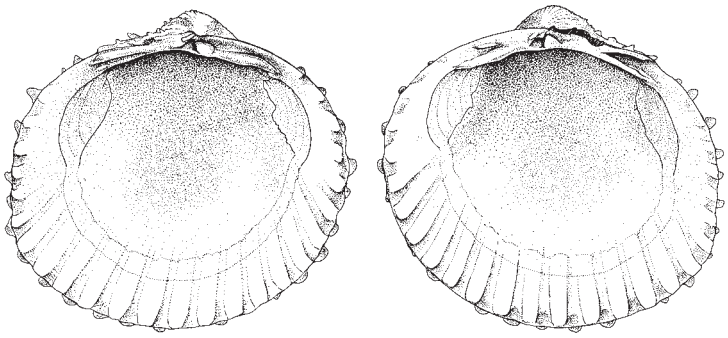
Biotope. In clean, fine sand and mixed sand, on open coasts from shallow water (5-10 m) to about 50 m, common.

Remarks. This species is occasionally found in the by-catch of trawlers; shells and valves are commonly cast ashore on many beaches but live-taken specimens are rare. This is "Le Mofat" of Adanson and the type species of the genus *Bucardium*.



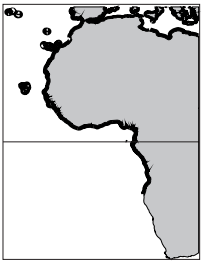
12.8. ***Bucardium ringens*** **(Bruguière, 1789). A**, Baie de Gorée, Senegal, 5-20 m (37.3 mm ht). **B**, Kafountine, N-Casamance, 12°53.8N, 17°03.5'W, 19 m (38.5 mm ht). **C**-**G**, Morton Bay, Victoria (now Limbe), Cameroon, 1-3 m (38.2 mm ht). **H**, Port-Gentil, Gabon, Plage de la Sogara (40.4 mm ht). **I**, Cacuaco, Bengo prov., N-Angola, beach drift (37.5 mm ht).

Papillicardium papillosum (Poli, 1791)



12.9. SW of Cap Timiris, Mauritania, 19°00'N, 16°30'W, 31 m (15.7 mm).

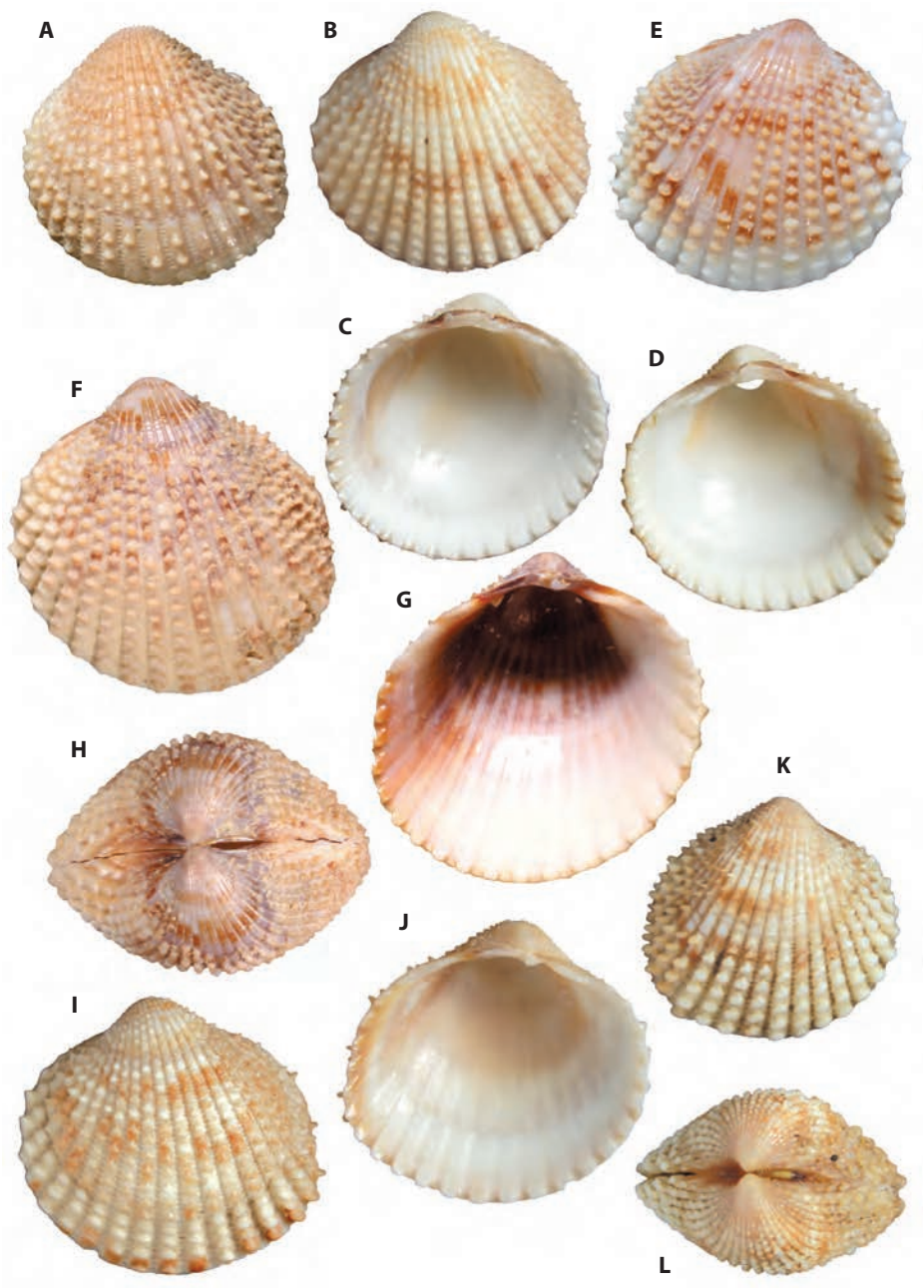
Shell up to 18 mm long, somewhat variable in outline, subcircular-oval to subcircular, slightly oblique, longer than high to nearly as high as long, with rounded anterior and more or less narrowly rounded posterior margin, rather thin to quite thick and solid, inflated. Surface with 24-26 strong, broad, rather flat, radial ribs bearing regular and close-set, bead-like nodules, these are eroded on a more or less large part on and near the umbos. Interspaces narrow, with dense, transverse grooves and ladder-like ridges, in some interspaces on the posterior part slightly V-shaped. Periostracum dull, very thin and nearly colourless. Inner margin dentate corresponding to the external sculpture. Outside whitish to pale pinkish with more or less scattered, commarginally arranged, reddish brown streaks or markings, or occasionally entirely light brown. Inside white, tinged with reddish brown, pink or purple, mostly under the beaks or near the posterior margin. Occasionally outside pattern showing through.



Distribution. Extreme south-western England (rare) to southern Angola (Lucira, Namibe province); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

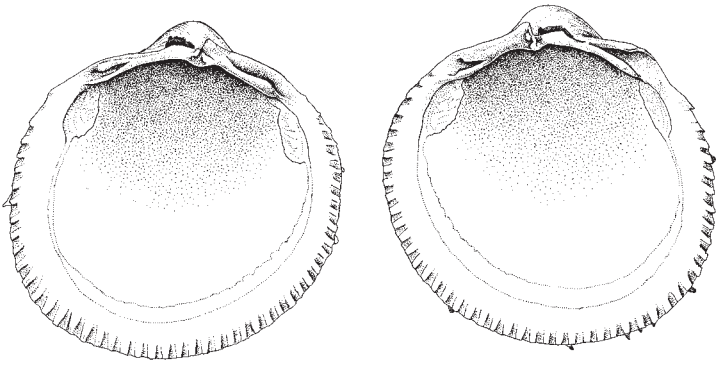
Biotope. In mixed sand, coarse sand and gravel, also with calcareous algae, shells and shell debris, from about 20 to 60 m, locally common.

Remarks. Empty valves are occasionally found on the beach, especially on the islands. *Corculum* (*Trigoniocardia*) *auri* Fischer-Piette, 1977 is a synonym. This is the type species of *Papillicardium*. A very close South African species is *P. turtoni* (G.B. Sowerby III, 1894) (False Bay to Natal and Mozambique; Madagascar).



12.10. ***Papillicardium papillosum*** **(Poli, 1791). A**, Mauritania 17°30'N, 16°12'W, 30 m (9.2 mm). **B-D**, Mauritania 18°48'N, 16°22'W, 28 m (10.0 mm). **E**, off Mauritania 19°12'N, 16°31'W, 16 m (11.0 mm). **F-H**, Baie de Rufisque, Senegal, 18-20 m (14.2 mm). **I-J**, Buraco, Palmeirinhas, Luanda prov. N-Angola (11.2 mm). **K-L**, same locality (8.6 mm).

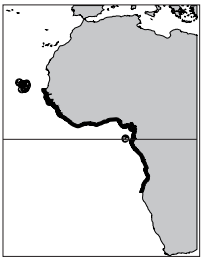
Europicardium caparti (Nicklès, 1955)



12.11. Pointe-Noire, Congo, 5°00'S/ 11°36'E, 90 m (22.9 mm).

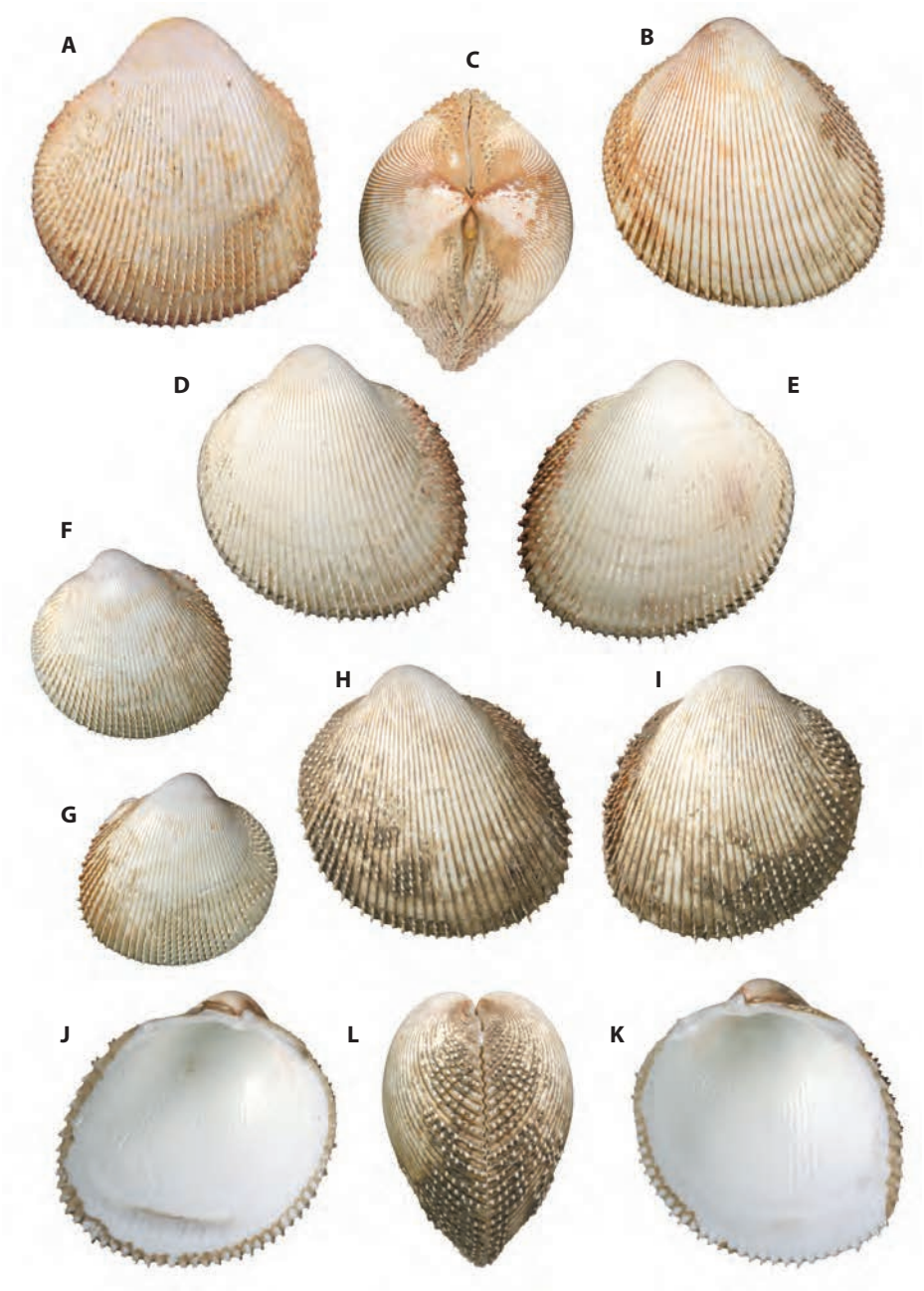
Shell up to 42 mm long and up to 43 mm high, slightly variable in outline, high-oval, somewhat oblique, generally slightly higher than long, with rounded anterior margin and less convex posterior margin, rather thin but solid, inflated. Beaks slightly in front of the vertical midline. Surface with 49-56 radial ribs, the anterior 9-12 ribs bearing numerous tiny bead-like nodules on a keel on their anterior side, the following ribs bearing the nodules on their posterior side. From the middle of the valve towards posterior the isolated pearls transform into thin, irregularly undulate flanges. Interspaces flat and much narrower than ribs. Periostracum thin, light greyish, persistent only on the marginal part of the valves. Inner margin dentate corresponding to the external sculpture. Outside whitish to ivory, often with a few scattered, irregular, light orange-brownish blotches or zigzag markings, umbos whitish. Inside white, often with pale yellowish under the beaks.

Distribution. Senegal (Dakar) to Congo Brazzaville (Pointe-Noire); Angola (Luanda to Moçâmedes); Cape Verde Islands; Annobon.



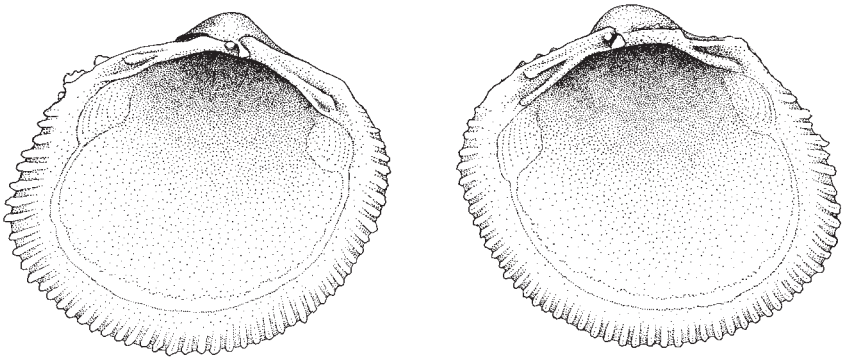
Biotope. In sandy mud, fine, muddy sand and fine sand, offshore from 40 to 110 m, not common.

Remarks. *E. caparti* is a typical deeper shelf species and is occasionally taken as a by-catch in shrimp or fish trawls.



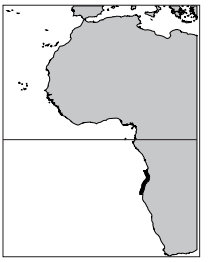
12.12. ***Europicardium caparti*** **(Nicklès, 1955)**. **A**, SW of Boavista, Cape Verde Islands, 15°55'N, 23°06'W, 100 m, (NMR Rotterdam, 46.4 mm ht, photo courtesy J.J. ter Poorten). **B**-**C**, Kafountine, N-Casamance, Senegal, 12°56.6'N, 17°36'W (39.0 mm ht). **D**-**E**, Cameroon, 3°54'N, 8°50'E, 65-70 m (38.9 mm ht). **F**-**G**, Grand Lahou, Abidjan, Côte d'Ivoire, 100 m (27.2 mm). **H**-**L**, off Pointe-Noire, Congo Brazzaville (41.5 mm ht).

Europicardium nolfi Swinnen, 2010



12.13. Praia Amelia, Namibe prov., S-Angola, 40-60 m (38.2 mm ht).

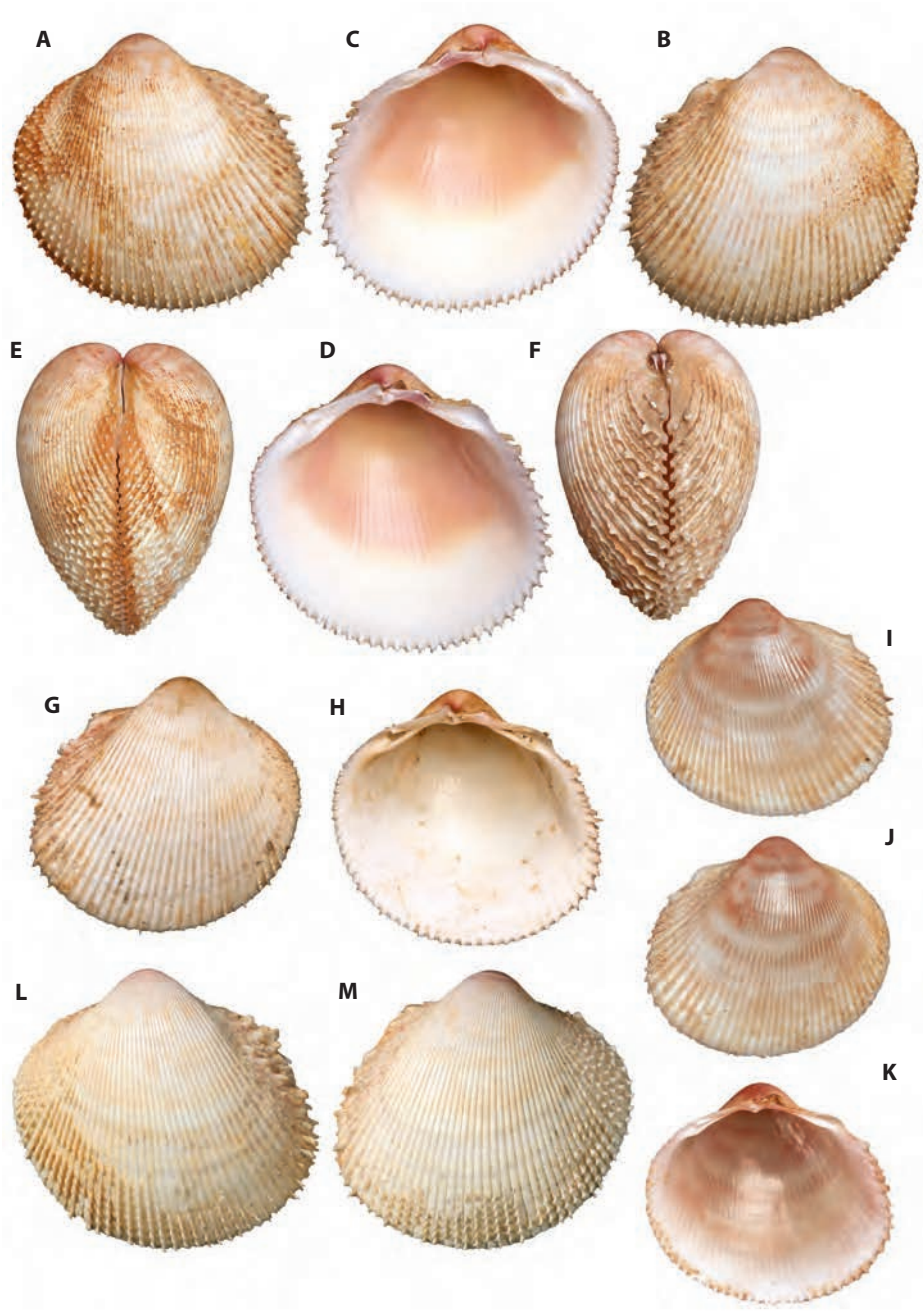
Shell to 50 mm long and up to 43 mm high, slightly variable in outline, almost circular, somewhat oblique, generally slightly longer than high, with rounded anterior margin and slightly rounded-angular posterior margin, rather thick and solid, inflated. Beaks slightly in front of the vertical midline. Surface with about 50 radial ribs, the anterior 9-11 ribs bearing numerous scale-like nodules on a keel on their anterior side, the following ribs bearing the nodules on their posterior side. On posterior part of the valves towards posterior, ribs with spiny scales. Interspaces deep and narrower than ribs. Periostracum thin, persistent only on the marginal part of the valves. Inner margin strongly dentate corresponding to the external sculpture. Outside yellowish white to ivory, often with a few scattered, irregular, pinkish zigzag markings, umbos light pinkish. Inside white, often with pale yellowish or salmon hue under the beaks.



Distribution. Restricted to northern and southern Angola (Luanda to Namibe province).

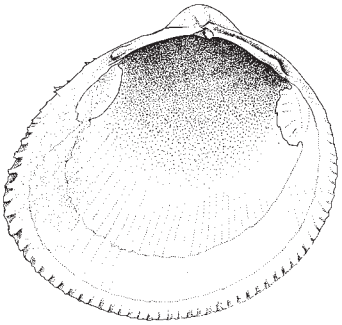
Biotope. In sandy mud, fine, muddy sand and fine sand, offshore from 40 to 110 m, not common.

Remarks. This species was for a long time misidentified as *E. caparti*, and in fact, is very close to it; during work on this volume, it was already perceived as a separate species by ter Poorten and the present author, before Swinnen (2010) described it. From *E. caparti*, it differs in having a somewhat thicker, more solid and slightly longer and less high shell with a more circular-angular outline and stronger ribs, the interspaces are broader and deeper than in *E. caparti*; the umbos of *E. nolfi* are less protruding. The species grows larger, up to a length of 50 mm, the shells are more vividly coloured on the exterior and have a pink-salmon stained interior. *Europicardium serrulatum* (see next entry) can be found together with the two abovementioned species, but is smaller (30 mm), has more ribs which lack definite spines on the posterior part, and has the posterior end more pointed.



12.14. *Europicardium nolfi* Swinnen, 2010. **A-F**, Ilha de Luanda, Luanda prov., N-Angola, dredged 40-60 m (30.5 mm ht). **G-H**, same locality (rv, 29.0 mm ht). **I-K**, same locality, juvenile (10.7 mm ht). **L-M**, Praia Amelia, Namibe prov., S-Angola, dredged 40-60 m (34.6 mm ht) [A-K], photos courtesy of J.J. ter Poorten.

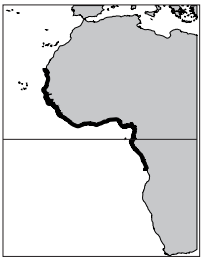
Europicardium serrulatum (Deshayes, 1855)



12.15. Banc de Seminole, Baie de Gorée, Senegal (lv, 18.4 mm).

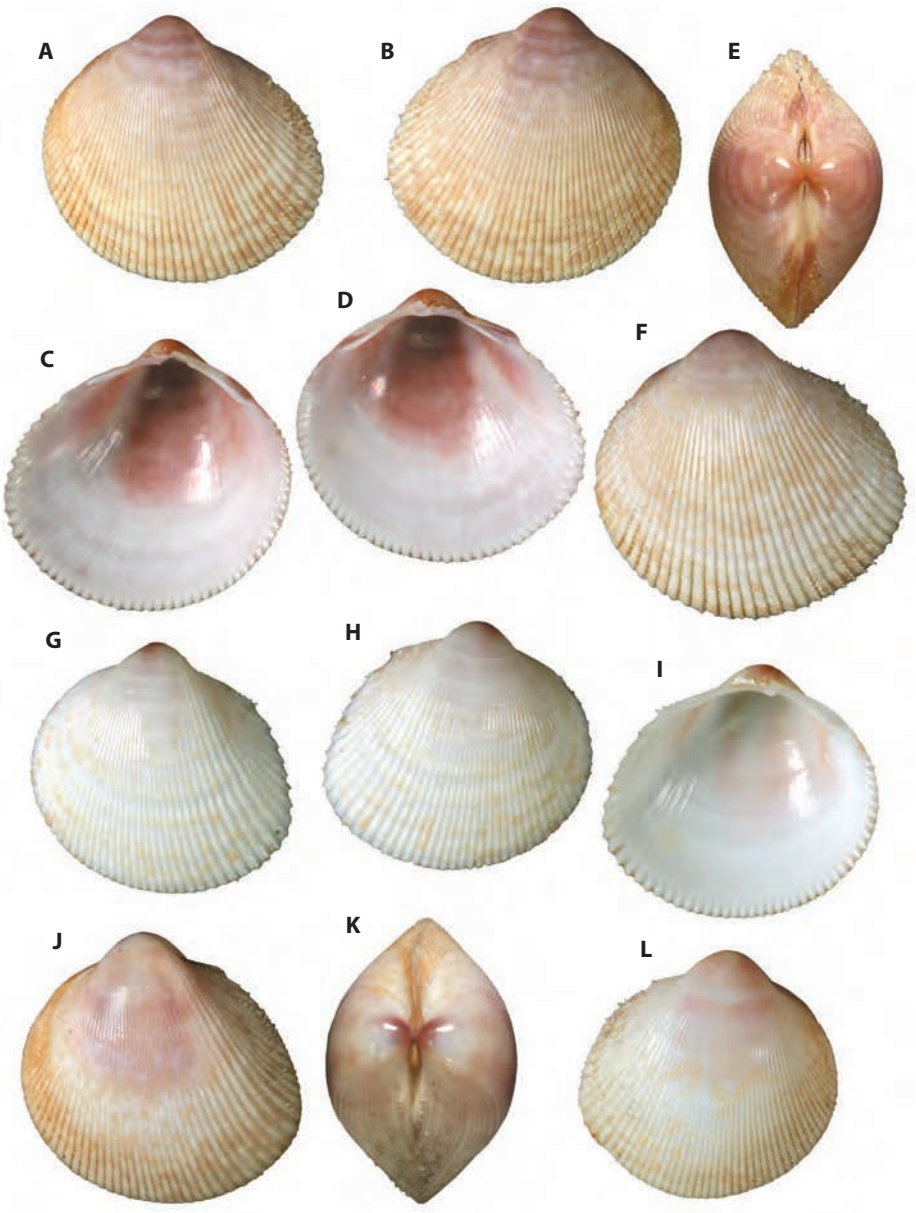
Shell up to 30 mm long, variable in outline, tumidity, rib number and rib ornamentation, rounded, often somewhat oblique, slightly longer than high, with broadly rounded anterior margin and narrowly rounded posterior margin, thin and rather fragile, inflated. Beaks slightly in front of the vertical midline. Surface with 49-62 radial, close-set and nearly contiguous ribs, the anterior 13-15 ribs bearing tiny, somewhat scaly nodules on their anterior side, the following ribs bearing the same type of nodules on their posterior side. Nodules on the posterior area becoming longer and more scaly. Rib ornamentation present only on the marginal part, occasionally entirely obsolete. Periostracum thin, light greyish to nearly colourless, persistent only on the marginal part of the valves. Inner margin dentate corresponding to the external sculpture.

Distribution. Mauritania (Cap Blanc) to northern Angola (Luanda prov.).



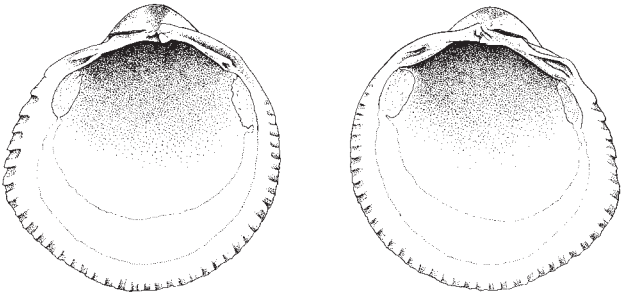
Biotope. In fine sand, mixed sand and coarse sand, also with calcareous algae and shell debris, from 5 to about 50 m, not common anywhere. The species occurs together with among others: *Anadara geissei*, *Bucardium ringens*, *Cardiocardita tankervillii*, *Gastrana matadoa*, *Gari fervensis*, *Gari castrensis* and *Mactra glabrata*.

Remarks. This species is distinguished from *E. caparti* by being less tumid, the smaller size, the less high shell, the, on average, slightly more numerous ribs and the different rib ornamentation, especially on the posterior ribs: instead of the longitudinal, wavy flanges with nodules typical for *E. caparti*, *E. serrulatum* has isolated scales. Empty valves are occasionally washed ashore on certain beaches. *Cardium kobelti* Maltzan, 1885 is a synonym.



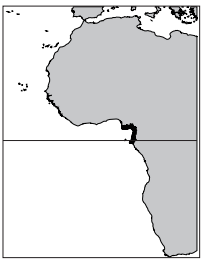
12.16. *Europicardium serrulatum* (Deshayes, 1855). **A**-**E**, Dakar, Senegal, 14°02.5'N, 17°09.6'W (21.4 mm). **F**, Baie de Rufisque, Senegal (23.2 mm). **G**-**I**, Takoradi, Ghana (14.7 mm). **J**-**K**, Ghana, 4°36.5'N, 1°31'W, 50 m (15.7 mm). **L**, same locality (14.6 mm).

Europicardium vepris (Vidal & Kirkendale, 2007)



12.17. Gabon (14 mm).

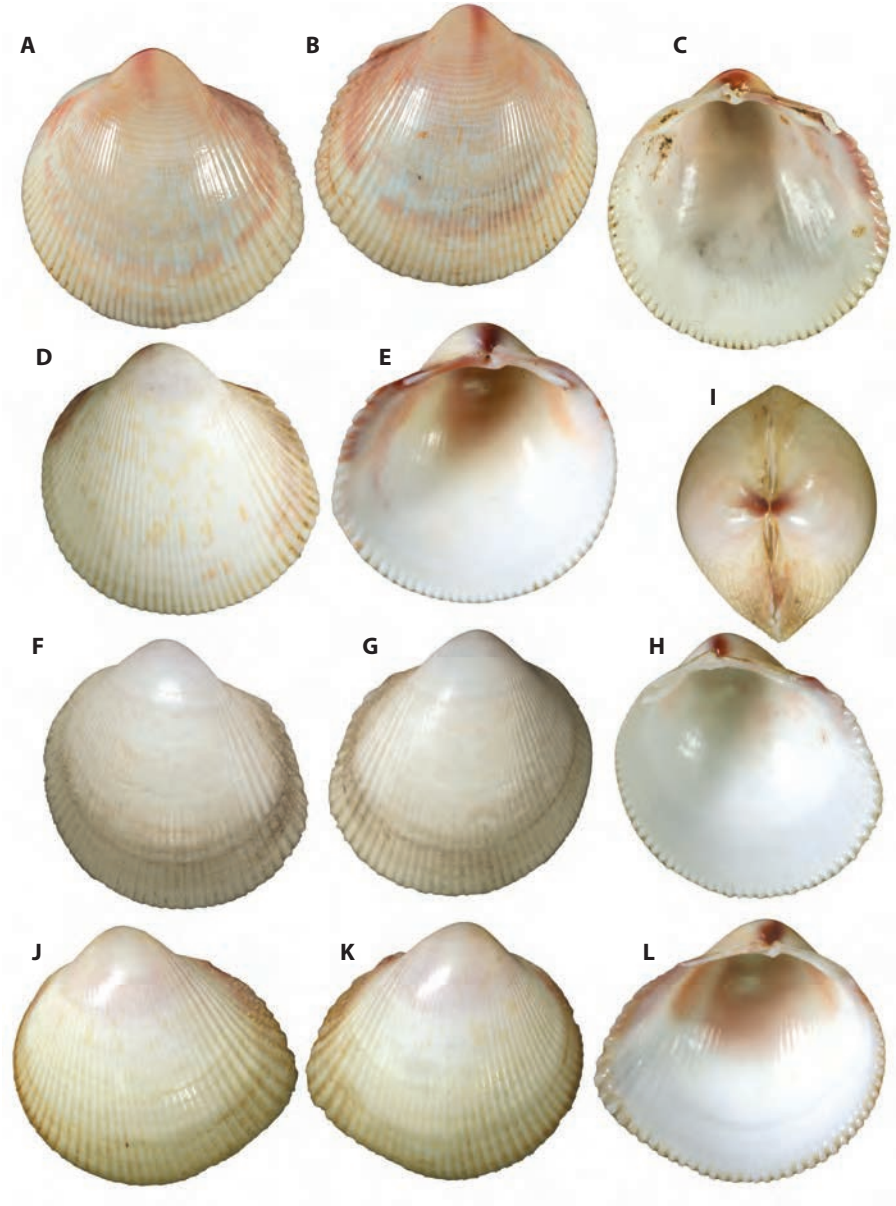
Shell up to 20 mm long, somewhat variable in outline and tumidity, rounded, only very slightly oblique, somewhat longer than high, with broadly and evenly rounded anterior margin and more obliquely rounded-truncated posterior margin, rather thin, quite tumid and appearing globose. Beaks almost in the middle. Surface with 52-54 radial, close-set ribs, the anterior 6-9 ribs bearing a few tiny nodules mostly near the valve margin on their anterior side, the following ribs being entirely smooth. Rib ornamentation present only near and on the marginal part, occasionally entirely obsolete. About 14 of the most posterior ribs broader than those on the anterior and middle part. Periostracum thin, light greyish to nearly colourless, persistent only on the marginal part of the valves. Inner margin dentate corresponding to the external sculpture. Outside whitish with a few light brownish blotches or entirely white. Beaks dark reddish pink, this pink colouration continuing on the anterior side of the umbos and disappearing more towards the ventral edge. Often light pink to reddish brown colouration just near the anterior and posterior margin. Inside with a light yellowish hue or yellowish-brownish to pinkish in the umbonal cavity.



Distribution. Known only from Cameroon to Gabon, where it seems to replace *E. serrulatum*.

Biotope. In fine sand, in shallow water. Almost only known from empty fresh shells and valves from the beach drift.

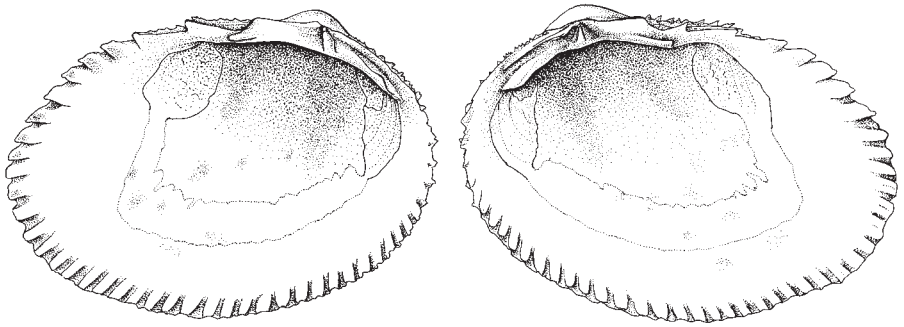
Remarks. This species is distinguished from *E. serrulatum* in being generally higher, less oblique and more tumid. The almost smooth ribs, the reddish tip on the umbos and the yellowish to pinkish inner part of the umbos are reminiscent of small *Fulvia*. Small specimens of *Fulvia fragilis congoensis* could indeed be confused with this species but differ in being longer than high, having broader and flatter ribs on the central part of the shell, and in having the lateral teeth coming much closer to cardinals and the posterior lateral very weak on lv; a juvenile *Fulvia* in the size-range of *E. vepris* is shown on Figure 12.28E-F. Only during work on a description of this species in collaboration with J.J. ter Poorten, it was discovered, that the species had recently been named *Fulvia* (*Fulvia*) *vepris* by Vidal & Kirkendale (2007)



12.18. *Europicardium vepris* (Vidal & Kirkendale, 2007). A-C, "Nouvelle Calédonie" [in error], coll. Dautzenberg (holotype, 15.8 mm, photo Manuel Caballer/Recolnat). D-E, Victoria (now Limbe), Morton Bay, Cameroon, beach drift (20.1 mm). F-I, Plage de la Sogara, Port-Gentil, Gabon (16.8 mm). J-L, same locality (16.1 mm).

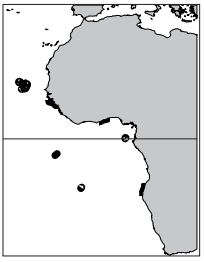
from a small single lot in MNHN, erroneously labelled "New Caledonia". According to the label, this material had been donated by P. Dautzenberg to another collector from whom it came, together with a part of his collection, to MNHN. So, a mislabelling subsequent to Dautzenberg may have been possible.

Papyridea soleniformis (Bruguière, 1789)



12.19. Ilha do Sal, Cape Verde Islands (40 mm).

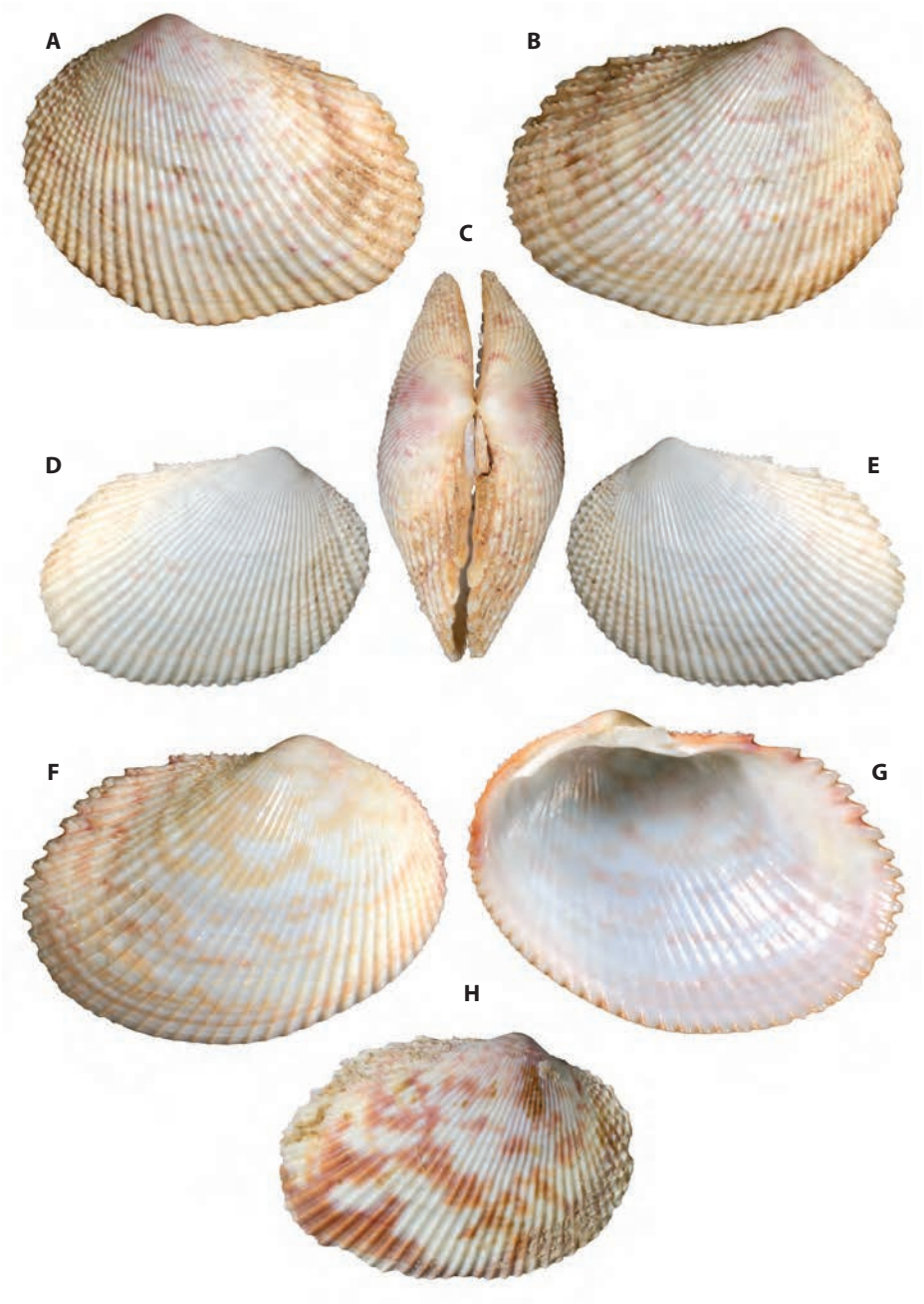
Shell up to 55 mm long (specimens from the Caribbean up to 61 mm, ter Poorten coll.) elongate-oval, oblique, with rounded anterior and posterior margin, thin but fully grown specimens quite solid, rather compressed. Beaks at the end of the anterior third of the valves. Surface with 41-46 rounded, radial ribs, the anterior 11-16 ribs bearing low scales on their middle and marginal part, the following ribs smooth and the last 11-14 ribs bearing small, irregularly spaced scaly spines on their posterior side. Interspaces narrower than ribs and slightly convex. Periostracum very thin, pale yellowish to nearly colourless, mostly persistent on the marginal part of the valves. Inner margin dentate corresponding to the external pattern, posterior margin with short digitations. Outside white with isolated to more or less crowded, irregular, reddish to reddish brown mottles, streaks or zigzag markings. Inside white with reddish rays under the beaks and occasionally with a yellowish hue, outside pattern in younger specimens showing through.



Distribution. Eastern Atlantic: Cape Verde Islands; São Tomé; St. Helena. On the continental shelf found to date only in Guinea (Rio Nuñez, 10°7'N), Ghana (E of Tema) and southern Angola (Praia do Cesar, Lucira, Namibe prov.). Western Atlantic: North Carolina to Florida, throughout the Caribbean and southward to Brazil (São Paulo State).

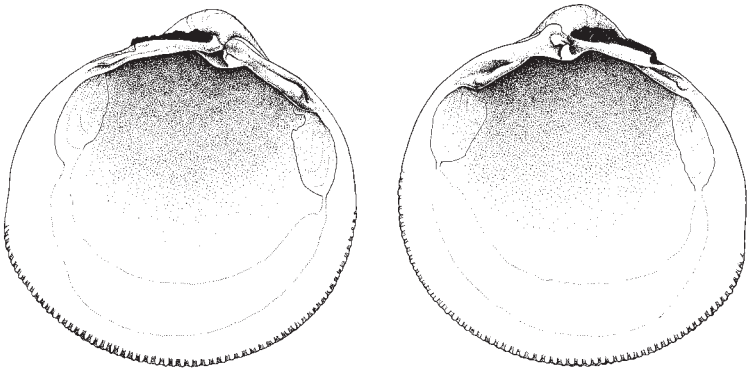
Biotope. In mixed and coarse sand, also with calcareous algae, corals and shell debris, from about 10 to 40 m, very rare on the West African continental shelf, not uncommon around the Cape Verde Islands. In the Caribbean also in shallower water, from 2 m downward.

Remarks. This is an amphiatlantic species also found in the Western Hemisphere, in St. Helena and in the tropical Eastern Atlantic islands and vary rarely along the West African mainland. Empty shells and valves are occasionally washed up on Cape Verde Islands beaches. *Papyridea lata* (Born, 1778), another very close species from the Caribbean has also been recorded from West Africa (*fide* Huber 2010). That species was also cited as *P. soleniformis* (see Kafanov 1997). The type lot (2 sh.) in NHMW is, however, without locality.



12.20. ***Papyridea soleniformis*** **(Bruguière, 1789).** **A**-**C**, Ilha do Sal, Cape Verde Islands (37.1 mm). **D**-**E**, same locality (30.2 mm). **F**-**G**, W of Rio Yomboya, Guinea, 10°27'N, 15°37.5'W, 39 m (49.6 mm). **H**, Baia de Lucira, Praia do Cesar, Namibe prov., S-Angola (29.4 mm).

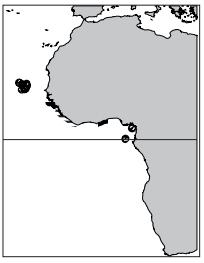
Lyrocardium aeolicum (Born, 1778)



12.21. Cape Verde Islands, 15°48'N, 23°04'W, 190-200 m (49 mm).

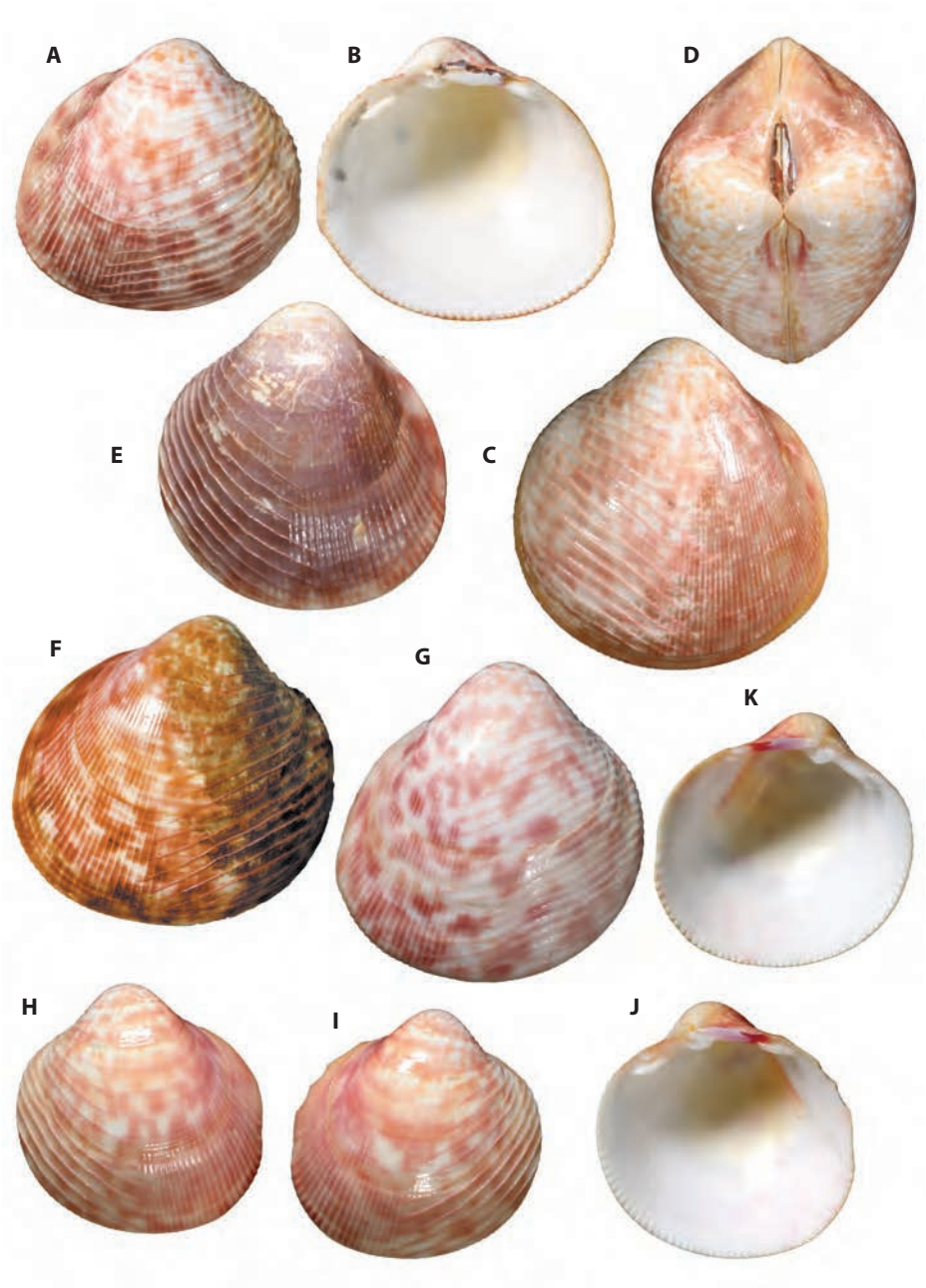
Shell up to 62 mm long and up to 65 mm high (spm. in ter Poorten coll., CVI), rounded, slightly longer than high to higher than long, somewhat oblique, rather thick and solid, inflated. Beaks slightly anterior to the vertical margin. Surface glossy, with numerous, smooth radial ribs which are more or less obsolete on the anterior half and the umbonal area, and which are missing on the posterior area. Secondary sculpture on the anterior half of the valves consisting of well-marked, evenly spaced, slightly irregular, sharp, oblique ridges. Periostracum thin, brownish, often partly eroded. Inner margin finely denticulate except the antero-dorsal margin, corresponding to the radial ribs. Outside whitish, with numerous, more or less dense, irregular, reddish-pink to brownish-red zigzag markings, blotches and streaks. Inside white, from the umbos downwards often tinged with yellow and light pink around the posterior adductor scar.

Distribution. Guinea (10°19'N), Ghana and probably northern Angola; Cape Verde Islands; São Tomé, Ilha do Principe.



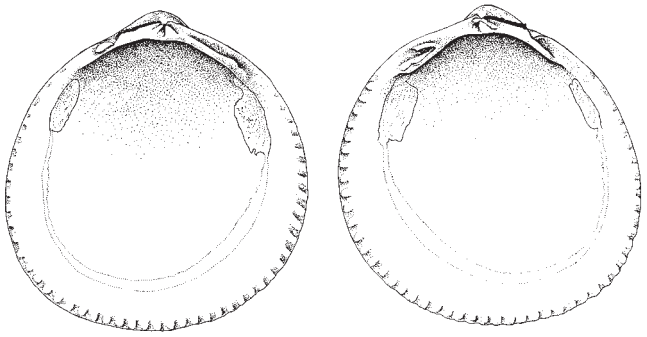
Biotope. In coarse sand and gravel, also with shells, shell debris, calcareous algae and stones, from about 10 to 50 m, not uncommon at Cape Verde Islands, rare on the continental shelf. The species was dredged on the Guinean shelf together with *Talochlamys multistriata*, *Chama crenulata*, *Arca bouvieri*, *Crassatina corrugata*, *Globivenus libellus*, and the snails *Bolma jacquelinae* (Marche-Marchad, 1957) and *Latirus filosus* (Schubert & Wagner, 1829).

Remarks. This species shows a nearly exclusively tropical distribution pattern and seems to avoid influence of upwelling. It is the only Atlantic representative of *Lyrocardium*, an otherwise Indo-Pacific group. A sibling species is *Lyrocardium anaxium* Oliver & Chesney, 1997 from the northwestern Indian Ocean (Somalia to Gulf of Oman) and the northern Red Sea (Oliver & Chesney 1997; see also Oliver 1995). Single valves and fragments of *L. aeolicum* are sometimes found on the beach in Cape Verde Islands.



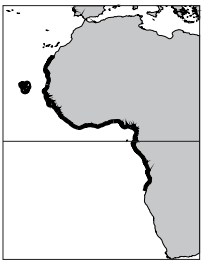
12.22. *Lyrocardium aeolicum* (Born, 1778). **A**-**B**, Baia de Calhau, São Vicente, Cape Verde Islands, beach drift (43.0 mm). **C**-**D**, Cape Verde Islands, 15°48'N, 23°04'W, 190-200 m (50.7 mm). **E**, Mindelo Port near outer mole head, São Vicente, Cape Verde Islands, 10-15 m (40.0 mm ht). **F**, W of Ile Tannah; Guinea, 9°11.9'N, 14°21'W, 41 m (41.5 mm). **G**, Ilha do Principe, 1-4 m (42.1 mm ht). **H**-**K**, Gabon, Nyonie, near Gombé lighthouse, 0°03'S, 9°19.5'E, beach drift (24.5 mm).

Laevicardium crassum senegalense Dautzenberg, 1891



12.23. Guinea, 9°35.9'N, 15°40'W, 48 m (24.4 mm).

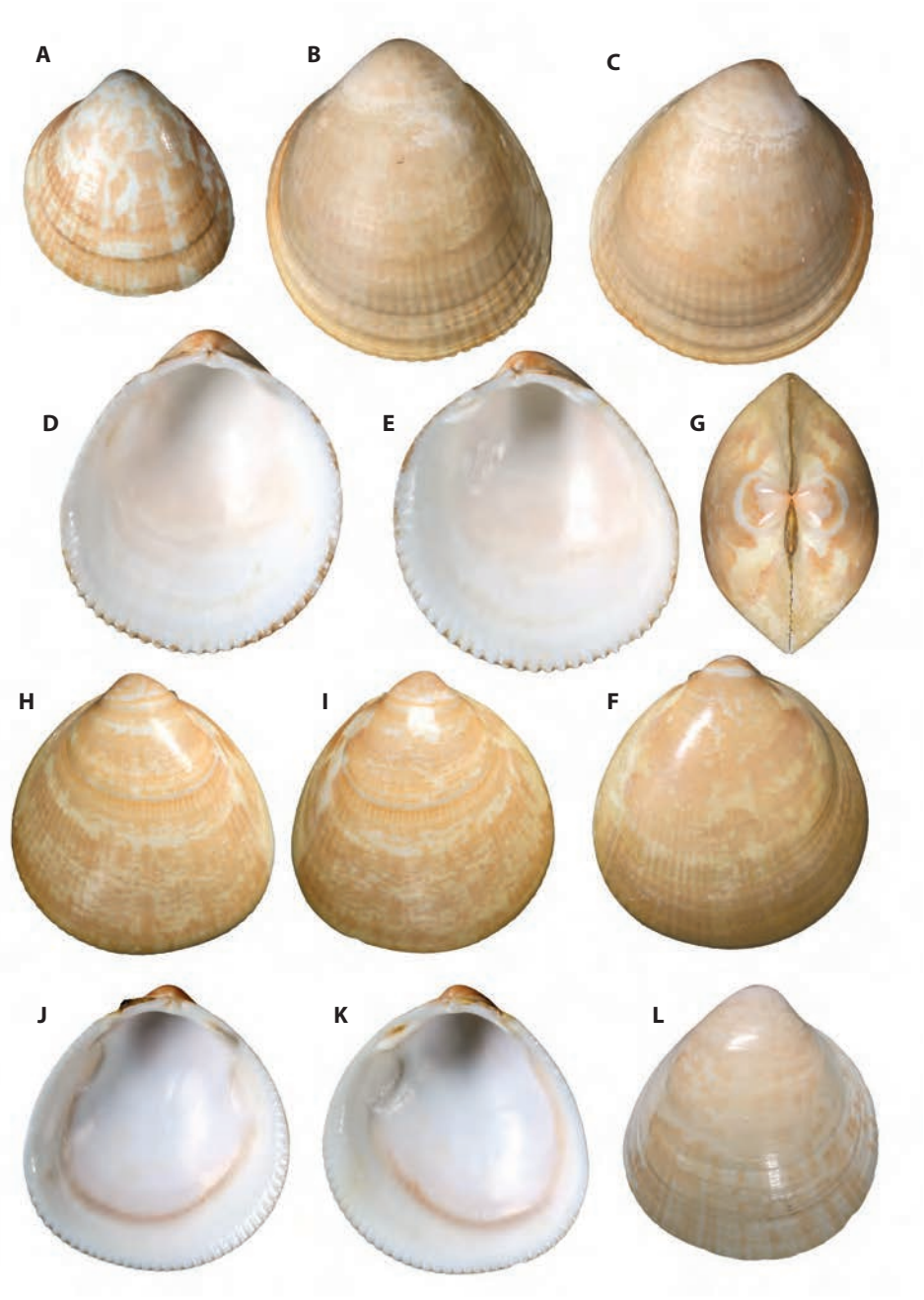
Shell (West African specimens only) to 41 mm long and 45 mm high (spm. from CVI in ter Poorten coll.), oval, generally slightly higher than long, but sometimes as long as high and occasionally longer than high, somewhat oblique, with broadly rounded anterior margin and more narrowly rounded posterior margin, thin to rather thick and solid, inflated. Beaks in front of the vertical midline. Surface nearly smooth, with 38-50 radial ribs visible but nearly not touchable. No ribs on the postero-dorsal area. Periostracum rather thin, greenish brown to brown, transparent only on the umbonal part of the valves. Inner margin dentate corresponding to the ribs. Outside whitish, cream or pale yellowish, with light brownish streaks, blotches or zones. Inside white, with pale pinkish hue at the umbonal zone or tinged with pinkish brown to brown.



Distribution. *L. crassum crassum*: Norway (62°N), Shetlands, British Isles southward to Morocco; throughout the Mediterranean. *Laevicardium crassum senegalense*: West Sahara (Rio de Oro or already further northward) to southern Angola (Lucira); Cape Verde Islands.

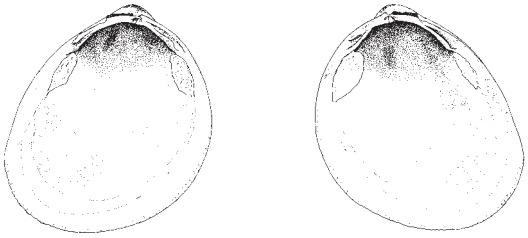
Biotope. In clean fine sand, mixed sand, coarse sand, also with gravel, shell debris and calcareous algae, offshore from 10 to about 80 m, common.

Remarks. The nominal subspecies *L. crassum crassum* grows largest in the northern European Atlantic (British Isles, France, northern Spain, 67 mm long and 68 mm high); in the Mediterranean and the adjacent Atlantic region its maximum size is about 50 mm. In the tropical zone it only reaches 45 mm. This smaller West African form is here treated as a geographical subspecies, *L. crassum senegalense*. Apart from the smaller size, the often somewhat thinner shell and the more colourful appearance, there are no fundamental differences between *L. c. senegalense* and the nominal subspecies. Specimens are occasionally taken in shrimp trawls. The nominal subspecies is *Cardium norvegicum* Spengler, 1799 and the West African form is "Le Movin" of Adanson. The Mediterranean endemic *L. oblongum* (Gmelin, 1791) is another species consistently separated from *L. crassum* by the higher and more tumid valves and the more clearly developed ribs.



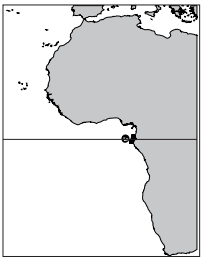
12.24. ***Laevicardium crassum senegalense*** **Dautzenberg, 1891**. **A**, Baia Mordeira, Ilha do Sal, Cape Verde Islands (29.3 mm ht). **B**-**E**, Abéné, N-Casamance, 13°02.3'N, 17°08.5'W, 27 m (37.2 mm ht). **F**-**G**, W of Sierra Leone border, 9°06'N, 14°20 W, 33 m (36.0 mm ht). **H**-**K**, W of Sierra Leone border, 9°02.4'N, 14°19'W, 35 m (32.1 mm ht). **L**, Buraco, Palmeirinhas, Luanda prov., N-Angola (37.6 mm ht).

Laevicardium sybariticum (Dall, 1886)



12.25. Ilha do Principe, 1°42.5'N, 7°28'E, 21 m (14.1 mm ht).

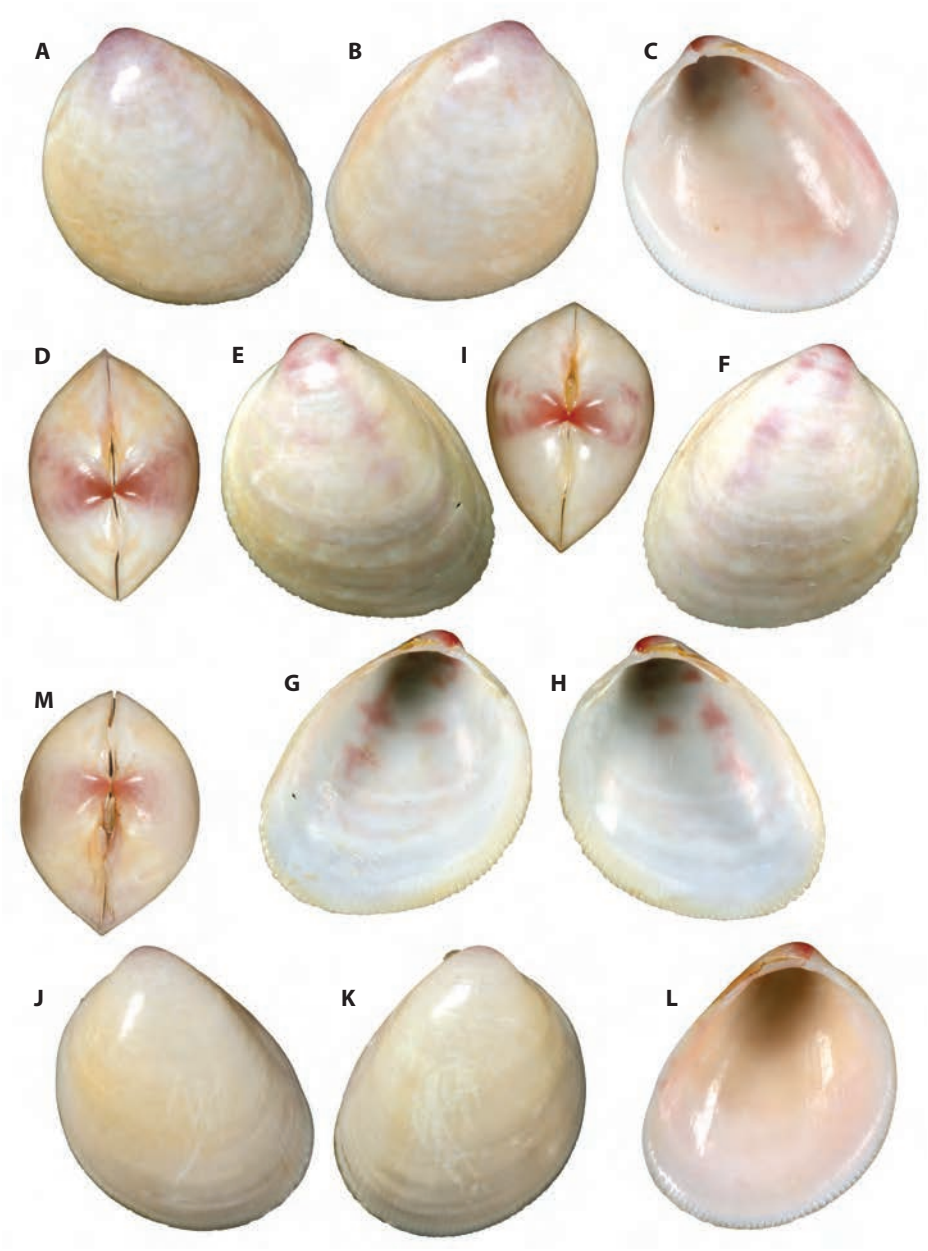
Shell small, up to 15 mm long and 18 mm high, rounded-oblique, inequilateral, higher than long, with broadly rounded anterior margin and narrowly rounded postero-ventral margin, thin but rather solid, inflated. Beaks slightly in front of the vertical midline. Last fold and last flat (equivalent to the escutcheon) not sharply delimited. Lunular heart clearly demarcated and raised. Surface nearly smooth, glossy, with about 50-65 radial subsurface ribs which are minute and often poorly visible. No ribs on the antero-dorsal and postero-dorsal area. Periostracum very thin, pale yellowish grey, nearly transparent. Inner margin very finely dentate on the ventral half of the valves, corresponding to the ribs. The width of the ventral pallial line is somewhat variable. Outside whitish to cream, with numerous, faded, pale yellowish mottles and a purplish hue on the umbonal region of the valves. Umbos themselves always distinctly purplish red, often continuing in two purplish rays pointing towards the antero- and postero-ventral margin but soon disappearing. Inside pale pink, posterior half often more pinkish red, with exterior purple visible in same intensity. Immediate marginal zone often white.



Distribution. Eastern Atlantic: São Tomé, Ilha do Principe; on the continental shelf only known from the Port Gentil area, Gabon. Western Atlantic: Florida, Bahamas, Greater and Lesser Antilles, Nicaragua to Colombia, Guyana, Brazil to Estado Espirito Santo.

Biotope. In fine and mixed sand with calcareous algae and shell debris, often also with mud, between 5 and about 100 m, uncommon on the islands, very rare on the continental shelf.

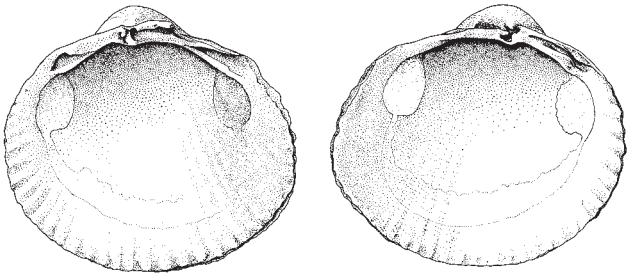
Remarks. This species is easily distinguished from *L. crassum senegalense* by its small size and the high, oblique shell form. Young specimens of *L. crassum* are much broader and frequently have zigzag markings. Western Atlantic *L. sybariticum* may have a somewhat more intensive reddish interior and mostly lack the two radial purplish rays emanating from the beaks, but otherwise specimens from the two populations are not essentially different. Despite the rather restricted Western Atlantic distribution of *L. sybariticum* and the minimal colour differences, both populations are considered to be the same species. The very small protoconch I indicates a planktotrophic development, and a rather large protoconch II shows that the larvae remain in the plankton for a considerable time and can be transported over very long distances. The close western Atlantic species *L. pictum* (Ravenel, 1861) lacks the deep red umbos and often



12.26. *Laevicardium sybariticum* (Dall, 1886). **A-D**, Ilha do Principe, 1°42.5'N, 7°28'E, 21 m (14.5 mm ht). **E-I**, Ilha do Principe, 1°42.9'N, 7°28.9'E, 37 m (12.5 mm ht). **J-M**, Port-Gentil, Gabon (15.8 mm ht).

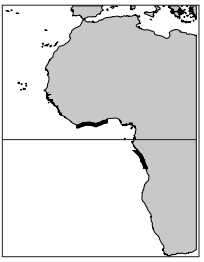
has a zigzag pattern on the exterior; reports from the Gulf of Guinea under that name (Nolf 2010) refer to *L. sybariticum* (ter Poorten pers. comm. 2018).

Fulvia fragilis congoensis Cosel 1995



12.27. Pointe Noire, Congo, Plage Mondaine (paratype, 41 mm).

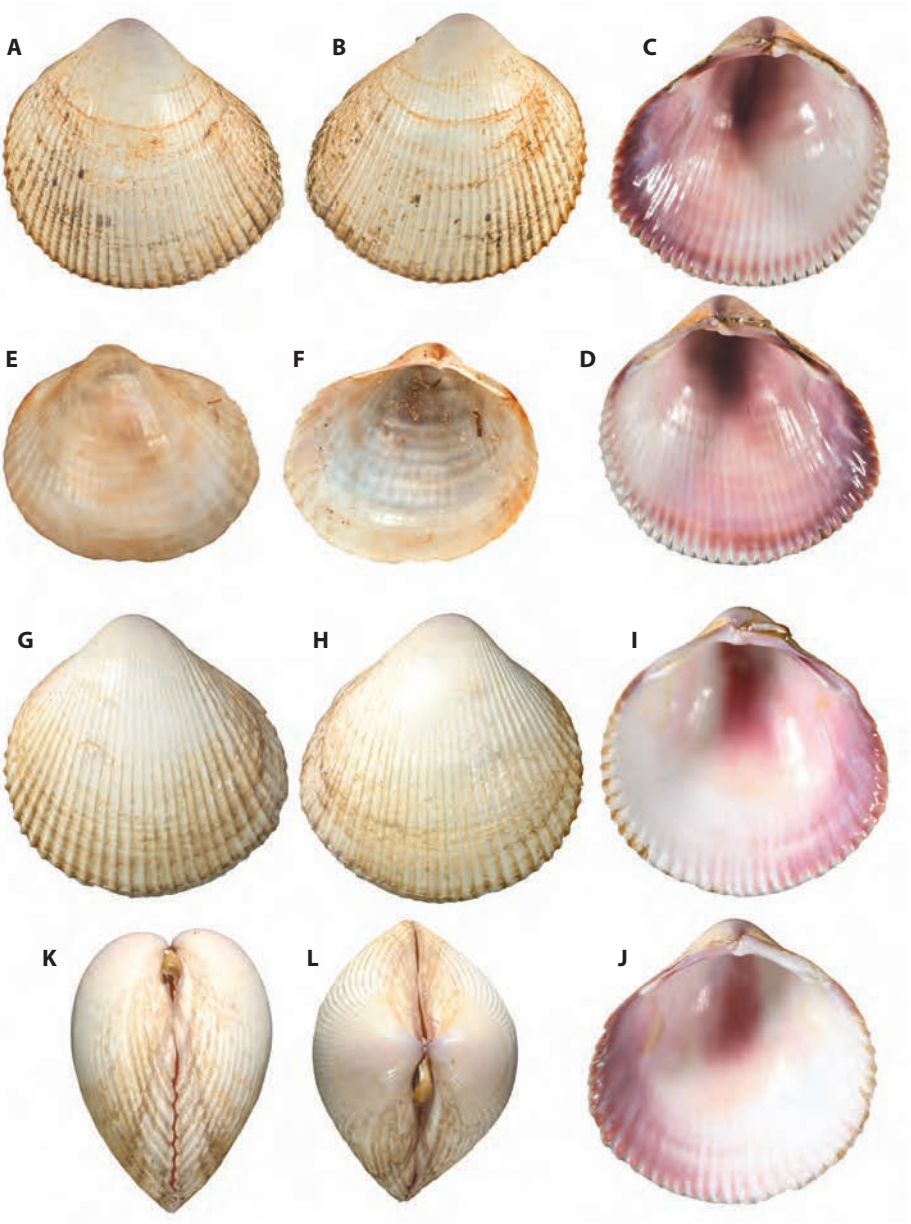
Shell up to 50 mm long, variable in outline, rounded to short-oval, often somewhat oblique, slightly longer than high to as high as long, thin, very inflated. Beaks more or less anterior to the vertical midline. Surface with 32-38 smooth and not prominent, radial ribs which have the summit at their posterior side. No ribs on the part of the antero-dorsal area close to the beaks. Interspaces smooth and narrower than ribs. Periostracum greyish brown, forming fringes on the summits of the ribs, otherwise thin and translucent. Inner margin finely dentate corresponding to the ribs. Outside cream to pale yellowish, on the umbonal part often with pale fawn, horizontally arranged zigzag markings, umbos more or less tinged with purple. Inside white, often with yellow or reddish near the umbos. Dark, purplish red zones under the beaks, on the postero-dorsal margin below the ligament and along the posterior and postero-ventral margin, often extending to the middle and sometimes to the anterior half.



Distribution. Known from Côte d'Ivoire to northern Angola, but so far found only in a few isolated populations in Côte d'Ivoire, Ghana, the Congo (Baie de Pointe-Noire) and Northern Angola. In Luanda, adult specimens were never found during the samplings 1981-1985 and therefore there may be only pseudopopulations.

Biotope. In muddy sand and fine sand, from just below low tide mark to about 10 m, mostly in calm bays and lagoons where it seems to tolerate somewhat reduced salinities. Locally common.

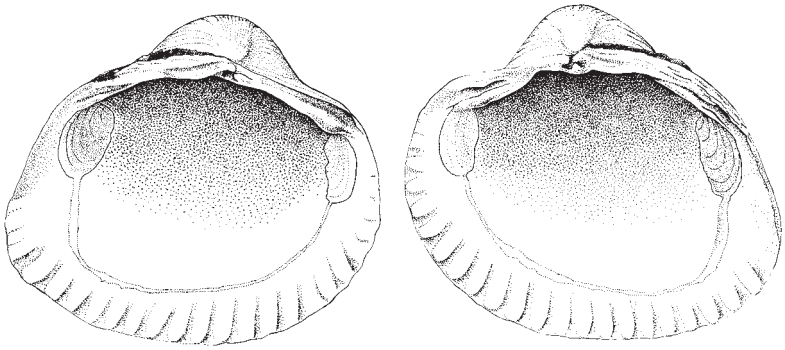
Remarks. The West African populations of the Indian Ocean species *Fulvia fragilis* (Forsskål, 1775 [1774]) are separated as a geographic subspecies. *Fulvia fragilis fragilis* grows larger (up to 82 mm, spm. in ter Poorten coll.) than *F. fragilis congoensis*, furthermore it differs by the even more thinner valves, the slightly more numerous ribs (35-43), the more brownish-red colouration on the inside and the often somewhat less tapering posterior margin. The species might have reached the West African coast from the Indian Ocean around the Cape of Good Hope, and afterwards the populations became separate and continued developing independently. The actual distribution pattern shows that the subspecies survived on the West African coast only in isolated pockets with an adequate biotope. In Ghana, specimens are gathered for food. *Fulvia fragilis fragilis* is a Lessepsian



12.28. *Fulvia fragilis congoensis* Cosel, 1995. **A**-**D**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, in beach drift (holotype, 49.2 mm, photo Manuel Caballer/Recolnat). **E**-**F**, Plage Mondaine, in beach drift, juvenile (11.5 mm, photo courtesy J.J. ter Poorten). **G**-**L**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, fine muddy sand, 1-3 m (39.5 mm).

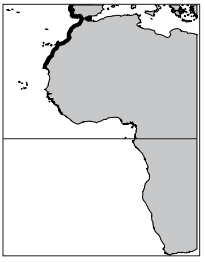
migrant to the Mediterranean (for details, see Zenetos *et al.* 2003) and the possibility that the West African populations could also have been introduced recently should be also considered.

Cerastoderma edule (Linnaeus, 1758)



12.29. S. Baie de l'Etoile, Mauritania, "La Rivière" 21ºN (34 mm).

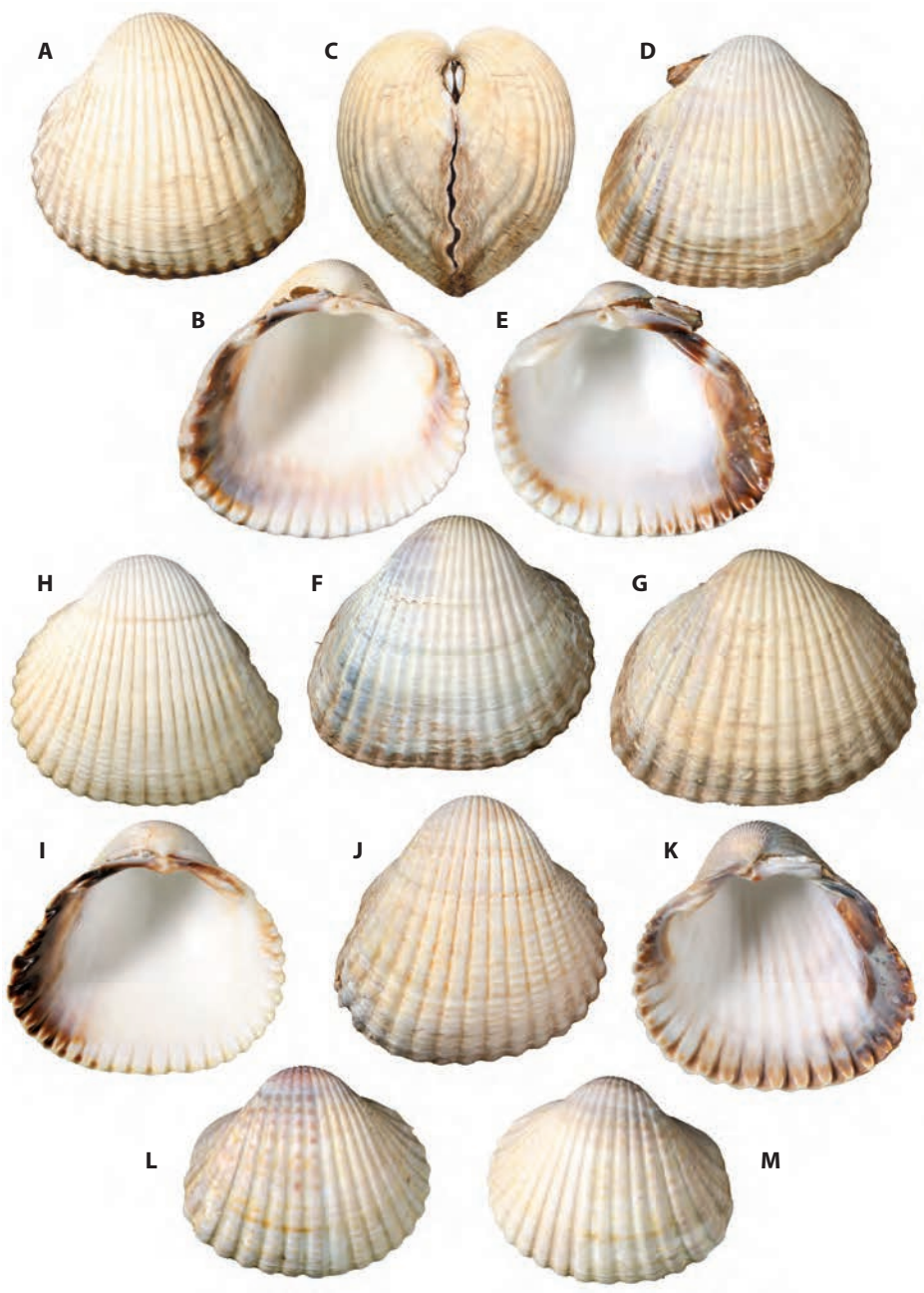
Shell up to 40 mm long (in Europe to 55 mm), variable in outline, broadly suboval, more or less oblique, with evenly rounded anterior margin and obliquely rounded-truncated posterior margin, thick and solid, very inflated. Beaks more or less anterior to the vertical midline. Surface with 22-28 close-set, rather low, rounded ribs bearing numerous, regular, transverse ridges or low scales which are well developed on the anterior part of the valves and less marked to obsolete towards the posterior part. Interspaces narrow, in the central part of the valves ribs contiguous. Periostracum thin, brownish, mostly eroded except close to the margins. Inner margin dentate corresponding to the external ribs. Outside cream to faint yellowish, occasionally light brown, posterior area stained with bluish brown. Inside white, with brown to dark brown along the posterior margin and occasionally also on the antero-dorsal margin.



Distribution. Western Barents Sea, Iceland, Norway (71°N), Faroe, Shetlands, British Isles, Baltic Sea, North Sea southward to Mauritania (Cap Blanc). There are no "modern" records from Senegal.

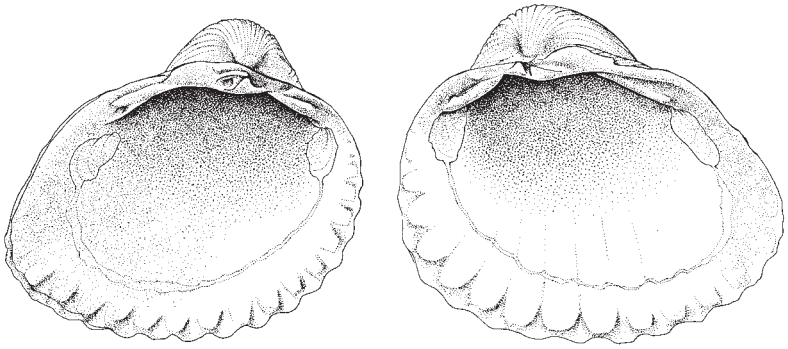
Biotope. In muddy sand, clean fine sand and mixed sand, from mid-tide level to just under low water mark. Abundant in Europe, common in Mauritania.

Remarks. This widespread cold-temperate species has its southern limit at the end of the influence of permanent upwelling. It is fished and consumed in many parts of Europe and might also be a food source in Mauritania, provided the populations there remain stable.



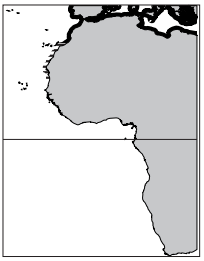
12.30. *Cerastoderma edule* (Linnaeus, 1758). **A**-**C**, Baie de l'Etoile Mauritania (34.1 mm). **D**-**E**, same locality (rv, 32.1 mm). **F**, same locality (35.2 mm). **G**, same locality (37.6 mm). **H**-**I**, Pointe des Maures, Mauritania (33.4 mm). **J**-**K**, same locality (33.8 mm). **L**-**M**, same locality (23.6 mm).

Cerastoderma glaucum (Poiret, 1789)



12.31. Nouakchott, subfossil (23.3 mm).

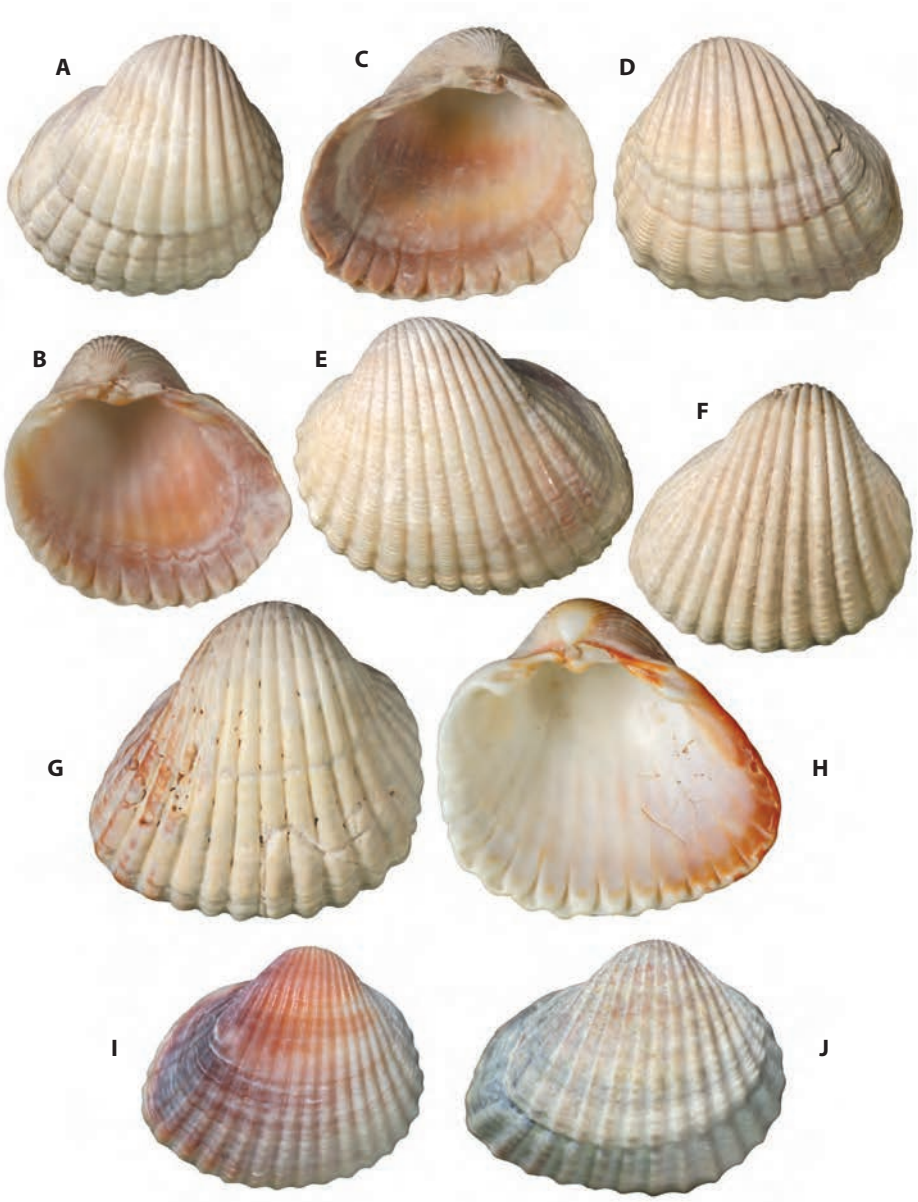
Shell up to 25 mm long (European specimens up to 40 mm), very variable in shape, sculpture and thickness, oblique-suboval, longer than high, with broadly rounded anterior margin and obliquely rounded-truncated posterior margin, thin to thick and solid, inflated. Beaks well in front of the vertical midline. Surface with 20-28 strong radial ribs, either smooth or bearing close-set, regular, transverse ridges or low scales which become obsolete or absent on the posterior half or the posterior area of the valves. Interspaces much narrower than ribs, in the middle of the valves either well marked or not existent and ribs contiguous. Periostracum very thin, light greyish brown to nearly colourless. Inner margin dentate corresponding to the external ribs. Outside white to pale yellowish, occasionally bluish green, a more or less large area on the posterior half bluish green to brownish. Inside white, posterior half brown, sometimes extending along the entire margin or over nearly the whole interior.



Distribution. Norway (Trondheimsfjord), North Sea, Faroe, West coast of British Isles southward to Morocco; throughout the Mediterranean and Black Sea + Caspian Sea, as a Holocene subfossil southward to Mauritania (Nouakchott).

Biotope. In muddy sand and fine sand in shallow water, mostly in lagoons, inlets, estuaries etc. with changes of salinity to lower or higher rates, common.

Remarks. Although this species has not been found alive in tropical West Africa, it is included herein because in Mauritania, extensive layers of subfossil shells and valves are present and valves might be found on the beaches. *C. glaucum* is very close to *C. edule* and sometimes the two species are difficult to distinguish, however *C. glaucum* is on average more oblique, has stronger ribs often with marked interspaces, a shorter ligament and more intense colouration. The species was often synonymized with *C. edule*, however, by the obvious morphological differences and by studies of DNA and larvae the existence of two species is now accepted



12.32. *Cerastoderma glaucum* (Poiret, 1789). **A-B**, Nouakchott (Holocene), Mauritania (20.6 mm). **C-D**, same locality (22.5 mm). **E**, same locality (24.3 mm). **F**, same locality (21.6 mm). **G-H**, Port-Etienne (now Nouadhibou) (42.0 mm). **I**, El Manghar, Mauritania (Holocene) (15.3 mm). **J**, same locality (17.5 mm).

(Brock 1978, 1987; Ladhar-Chaabouni *et al.* 2010, see there for other references). *Cerastoderma lamarcki* (Reeve, 1845) is a synonym.

Family **TELLINIDAE**
- Genus ***Tellina*** Linnaeus, 1758 (*s.l.*) – 7 subgenera, 14 species
- Genus ***Tampaella*** Huber, Langleit & Kreipl, 2015 – 1 species
- Genus ***Omala*** Schumacher, 1817 – 1 species
- Genus ***Moerella*** Fischer, 1887 – 7 species
- Genus ***Asbjornsenia*** Friele, 1886 – 2 species
- Genus ***Arcopagia*** Brown, 1827 – 1 species
- Genus ***Arcopella*** Thiele, 1934 – 1 species
- Genus ***Strigilla*** Turton, 1822– 1 species
- Genus ***Macomopsis*** Sacco, 1901– 4 species
- Genus ***Psammacoma*** Dall, 1900 – 2 species

Subgenus ***Austromacoma*** Olsson, 1961 – 1 species
- Genus ***Gastrana*** Schumacher, 1817 – 2 species
- Genus ***Rostrimacoma*** Salisbury, 1934 – 2 species
- Genus ***Leporimetis*** Iredale, 1930 – 2 species

Family **DONACIDAE**
- Genus ***Donax*** Linnaeus, 1758 – 4 subgenera, 11 species
- Genus ***Iphigenia*** Schumacher, 1817 – 4 species
- Genus ***Galatea*** Bruguière, 1797 – 1 species

Family **PSAMMOBIIDAE**
- Genus ***Gari*** Schumacher, 1817 – 4 subgenera, 8 species
- Genus ***Heterodonax*** Mörch, 1853 – 1 species
- Genus ***Sanguinolaria*** Lamarck, 1799 – 1 species

Family **SEMELIDAE**
- Genus ***Semele*** Schumacher, 1817 – 2 species
- Genus ***Abra*** Lamarck, 1818 – 9 species
- Genus ***Ervilia*** Turton, 1822 – 1 species

Family **SOLECURTIDAE**
- Genus ***Solecurtus*** Blainville, 1827 – 2 species
- Genus ***Azorinus*** Récluz, 1869 – 1 species
- Genus ***Tagelus*** Gray, 1847 – 1 species

Superfamily Tellinoidea

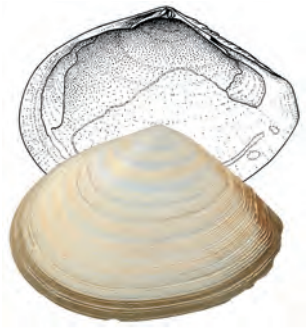
This very large group includesWW the Recent families Tellinidae, Donacidae, Semelidae, Psammobiidae and Solecurtidae, which all share the presence of a "cruciform muscle", unique among bivalves, which connects the valves postero-ventrally and serves as a support for the large siphons. The impressions of this may be visible close to the postero-ventral margin, mostly beneath the opening of the pallial sinus; occasionally (*e.g.* in *Donax*) the impressions are not visible and this character may then be seen only on the living animals.

Family TELLINIDAE

Shells small to large (occasionally over 150 mm), thin to moderately thick, more or less elongate, commonly inequilateral, somewhat inequivalve, mostly due to a flexure at the posterior end, compressed. Beaks generally behind the vertical midline. Surface smooth with growth lines only or with commarginal sculpture, sometimes with fine oblique incisions on one or both valves or with quincuncially arranged scales. Ligament mostly external, sometimes also in part internal. Hinge with small cardinal teeth in both valves, the anterior one on the left valve and the posterior one on the right valve tending to be bifid; with or without lateral teeth. There are 541 recognized species worldwide; from West Africa, 41 species are known.

The Tellinidae are a very difficult group in which species have been assigned inconsistently to subgenera or genera by different authors. The latest overview of the family with nine subfamilies and many of the current subgenera treated as full genera was presented by Huber *et al.* (2015), mostly based on shell morphology. However, as noted also by Coan & Valentich-Scott (2012), many lineages may be convergent in morphology. Consequently, most of Huber's newly introduced supraspecific taxa in the subfamily Tellininae are here conservatively treated on the subgeneric level, pending a comprehensive and exhaustive revision on molecular basis which is greatly needed. Species distinction based on colour patterns can also be problematic.

Genus *Tellina* Linnaeus, 1758 (*s.l.*). Shells small to medium-sized (over 50 mm), rather thin, mostly somewhat inequivalve due to a flexure of the posterior end, inequilateral with a rostrate posterior part, compressed. At least one valve with lateral teeth. Surface smooth to strongly sculptured.



Subgenus *Serratina* Pallary, 1920. Shells medium-sized to large (over 100 mm), rather thin, inequivalve with posterior end skewed to the right, subtriangular in outline with pointed posterior end, compressed. Beaks close to the vertical midline. Surface with marked commarginal ridges and a and deep escutcheon stretching over the whole length of the postero-dorsal margin.

Subgenus *Bosemprella* Huber, Langleit & Kreipl, 2015. Shells medium-sized (up to 50 mm), thin, compressed, inequivalve with posterior part slightly skewed to the right, subtriangular with more or less evenly curved ventral margin. Beaks slightly behind the vertical midline. Surface nearly smooth. Ligament long, strong and somewhat sunken.

Subgenus *Senegona* Huber, Langleit & Kreipl, 2015. Shells large (up to 100 mm), moderately thick, suboval, rather high for a tellinid, with beaks slightly behind the vertical midline. Surface smooth. Ligament sunken. The subgenus is monospecific in the Recent, but there is another fossil species in the Indo-Pacific realm.

Subgenus *Peronaea* Poli, 1791. Shells quite large (over 90 mm), oval with more or less broad posterior part, the beaks near the vertical midline or slightly in front of it, unlike most members of the family. Ligament deeply sunken in a short, very narrow escutcheon; no lunule. The distribution centre of this subgenus is the eastern Atlantic.

Subgenus *Tellinella* Mörch, 1853. Shells quite large (to 100 mm), elongate to very elongate, with rounded anterior margin and tapering posterior part. Postero-dorsal slope with one or two radial ridges, posterior angle more or less pronounced. Surface with fine but strong commarginal lamellae.

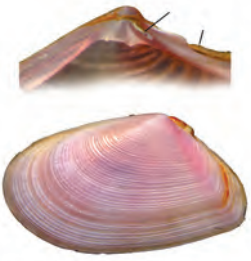
Subgenus *Macomangulus* Nordsieck, 1969. Shells small to medium-sized (to 30 mm), oblong-oval to broadly suboval, compressed, with commarginal sculpture or more or less smooth. No distinct flexure of the posterior end. On the inside a weak radial reinforcement going from under the beaks to just behind the anterior muscle scar. Right valve with anterior lateral short and close to the cardinals, posterior lateral small and weak to absent.

Subgenus *Oudardia* Monterosato, 1884. Shells small, suboval, compressed, mostly with typical oblique striae on both valves, occasionally smooth. Lunule ill-defined, escutcheon short and very narrow, ligament protruding. Inside with a more or less strong reinforcement going from under the beaks to the ventral margin just behind the anterior adductor scar. Hinge dentition like in *Macomangulus*. Some species from the Caribbean and the Panamic-Pacific Province hitherto classified in *Scissula* Dall, 1900 share with *Oudardia* the oblique striae on the surface; some species seem quite close to the eastern Atlantic species here treated (for more details see Huber *et al.* 2015: 661).

Genus *Tampaella* Huber, Langleit & Kreipl, 2015. Shells small to medium-sized (over 20 mm), rather thin to very thin and fragile, slightly inequivalve with posterior part skewed to the right, moderately inflated. Outline short-oval, with anterior part broader than posterior, anterior margin broadly rounded, ventral margin curved, less so in its posterior part, posterior margin more or less tapering. Beaks situated on or behind the vertical midline. Hinge with anterior lateral wanting on the left valve, moderately developed and far apart on the right valve. Surface with fine regular commarginal sculpture or appearing almost smooth. Pallial sinus variable but mostly rather large. This small group is mostly restricted to the Western Hemisphere: five in the tropical Western Atlantic and two in the Panamic-Pacific province; only one species is known from tropical West Africa; its position within the family is unclear and it is here retained in its original rank as genus.

Genus *Omala* Schumacher, 1817. Shells elongate-oval, thin, compressed, with short anterior part and long posterior part. Ligament short and sunken. Laterals poorly developed. Scars of the cruciform muscle situated parallel to the vertical part of the extreme posterior margin and not to the postero-ventral pallial line as in many other Tellinoidea. There are only two species in the genus, one Indo-Pacific and the other West African. A unique feature of *Omala* is the characteristic position of the cruciform muscle scars parallel to the extreme posterior shell margin and posterior to the upwards-bending end of the pallial line, a feature never seen yet in other tellinids which implies a somewhat different soft anatomy and merits giving *Omala* full generic rank.

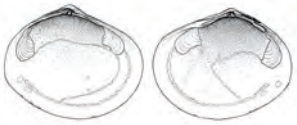
Genus *Moerella* Fischer, 1887. Shells small (over 20 mm), moderately solid, suboval with posterior end more or less rostrate, moderately compressed. Surface with commarginal sculpture. Beaks behind the vertical midline. Hinge with laterals strong and definite on the right valve and nearly wanting in the left valve. Ligament with a short, strong external portion inserted in a deep groove bordered by a raised ridge, and with a tenuous internal portion situated posterior to the cardinal teeth. Pallial sinus large and nearly reaching the anterior adductor scar. *Moerella* is predominantly eastern Atlantic, but has been used for many species of small tellinids which could not be easily assigned to a genus, therefore the array of species placed in *Moerella* is haphazard. This underlines once more the need of a profound worldwide revision of the family. Huber *et al.*



(2015) differentiated *Atlantella* (in subfamily Tellininae) but this was rebutted by Cosel & Gofas (2018) on the basis that the internal portion of the ligament is present in the type species of *Atlantella*, *Moerella distorta*, with the same extension as in *M. donacina*, type species of *Moerella*.

Genus *Asbjornsenia* Friele, 1886. Shells very small (to 10 mm), rather short, suboval, convex. Surface with fine commarginal ridges. Ligament external and internal, the latter persisting as functional also in adult size. The name is one year earlier than *Moerella*, and ought to be used for the entire group if both were considered congeneric.

Genus *Arcopagia* Brown, 1827. Shells medium-sized to large (over 70 mm), thick and solid, very slightly inequivalve, inequilateral with beaks behind the vertical midline. Surface with strong commarginal sculpture. Hinge with weak anterior lateral and small posterior knob in the left valve. Pallial sinus separated from the pallial line, ascending and rounded at the end. Area just behind the anterior adductor scar markedly thickened. Restricted to the eastern Atlantic with one species in Europe and one in West Africa.



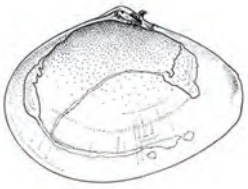
Genus *Arcopella* Thiele, 1934. Shells small (to 20 mm), thin, with weak commarginal sculpture. Hinge with strong lateral teeth on the right valve, with very weak, hardly visible laterals on the left valve. Pallial sinus partly confluent with the ventral pallial line, in the left valve much larger than in the right valve. Inner surface not thickened behind the anterior adductor scar.

Genus *Strigilla* Turton, 1822. Shells small to medium-sized (over 30 mm), subcircular, compressed to inflated, beaks mostly anterior to the vertical midline. Surface with fine, oblique sculpture. Hinge with two weak laterals on the left valve, with strong laterals on the right valve. Several subgenera have been defined according to the configuration of the oblique sculpture but are believed (Coan & Valentich-Scott 2012) to be of little significance. The West African species would belong to the subgenus *Aeretica* Dall, 1900, which has the oblique sculpture only on the posterior part of the valve. Most species of the genus *Strigilla* live on both sides of the Panama Isthmus. With exception of *S.* (*A.*) *splendida*, the subgenus *Aeretica* is mostly Indo-Pacific.

Genus *Macomopsis* Sacco, 1901. Shells rather small (15 mm) to quite large (over 50 mm), thin, slightly inequivalve, oblong-oval to more or less short-oval, inequilateral with beaks behind the vertical midline, moderately tumid. Surface smooth, glossy to dull, with more or less pronounced irregular growth lines or growth stages. Hinge without any laterals. Ligament short. Pallial sinus confluent with the ventral pallial line on about half of the sinus depth. Periostracum thin. Umbonal area often coloured. This genus, as well as *Psammacoma* and *Austromacoma*, have been often treated as subgenera of *Macoma* Leach, 1819 but are currently held as separate. *Macoma* (*s.s.*) is restricted to cold and cold-temperate seas and differs in having a chalky outer surface from which the periostracum is easily detached, and in having a pallial sinus confluent with the ventral pallial line over most of its length.

Genus *Psammacoma* Dall, 1900. Shells small to moderately large (over 50 mm), elongate-oval, thin, moderately compressed, inequilateral, smooth, mostly like *Macomopsis* but not coloured, with very weak posterior flexure, and with the hinge line narrower, tending to subtrigonal and broader below the umbos. Beaks posterior to the vertical midline. Pallial sinus confluent with the ventral pallial line over half its length. *Macoploma* Pilsbry & Olsson, 1941 is distinguished by Huber (2015) for having a sinuous, not evenly rounded ventral margin, but is treated as a synonym by Coan & Valentich-Scott (2012).

Subgenus *Austromacoma* Olsson, 1961. Shells medium-sized (to 60 mm), thin, rather inflated, suboval-triangular, with beaks about in the middle, well convex ventral margin, broadly rounded anterior margin and tapering posterior part. Pallial sinus large, broad in the middle and ending close to the anterior adductor scar or even touching it. Nymph very narrow or broader and well visible. The type species of *Austromacoma* Olsson, 1961, *A. constricta* (Bruguière, 1792) from the Caribbean, has a large pallial sinus which touches the anterior adductor scar.



Genus *Gastrana* Schumacher, 1817. Shells medium-sized, equivalve, thin and fragile to quite solid, suboval, surface with coarse to fine, irregular commarginal lamellae. Hinge without laterals, two cardinals in each valve, anterior cardinal of left valve broad, somewhat triangular, prominent and bifid. Pallial sinus reaching just beyond the vertical midline, rather low, parallel to the ventral pallial line and confluent with it over more than

half its length. Six species are known: 3 in the Indian Ocean, 2 in West Africa, 1 in Europe.

Genus *Rostrimacoma* Salisbury, 1934. Shells large to very large, slightly inequilateral to nearly equilateral, inequivalve, elongate-oval to very elongate, with irregular commarginal sculpture. Posterior end rostrate, with a sinuosity on the postero-ventral margin. Pallial sinus rather small, horizontal, narrow, tapering towards its anterior part, confluent with the pallial line only in its posterior half or third. The genus is exclusively West African with 2 species.

Genus *Leporimetis* Iredale, 1930. Shells large, nearly equilateral, inequivalve, quadrangular to oval-trigonal, on the anterior part markedly inflated, towards the posterior end more compressed, with strong posterior flexure to the right. Surface smooth except for growth lines, a blunt keel delimiting the postero-dorsal area. Pallial sinus deep, reaching close to the anterior muscle scar but not touching it.

Species treated (41)

Tellina (*Serratina*) *serrata* Brocchi, 1814; *Tellina* (*Serratina*) *owenii* Hanley, 1845; *Tellina* (*Bosemprella*) *incarnata* Linnaeus, 1758; *Tellina* (*Senegona*) *senegambiensis* Salisbury, 1934; *Tellina* (*Peronaea*) *planata afroccidentalis* Cosel, 1995; *Tellina* (*Peronaea*) *strigosa* Gmelin, 1791; *Tellina* (*Peronaea*) *madagascariensis* Gmelin, 1791; *Tellina* (*Peronaea*) *mars* Hanley, 1848; *Tellina* (*Tellinella*) *mexicana* Petit de la Saussaye, 1841; *Tellina* (*Macomangulus*) *tenuis* da Costa, 1778; *Tellina* (*Macomangulus*) *posteli* Nicklès, 1955; *Tellina* (*Oudardia*) *compressa* Brocchi, 1814; *Tellina* (*Oudardia*) *coseli* (Huber, Langleit & Kreipl, 2015); *Tellina* (*Oudardia*) *crosnieri* Cosel, 1995; *Tampaella ampullacea* (Philippi, 1844); *Omala hyalina* (Gmelin, 1791); *Moerella donacina* (Linnaeus, 1758); *Moerella distorta* (Poli, 1795); *Moerella rubicincta* (Römer, 1870); *Moerella boucheti* (Cosel, 1995); *Moerella bertrandi* (Cosel, 1995); *Moerella modica* (Cosel, 1995); *Moerella leloeuffi* Cosel & Gofas, 2018; *Asbjornsenia pseudopusilla* (Cosel, 1995); *Asbjornsenia oryza* (Cosel, 1995); *Arcopagia richardi* Dautzenberg & Fischer, 1906; *Arcopella balaustina* (Linnaeus, 1758); *Strigilla* (*Aeretica*) *splendida* (Anton, 1838); *Macomopsis cumana* (O.G. Costa, 1830); *Macomopsis hanleyi* (Dunker, 1853); *Macomopsis bruuni* (Nicklès, 1955); *Macomopsis melo* (G.B. Sowerby II, 1866); *Psammacoma pseudofallax* (Cosel, 1995); *Psammacoma inexpectata* (Cosel, 1995); *Austromacoma nymphalis* (Lamarck, 1818); *Gastrana matadoa* (Gmelin, 1791); *Gastrana orstomi* Cosel, 1995; *Rostrimacoma largillierti* (Philippi, 1851); *Rostrimacoma cancellata* (G.B. Sowerby II, 1873); *Leporimetis papyracea* (Gmelin, 1791); *Leporimetis elouardi* (Rosso, 1976).

Other species reported in the area (1)

Macomopsis schultzei (Thiele, 1910). Namibia and W South Africa (Thiele 1910).

Family DONACIDAE

Shells small to medium-sized (up to 90 mm), solid, equivalve to slightly inequivalve, inequilateral, triangular, more or less elongate. Margin crenulate or smooth. Hinge dentition rather variable, with usually two cardinals in each valve, the anterior one on the left valve and the posterior one on the right valve tending to be larger and bifid; laterals more or less marked,

sometimes obsolete or absent. Ligament short, on a nymphal plate which is either protruding or more or less deeply sunken. Pallial sinus small to large. The cruciform muscle impressions are generally ill-defined or not seen, on most drawings they are not reproduced. The worldwide species number is 106, about 16-20 species are West African (including *Iphigenia* and *Galatea*). A revision of the family is long overdue.

Genus *Donax* Linnaeus, 1758. Shells rather small to medium-sized (up to 50 mm), equivalve, wedge-shaped, with beaks well behind the vertical midline, mostly with radial sculpture. Ligament very short, set in a deep groove. Huber (2010) noted that neither biogeography nor morphology could provide clear-cut features to recognize genera within *Donax s.l.*, but recognized several subgenera based on characters of surface sculpture, pallial sinus, hinge and margin crenulation.

Subgenus *Donax* Linnaeus, 1758. Shells solid, surface with radial sculpture and commarginal wrinkles on the posterior area, ventral and posterior margin serrated or smooth, pallial sinus broad and large.

Subgenus *Cuneus* da Costa, 1778. Shells solid, with radial sculpture, sometimes overlain by irregular commarginal or somewhat oblique sculpture on the posterior area. Postero-dorsal margin less abruptly sloping than in *Donax*, posterior angle rounded.

Subgenus *Machaerodonax* Römer, 1870. Shells small, rather thin, very elongate, more or less tapering anteriorly and posteriorly, with short posterior part delimited by a sharp keel; posterior angle very sharp. Surface with commarginal sculpture, also sometimes with faint, radial sculpture mostly on the posterior part posterior to the keel. Three species in the eastern Atlantic and a few species in the Indian Ocean

Subgenus *Tentidonax* Iredale, 1930. Shells rather small, thin to moderately solid, elongate, more or less compressed, with rather long posterior part. Surface smooth except for the posterior area which bears characteristic commarginal wrinkles or ridges. Internal margin smooth, Hinge with weak laterals.

Genus *Iphigenia* Schumacher, 1817. Shells small to medium-sized, thin to thick and solid, equivalve, nearly equilateral to inequilateral with beaks behind or very slightly in front of the vertical midline, triangular to ovate, moderately compressed to very inflated, externally smooth, with well developed periostracum. No lunule or escutcheon. Pallial sinus large. *Capsa* Lamarck, 1818

(*non* Lamarck, 1799 *nec* Lamarck, 1801), *Procos* Gistel, 1848, *Fischeria* Bernardi, 1860 and *Profischeria* Dall, 1903 are synonyms. The genus is restricted to both coasts of America (3-4 species) and West Africa. From West Africa, twelve species are listed by Pilsbry & Bequaert (1927), whereas Daget (1998) recognized at most 5 species as valid. Most species of this genus live in estuaries, lagoons and rivers with reduced salinity (see Yoloye 1977), while one species, *I. centralis* (Germain, 1905) was found far inland. Several species seem to have a very restricted range, and due to their distribution and biotope, they are difficult to obtain. Apart from *I. laevigata,* the West African taxa are hardly represented in collections, remain poorly known and difficult to identify. It cannot be said how many of the known taxa are valid species or just varieties. Huber (2010) placed the smaller West African species in *Profischeria* but his view is not followed. A revision of the group with DNA analysis is overdue.

Genus *Galatea* Bruguière, 1797. Shells mostly large (over 90 mm), thick and solid to extremely thick and heavy, equivalve, equilateral to slightly inequilateral with beaks in front of the vertical midline, triangular to high-triangular or suboval, inflated, externally smooth, with marked, irregular growth lines and often coarse growth stages. Periostracum strong, smooth and shiny, dark brownish. Lunule and escutcheon very ill-defined or not defined. Hinge plate very broad and heavy, ligament short, very thick. Pallial sinus small, not reaching the vertical midline. As the original genus name *Galatea* as spelled by Bruguière is without a "th", there is no homonymy with *Galathea* Fabricius, 1793: "t" (tau) and "th" (theta) being two distinct greek letters. *Egeria* de Roissy, 1805, an unnecessary replacement name, is hence a synonym. Other synonyms are *Potamophila* G.B. Sowerby I, 1822, *Megadesma* Bowdich, 1822 and *Galateola* Herrmannsen, 1846. *Galataea* (*in* Leach 1823), *Galathaea* (*in* Bory de Saint-Vincent 1827), *Galateia* (*in* Brito Capello1878) and *Galatheia* (*in* Dautzenberg 1891) are misspellings. Thirteen species of this endemic West African genus are monographed by Bernardi (1860) (see there also for gross anatomy) and 17 species or subspecies are listed by Pilsbry & Bequaert (1927). Seven species and 3 varieties, among them 4 newly described taxa, were cited for Angola by Brito Capello (1878). Daget (1998) lists 14 species but admits that a revision of the genus would certainly reduce the species number. At least 8 species seem to be valid. The genus is confined to rivers with only a minimal influence of sea water and where the species live in mud or sandy mud biotopes high upstream. However, a very light salinity, at least

seasonal, seems to be necessary. The high number of species can be explained by the isolated biotopes in the rivers with no connection and the barrier of high salinity at the mouths. In the studied museum collections, little "modern" material with precise locality data is preserved. In general, *Galatea* is considered belonging to the freshwater fauna. Our knowledge on taxonomy, distribution and biology of this peculiar group is still very incomplete. As an example, only the type species, *G. paradoxa* (Born, 1778) is treated herein and a list of other nominal taxa is given hereafter following Daget (1998).

Species treated (16, one with 2 subspecies)

Donax (Donax) rugosus rugosus Linnaeus, 1758; *Donax (Donax) rugosus interruptus* Deshayes, 1855; *Donax (Donax) pulchellus* Hanley, 1843; *Donax (Donax) pusillus* Philippi, 1849; *Donax (Donax) verdensis* Cosel, 1995; *Donax (Cuneus) vittatus* (da Costa, 1778); *Donax (Machaerodonax) acutangulus* Deshayes *in* Reeve, 1854; *Donax (Machaerodonax) pseudacutangulus* Cosel & Gofas, 2018; *Donax (Machaerodonax) phariformis* Cosel, 1995; *Donax (Tentidonax) oweni* Hanley, 1843; *Donax (Tentidonax) burnupi* G.B. Sowerby III, 1894; *Donax (Tentidonax) domaini* Cosel, 1995; *Iphigenia laevigata* (Gmelin, 1791); *Iphigenia curta* (Dunker, 1867); *Iphigenia delessertii* (Bernardi, 1860); *Iphigenia messageri* (Preston, 1909); *Galatea paradoxa* (Born, 1778).

Other species reported in the area (8)

Donax (s.l.) serra Dillwyn, 1817. Namibia and South Africa, in the surf zone, reported from Baia dos Tigres, S. Angola (Paes da Franca 1960).

Iphigenia centralis (Germain, 1905). Niger, Bani, never found again after original description (Daget 1998).

Galatea bengoensis Dunker, 1849. Bengo River, Angola (Daget 1998).

Galatea bernardii Dunker, 1857. Gabon, Angola (Daget 1998).

Galatea cailliaudi (Bemardi, 1860). Atlantic coast of Africa (Daget 1998).

Galatea congica O. Boettger, 1885 Congo River (Daget 1998).

Galatea nux (Pilsbry & Bequaert, 1927).Congo River (Daget 1998)

Galatea tenuicola Philippi, 1849. Congo River (Daget 1998).

Family SEMELIDAE

Shells small to large, more or less inequilateral, nearly circular to suboval or subtrigonal, mostly with sculptured surface. Hinge with two cardinals in each valve and mostly also laterals. Ligament mainly internal on more or less long resilifer. Pallial sinus large. There are 161 species known worldwide, 14 of them are West African.

Genus *Semele* Schumacher, 1817. Shells mostly medium-sized to rather large, solid, nearly circular to broadly suboval, very slightly inequivalve, with beaks mostly behind the vertical margin. Surface with commarginal, radial, cancellate or irregular sculpture. Hinge with two cardinals in each valve, laterals well developed in the right valve, indistinct in the left valve. Pallial sinus large, pointing obliquely upwards. The genus is exclusively tropical with distribution centres in the Panamic-Pacific

faunal Province and California, Japan, Australia and only two West African species.

Genus *Abra* Lamarck, 1818. Shells small, suboval to subtriangular, equivalve to very slightly inequivalve, thin and fragile, with beaks more or less median or just behind the vertical midline. Surface smooth. Hinge with two cardinals and two lamellar laterals in the right valve, left valve with one cardinal only. External ligament reduced, internal ligament in an oblique resilifer. Pallial sinus large, partly confluent with the pallial line. Cruciform muscle scars not well marked.

Genus *Ervilia* Turton, 1822. Shells small, more or less narrowly suboval, solid, equivalve, with a small internal ligament and a rudimentary external ligament. Hinge with one cardinal and a small posterior lateral in each valve. Cruciform muscle present. This genus was formerly placed in the Mesodesmatidae (Mesodesmatoidea), however, its correct position within the Semelidae had been proved (Morton & Scott 1990).

Species treated (12)

Semele lamyi Nicklès, 1955; *Semele modesta* (Reeve, 1853); *Abra tenuis* (Montagu, 1803); *Abra alba* (W. Wood, 1802); *Abra pilsbryi* (Dautzenberg, 1912); *Abra elata* Nicklès, 1955; *Abra lecointrei* Nicklès, 1955; *Abra jarli* Nicklès, 1955; *Abra pini* Cosel, 1995; *Abra intesi* Cosel, 1995; *Abra demosia* (Dautzenberg & Fischer, 1906); *Ervilia castanea* (Montagu, 1803).

Other species reported in the area (2)

Abra grimaldii (Dautzenberg & Fischer, 1906). Cape Verde Islands, 628 m (Dautzenberg & Fischer 1906).

Abra profundorum (E.A. Smith, 1885). off Liberia, 3196 m; off Côte d'Ivoire, 5160 m; off Equatorial Guinea, 2550 m; also N Atlantic, South Africa, Indian and Pacific Oceans, 2058-5422 m (Knudsen 1970).

Family PSAMMOBIIDAE

Shells small to rather large, equivalve to somewhat inequivalve, inequilateral, suboval to oblong or elongate, not very thick but solid, often slightly gaping laterally, more so at the posterior end. Margin smooth. Hinge plate narrow, hinge with usually two small but prominent cardinal teeth, laterals weak or missing. Ligament on a projecting nymph. Pallial sinus large. The worldwide species number is 102, from West Africa, 10 species are recorded. The last comprehensive worldwide revision of the family was that of Bertin (1880). For a review of the eastern Atlantic species, see Cosel (1990a); the western Pacific species are revised by Willan (1993).

Genus *Gari* Schumacher, 1817. Shells small to rather large, oblong to elongate, very slightly gaping, anteriorly rounded, posteriorly more or less truncated or angulate. Beaks more or less median or behind the vertical midline. Surface smooth or with radial or oblique sculpture, which on the posterior area is often radial, cancellate or irregular. Ligament on protruding nymphal plate. Hinge with two cardinals in each valve, no laterals. Pallial sinus large and horizontal. Cruciform muscle impressions obscure.

Subgenus *Psammobia* Lamarck, 1819. Shells rather elongate-oblong, with rounded anterior margin and obliquely truncated or rounded-truncated posterior margin. Posterior angle rounded to sharply marked. Sculpture of commarginal ridges and more or less cancellate on the posterior area.

Subgenus *Gobraeus* Brown, 1844. Shells suboval to suboval-oblong, with rounded anterior margin and more or less rounded posterior margin; surface with growth lines only or broad irregular commarginal ribs and rounded or indistinct posterior angle. Beaks near the vertical midline.

Subgenus *Psammobella* Gray, 1851. Shells small, oblong-suboval, with rounded anterior and posterior margin. Surface almost smooth, with very fine commarginal ridges and on the posterior area strong radial ribs. Beaks on or behind the vertical midline.

Subgenus *Psammodonax* Cossmann, 1887. Shells small to medium-sized, oval-oblong to elongate, solid with broadly rounded anterior and posterior margin. Surface almost smooth, with growth lines. Posterior area smooth or with fine radial sculpture. Beaks markedly behind the vertical midline. Ventral limb of the pallial sinus confluent with the pallial line for about 1/3 or 2/3 of its length.

Genus *Heterodonax* Mörch, 1853. Shells small, equivalve, rounded-quadrangular to oval, rather solid, with beaks more or less behind the vertical midline. Surface smooth, only with irregular growth lines. Hinge in both valves with two cardinals, laterals very indistinct or absent. Ligament on nymphal plate. Pallial sinus broad, short to rather long. The Indo-Pacific *Gari* (*Psammodonax*) *rasilis* (Melvill & Standen, 1899) is very close in outline and pallial sinus (see Willan 1993: figs 242, 407) and this raises the question to which extent *Heterodonax* is really separable as a genus from *Gari* (*s.l.*) or if *Psammodonax* might not finally result synonym of *Heterodonax*.

Genus *Sanguinolaria* Lamarck, 1799. Shells medium-sized, somewhat inflated, rather thin, suboval with markedly convex ventral margin, rounded anterior and tapering posterior end. Beaks mostly slightly in front of the vertical midline. Surface smooth, only with growth lines. Ligament on narrow nymphal plate. Hinge with two cardinals, no laterals. Pallial sinus large and deep. Nine species are known worldwide (Huber 2010), most are uncommon to rare.

Species treated (10)
Gari (Psammobia) fervensis (Gmelin, 1791); *Gari (Psammobia) jousseaumeana* Bertin, 1880; *Gari (Psammobia) pseudoweinkauffi* Cosel, 1990; *Gari (Gobraeus) virgata* (Lamarck, 1818); *Gari (Gobraeus) depressa* (Pennant, 1777); *Gari (Gobraeus) castrensis* (Spengler, 1794); *Gari (Psammobella) costulata* (Turton, 1822); *Gari (Psammodonax) gofasi* Cosel, 1990; *Heterodonax parvus* Dunker, 1853; *Sanguinolaria achatina* (Spengler, 1798).

Family SOLECURTIDAE

Shells medium-sized, oblong to elongate, more or less inflated, with parallel or nearly parallel dorsal and ventral margin, anteriorly and posteriorly rounded to semicircular, moderately to widely gaping at both ends. Beaks in the middle, anterior to or behind the vertical midline. Surface sculptured or smooth. Ligament external. Hinge with two cardinals in each valve, no laterals. Pallial sinus large. Because of a complete lack of a worldwide revision of the family, the species number can only be roughly estimated at about 40, 4 of them are West African.

Genus *Solecurtus* Blainville, 1827. Shells oblong, inflated, generally widely gaping anteriorly and posteriorly, with parallel dorsal and ventral margin, anterior and posterior margin semicircular. Beaks median or in front of the vertical midline. Surface with densely to more or less widely spaced, oblique, irregular incised lines. Ligament on long nymphal plate. Hinge with two jutting cardinals in each valve which do not interlock firmly but allow the valves to pivot against each other in a certain amount. Posterior left cardinal occasionally reduced. No laterals. Pallial sinus very deep. "*Solenocurtus*" *auct.* is a misspelling.

Genus *Azorinus* Récluz, 1869. Shells medium-sized, oblong-suboval, rather compressed, moderately gaping at both ends, with somewhat parallel dorsal and ventral margin and well rounded anterior and posterior margin. Surface smooth, with dense, coarse growth lines and a wrinkled periostracum. Ligament on a narrow nymphal plate. Hinge with two cardinals in each valve, the posterior one in the left valve often reduced; no

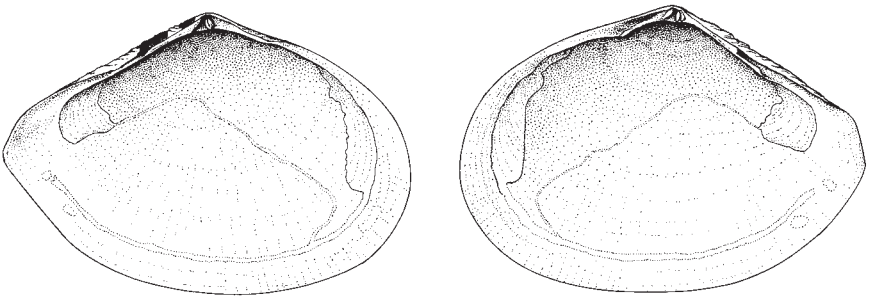
laterals. Pallial sinus deep and broadening in its middle. *Zozia* Winckworth, 1930 is a synonym.

Genus *Tagelus* Gray, 1847. Shells medium-sized to rather large, quite narrow, elongate, equivalve, moderately gaping at both ends, more or less inflated, with nearly parallel dorsal and ventral margin. Anterior and posterior margin rounded to semicircular. Beaks on or behind the vertical midline. Surface without sculpture, only with growth lines. Ligament on narrow nymphal plate. Hinge with two cardinals in each valve, no laterals. Pallial sinus small to moderately deep.

Species treated (3)
Solecurtus afroccidentalis Cosel, 1989; *Solecurtus scopula* (Turton, 1822); *Azorinus chamasolen* (da Costa, 1778); *Tagelus adansonii* (Bosc, 1801).

13.1. The living holotype of *Solecurtus afroccidentalis* photographed on board. Note the spectacular extension of the cruciform muscle, which helps holding together the valves in all members of the Tellinoidea.

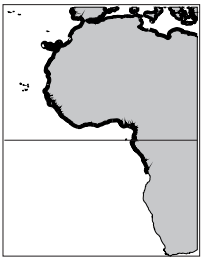
Tellina (*Serratina*) *serrata* Brocchi, 1814



13.2. Off Pointe-Noire, Congo, 300 m (42 mm).

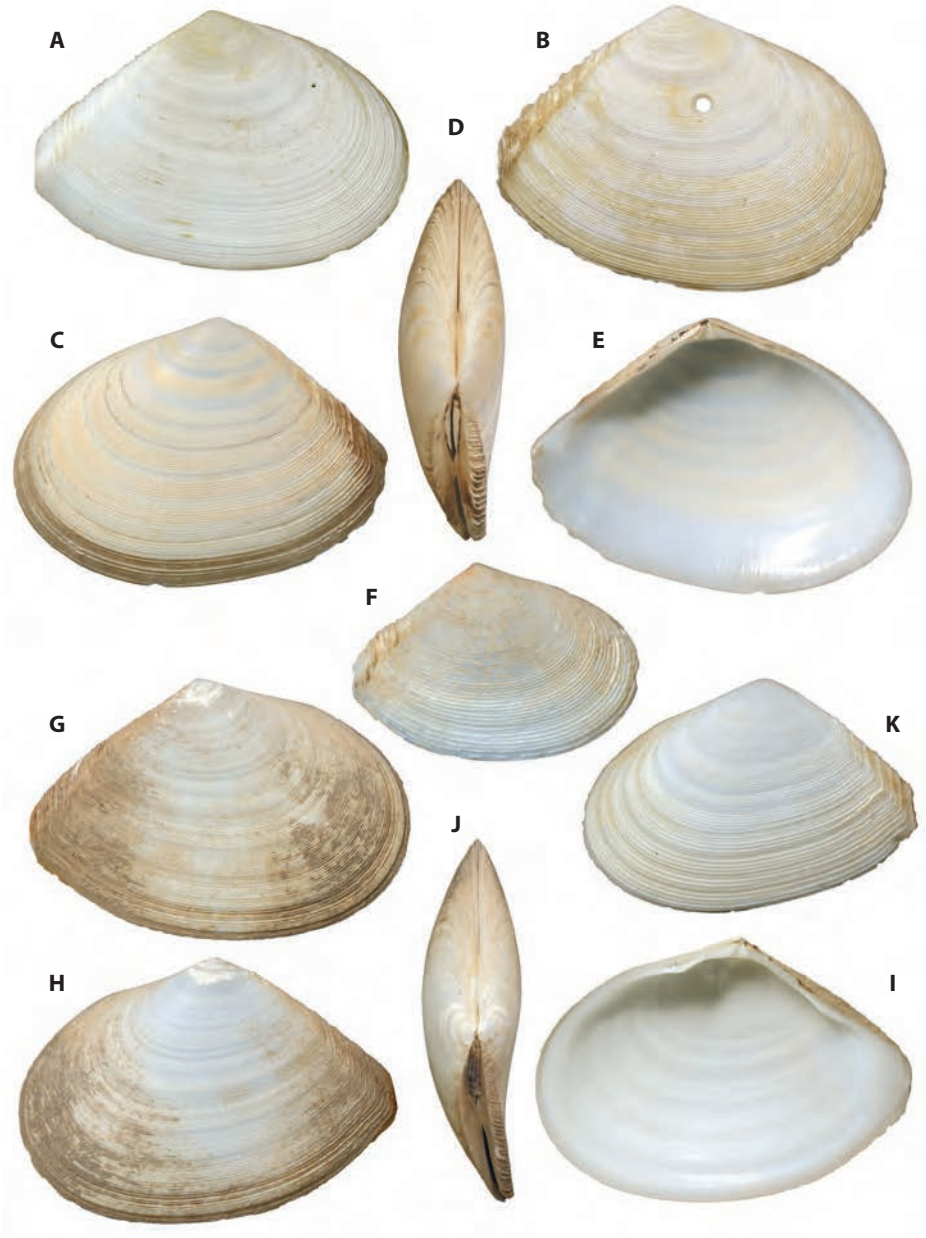
Shell up to 45 mm long, triangular-suboval, rather thick, compressed. Anterior margin well rounded, posterior part tapering, posterior end pointed, with a slight flexure to the right. Beaks more or less median. Escutcheon narrow, very deep, separated from the postero-dorsal area by a sharp keel. Surface with fine to very fine, regular, commarginal ridges which often are lamellate and more foliate on the narrow postero-dorsal area. On the right valve, this latter is delimited from the rest of the surface by the slightly rounded postero-dorsal angle, on the left valve it is concave, with a very weak postero-dorsal angle. Periostracum brownish, present only on the marginal part of the valves. Outside cream to light greyish white, with slightly darker greyish commarginal growth zones. Inside white with outside colouration showing through.

Distribution. SW England (Scilly Isles, McMillan 1971) southward to northern Angola (Luanda); throughout the Mediterranean.



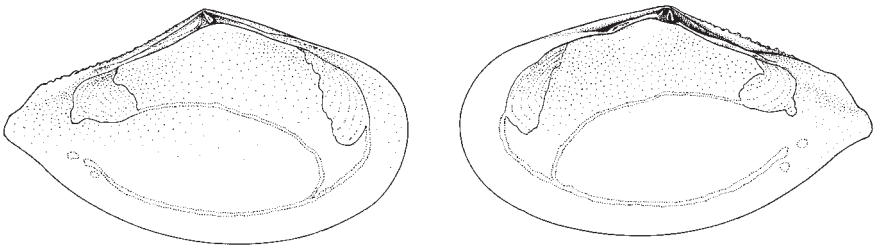
Biotope. In mud and sandy mud, from about 30 to 200 m, not common.

Remarks. This deeper shelf species may occasionally be taken in the try-net of shrimp boats. It is more common in the Mediterranean than in West Africa, where it seems to have a continuous distribution, confirmed by samples from both the atypical and the two typical tropical regions. *T.* (*S.*) *serrata* is the type species of the subgenus *Serratina*.



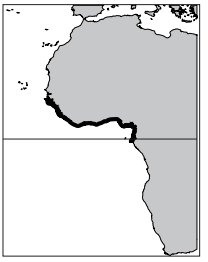
13.3. ***Tellina (Serratina) serrata*** **Brocchi, 1814. A,** Dakar region, Senegal, 14°50.1'N, 17°29.3'W, 150 m (rv, 38.8 mm). **B**, off Lompoul, Senegal, 600-1000 m (39.8 mm). **C-E,** off Jacqueville, Côte d'Ivoire, 200 m (42.3 mm). **F,** Victoria (now Limbe), Cameroon, 3°50'N, 9°10'E, 32 m (rv, 24.2 mm). **G-J,** off Pointe-Noire, Congo Brazzaville, 300 m (39.7 mm). **K**, Ilha de Luanda, Luanda prov. N-Angola, 40-60 m (lv, 35.3 mm).

Tellina (*Serratina*) *owenii* Hanley, 1845



13.4. Off Rio Koumba, Guinea, 10°22.6, 15°16'W, 10 m (47 mm).

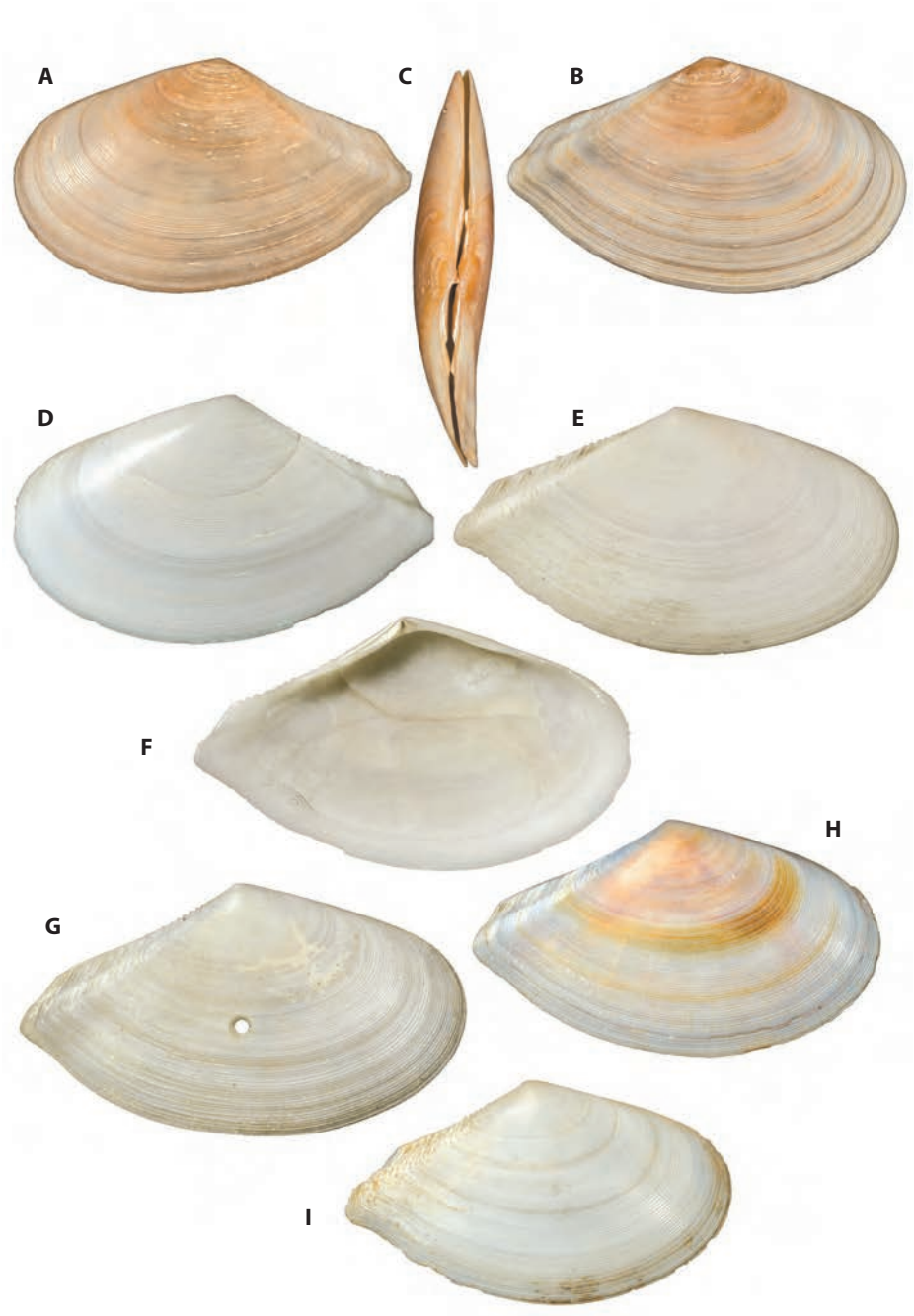
Shell up to 51 mm long, narrowly suboval, rather thin but strong, compressed. Anterior margin rounded, posterior end sharply pointed, with a slight flexure to the right. Ventral margin evenly rounded except a short postero-ventral sinuosity just anterior to the posterior end. Escutcheon narrow, delimited by a sharp keel with spine-like lamellae. Surface with fine, slightly irregular commarginal ridges which touch each other on the anterior and middle part of the valve and which become lamellate towards the posterior end; some of them bifurcating after the first third of the valve. Postero-dorsal area narrow, delimited on both valves by a rounded keel, on the left valve with a sharp radial furrow in the middle, on the right valve with a broader depression. Periostracum not seen. Outside cream to light greyish, occasionally with a light orange hue on the umbonal part and with slightly darker irregular growth zones; inside with exterior colour showing through.



Distribution. Senegal (Casamance) to Gabon (Port-Gentil).

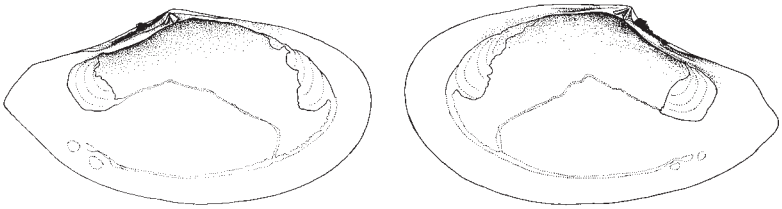
Biotope. Most probably in fine muddy sand and fine sand, from about 5 to 50 m, rare.

Remarks. This species has to our knowledge not yet been found alive, and only very few fresh valves are here recorded from Cameroon (Victoria/Limbe region). Most of the studied material consists of odd valves without periostracum that had been encountered in shell concentrates on muddy bottom in shallow water off the coast of Guinea. *Quadrans chetelati* Fischer-Piette & Nicklès, 1946 is a synonym.



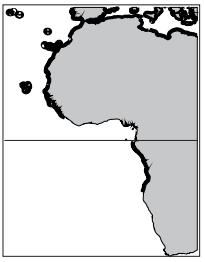
13.5. *Tellina(Serratina) owenii* Hanley, 1845. **A-C,** Iles Tristão, Guinea (45.6 + 46.1 mm. the two figured syntypes of *Quadrans chetelati* Fischer-Piette & Nicklès, 1946, single, not corresponding valves of same size, dorsal view to show flexure, photo Manuel Caballer/Recolnat). **D-F,** off Rio Koumba, Guinea, 10°22.6, 15°16'W, 10 m (48.0 mm). **G,** Banc Crawford, Iles de Los, Guinea, 2-3 m (rv, 48.7 mm). **H,** Abidjan, Côte d'Ivoire, 5°07'N, 3°22'W, 20 m (45.7 mm). **I**, between Wouri estuary and Cape Nachtigal, Cameroon, 3°37'N, 9°16'E, 32-40 m (37.0 mm).

Tellina (*Bosemprella*) *incarnata* Linnaeus, 1758



13.6. Bissonga, Baia da Lucira, S-Angola, maërl, 10-20 m (25.5 mm).

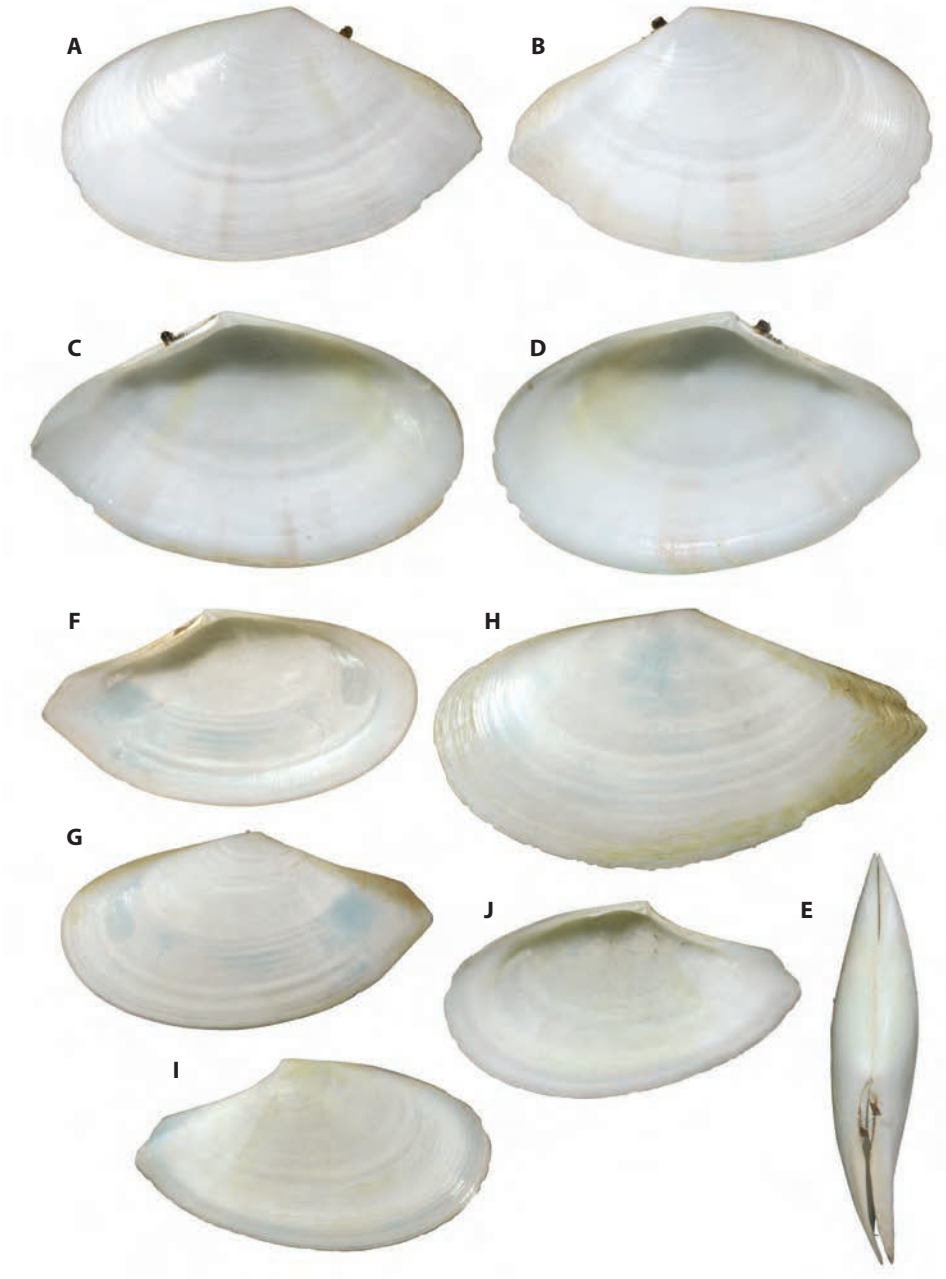
Shell up to 47 mm long, variable in shape and colour, narrowly suboval, thin, compressed. Anterior margin rounded, posterior part tapering, posterior end pointed and slightly twisted to the right. Ventral margin well rounded, mostly with a weak sinuosity on the posterior part just anterior to the posterior end. Beaks slightly behind the vertical midline. Escutcheon very narrow and deep, ligament somewhat sunken. Surface with very faint commarginal grooves or only smooth with irregular growth lines; sometimes the commarginal grooves are present on parts of the surface. Postero-dorsal area delimited by a rounded keel. Right valve with a slight, broad, radial depression just anterior to the postero-dorsal angle. Periostracum very thin and straw-coloured-yellow, mostly present only on the immediate marginal part of the valves. Outside pink, salmon-pink or orange, mostly with commarginal zones of different intensity, white with yellowish or orange umbonal area or white with weak pink radial rays. Inside white to pink or orange, often more intensely coloured than outside.



Distribution. West coast of Scotland southward to Sierra Leone; Gabon (Port Gentil) to southern Angola (Lucira, Namibe province); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean. Not in the North Sea and the northern part of the English Channel.

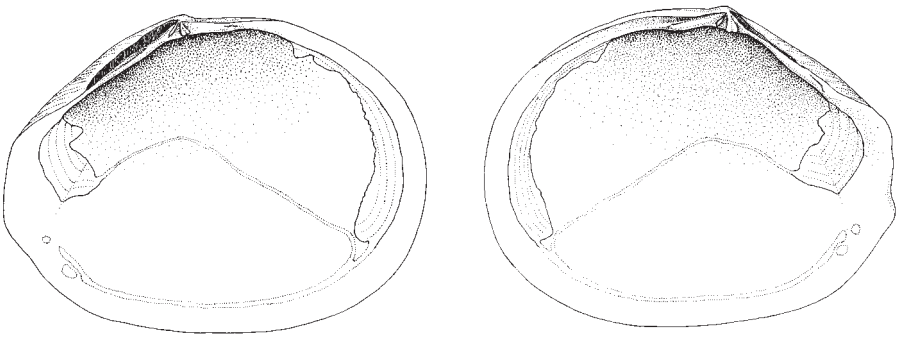
Biotope. In sandy bottom, also with calcareous algae and shell debris, from 2 to 85 m, common in Europe and the Atlantic Islands, rare on the West African continental shelf.

Remarks. *T.* (*B.*) *incarnata* is the type species of the subgenus *Bosemprella*. The species is very variable in colouration but less so in outline. Mediterranean specimens are mostly bright salmon-red or pink, whereas European Atlantic specimens are of a lighter orange to yellowish hue, on the outside often only in the umbonal area. The Atlantic specimens are sometimes separated under the synonym *T.* (*B.*) *squalida* Pulteney, 1799. West African specimens are white with pale yellow in the umbonal zone; those from Cape Verde Islands typically have additional pink radial rays. Huber *et al.* (2015: 619) treat this colour form as a separate undescribed species, *Bosemprella* sp. 1, but more material would be necessary. A very close sibling species (if not the same) occurs in the upwelling area of Southern Arabia and the Gulf of Oman; Oliver (1995) points out its similarity citing it as "*Laciolina* cf. *incarnata* (Linnaeus, 1758)".



13.7. *Tellina (Bosemprella) incarnata* Linnaeus, 1758. **A-E**, Islote Sal-Rei, Boavista, Cape Verde Islands (38.8 mm). **F-G**, Port-Gentil, Gabon, 4 m, sand, (34.2 mm). **H**, Port-Gentil, Gabon (lv, 45.5 mm). **I-J**, Baia da Lucira, Namibe prov., S-Angola, 10-20 m, maërl (rv, 25.0 mm).

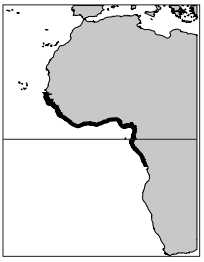
Tellina (*Senegona*) *senegambiensis* Salisbury, 1934



13.8. Grand Bassam, Côte d'Ivoire, 20 m (86 mm).

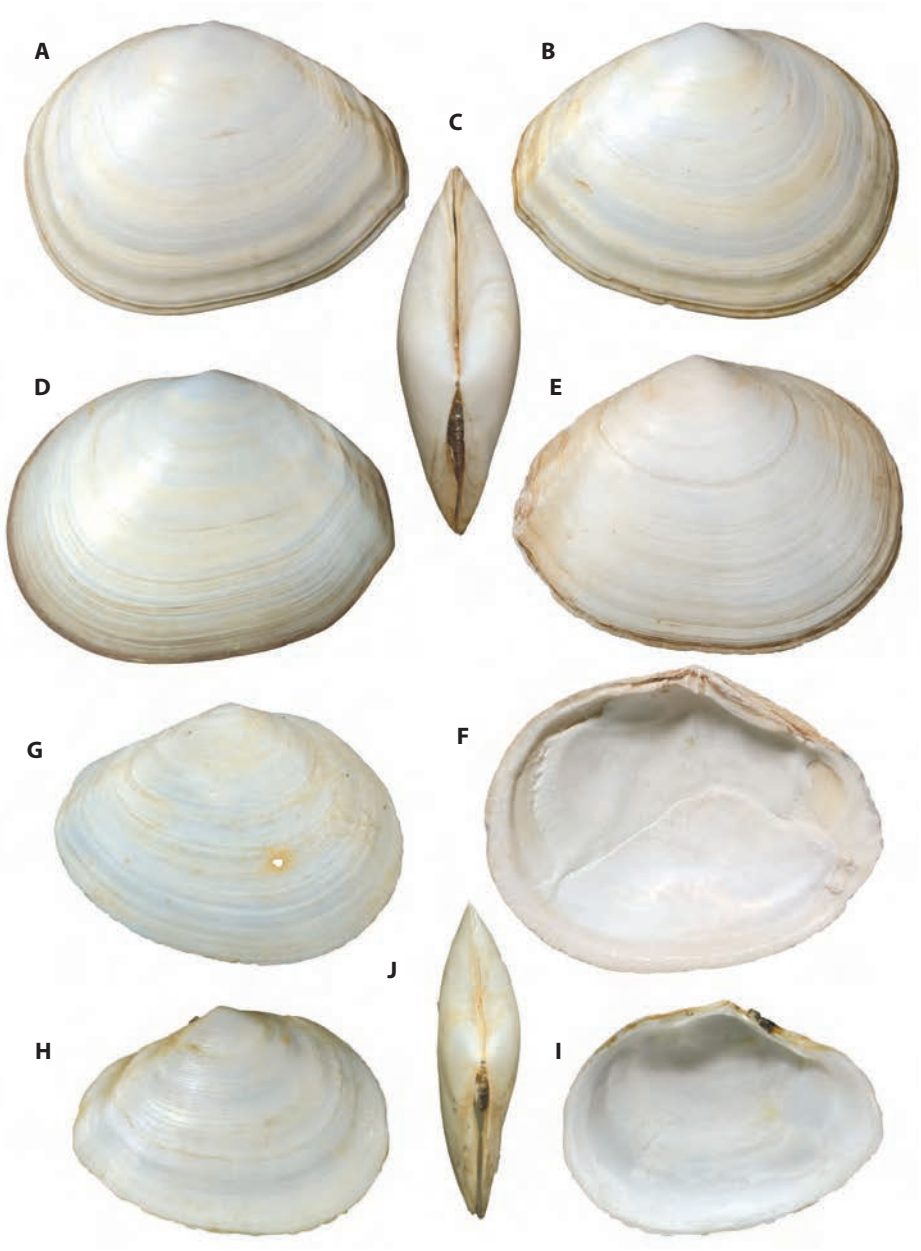
Shell up to 86 mm, occasionally to 97 mm long, rounded-suboval, moderately thick and solid (younger specimens thin), rather inflated. Anterior margin broadly rounded, posterior part rounded-tapering, posterior end broadly pointed and twisted to the right. Weak sinuosity on the postero-ventral margin just anterior to the posterior end. Beaks on or slightly behind the vertical midline. Lunule and escutcheon narrow and deep, ligament deeply sunken. Surface smooth, with irregular growth lines and coarser growth stages; umbonal part with very fine commarginal lamellae on the first 10 mm. Postero-dorsal area delimited by a weak, rounded keel; slight, broad, radial depression on the right valve just anterior to the postero-dorsal angle. Periostracum very pale brown, thin and translucent, thicker only on the immediate marginal area. Outside dirty whitish to cream, inside white.

Distribution. Mauritania (?); Senegal (Saloum) to northern Angola (Cacuaco).



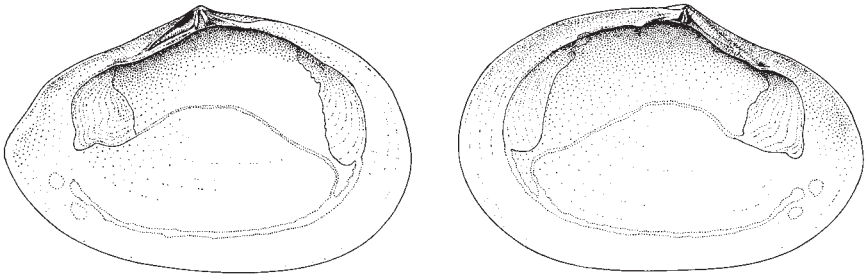
Biotope. In fine muddy sand and fine sand, from shallow water (3-6 m) to 20 m, not uncommon.

Remarks. *Tellina* (*S.*) *senegambiensis* is occasionally taken by shrimp boats, empty valves may be found on the beach and at low tide. Originally, the species was known as *T. listeri* Hanley, 1844 (*non* Röding, 1798).



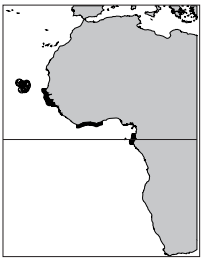
13.9. *Tellina (Senegona) senegambiensis* Salisbury, 1934. **A**-**C**, Casamance, Senegal, 10-20 m (68.2 mm). **D**, off Grand Bassam, Côte d'Ivoire (86.6 mm). **E**-**F**, Komo Rive droite, Libreville, Gabon, low water (70.8 mm). **G**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (38.8 mm). **H**-**J**, same locality (23.3 mm).

Tellina (*Peronaea*) *planata afroccidentalis* Cosel, 1995



13.10. Pointe-Noire, Congo (45.8 mm).

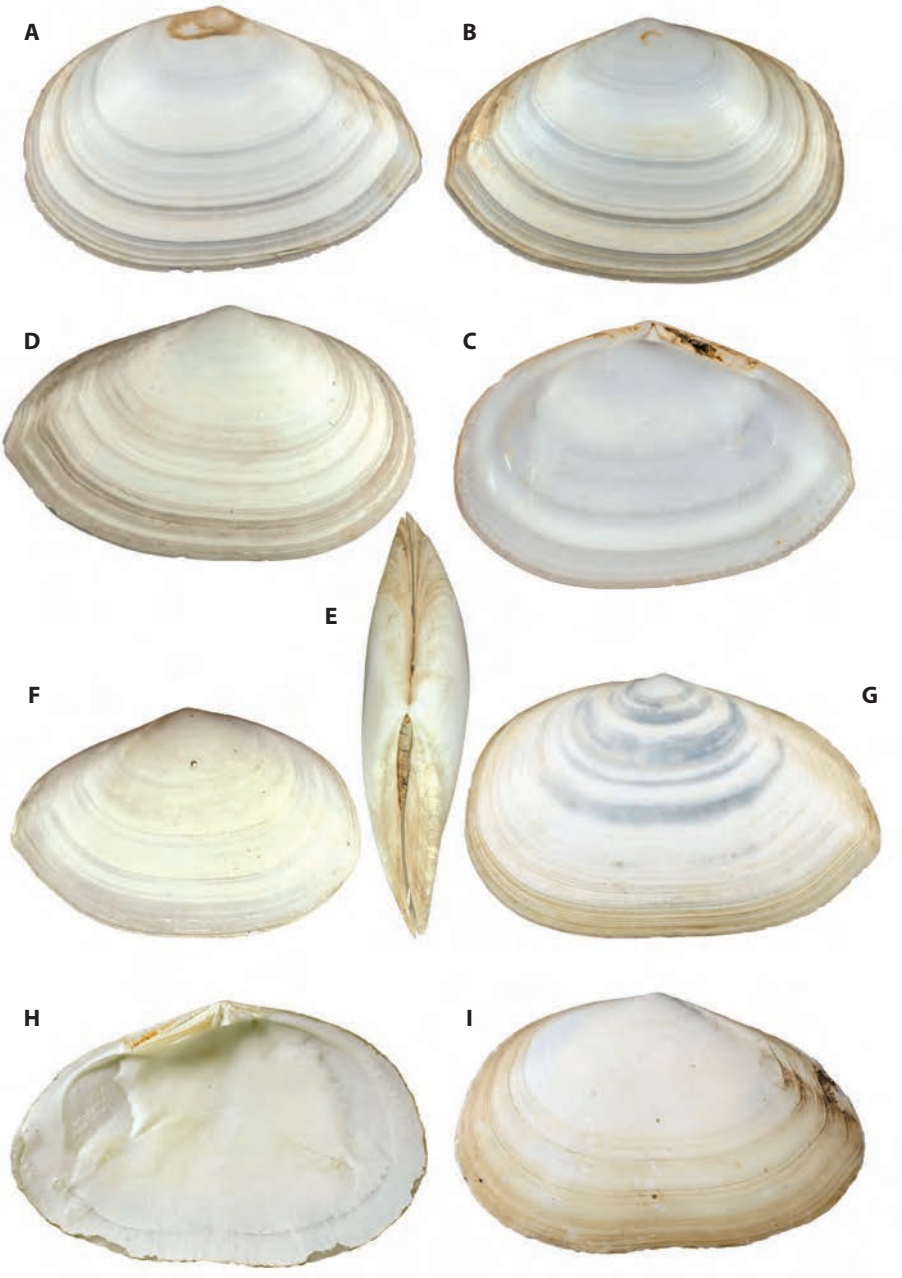
Shell up to 82 mm long, suboval, rather solid, compressed. Anterior margin broadly rounded, posterior margin rounded and slightly angulate at the end which is slightly twisted to the right. Postero-dorsal margin gently convex. Ventral margin with very slight or without posterior sinuosity. Beaks slightly in front of the vertical midline. Escutcheon restricted to the length of the deep sunken ligament. Surface smooth, with irregular growth lines and very faint irregular radial striae, fully visible only under a lens (x 10). There are also faint, regular, not too close-set, commarginal threads on the first 12-15 millimetres of the umbonal area. Postero-dorsal area delimited by a very weak angle. Periostracum light yellowish brown, thin and translucent, present only on the marginal area. Outside cream or dirty white, often with light greyish growth zones. Inside white, with exterior colouration showing through.



Distribution. Senegal (Dakar) to Guinea (10°33'N); Côte d'Ivoire to Ghana; Equatorial Guinea (Bata) to Gabon (Port Gentil); Cape Verde Islands. No record from the northern typical tropical region. A single record from Pointe Noire (Congo Brazzaville).

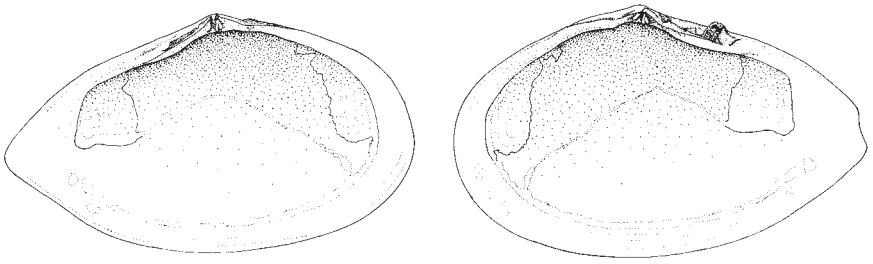
Biotope. In sandy bottom, from about 10 to 20 m, not common.

Remarks. *Tellina* (*P.*) *planata afroccidentalis* is very close to *T.* (*P.*) *planata planata* Linnaeus, 1758 from the Mediterranean; there are, however, a few minor but constant differences which justify the separation as a geographic subspecies. The Mediterranean subspecies is smaller (up to 67 mm), somewhat shorter, thinner and always stained with light orange on the umbonal area or the central part of the valves, whereas the West African subspecies is never coloured. In the Mediterranean specimens, the postero-dorsal margin may be slightly more convex in its middle, and the fine commarginal threads on the umbonal area are still finer, much closer set and occasionally absent. *T.* (*P.*) *planata planata* is the type species of *Peronaea*. There is a sibling species, *T.* (*P.*) *manumissa* (Melvill, 1898) on the coast of south-eastern Arabia (see Oliver 1995). In contrast to the opinion of Huber *et al.* (2015: 614), the very similar *T.* (*P.*) *strigosa* Gmelin, 1791 (see next entry) is here considered to show slight but constant differences in being less high and slightly more slender, the beaks are placed somewhat more forward; the posterior end is more acute. *T.* (*P.*) *strigosa* has a much more restricted range in the northern zone of permanent and intermittent upwelling southwards to the northern Guinean shelf.



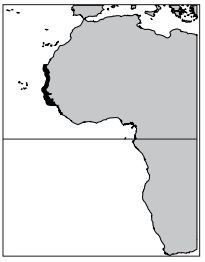
13.11. *Tellina (Peronaea) planata afroccidentalis* Cosel, 1995. **A-C**, Casamance, 10-20 m (holotype, 63.2 mm, photo Manuel Caballer/Recolnat). **D-E**, same locality (paratype, 67.0 mm). **F**, Praia, São Tiago, Cape Verde Islands, beach drift (rv, 56.6 mm). **G**, Abidjan region, Côte d'Ivoire (77.6 mm). **H-I**, Port-Gentil, Gabon (lv, 78.0 mm).

Tellina (*Peronaea*) *strigosa* Gmelin, 1791



13.12. Pointe des Maures, Mauritania, sand, low tide (64 mm).

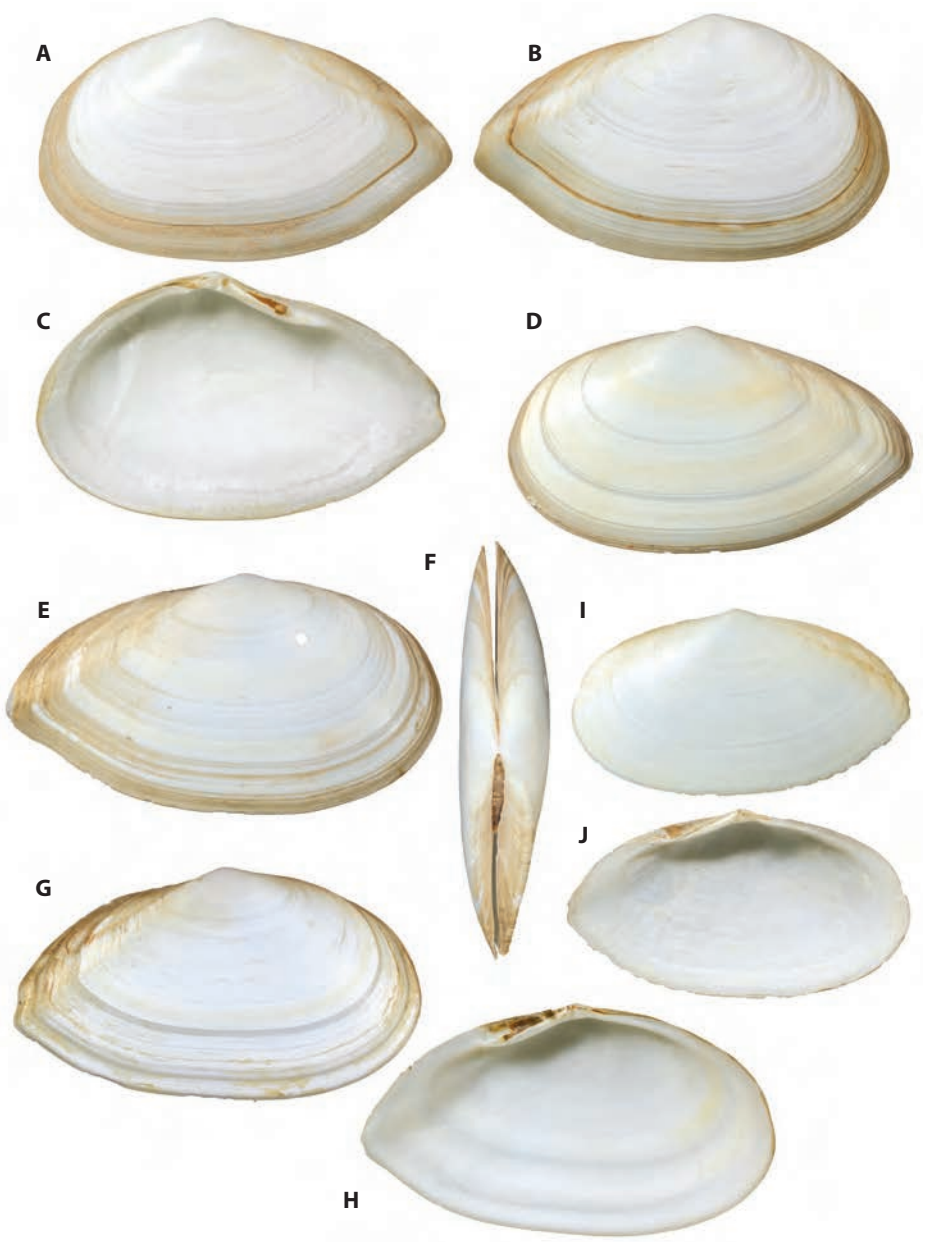
Shell up to 75 mm long, suboval, rather solid, compressed. Anterior margin broadly rounded, posterior part rounded-tapering, posterior margin angulate, with a flexure towards the right. Postero-ventral margin with a very weak sinuosity. Beaks slightly anterior to the vertical midline. No lunule and no visible escutcheon, ligament deeply sunken. Surface smooth, with irregular growth lines, a few coarser growth stages and very fine, irregular radial striae, only visible under a lens (x 10). There are also extremely fine, close-set, commarginal threads on the umbonal part predominantly in the right valve. Postero-dorsal area delimited by a rounded keel in the right valve and by a very faint angle in the left valve. Periostracum straw-coloured to light brownish, generally present only marginally. Outside whitish to cream, with occasional light greyish growth zones, rarely with a pale pinkish hue in the umbonal area. Inside white, occasionally with pink under the umbos.



Distribution. Mauritania (Cap Blanc) southward to the northern part of Guinea (Company Bancs, Tristão Island).

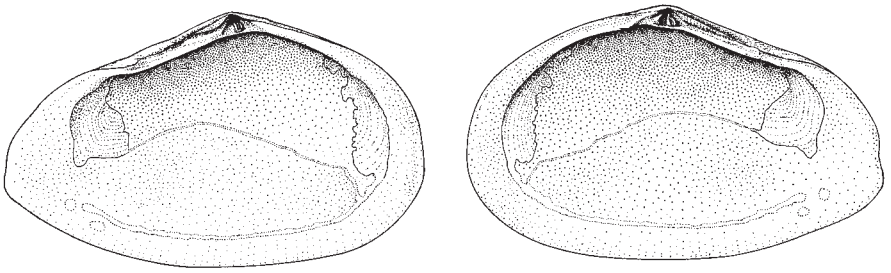
Biotope. In clean fine to mixed sand, from low water to about 10 m, common to abundant in Mauritania and Senegal, rare in Casamance, Guinea-Bissau and Guinea.

Remarks. The range of this species is restricted to the northern seasonal upwelling zone and extreme south of the more or less permanent upwelling. Empty shells and valves are commonly washed up on beaches of Mauritania and Senegal. This is "Le Vagal" of Adanson.



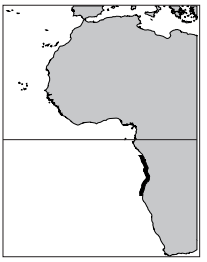
13.13. *Tellina (Peronaea) strigosa* Gmelin, 1791. **A**-**C**, Pointe des Maures, Mauritania, low tide (60.3 mm). **D**, Dakar Bel-Air, Senegal, on beach (60.2 mm). **E**-**F**, Casamance, Senegal, 10-20 m (70.5 mm). **G**-**H**, same locality (rv, 62.2 mm). **I**-**J**, S of Ilha do Mel, Guinea-Bissau, 10°45'N, 15°41'W, 27 m (lv, 42.3 mm).

Tellina (*Peronaea*) *madagascariensis* Gmelin, 1791



13.14. Baia de Santa Maria, Benguela, S-Angola, sand 1-2 m (68 mm).

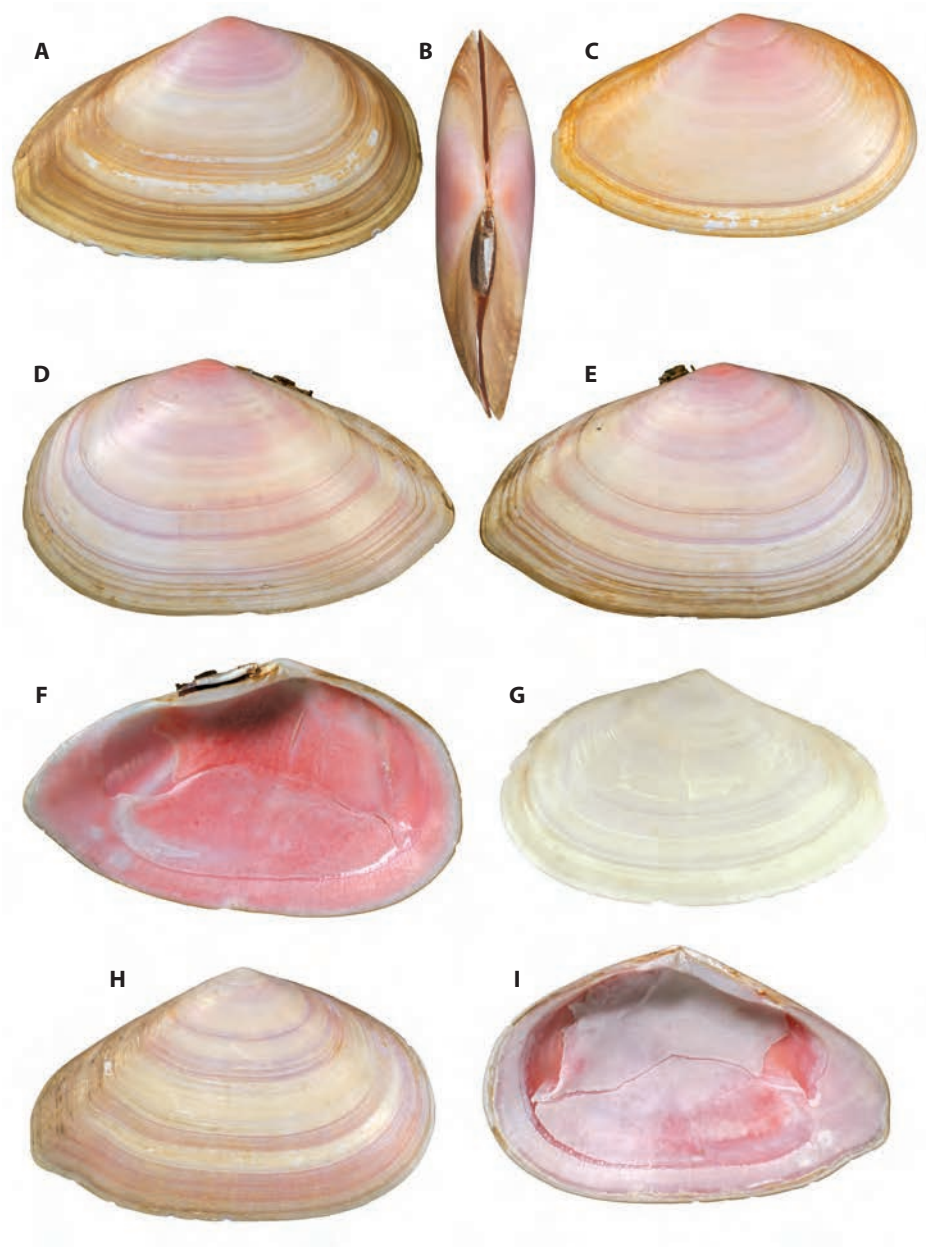
Shell up to 90 mm long, slightly variable in outline, suboval, rather thick and solid, compressed. Anterior margin broadly rounded, posterior part tapering, posterior margin narrowly rounded-angulate. Postero-ventral sinuosity only occasionally in left valve. Beaks somewhat anterior to the vertical midline. No lunule and very narrow, short escutcheon with large, sunken ligament. Surface smooth, with irregular growth lines, coarser growth stages and extremely fine, irregular radial striae, only visible under a lens (x 10). There are also very fine, commarginal threads on the umbonal part, more developed on the right valve. Postero-dorsal area delimited by a rounded keel in the right valve and by a faint line in the left valve. Periostracum thin and light brown, thicker on the marginal part of the valves. Outside pale pink with more intensely coloured growth zones and umbonal region. Inside deep pink.



Distribution. Congo Brazzaville (Pointe-Noire) to southern Angola (Baia dos Tigres).

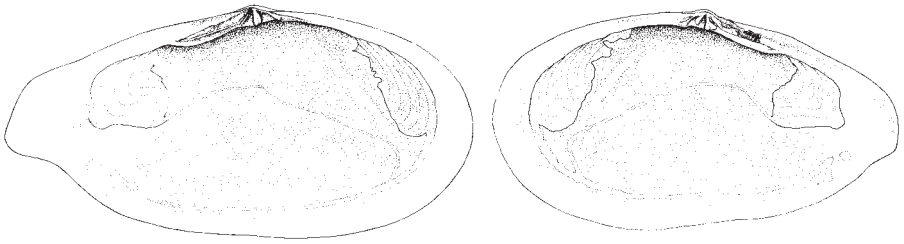
Biotope. In clean fine and mixed sand, from low tide level to about 5 m, not uncommon.

Remarks. This species is the southern upwelling zone counterpart to *T.* (*P.*) *strigosa*. It is distinguished by its bright pink colour, the heavier shell with coarser ligament and the more rounded posterior margin. Beached shells are common, often double-valved. A synonym is *Tellina capsicum* Römer, 1872, described from Angola.



13.15. *Tellina (Peronaea) madagascariensis* Gmelin, 1791. **A**-**B**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (70.1 mm). **C**, Pointe-Noire, Congo Brazzaville, Plage Orstom, beach drift (59.3 mm). **D**-**F**, Praia Etambar, Corimba, Luanda prov., N-Angola, beach drift (80.5 mm). **G**, Baia de Corimba, Luanda prov., N-Angola, dredged, 10-20 m (22.6 mm). **H**-**I**, Baia do Mussulo, Luanda prov., N-Angola, beach drift (rv, 55.2 mm).

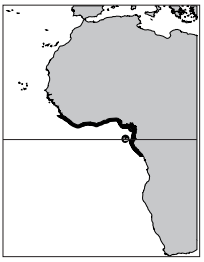
Tellina (*Peronaea*) *mars* Hanley, 1848



13.16. Pointe-Noire, Plage Mondaine, on beach, two specimens (lv, 57 mm; rv, 50 mm).

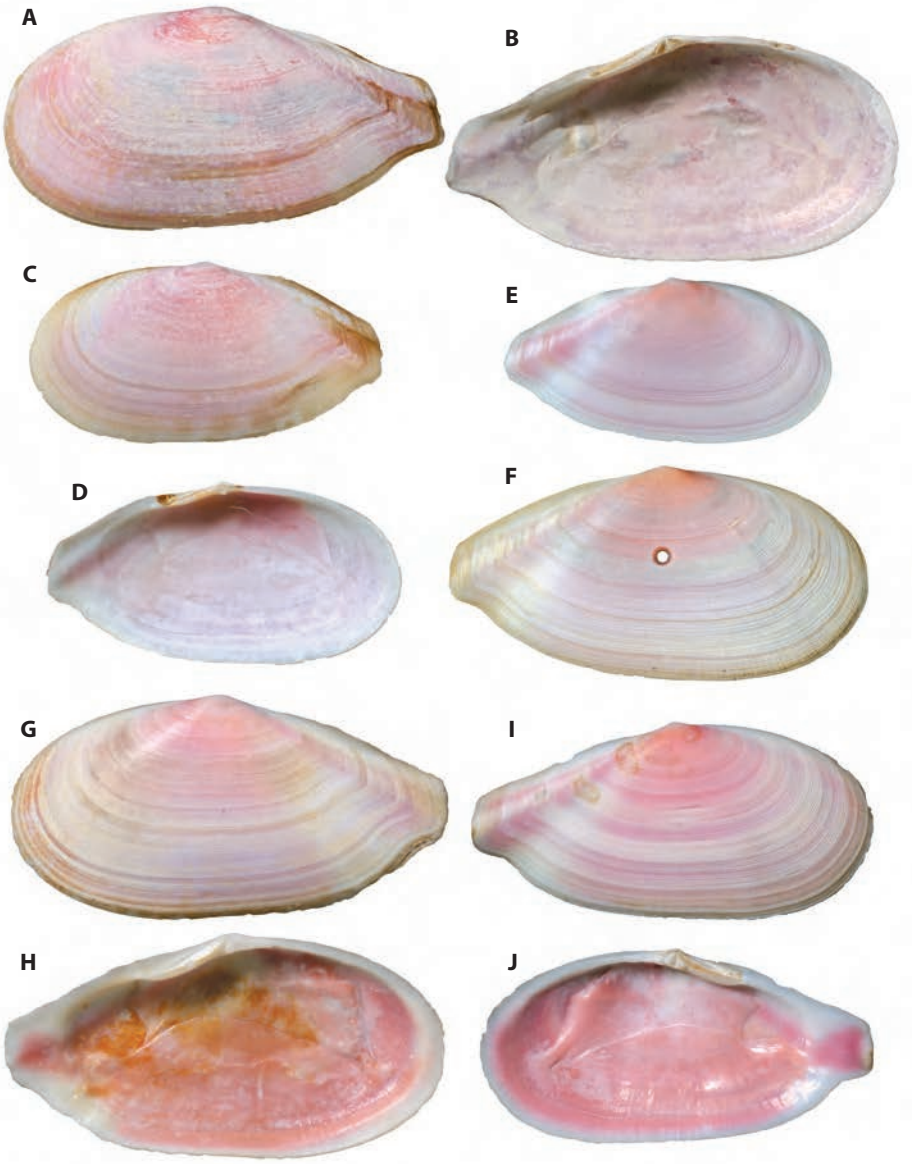
Shell up to 60 mm long, subelliptical, rather solid, compressed. Anterior margin rounded, posterior part tapering, posterior end pointed, with a slight flexure towards the right. Postero-ventral margin with a more or less strong sinuosity. Beaks on or just anterior to the vertical midline. No lunule and escutcheon, ligament deeply sunken. Surface with numerous, close-set, regular, very fine commarginal ridges and extremely fine, irregular radial striae, only visible under a lens. Right valve with a broad and deep radial depression just anterior to the rounded posterior angle. Postero-dorsal area in the right valve delimited by a weak line only. Periostracum thin and light brownish, mostly present just on the marginal part of the valves. Outside pink with a whitish ray just in front of the posterior angle and darker growth zones. Inside pink, hinge line white.

Distribution. Liberia (Monrovia) to Congo Brazzaville (Pointe-Noire); Ilha de São Tomé.



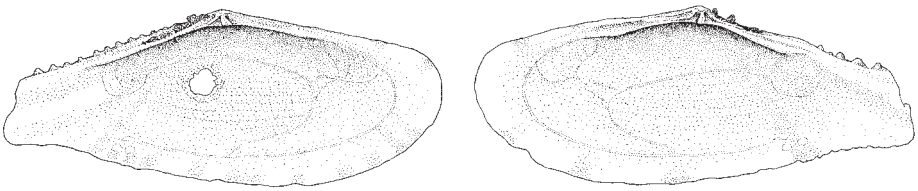
Biotope. Unknown, most probably fine sand in shallow water to 5-6 m, fairly common in Gabon, rare elsewhere.

Remarks. No live record of this pretty species is yet known to me, almost all available material consists of more or less fresh single valves from the beach drift, remarkably, mostly right valves were found. Synonyms are *Tellina gracilis* G.B. Sowerby II, 1867 and *T. dautzenbergi* Nobre, 1894. The outline of the valves reminds certain species of the Indo-Pacific subgenus *Pharaonella* Lamy, 1918, however, these are more elongate, have a much smaller and shallower pallial sinus and the hinge line is finer.



13.17. *Tellina (Peronaea) mars* Hanley, 1848. **A-B**, Victoria (now Limbe), Cameroon, beach drift (48.5 mm). **C-D**, same locality (38.3 mm). **E**, Pointe du Phare, Cap Lopez, Gabon, 0°38'S, 8°42.1'E, beach drift (43.0 mm). **F**, same locality (55.5 mm). **G-H**, Mayumba, Gabon, beach drift (60.0 mm). **I-J**, same locality (54.4 mm).

Tellina (*Tellinella*) *mexicana* Petit de la Saussaye, 1841



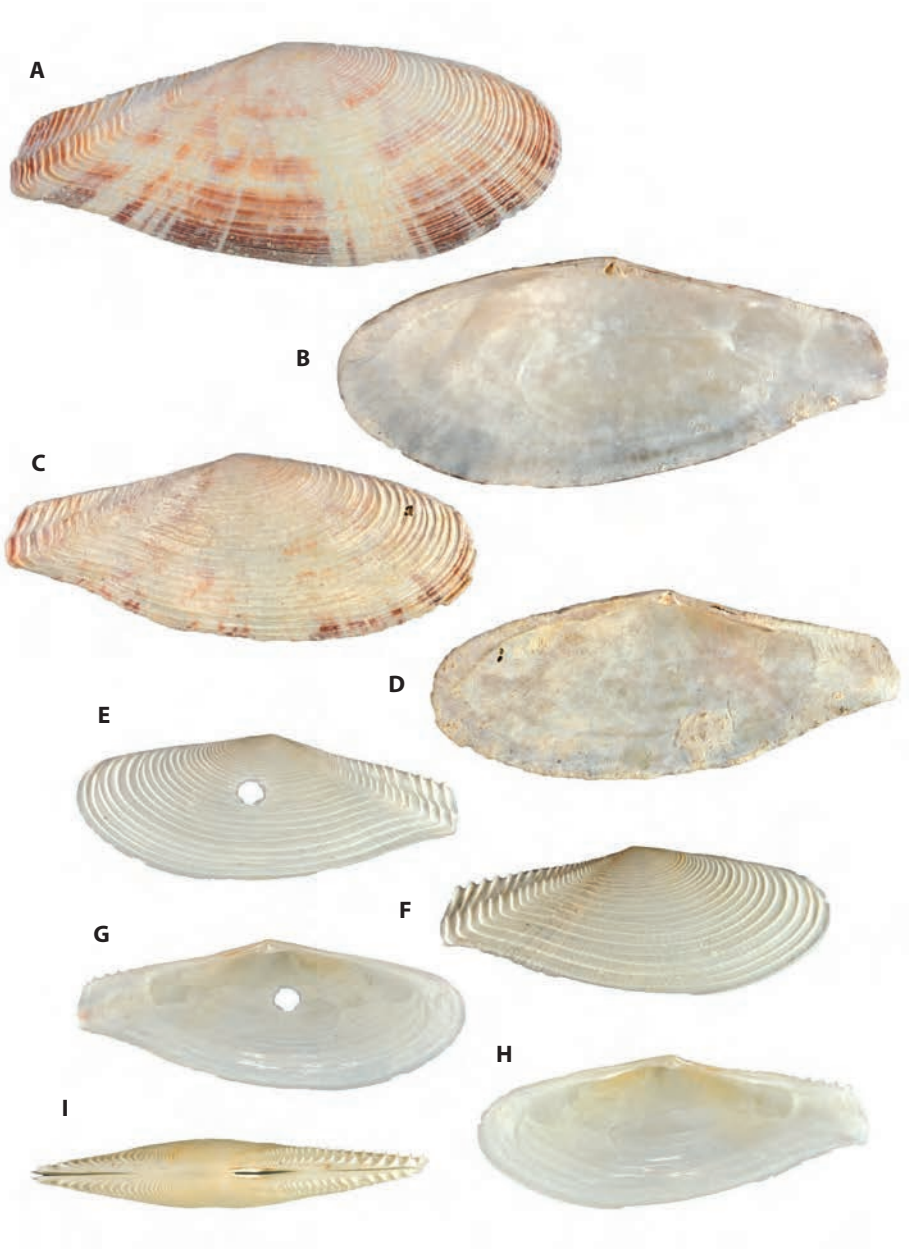
13.18. Guadeloupe, Lesser Antilles (24.8 mm).

Shell to 65 mm long, slender, narrowly subelliptical, rather solid, compressed. Anterior margin very narrowly rounded, posterior part tapering, posterior end narrowly-rostrate and slightly twisted to the right. Antero-dorsal margin very slightly convex to almost straight, postero-dorsal margin straight, ventral margin convex, postero-ventral margin with a weak sinuosity just anterior to the subtruncate posterior margin. Beaks about in the middle. Lunule short very narrow, ill-defined, escutcheon not seen, ligament not sunken. Surface with narrow, raised, close-set commarginal ridges which partly bifurcate about in the middle and are more numerous on the anterior half of the valve, becoming more lamellar on the anterior slope and the posterior area. Interspaces with fine, shallow and densely spaced radial striae, especially towards the extremities of the valves. On the postero-ventral part of the valves the radial striae cause slight undulations of the commarginal lamellae. Postero-dorsal angle narrowly rounded in the right valve and broadly rounded in the left valve and marked by still more lamellar sculpture. Periostracum not seen. Outside cream with irregular reddish-brownish rays, inside whitish with outside colouration slightly showing through; juveniles whitish cream.

Distribution. Western Atlantic: Gulf of Mexico to Lesser Antilles and Brazil but not in Colombia and Venezuela. Eastern Atlantic: St. Helena.

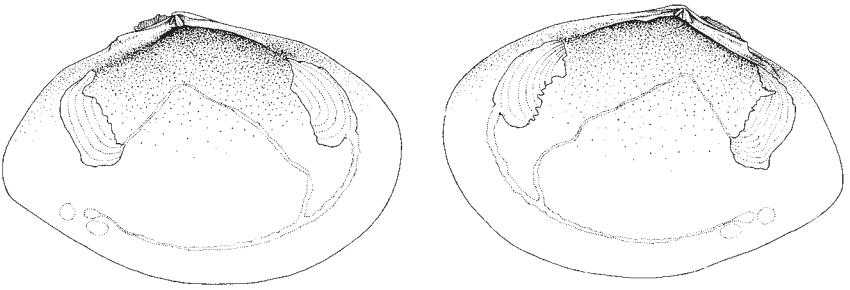
Biotope. The valves were collected on sandy bottom with calcareous algae and fine sand, obviously in shallow water, found together with valves of *Pecten turtoni*.

Remarks. The material of this species was taken by the R/V *Reine Pokou* of CRO Abidjan during a cruise to St. Helena Island in February 1962, with I. Marche-Marchad as chief scientist. During a visit to the CRO in 1999 together with P. Le Loeuff, we found these lots with other mollusc material from the cruise still in their original bags, accompanied by provisional field labels with dredge haul numbers; however, a field journal was not encountered neither in CRO nor in Marche-Marchad's notes. This species belongs to a group of mostly Indo-Pacific long and slender tellinids, with very few other species in the Western Hemisphere, *e.g. T.* (*Tellinella*) *listeri* Röding, 1798, from the Caribbean, which is larger, stouter and less slender. *Tellina* (*T.*) *mexicana* also originates from the Western Atlantic and is one of the very few Caribbean province species that reach eastward to St. Helena, where it attains larger sizes than in the western Atlantic.



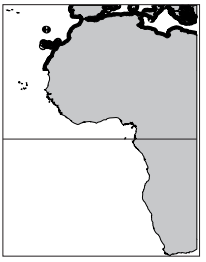
13.19. *Tellina (Tellinella) mexicana* Petit de la Saussaye, 1841. A-B, St. Helena Island (rv, 64.7 mm). C-D, same locality (55.6 mm). E-I, same locality (32.6 mm).

Tellina (*Macomangulus*) *tenuis* da Costa, 1778



13.20. Port Etienne (Nouadhibou), Mauritania (23.4 mm).

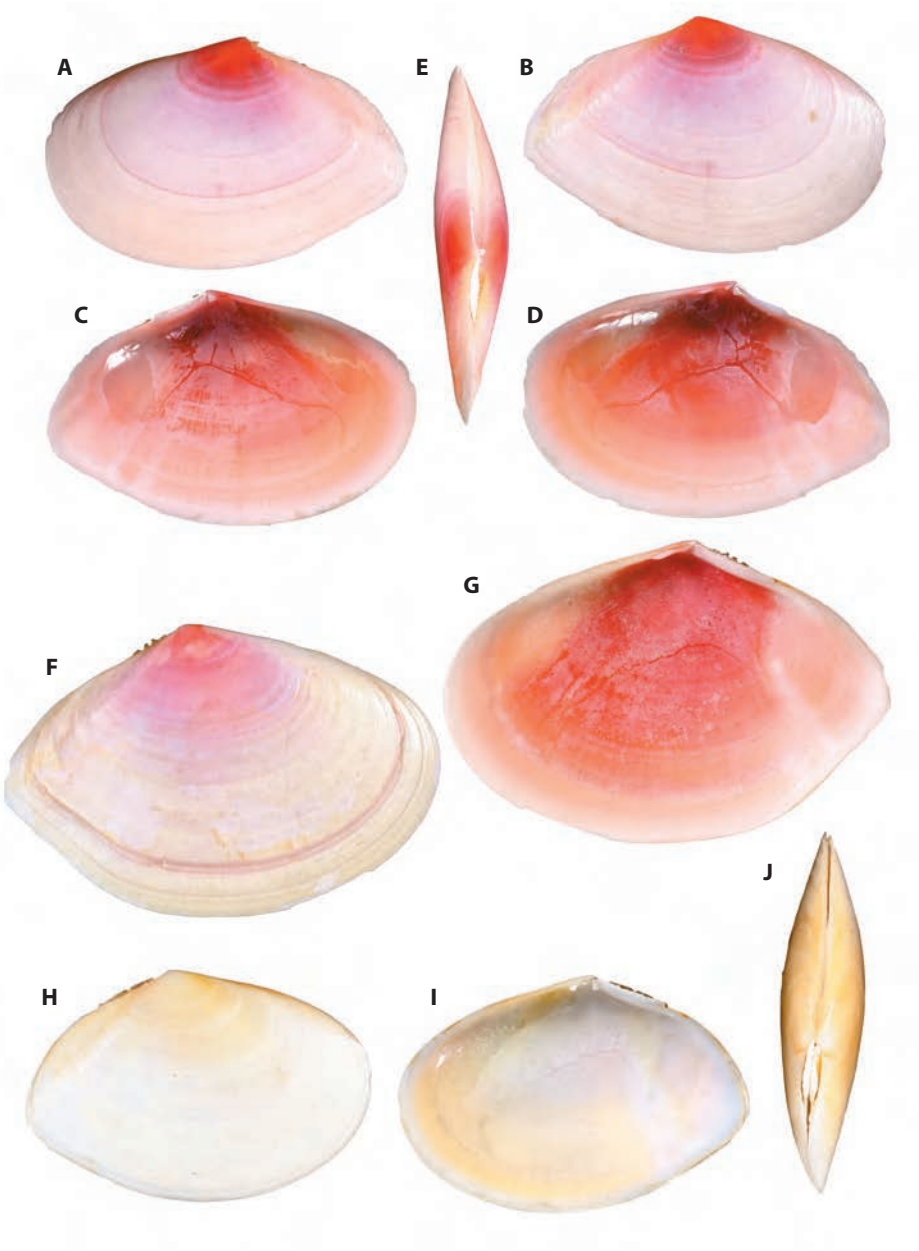
Shell up to 33 mm long, considerably variable in outline, size and colour, suboval to high-oval, rather thin and fragile, very compressed. Anterior margin well rounded, posterior part tapering, posterior margin pointed and angulate, posterior end very slightly bent to the right. Ventral margin strongly convex, more or less raised posteriorly. Beaks slightly behind the vertical midline. Lunule and escutcheon narrow and ill-defined, ligament protruding. Surface smooth with irregular, commarginal growth lines and coarser growth stages. Posterior angle rounded and not very prominent. Periostracum very thin, glossy and nearly colourless, persistent only on the marginal part of the valves. West African specimens on the outside white with bright pink umbonal area, entirely white, pink or pale yellowish specimens are less common. Inside white, pink or pink with white marginal area. European specimens mostly pink, orange, yellow or cream, with often more intensely coloured inside.



Distribution. Norway (70°N) and Shetlands, North Sea, British Isles southward to Mauritania (Nouadhibou, Baie de l'Etoile); Madeira, Canary Islands; throughout the Mediterranean; Black Sea.

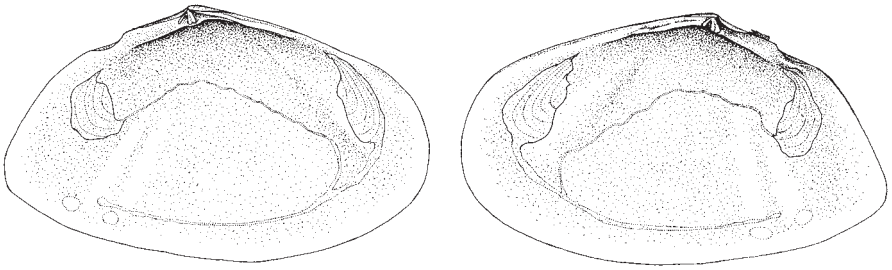
Biotope. In clean fine and mixed sand from shallow water (1-3 m) to about 10 m; abundant in Europe, becoming uncommon in Mauritania.

Remarks. This is one of the typical widespread European temperate species, which reach their southernmost point at Cap Blanc, the southern limit of permanent upwelling. It is extremely common in the beach drift at many places in Europe. This is the type species of *Macomangulus*.



13.21. *Tellina (Macomangulus) tenuis* da Costa, 1778. **A**-**E**, Port-Etienne (now Nouadhibou), Mauritania (21.2 mm). **F**-**G**, same locality (33.1 mm). **H**-**I**, same locality (25 mm). **J**, same locality (23.4 mm).

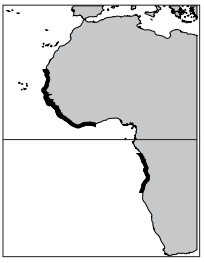
Tellina (*Macomangulus*) *posteli* Nicklès, 1955



13.22. Pointe des Maures, Mauritania, low tide (19.8 mm).

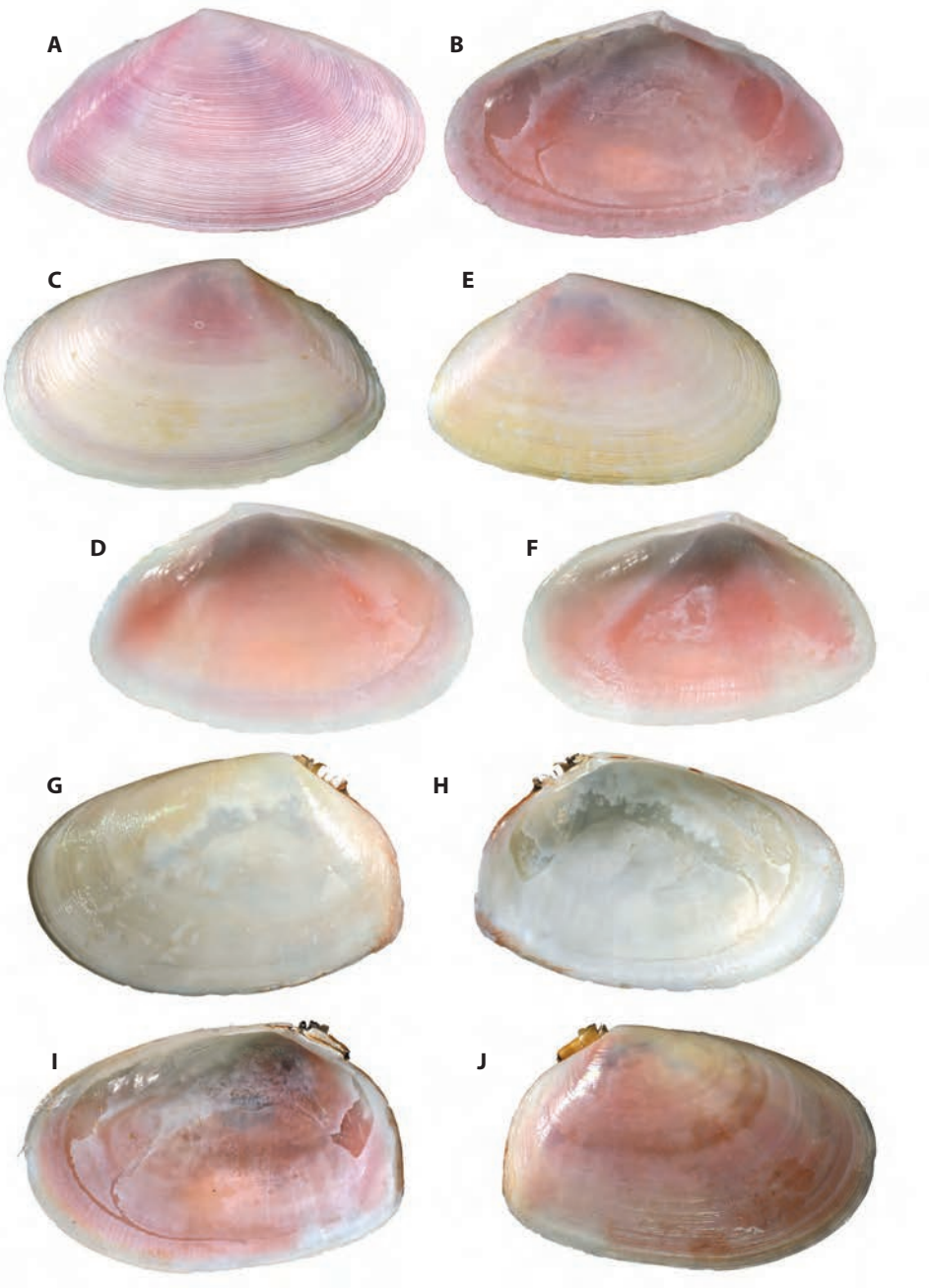
Shell small, up to 20 mm long, variable in outline (length/height ratio), colour and sculpture, thin but rather solid to very thin and fragile, compressed. Anterior margin rounded, posterior part with variable length, more or less tapering, posterior margin with a rounded corner at the end. Ventral margin weakly convex, no sinuosity. Beaks more or less behind the vertical midline. No lunule and escutcheon, ligament not sunken. Surface smooth and glossy with irregular growth lines and often with fine commarginal grooves mostly on the marginal part (especially in specimens from Mauritania), rarely over the whole valve. Postero-dorsal angle rounded. Periostracum thin, translucent, glossy and nearly colourless, in live-taken specimens or fresh valves showing a distinct iridescent sheen when exposed to light in a certain angle. Hinge plate narrow, anterior lateral somewhat variable in length. Outside entirely pink, white, cream or pink with white on the marginal part. Inside white, rich pink or pink with a white rim.

Distribution. Mauritania (Cap Blanc) to Senegal (S of Dakar); Guinea; Liberia (Monrovia); Côte d'Ivoire; Congo Brazzaville (Pointe-Noire) to southern Angola (Moçâmedes, Namibe province). Not yet recorded from Ghana to Gabon.



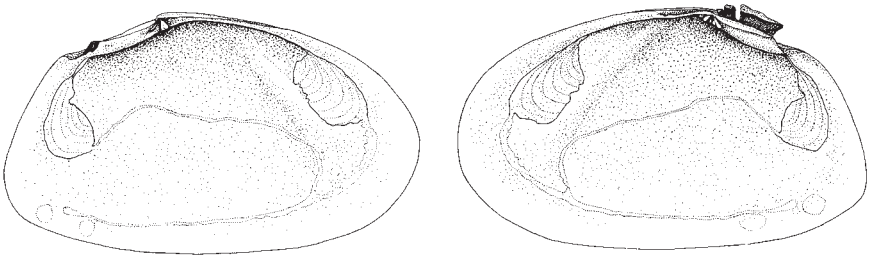
Biotope. In fine sand or fine muddy sand, from low tide to about 25 m, fairly common in Mauritania, uncommon to rare in the tropical zone, again more common from Congo Kinshasa (Banana) southward.

Remarks. Because of its variability, this species is not easy to understand. Two "morphs", which seem to be linked by intergrades, can be distinguished. A pink, slightly more solid form, most common off Mauritania and Senegal, conforms the original description of *Tellina posteli* from Monrovia, Liberia. A white, somewhat thinner and more translucent and slightly higher form, which is known from Guinea by two samples and which predominates in the southern part of the range, has received the preoccupied name *T. prismatica* G.B. Sowerby III, 1905 (*non* G.B. Sowerby III, 1897, a South African species).



13.23. ***Tellina (Macomangulus) posteli*** **Nicklès, 1955. A-B**, Baie de Cansado, Mauritania (rv, 18.5 mm). **C-D**, Port Etienne area, seagrass with *Yetus*, Mauritania (17.4 mm). **E-F**, same locality (16.6 mm). **G-H**, W of Saloum, Senegal, 13°53.4'N, 16°56'W, 12 m (16.8 mm, white spm). **I-J**, same locality (16.5 mm, pink spm).

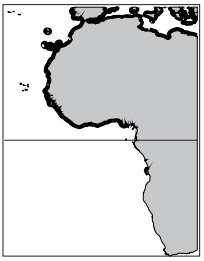
Tellina (*Oudardia*) *compressa* Brocchi, 1814



13.24. Off Cap Timiris, Mauritania, 18°12'N, 16°32'W, 200 m (19.3 mm).

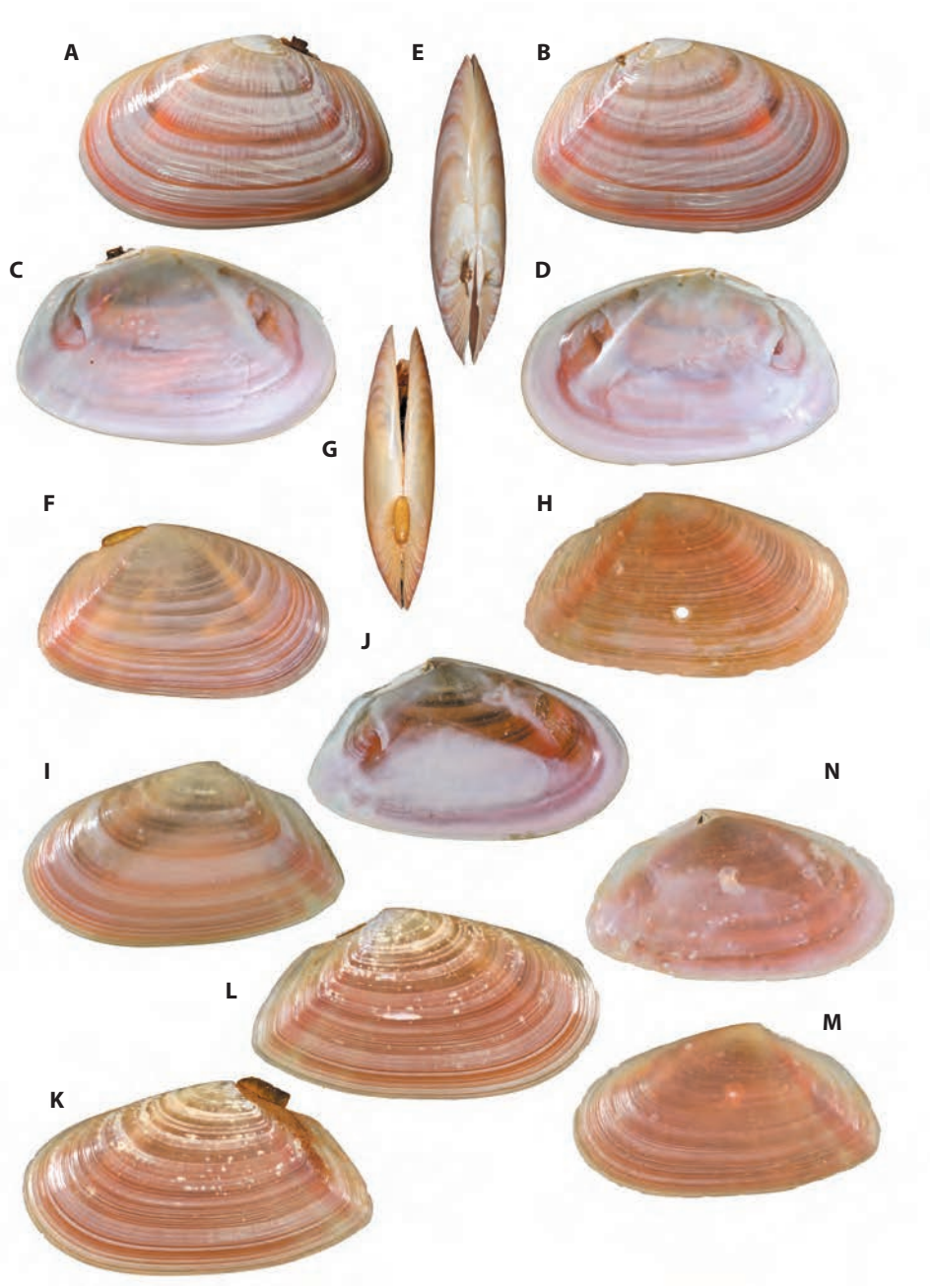
Shell small, up to 22 mm long, somewhat variable in outline and sculpture, suboval, thin and fragile, compressed. Anterior margin rounded, posterior part broad, posterior margin obliquely truncated, with rounded corners. Ventral margin only slightly convex. Beaks well behind the vertical midline. Surface glossy, with fine, irregular growth lines, commarginal lamellae on the postero-dorsal slope and in many specimens more or less widely spaced, fine, oblique incisions going from the antero-dorsal slope to an imaginary line running from the beaks to the postero-ventral margin, leaving an entirely smooth space between this and the rounded posterior angle. Periostracum very thin and translucent, mostly eroded and only occasionally remaining on the postero-marginal part. Inside with strong reinforcement from the beaks to the antero-ventral margin just behind the anterior adductor scar. Outside flesh-red with darker growth zones and a darker ray just anterior to the posterior angle, inside with the same colour.

Distribution. Southern Bay of Biscay to Nigeria, one isolated record from northern Angola (Luanda); Madeira, Canary Islands; Western Mediterranean.



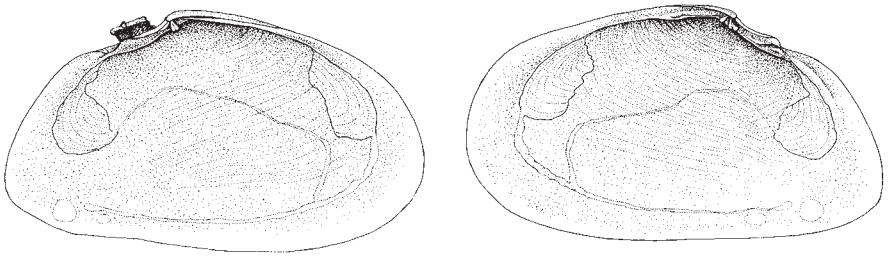
Biotope. In mud and muddy sand, from about 60 to 200 m, West African population mostly between 100 and 200 m, in the Mediterranean also in shallower water (from 30 m) and more sandy bottom.

Remarks. Two forms of this species occur, one with the typical oblique striae, that is known from Europe to Senegal, and one without any striae but otherwise identical that has been collected between Senegal (Dakar) and Nigeria. Occasionally specimens with very few widely-spaced striae are taken (*e.g.* the sample from Angola). There is no reason for separating these two forms. *T.* (*O.*) *oudardii* Payraudeau, 1826, *T.* (*O.*) *unicostalis* Deshayes, 1835 and *T.* (*O.*) *strigilata* Philippi, 1834 are synonyms. This is the type species of *Oudardia*.



13.25. *Tellina (Oudardia) compressa* Brocchi, 1814. **A-E**, Mauritania, 17°24'N, 16°39'W, 200 m (20.1 mm). **F-G**, Mauritania, 18°54'N, 16°47'W, 200 m (16.4 mm). **H**, Dakar region, Senegal, 129-150 m (rv, 18.8 mm). **I-J**, W of Rio Morébaya, Guinea, 9°24'N, 16°03.5'W, 200 m (19.3 mm). **K-L**, off Abidjan, Côte d'Ivoire, 200 m (18.5 mm). **M-N**, Cape Palmeirinhas, Luanda prov., N-Angola, 60-80 m (lv, 15.2 mm).

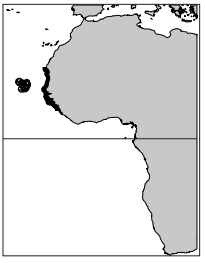
Tellina (*Oudardia*) *coseli* (Huber, Langleit & Kreipl, 2015)



13.26. Baie de Gorée, Dakar, Senegal, 14°41'N. 17°23.2'W, 17 m (13.6 mm).

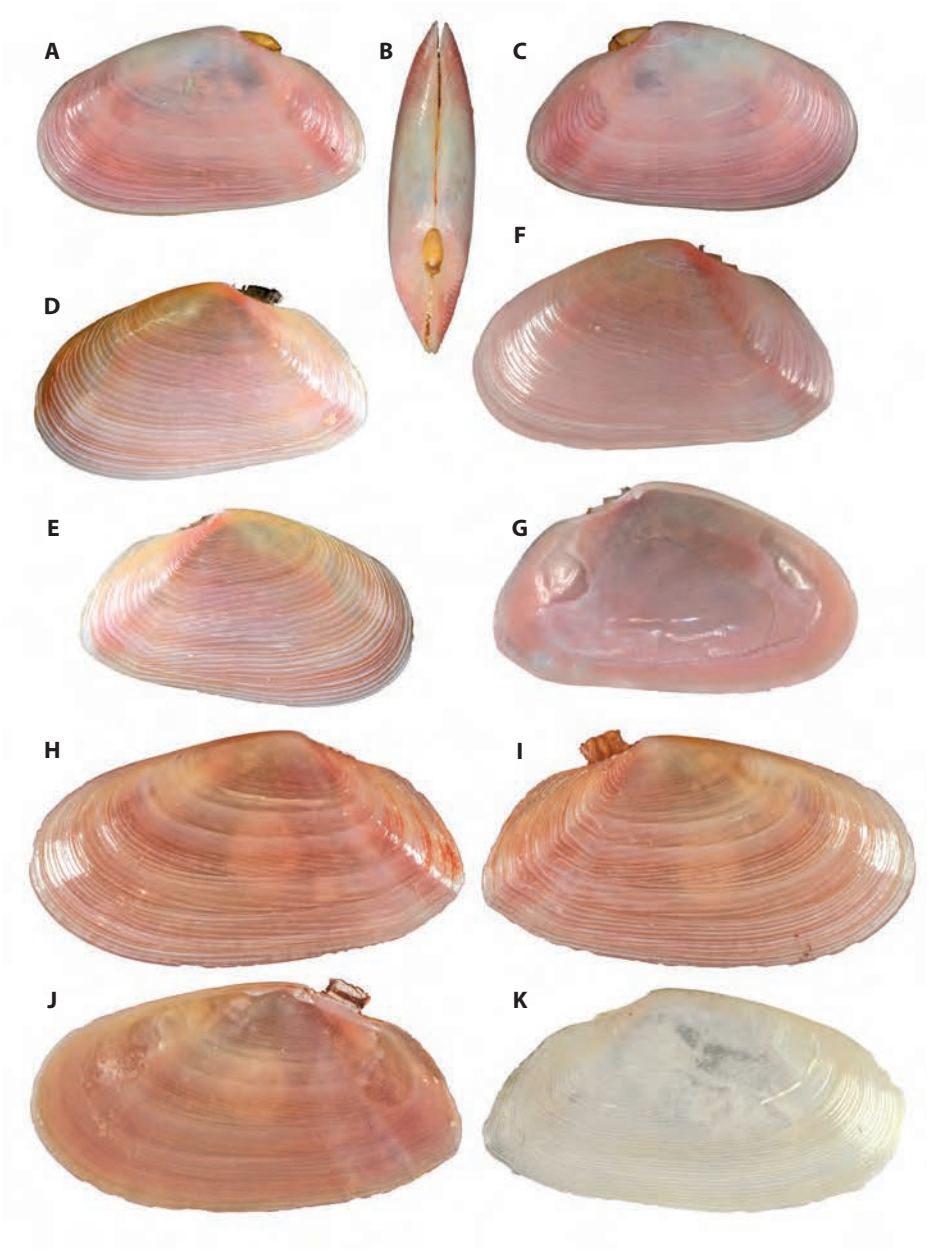
Shell small, up to 20 mm long, slightly variable in outline and sculpture, suboval, thin and fragile, compressed. Anterior margin rounded, posterior part slightly tapering, posterior margin obliquely truncated, weakly convex, with rounded corners. Ventral margin very slightly convex, a bit rising posteriorly. Surface with dense grooves which on the anterior third are commarginal, then gradually diverge and become more or less oblique towards ventrally. On a line from the beaks to the postero-ventral margin these grooves transform to ridges and abruptly change the direction to become again commarginal, continuing on the rounded posterior angle and the postero-dorsal slope. On the left valve this posterior sculpture is less pronounced, the part between the umbonal-ventral line and the posterior angle being nearly or completely smooth. Periostracum not seen, even in live-taken specimens. Weak reinforcement on the inside behind the anterior adductor scar. Outside creamish, pale pinkish or salmon, often with yellowish umbonal area. Inside with same colour. Specimens from Cape Verde Islands translucent white with very pale yellowish hue.

Distribution. Mauritania (20°N) to Guinea (off Ile Kabak, 9°18'); Cape Verde Islands.



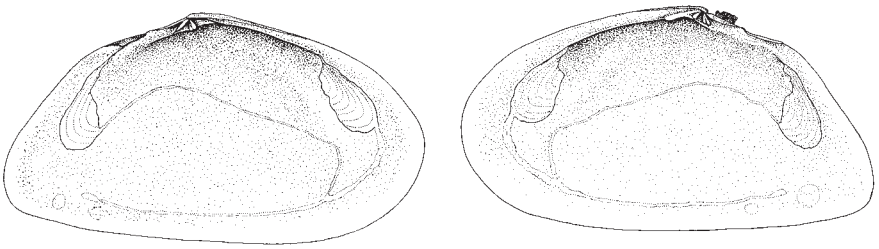
Biotope. In clean or occasionally very slightly muddy, fine sand or mixed sand, also with calcareous algae and shell debris, from about 17 m to 50 m, not uncommon.

Remarks. This species is distinguished from *O. compressa* by its slightly more elongate shell with less truncated posterior end and the denser oblique incisions that transform into ridges on the posterior part of the right valve, which is not seen in other *Oudardia* species. The inner reinforcement is less developed. It is found much shallower than *O. compressa*. *Tellina* (*O.*) *coseli* is another species endemic to the northern alternant region with seasonal upwelling. The name *Tellina* (*Oudardia*) *densestriata* Cosel, 1995 was found to be preoccupied by *Tellina* (*Macoma*) *densestriata* Preston, 1906, and a replacement name was given.



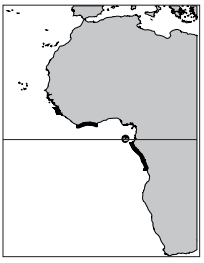
13.27. ***Tellina (Oudardia) coseli*** **(Huber, Langleit & Kreipl, 2015).** **A**-**C**, Mauritania, 17°42′N, 16°13′W, 40 m (11.8 mm). **D**-**E**, Gorée, Senegal, 14°41′N, 17°23.2′W, 17 m (13.6 mm). **F**-**G**, same locality (14.7 mm). **H**-**J**, Abéné, N-Casamance, 13°01.8′N, 17°25.5′W, 53 (holotype, 18.4 mm, photo Manuel Caballer/RecoInat). **K**, W of Ilha Une, Bissagos, Guinea-Bissau, 11°11′N, 16°59′W, 26 m (20.3 mm).

Tellina (*Oudardia*) *crosnieri* Cosel, 1995



13.28. Abidjan region, Côte d'Ivoire (15 mm).

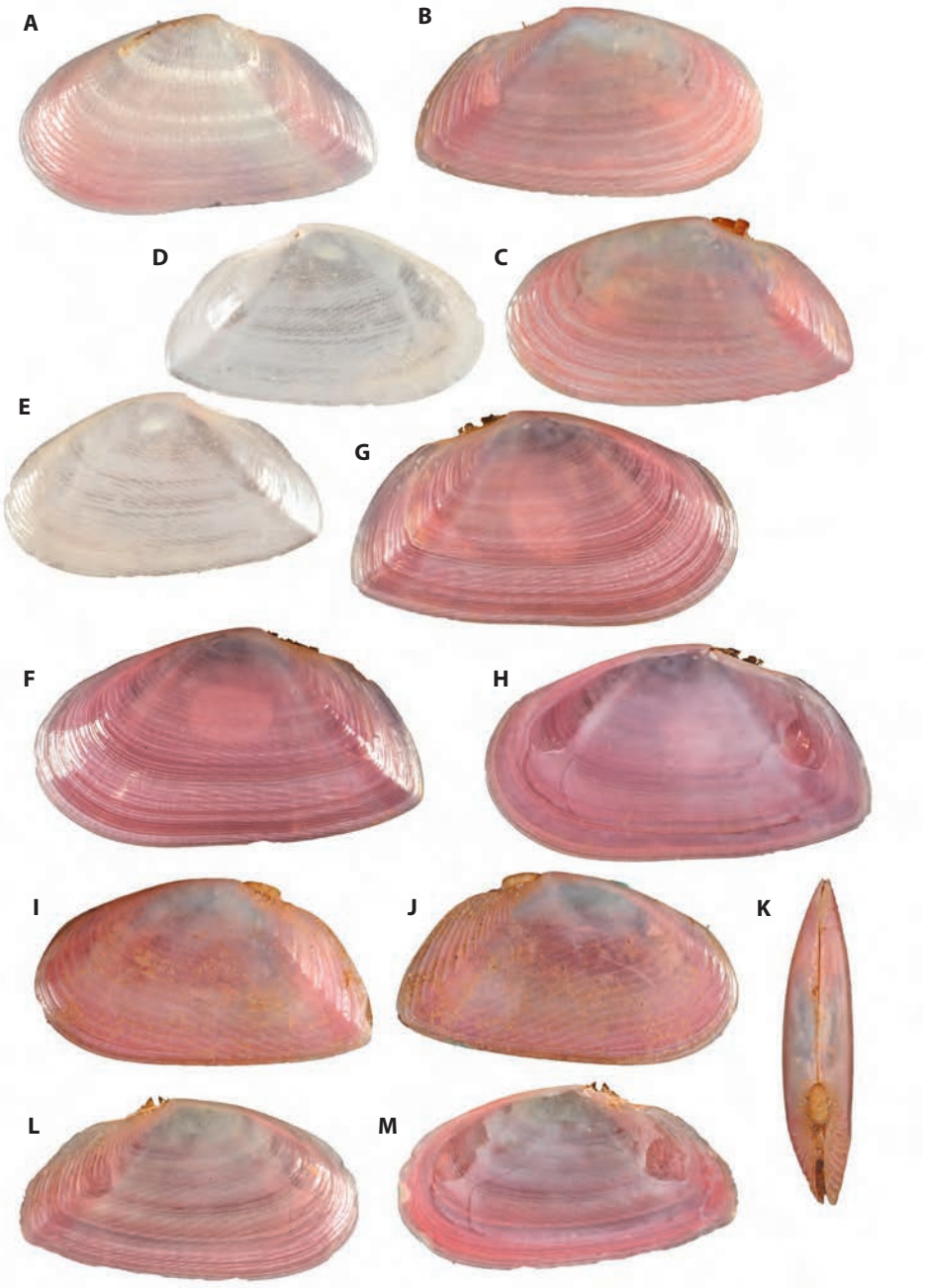
Shell small, up to 19 mm long, slightly variable in outline, suboval, thin and fragile, compressed. Anterior margin rounded, posterior margin obliquely truncated, slightly convex, with quite angulate postero-ventral corner. Ventral margin slightly convex to straight. Beaks slightly behind the vertical midline. Surface glossy, with more or less densely spaced grooves, on the anterior part somewhat but not entirely following the growth lines, more or less median bending down and becoming oblique. They end just anterior to the rather sharp posterior angle and leave a narrow smooth space between them and the commarginal ridges on the postero-dorsal slope. Periostracum very thin, colourless to brownish, persistent only on the marginal posterior part. Inside with moderately prominent reinforcement just after the antero-ventral adductor scar. Outside pale to bright pink, occasionally translucent white on the umbonal area. Inside with same colour.



Distribution. Guinea (Conakry and Iles de Los region); Côte d'Ivoire; Gabon (Port-Gentil) to northern Angola (Luanda); Ilha do Principe.

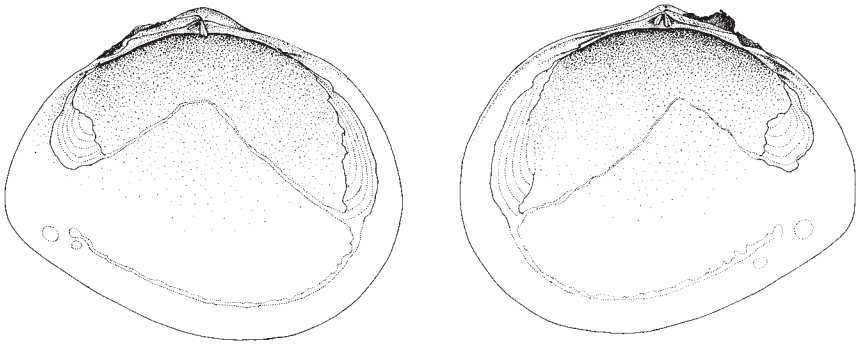
Biotope. In fine muddy sand and fine sand, from shallow water (1.5-6 m) to about 25 m, rarely deeper, in sheltered bays as well as offshore; not common.

Remarks. This species is very close to the preceding species and sometimes difficult to distinguish, however it differs from *T.* (*O.*) *compressa* by its pink colour, the sharper postero-ventral corner, the often somewhat less convex ventral margin and the often denser oblique grooves; also the biotope is different. *Tellina* (*O.*) *coseli* has coarser, posteriorly non-interrupted oblique grooves and a more rounded and raised postero-ventral corner. The known distribution pattern shows an affinity to feeble influence of seasonal upwelling; the absence of records from Sierra Leone and Liberia as well as Ghana to Equatorial Guinea indicate probable gaps. A superficially similar looking species, especially in outline and colouration, is the Caribbean *Tellina sandix* Boss, 1966, which had been described in the subgenus *Scissula* (*fide* Huber *et al.* 2015).



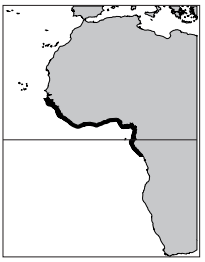
13.29. *Tellina (Oudardia) crosnieri* Cosel, 1995. **A**, Ile de Roume, Iles de Los, Guinea, N-side, 1.5-2 m (14.1 mm). **B**-**C**, off Abidjan, Côte d'Ivoire (12.6 mm). **D**-**E**, Baia S. Antonio, Ilha do Principe, 15 m (11.2 mm). **F**-**H**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 3-6 m (holotype, 15.7 mm, photo Manuel Caballer/Recolnat). **I**-**K**, same locality (paratype, 12.4 mm). **L**-**M**, Palmeirinhas, Luanda prov., N-Angola, 20-30 m (14.7 mm).

Tampaella ampullacea (Philippi, 1844)



13.30. Senegal (11 mm).

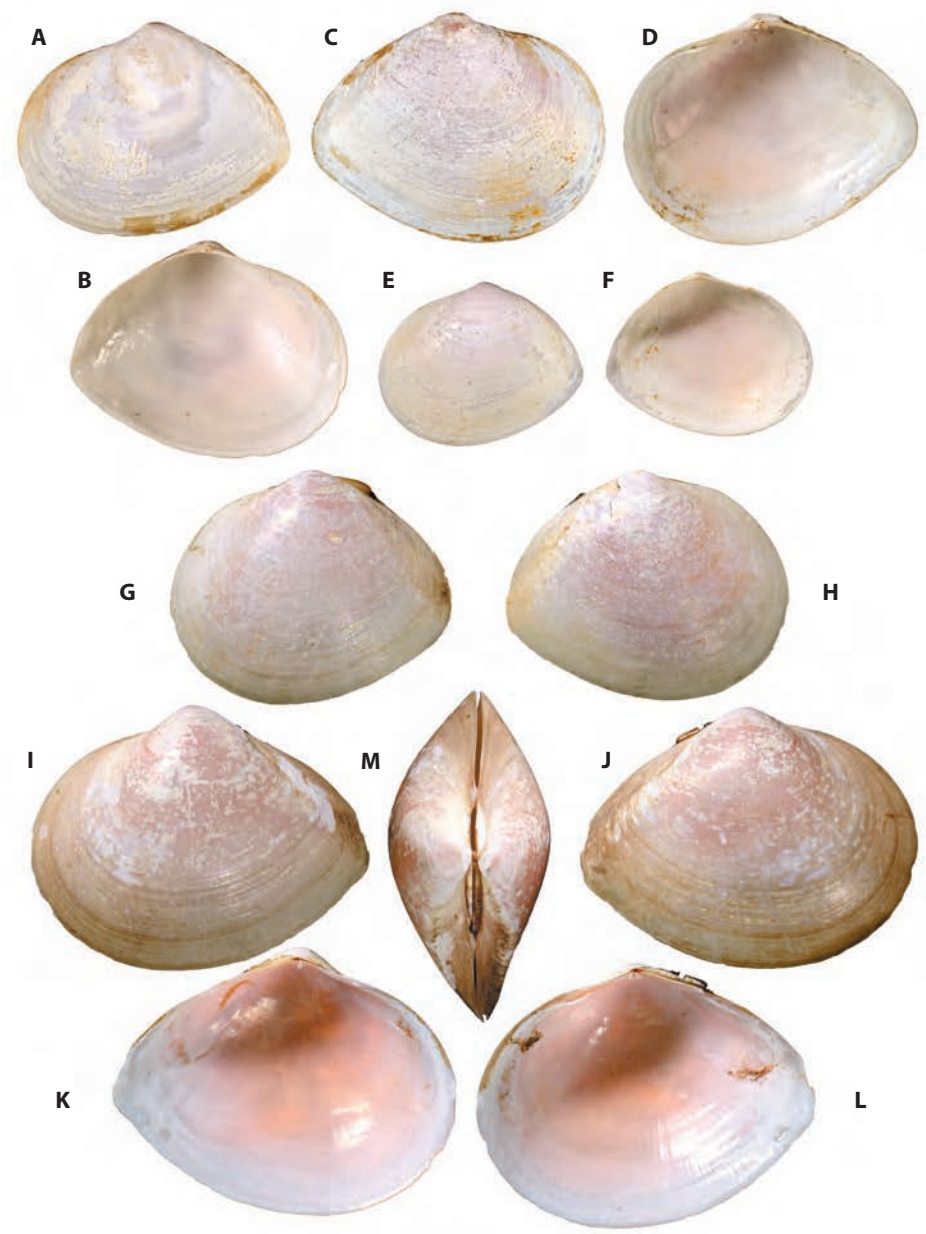
Shell small, up to 17 mm long, slightly variable in shape, broadly suboval, thin and fragile, inflated. Anterior margin broadly rounded, posterior part tapering, posterior margin pointed, ventral margin strongly convex. Beaks more or less median of the valve. Small, rather broad and ill-defined lunule, no visible escutcheon, ligament not sunken. Surface smooth, with irregular growth lines and some coarser growth stages. Posterior angle weak and rounded. Periostracum thin, dull, nearly colourless to pale olive brown, eroded on the umbonal part of the valves. Hinge line very narrow, with two cardinals in each valve, left valve with two small short laterals on the dorsal margin, right valve with two short but strong laterals. Outside whitish with pale salmon on the umbonal area, inside pale salmon red, with the marginal area more or less broadly whitish.



Distribution. Senegal (Casamance) to Nigeria and the mouth of the Congo River (Banana, Zaïre, material ANSP).

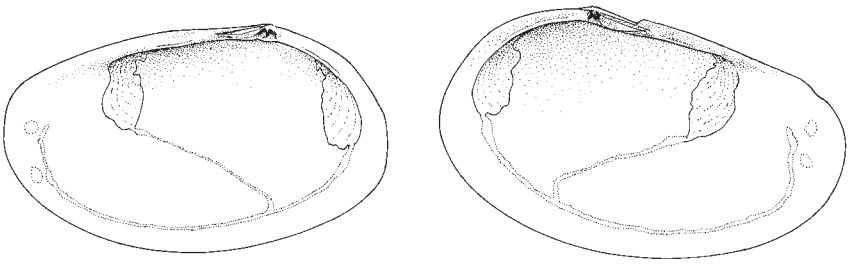
Biotope. In muddy sand, only in lagoons, estuaries and creeks ("bôlons") under influence of seasonal salinity changes, from 0.5 to about 3 m, may be locally common.

Remarks. This poorly known species was always somewhat enigmatic, and was placed in an appropriate genus as recently as 2015. *Tampaella ampullacea* is the smallest species in the genus and is also distinguishes from the other *Tampaella* by the slightly more tumid shell, the almost smooth surface and the more vivid colouration. It seems to be restricted to estuarine conditions; specimens are difficult to obtain and not common in collections.



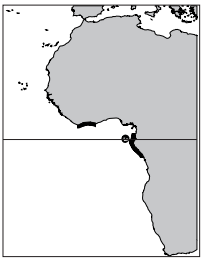
13.31. *Tampaella ampullacea* (Philippi, 1844). **A**-**B**, Ziguinchor, Casamance River, Senegal, 3-5 m (11.3 mm). **C**-**D**, same locality (10.6 mm). **E**-**F**, same locality (7.7 mm). **G**-**H**, Dabou, Lagune Ebrié, Côte d'Ivoire (8.5 mm). **I**-**M**, Ile Boulay Sud, Lagune Ebrié, Côte d'Ivoire, 0.4 m (15.5 mm).

Omala hyalina (Gmelin, 1791)



13.32. Sette Cama, Gabon (lv, 59.4 mm; rv, 62.8 mm).

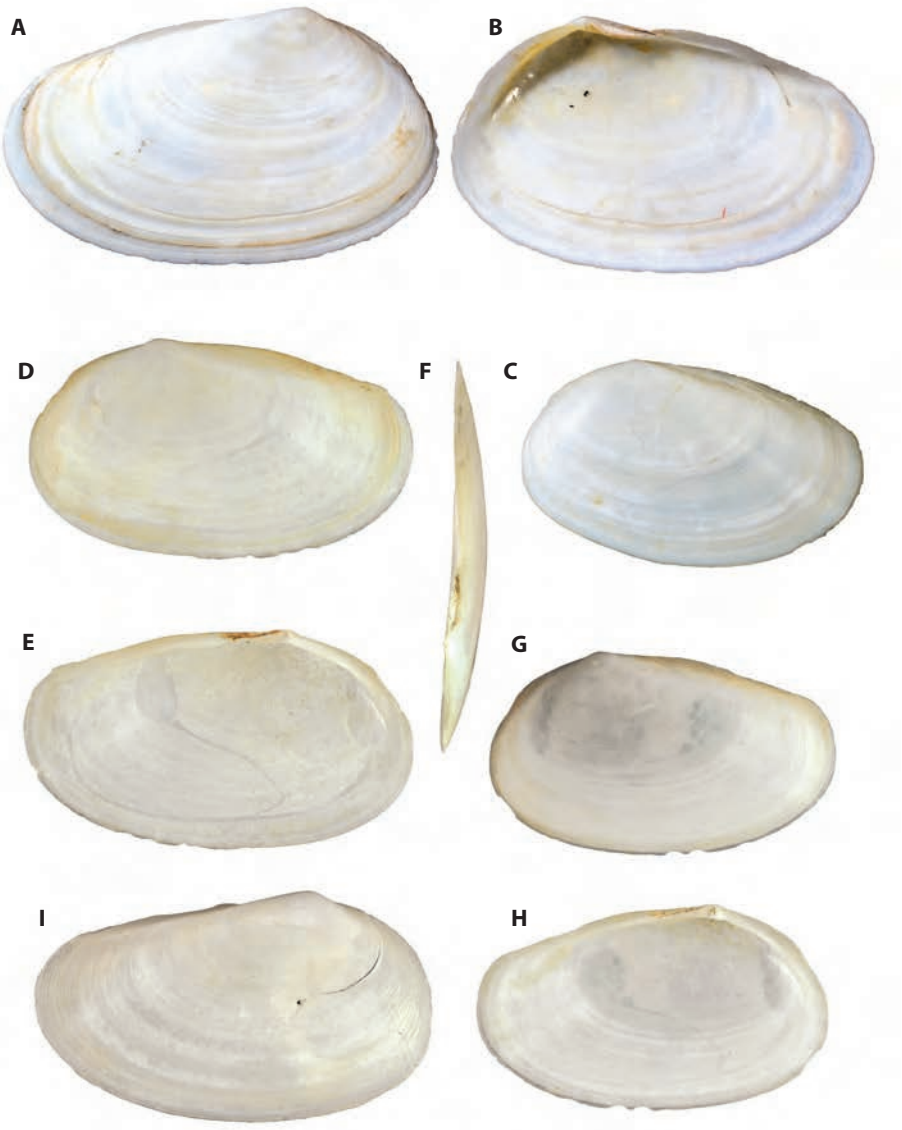
Shell up to 80 mm long, oblong-oval, thin and fragile, very compressed. Anterior and posterior margin broadly rounded, ventral margin gently convex. Beaks well in front of the vertical midline. No lunule and escutcheon, ligament short and sunken, with an incision in the right valve. Surface smooth, with faint growth lines and with fine, irregular, widely-spaced striae on the antero-dorsal and postero-dorsal slope. Postero-dorsal area delimited by a rounded angle. Periostracum very thin, translucent and nearly colourless. Outside and inside cream to white.



Distribution. Côte d'Ivoire; Gabon (Libreville) to Congo Brazzaville (Pointe-Noire), perhaps also northward; São Tomé.

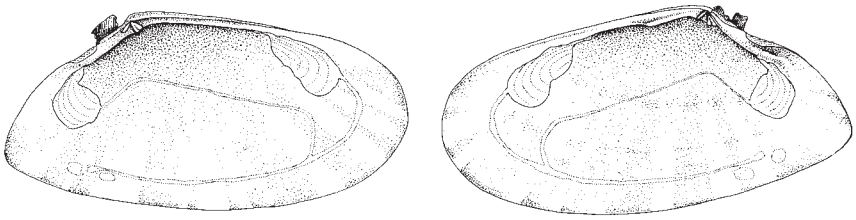
Biotope. Unknown, most probably in fine muddy sand and fine sand in shallow water (2-10 m), rare.

Remarks. This rare and rather poorly known species is not yet represented by any live-collected specimen. The distribution is restricted to the atypical tropical region and the northern part of the southern alternant region. *Omala inequivalvis* Schumacher, 1817 and *Tellina mariae* Nobre, 1894 are synonyms.



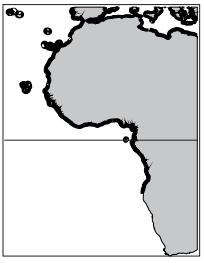
13.33. ***Omala hyalina*** **(Gmelin, 1791). A-B**, San Pedro region, Côte d'Ivoire, on beach (73.0 mm). **C**, Setté Cama, S-Gabon (58.6 mm). **D-F**, Baia de Ana Chaves, São Tomé, 5 m (39.1 mm). **G-H**, same locality (33.3 mm). **I**, Pointe-Noire, Congo Brazzaville, beach drift (rv, 46.1 mm).

Moerella donacina (Linnaeus, 1758)



13.34. W Ile Konebomby, Guinea, 9°48'N, 16°30.5'W, 123 m (15.7 mm).

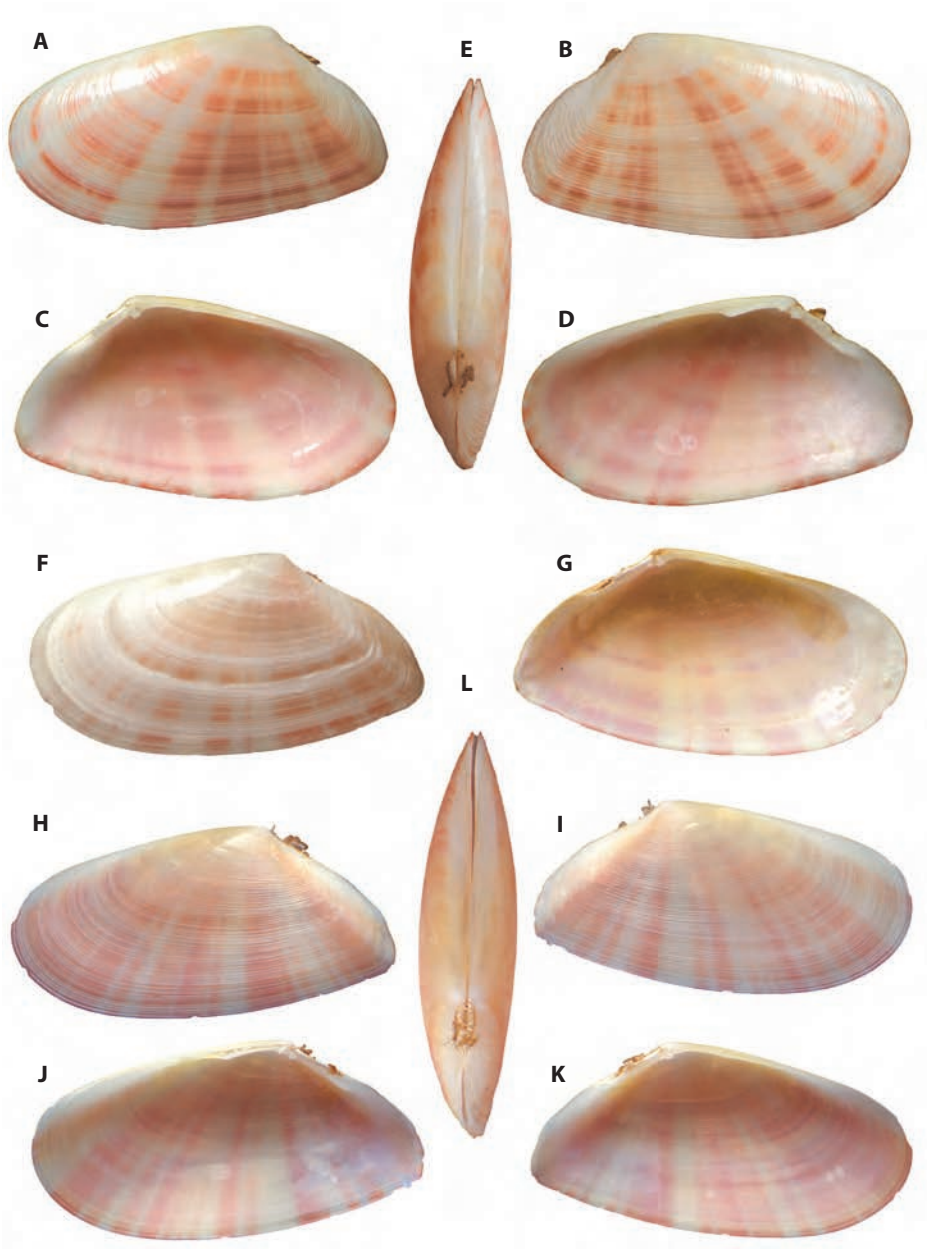
Shell up to 27 mm long, quite variable in outline, size and colouration, suboval, thin but rather solid, moderately compressed. Anterior margin rounded, posterior part tapering, posterior end rostrate and slightly bent to the right. Ventral margin in its posterior part only very slightly convex. Beaks well behind the vertical midline. Escutcheon short and narrow, ligament not sunken. Surface with fine, regular, close-set commarginal ridges which become somewhat lamellate towards postero-dorsally. Postero-dorsal angle rounded. Periostracum not seen. Outside cream to bright yellow or pink, with irregular red radial rays. Inside yellowish to pink, with exterior colour showing through.



Distribution. Shetlands and Orkneys, British Isles southward to southern Angola (Lucira, Namibe province); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

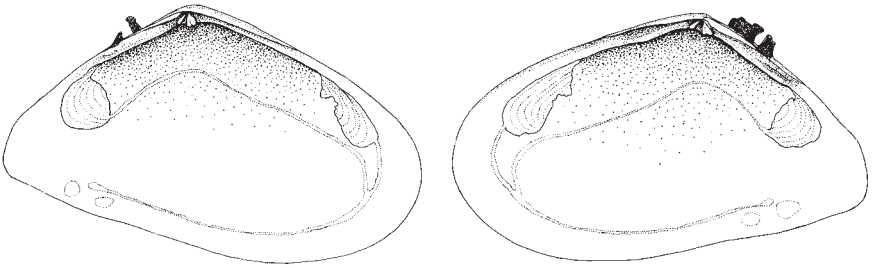
Biotope. In fine muddy sand and fine sand, from 30 to 200 m, common.

Remarks. In spite of its variability, this species is recognizable by its red rays mostly on yellow and the short posterior part. In tropical West Africa it is characteristic for the deeper circalittoral (50-200 m), whereas in the northern part of its range it goes shallower. *Atlantella ryalli* Huber, Langleit & Kreipl, 2015 was described from the Luanda area, N-Angola but is here treated as a synonym. No substantial difference could be found between a large lot from off Ilha de Luanda (40-60 m), the type locality of the former, and *M. donacina* from southern France, and the range is rather continuous with *M. donacina* being abundant in Senegal. This is the type species of *Moerella*.



13.35. ***Moerella donacina*** **(Linnaeus, 1758). A-E**, S of Gorée, Senegal, 110-112 m (15.2 mm). **F-G**, Abidjan region, Côte d'Ivoire (60 m) (13.8 mm). **H-L**, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (14.9 mm).

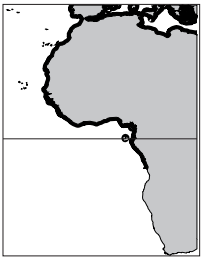
Moerella distorta (Poli, 1795)



13.36. Pointe-Noire, Congo, Plage Mondaine, on beach (13.9 mm).

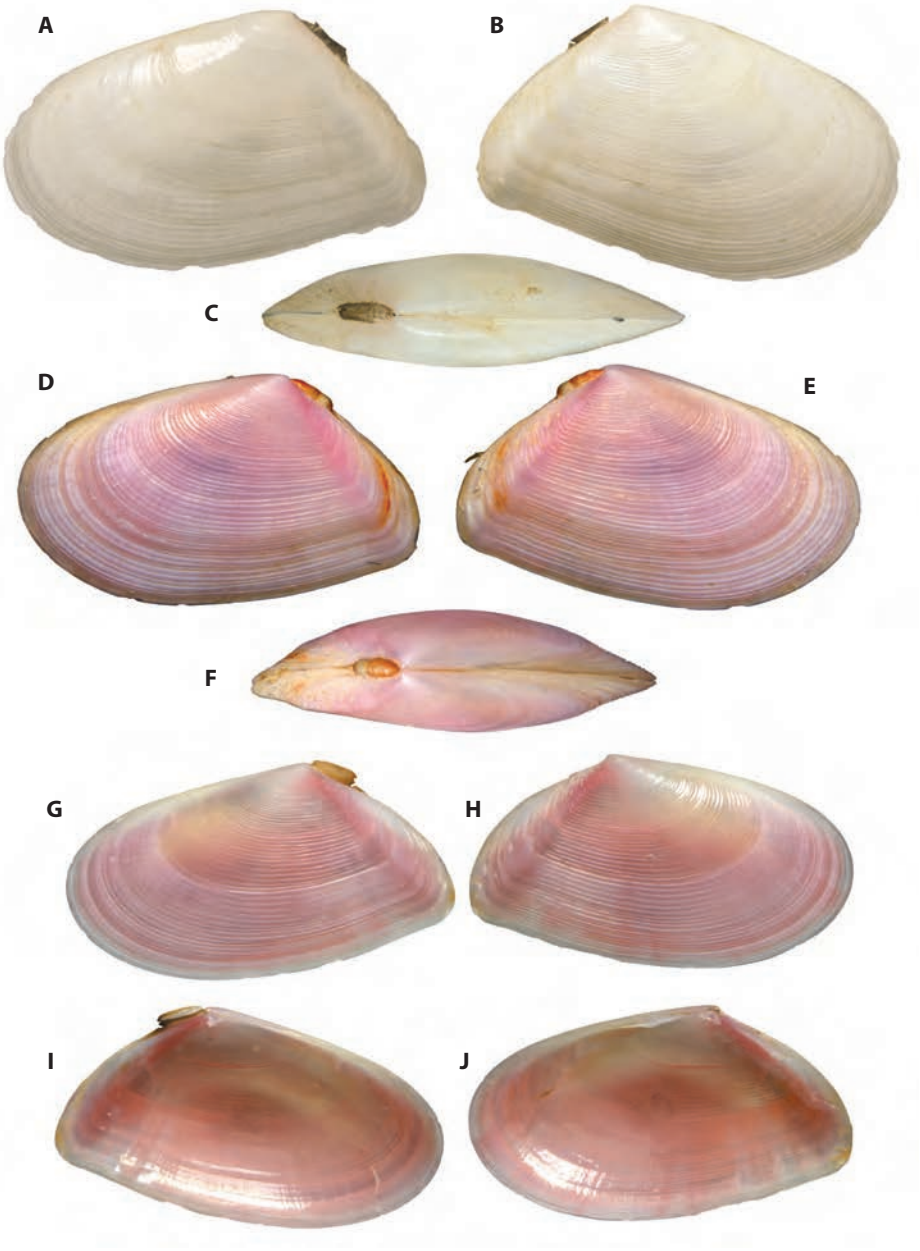
Shell up to 18 mm long, very variable in outline and colour, suboval-triangular, thin but solid, moderately compressed. Anterior margin rounded, posterior part tapering, ending in a narrow, rostrate posterior extremity which is twisted to the right. Ventral margin in its posterior part only slightly convex to straight. Beaks more or less behind the vertical midline. Escutcheon short and narrow, ligament not sunken. Surface with somewhat irregular commarginal grooves or ridges, occasionally bifurcating, variable from prominent on the whole valve to nearly absent on the umbonal or posterior part. Postero-dorsal angle rounded. Periostracum very thin, transparent and nearly colourless, generally present only on the marginal part of the valves. Outside deep to light pink, yellowish, cream or white, often with pale reddish or pink radial rays, occasionally whitish with pink only on the umbonal region. Inside white, yellowish or pale to deep pink.

Distribution. Western and south-western Mediterranean, Strait of Gibraltar to northern Angola (Luanda); São Tomé, Ilha do Principe.



Biotope. In muddy sand and fine sand, from shallow water (1-3 m) to about 30-40 m, in sheltered bays as well as offshore, uncommon in the Mediterranean, common in parts of West Africa.

Remarks. This is one of the most variable tellinids in tropical West African waters. Two forms can be distinguished: one more elongate and less sculptured form with longer and well tapering posterior part close to the Mediterranean specimens, which is often found in shallow water and sheltered bays, and one form with shorter and sometimes blunter posterior part and more pronounced sculpture, which occurs mostly offshore. As intermediates are frequently encountered, a separation is not possible and both forms are considered ecological variants of *M. distorta*. This is the type species of *Atlantella*.

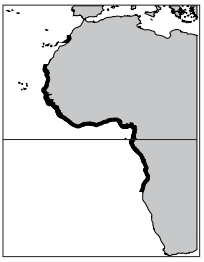


13.37. *Moerella distorta* (Poli, 1795). **A-C**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (11.0 mm). **D-F**, Baia da Corimba, Luanda prov., N-Angola, 10-20 m (10.3 mm). **G-J**, same locality (9.5 mm).

Moerella rubicincta (Römer, 1870)

13.38. Baia da Corimba, Luanda, N-Angola, 10-20 m (26.2 mm).

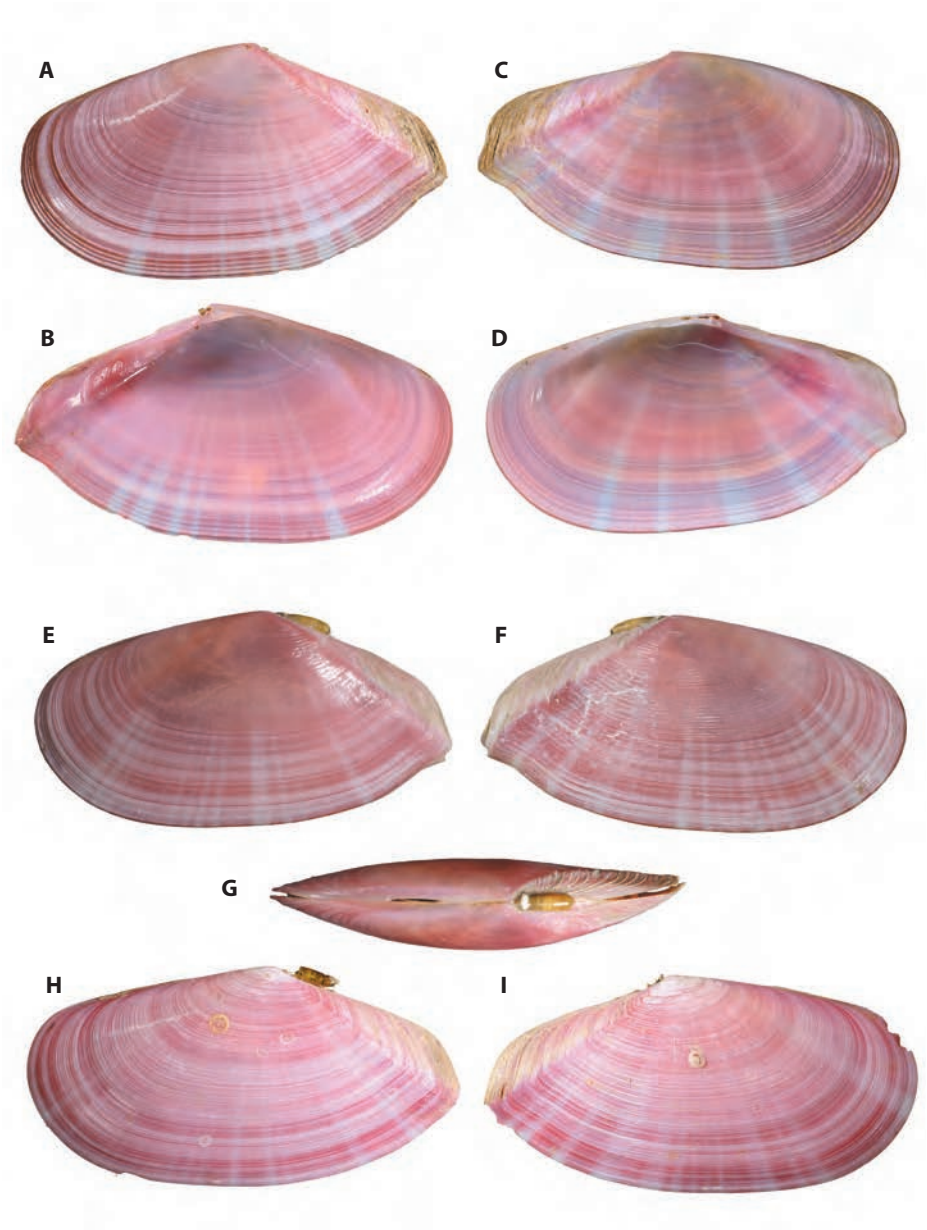
Shell up to 32 mm long, elongate, rather thin and fragile, compressed. Anterior margin rounded, posterior part tapering, posterior margin angulate, twisted to the right. Ventral margin weakly convex, rising behind, with very slight or without posterior sinuosity. Beaks just behind the vertical midline. Lunule and escutcheon very narrow, ligament short. Surface glossy, with fine, slightly irregular commarginal grooves which in the right valve of many specimens transform into lamellate ridges on the posterior third, in other specimens these ridges can be very weak or even absent. Left valve with weak grooves only. Posterior angle rounded, prominent on the right valve. Periostracum thin, light brownish, generally eroded except on the postero-dorsal slope. Outside bright pink, with whitish to light pink redial rays, occasionally the whole shell white. Inside with same colour as outside.



Distribution. Morocco, Agadir (Moukrim *et al.* 2010), Mauritania (20°N) to southern Angola (Moçâmedes, Namibe province).

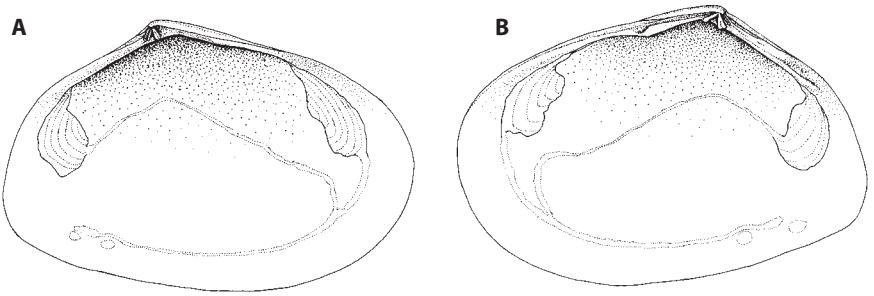
Biotope. In sandy mud and fine muddy sand, also with shells and shell debris, from 10 to 100 m, population maximum between 20 and 50 m; not uncommon.

Remarks. A close South African species is *M. tulipa* (Hanley, 1844), which occurs from St. Helena Bay on the west coast to Port Alfred. Another, almost exclusively Mediterranean species is *M. pulchella* (Lamarck, 1818), of which one isolated record from West Sahara is known (Huber *et al.* 2015: 199; 609). The name *rubicincta* was generally attributed to Gould (1845), however, that author had described this species as *rubicunda*, a name preoccupied by Röding (1798). Römer's emendation *rubicincta* is thence the next available name (see Boss 1969).



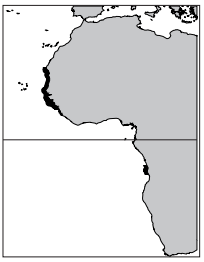
13.39. *Moerella rubicincta* (Römer, 1870). A-B, Victoria/Limbe, Cameroon, 3°50'N, 9°10'E, 32 m (29.2 mm). C-D, same locality (28.6 mm). E-G, Baia da Corimba, Luanda prov., N-Angola, 10-20 m (24.5 mm). H-I, same locality (26.2 mm).

Moerella boucheti (Cosel, 1995)



13.40. **A**, W Ile Quito, Guinea, 10°00'N, 15°09'W, 23 m (lv, 10.5 mm). **B**, Rio Nuñez, 10°36'N, 14.54'W, 12 m (rv, 12.0 mm).

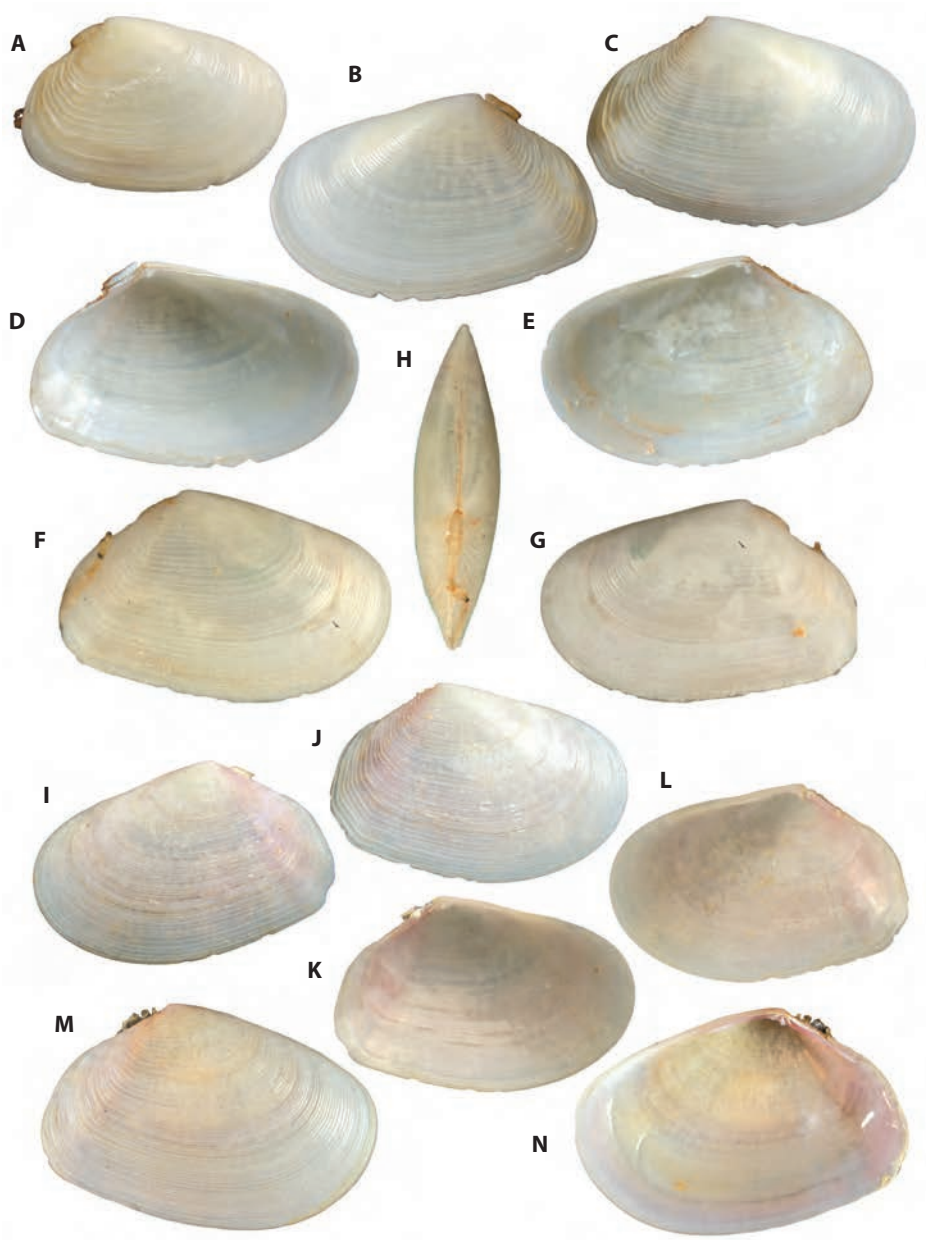
Shell up to 13 mm long, slightly variable in outline, rather broadly suboval, thin, moderately compressed. Anterior margin rounded, posterior margin narrowly rounded, end very slightly twisted to the right. Ventral margin slightly convex. Beaks slightly behind the vertical midline. Escutcheon narrow and short, ligament short and slightly sunken. Surface with fine regular close-set commarginal ridges on the anterior half. In the middle, each second or third ridge disappears, the remaining transform into wider spaced, somewhat irregular, fine, commarginal lamellae on the posterior half. Postero-dorsal angle rounded. Periostracum thin, transparent and nearly colourless, present only on the extreme marginal part of the valves. Outside pale yellowish, rarely cream, often with pale pink-lilac hue on the postero-dorsal slope and, to a lesser extent, occasionally parallel to the ventral margin. Inside with the same colour as outside.



Distribution. Mauritania (Baie de l'Etoile, 21°N) to Guinea (Conakry, 9°36'N); northern Angola (Barra do Dande, Bengo province). One record from northern Namibia (17°32'S) (*fide* Huber *et al.* 2015: 674); no record from the tropical zone proper.

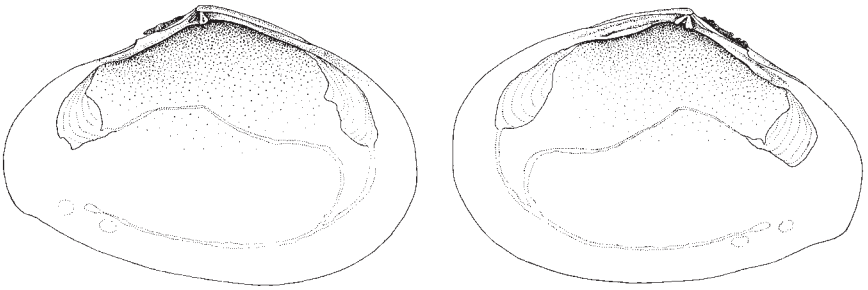
Biotope. In mixed and coarse sand, also with gravel, from low tide (rare) to offshore (15-35 m), not uncommon.

Remarks. The main range of this species coincides with the northern seasonal upwelling zone. In the northern extremity of that zone with a long annual duration of the upwelling (Cape Blanc region), *M. boucheti* occurs from low tide; in the more southern region where the upwelling is limited to one to few months (Casamance to Guinea), the species has been found only offshore. The single Angolan record lies within the influence of the southern seasonal upwelling, the species has been found there between 0 and 2 m.



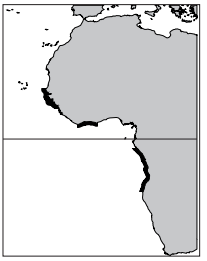
13.41. *Moerella boucheti* (Cosel, 1995). **A**, Baie de l'Etoile, Mauritania, intertidal seagrass bed with mud (5.6 mm). **B**-**E**, Petite Côte, Senegal, 14°21.3'N, 17°09.6'W, 21 m (10.0 mm). **F**-**H**, Guinea-Bissau, 10°41'N, 15°44.5'W, 25 m (8.9 mm). **I**-**L**, W of Pointe Goro, Guinea, 10°06'N, 15°35'W, 24 m (paratype, 9.4 mm). **M**-**N**, W of Ile Quito, Guinea, 10°N, 15°36.5'W, 26 m (rv of holotype, 11.2 mm, photo Manuel Caballer/Recolnat).

Moerella bertrandi (Cosel, 1995)



13.42. Pointe-Noire, Congo, off the Orstom station, fine muddy sand, 5-7 m (14.9 mm).

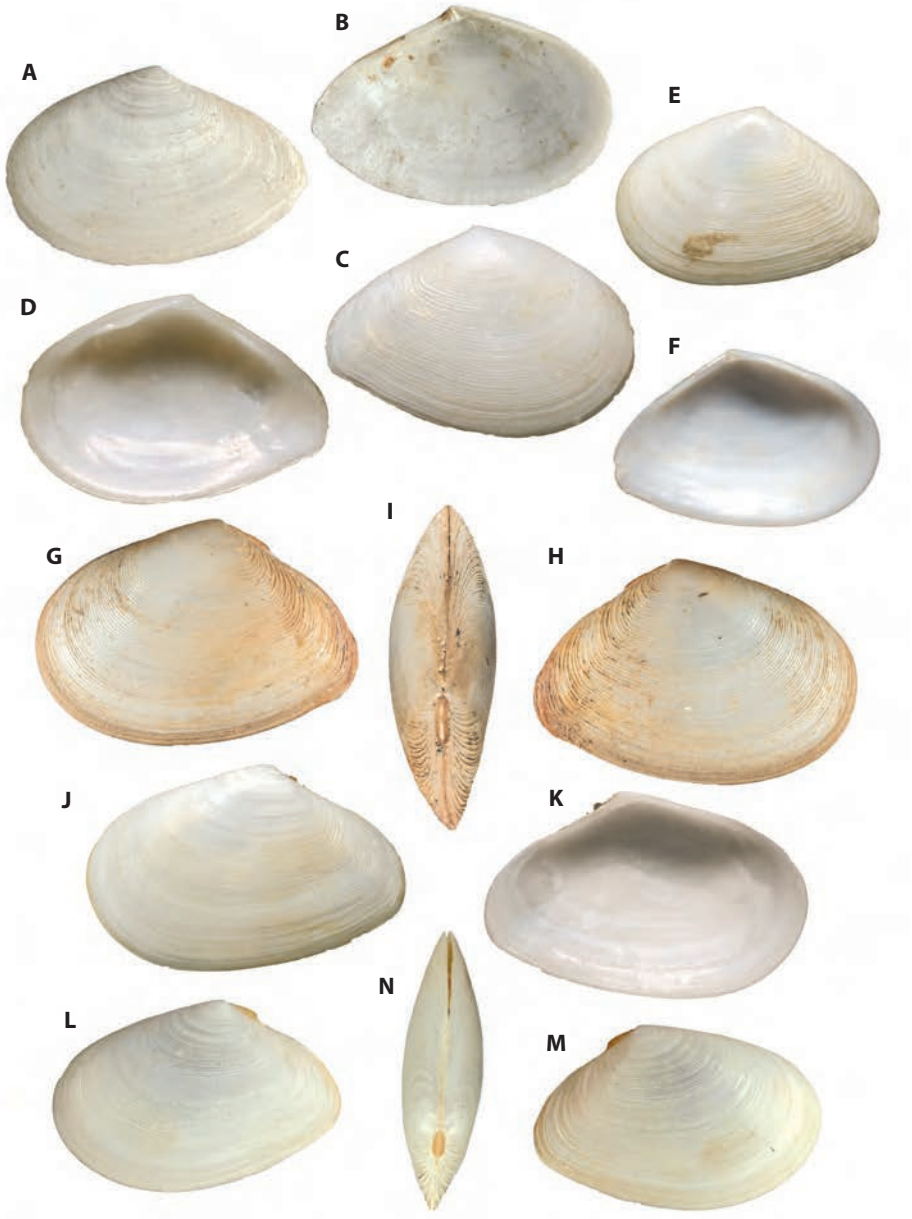
Shell up to 17 mm long, somewhat variable in outline, suboval, rather solid, not very compressed. Anterior margin well rounded, posterior part tapering, posterior end rounded-rostrate and twisted to the right. Postero-ventral margin more or less convex, occasionally with a small, very weak sinuosity just anterior to the posterior end. Beaks just behind or on the vertical midline. Lunule small, not well defined, escutcheon short and narrow, ligament not sunken. Surface with fine, regular, close-set commarginal ridges which transform into fine lamellae on the posterior third of the valves, with disappearing of each third to sixth ridge. Postero-dorsal angle well rounded. Periostracum thin and nearly colourless, more brownish on the extreme marginal area. Outside and inside white.



Distribution. Senegal (Baie de Gorée) to Guinea (Conakry); Côte d'Ivoire; southern Gabon to southern Angola (Baia dos Tigres). No record from Sierra Leone and Liberia and from Cameroon to northern Gabon.

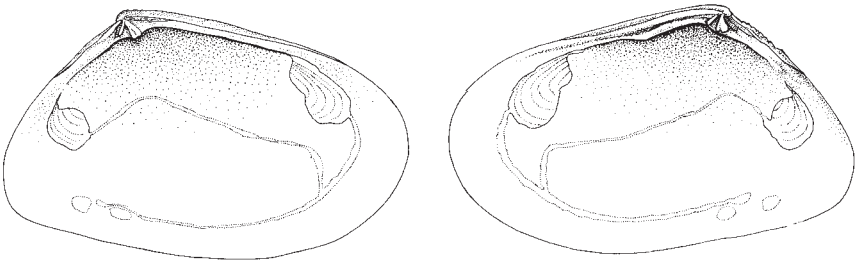
Biotope. In fine muddy sand and fine sand, from 2-3 m to about 20 m, occasionally deeper, to 30 m, often in sheltered bays, but also offshore, locally common. Often in the same biotope as *Scissodesma micronitida*.

Remarks. This species is quite close to *M. boucheti*, but is larger, has a longer and more pointed posterior part and lacks any colour. The species has two distribution gaps corresponding to the typical tropical regions.



13.43. *Moerella bertrandi* **(Cosel, 1995).** **A**-**B**, Bôlon opposite Elinkine, Casamance, Senegal, 3 m, shell sand (17.4 mm). **C**-**D**, W of Ouendi, Guinea, 9°54'N, 14°15'W, 15 m (15.3 mm). **E**-**F**, same locality (lv, 11.4 mm). **G**-**I**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 3-5 m, fine sand (holotype, 12.7 mm, photo Manuel Caballer/ Recolnat). **J**-**K**, Cape Palmeirinhas, Luanda prov. N-Angola, 20-30 m, dredged (15.4 mm). **L**-**N**, Baia dos Tigres, Namibe prov., S-Angola, 10-15 m, dredged (10.5 mm).

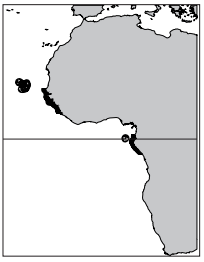
Moerella modica (Cosel, 1995)



13.44. W Ile Kabak, Guinea, 9°18'N, 14°27'W, 47 m (lv, 10.7 mm; rv, 13.1 mm).

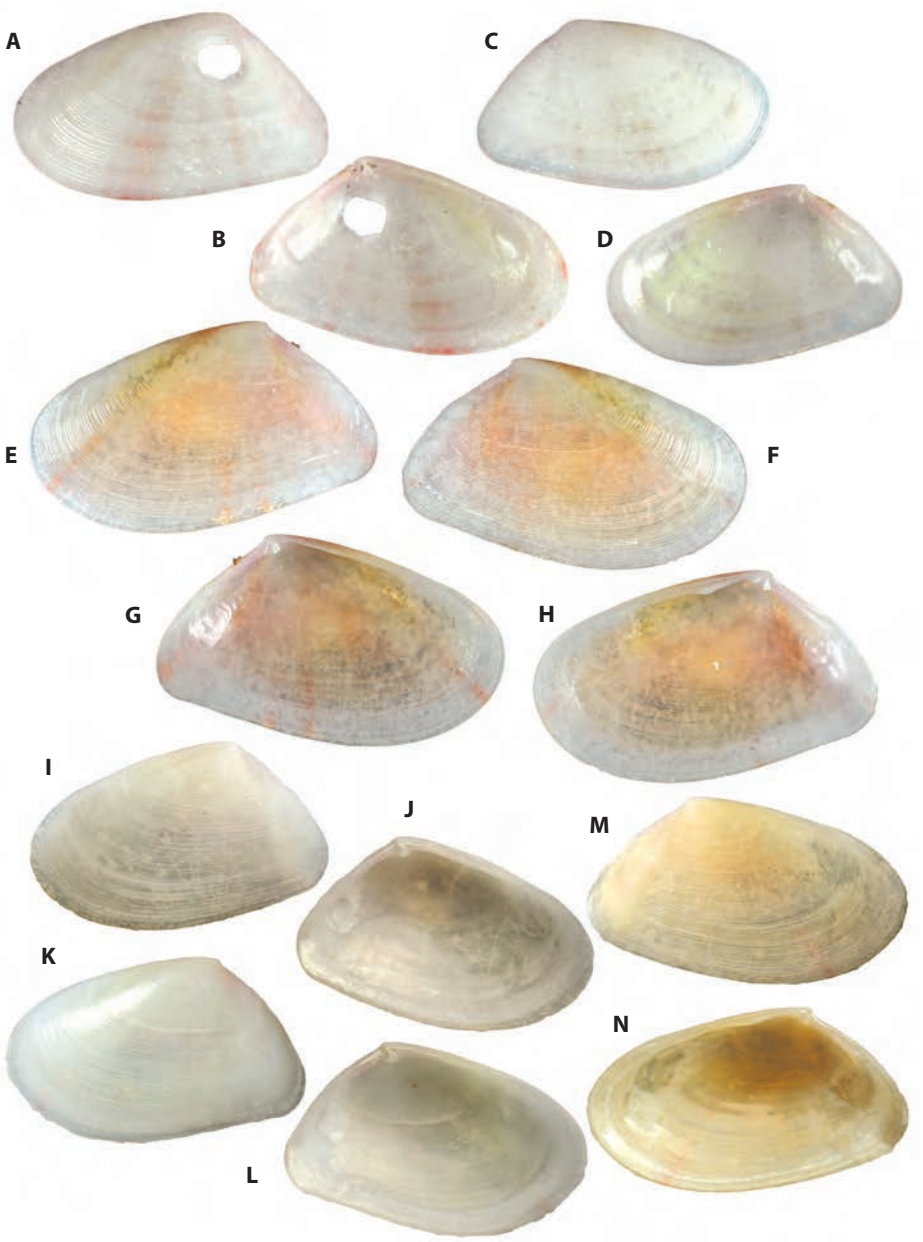
Shell small, 5-8 mm long, slightly variable in outline, suboval, rather thick and solid, somewhat inflated. Anterior margin rounded, posterior part tapering, posterior end narrowly rounded and rostrate, slightly twisted to the right. Ventral margin in its anterior half convex, posterior half very slightly convex, straight or even with a weak sinuosity. Beaks well behind the vertical midline, between the second and the third third or at the beginning of the third third of the valves. Lunule narrow and rather long, escutcheon and ligament very short. Surface with fine, dense commarginal ridges, becoming lamellate towards the posterior part, with every second to fifth ridge disappearing. Postero-dorsal angle broadly rounded. Periostracum not seen. Outside whitish, cream or pale yellowish, often with light orange hue on the umbonal part or with light pink on the upper part of the postero-dorsal slope, occasionally a few pale reddish to reddish brown radial rays. Inside whitish to yellowish, with exterior colour showing through.

Distribution. Senegal (Dakar) to Sierra Leone (7°N) and perhaps further towards SE; southern Gabon to Congo Brazzaville; Cape Verde Islands; Ilha do Principe.



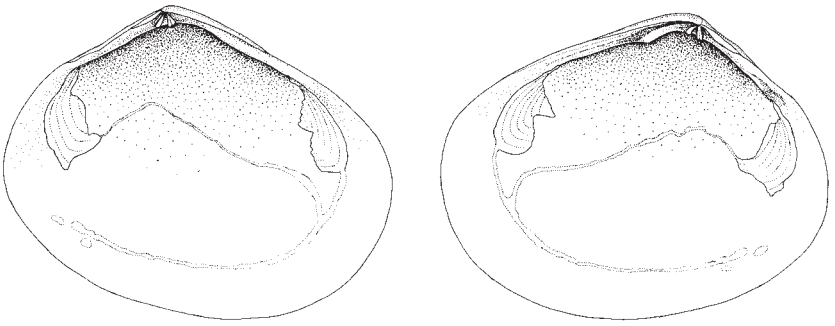
Biotope. In fine sand, also with calcareous algae and shell debris, from about 25 m to 150 m, mostly between 40 and 60 m, in the Cape Verde Islands probably also in shallower water; uncommon.

Remarks. This species is distinguished from *Asbjornsenia pseudopusilla* and *A. pygmaea* by its pointed and more twisted posterior end. Juvenile *Moerella distorta* are slightly more elongate and have a blunter posterior margin.



13.45. *Moerella modica* (Cosel, 1995). **A**-**B**, Baia Matiota, S Vicente, Cape Verde Islands, 3 m (6.4 mm). **C**-**D**, same locality (6.0 mm). **E**-**H**, W of Sierra Leone border, Guinea, 9°06.2'N, 14°52.5'W, 70 m (holotype, 6.7 mm, photo Manuel Caballer/Recolnat). **I**-**J**, W of Ile Kabak, Guinea, 9°18'N, 14°27'W, 47 m (paratype, 6.0 mm). **K**-**L**, same locality (paratype, 6.1 mm). **M**-**N**, same locality (paratype, 6.6 mm).

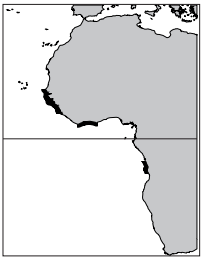
Moerella leloeuffi Cosel & Gofas, 2018



13.46. W Ile Kouffin, Guinea, 10°30', 15°46.5'W, 27 m (10 mm).

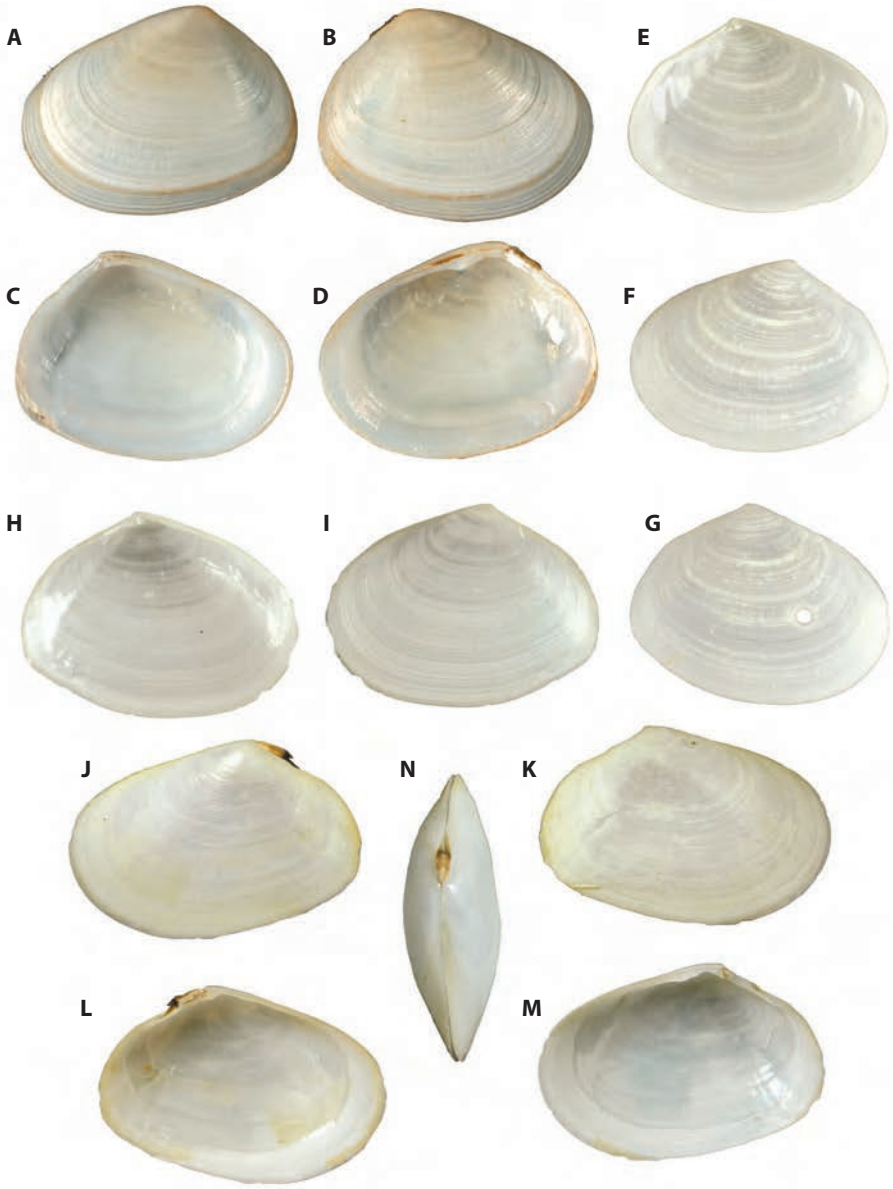
Shell very small, up to 13 mm long, variable in outline, broadly suboval, thin and fragile to rather solid, compressed. Anterior margin more or less broadly rounded, posterior margin narrowly rounded and slightly bent to the right. Ventral margin gently convex. Beaks well behind the vertical midline. Lunule long and ill-defined, esutcheon and ligament short. Surface appearing smooth, with very fine, irregular growth lines and some coarser growth stages. There may be also very fine, faint, irregular radial striae, visible only under a lens (x 10-20). Posterior angle broadly rounded, indistinct. Periostracum very thin and nearly colourless, completely eroded or present only on the marginal part of the valves. Outside white to cream, mostly with pale yellow on the umbonal half of the valve. Inside the same colour.

Distribution. Kayar (Grande Côte, Senegal) to Guinea (9°N); Côte d'Ivoire; northern Angola (Barra do Dande-Cabo Ledo).



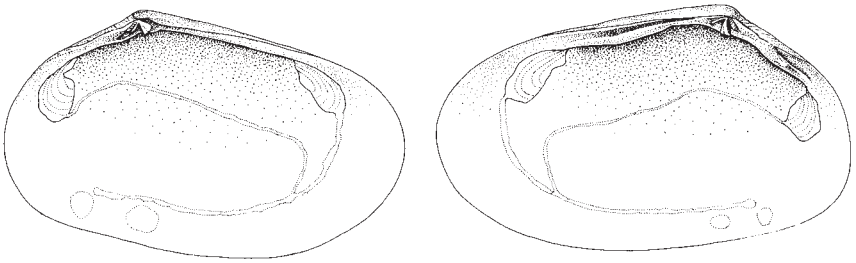
Biotope. In fine, mixed and coarse sand, also with gravel, offshore, from about 15 to 90 m, mostly between 20 and 50 m; not uncommon.

Remarks. This species is distinguished from the somewhat similar *M. boucheti* by its shorter shell and absence of lamellae on the posterior part. Another similar species is the South African *M. canonica* (Salisbury, 1934), which occurs from False Bay to East London. *Moerella leloeuffi* has not yet been recorded from the two typical tropical zones; in Guinea, it is very common in the northern part (to about 9°30'N) but becomes more and more rare towards the Sierra Leone border, where only a single valve was taken.



13.47. *Moerella leloeuffi* Cosel & Gofas, 2018. **A-D**, W of Ile Konebomby, Guinea, 9°48'N, 15°15'W, 23 m (holotype, 9.6 mm). **E-G**, Abidjan region, Côte d'Ivoire, continental shelf (6.6 mm). **H-I**, Idenau, Cameroon, 4°05'N, 8°28'E, 53 m (7.2 mm). **J-N**, Baia da Corimba, N-Angola, 10-20 m (7.8 mm).

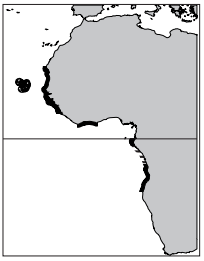
Asbjornsenia pseudopusilla (Cosel, 1995)



13.48. W Ile Kabak, Guinea, 9°17.8'N, 14°30'W, 38 m (lv, 6.6 mm; rv, 5.8 mm).

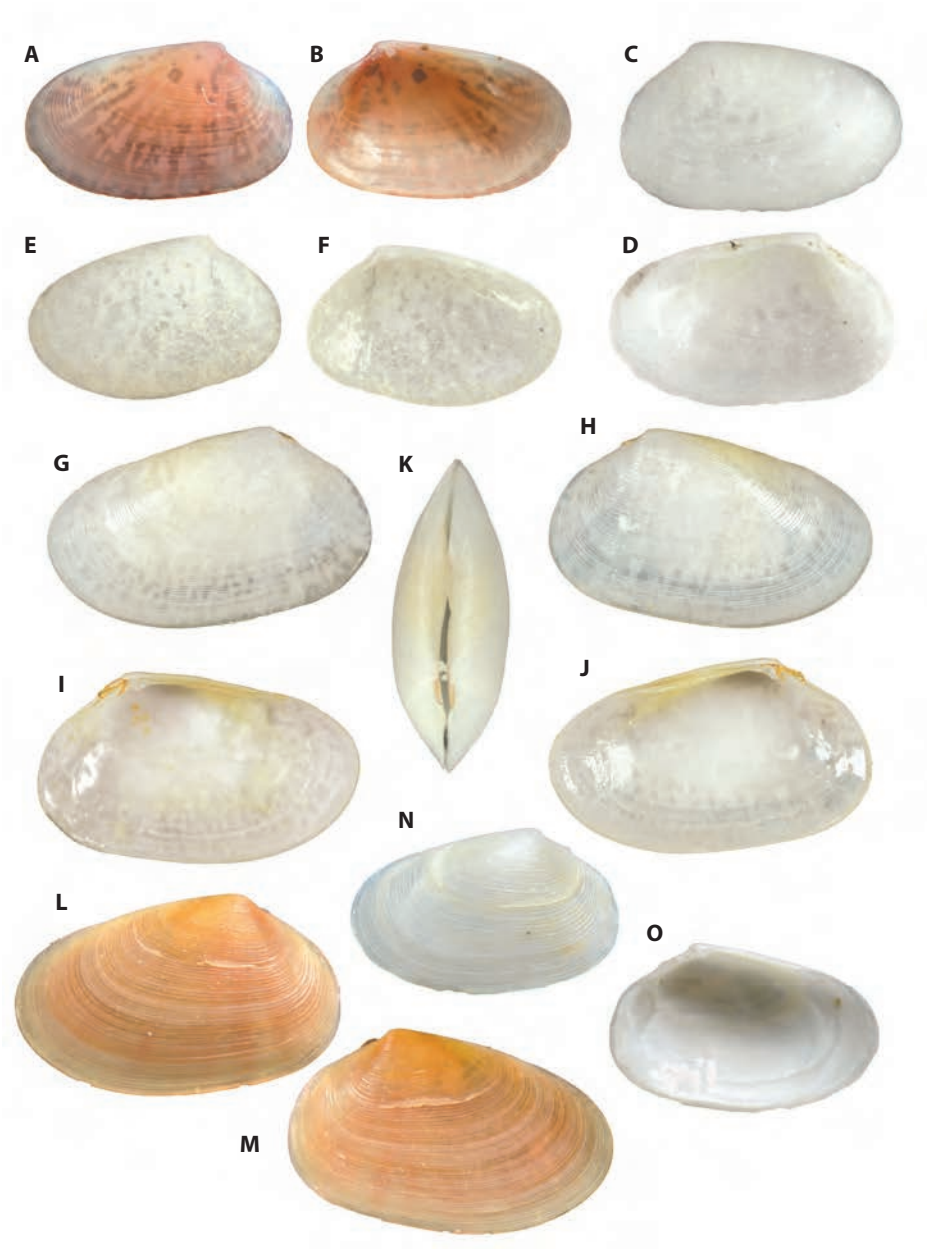
Shell very small, 4-7 mm long, somewhat variable in shape, suboval, solid, inflated. Anterior and posterior margin rounded, ventral margin in its anterior half strongly convex, posterior half only weakly convex. Beaks well behind the vertical midline, at the end of the third fourth of the valves. Escutcheon and ligament very short, escutcheon ill-defined. Surface with fine, dense commarginal ridges of which every second to fourth disappears on the third fourth of the valves, the remaining becoming more lamellate. Postero-dorsal slope not delimited by angle or keel. Periostracum not seen. Outside mostly white, cream, pale yellowish or very pale pink, occasionally pink with slightly darker radial rays. Inside with same colour as outside.

Distribution. Mauritania (Cap Blanc, 20°30'N), Senegal (Dakar) to Guinea (Sierra Leone border); Côte d'Ivoire (Abidjan region); southern Gabon, northern and southern Angola (to Baia dos Tigres); Cape Verde Islands. Not yet recorded from Sierra Leone and Liberia and from Ghana to northern Gabon and Congo Brazzaville.



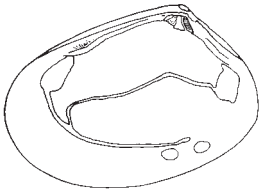
Biotope. In mixed and coarse sand, also with gravel and shell debris, from 15-60 m, occasionally deeper, most common between 25 and 45 m; not uncommon.

Remarks. This little species is close to *A. pygmaea* (Lovén, 1846) from Europe and the Mediterranean and has been mistaken as that species. The European species has a blunter posterior end and an even sculpture over the whole surface: the commarginal ridges do not change their appearance and none of them is disappearing towards the posterior end. *Asbjornsenia pseudopusilla* most probably is not occurring in the typical tropical zones. The type species of *Asbjornsenia* is *Asbjornsenia striata* Friele, 1886 = *pygmaea* (Lovén, 1846).



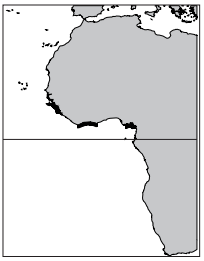
13.49. ***Asbjornsenia pseudopusilla*** **(Cosel, 1995).** **A**-**B**, Ilheu Branco, Cape Verde Islands, dredged 25 m (lv, 3.7 mm, MNCN). **C**-**D**, Baia Matiota, Porto Grande, São Vicente, Cape Verde Islands (4.7 mm). **E**-**F**, Santa Maria, Ilha do Sal, beach drift (4.0 mm). **G**-**K**, W of Baie de Sangarea, Guinea, 9°42'N, 15°33'W, 36 m (holotype, 6.0 mm, photo Manuel Caballer/Recolnat). **L**-**M**, Ambrizete, Zaïre prov., N-Angola, 7°07'S, 12°21'E, 80 m, box corer (lv, 6.1 mm). **N**-**O**, same locality (4.7 mm).

Asbjornsenia oryza (Cosel, 1995)



13.50. Grand Bassam near Abidjan, Côte d'Ivoire, 20 m (holotype, 4.2 mm) (reproduced from Cosel, 1995).

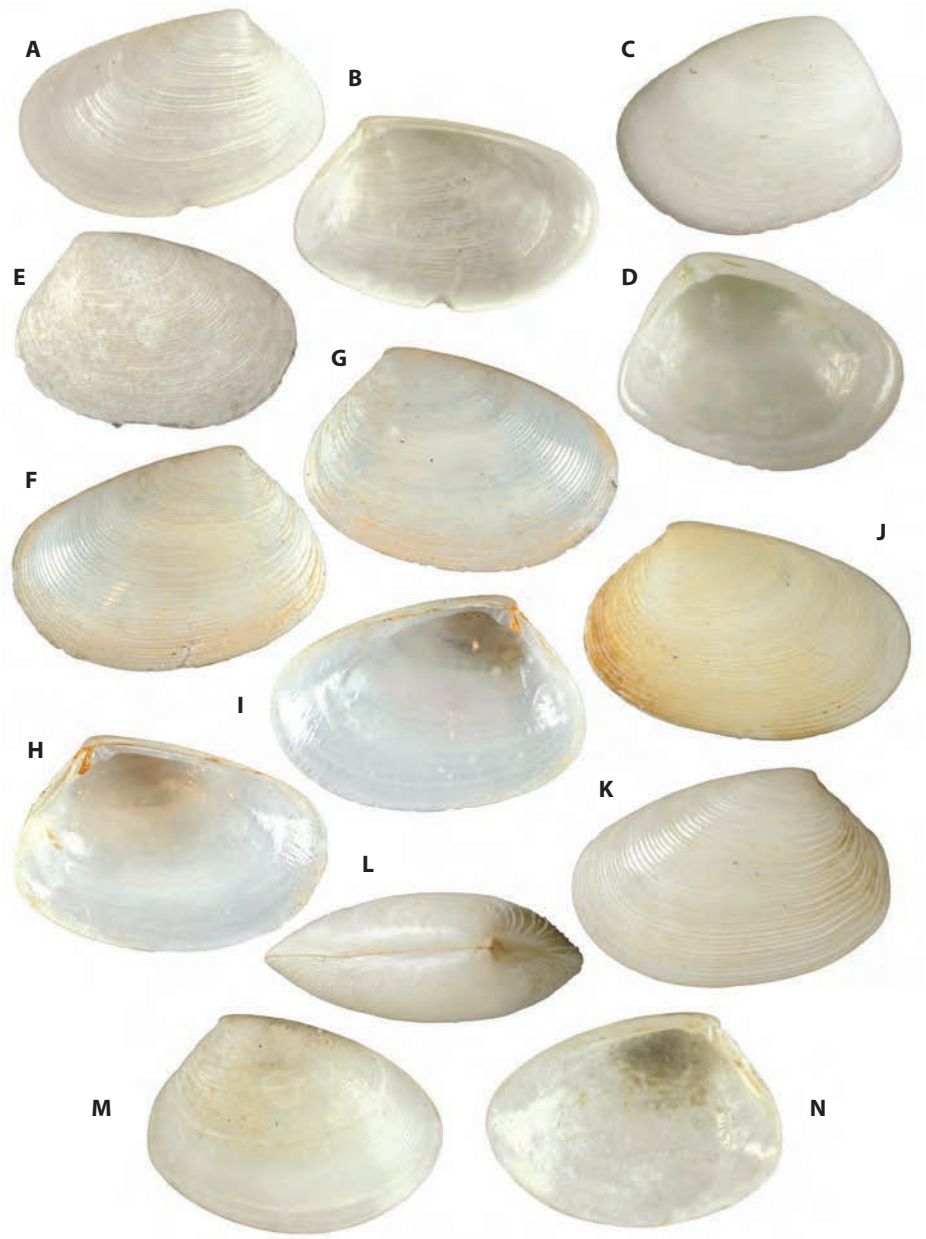
Shell very small, only 3-4 mm long, occasionally to 5 mm, quite variable in shape and also somewhat in length/height ratio, oblong-oval, solid, inflated. Anterior margin well rounded, ventral margin in its anterior half strongly convex, posterior half less convex. Posterior margin rounded in small and juvenile specimens, in larger adult specimens nearly straight in the upper part and more narrowly rounded in the lower part. Beaks well behind the vertical midline, within the posterior fourth of the valves. Escutcheon rather short, sunken and well delimited, lunule long and narrow. Surface with fine, dense commarginal ridges of which every second to fourth disappears before reaching the posterior fourth of the valves, the remaining becoming distinctly lamellate. Postero-dorsal slope not delimited by angle or keel. Periostracum not seen. Valves entirely white.



Distribution. Guinea (Iles Tristão to the Sierra Leone border); Côte d'Ivoire (Abidjan region); Cameroon (off Idenau). No records from Liberia and Sierra Leone.

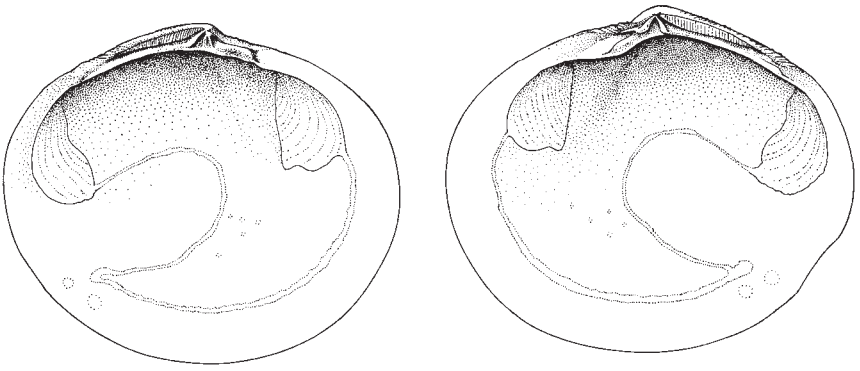
Biotope. In mixed and coarse sand, also with gravel and shell debris, from 15-60 m, occasionally shallower, not common.

Remarks. This is the smallest West African tellinid. It is close to *A. pygmaea* and *A. pseudopusilla*. From the latter, it is distinguished by its still smaller size, the shorter and stouter shell, the still further backwards placed beaks resulting in a shorter posterior part, the stronger lamellate sculpture on the posterior part and the lack of any colour. The pallial sinus terminates closer to the anterior adductor scar than in *A. pseudopusilla*. Both species occur sympatrically and were frequently found in the same bottom grab sample. This species, as well as other very small tellinids of the genus *Asbjornsenia*, retains its small internal ligament, which is formed in tellinids in the juvenile stage, up to the adult stage, whereas it disappears in other tellinids during ontogeny (for details, see Cosel 1995).



13.51. *Asbjornsenia oryza* (Cosel, 1995). **A**-**B**, W of Ile Kouffin, Guinea, 10°33'N, 15°34'W, 34 m (4.7 mm). **C**-**D**, W of Baie de Sangarea, Guinea, 9°41.5'N, 15°09'W, 34 m (lv, 5.0 mm). **E**, W of Ile Tannah, Guinea, 9°12'N, 14°34.5'W, 45 m (4.8 mm). **F**-**I**, Grand Bassam near Abidjan, Côte d'Ivoire, 20 m (holotype, 4.2 mm, photo Manuel Caballer/Recolnat). **J**, same locality (paratype, 4.0 mm). **K**-**L**, same locality (paratype, 4.3 mm). **M**-**N**, Idenau, Cameroon, 4°05'N, 8°28'E, 53 m (4.2 mm).

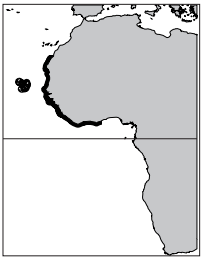
Arcopagia richardi Dautzenberg & Fischer, 1906



13.52. Casamance, 10-20 m (71.6 mm).

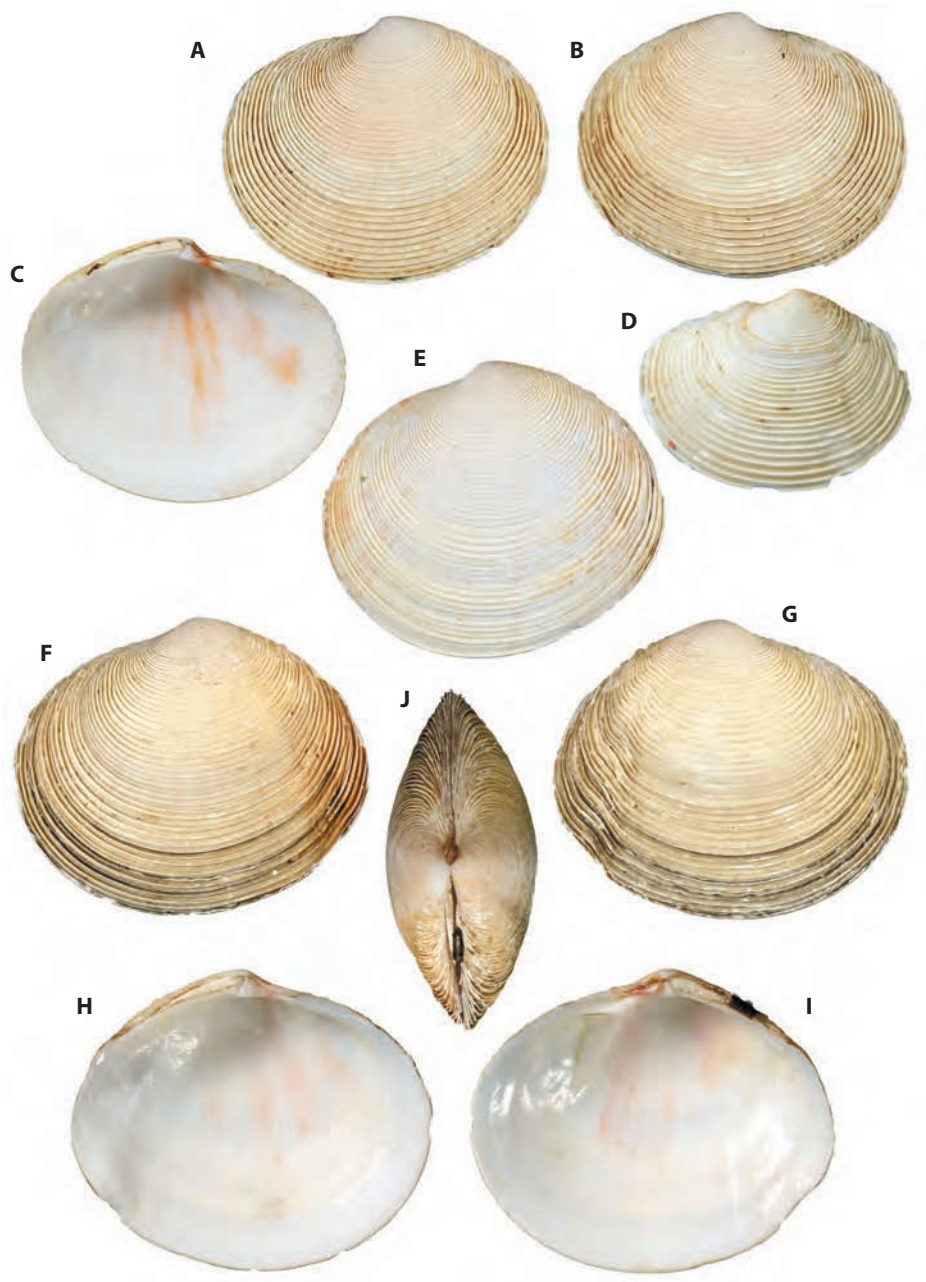
Shell large, up to 72 mm long, occasionally larger, to 80 mm (*fide* Huber *et al.* 2015), subcircular-oval, thick and solid, moderately inflated. Anterior and posterior margin broadly rounded, with a very slight flexure to the left. Ventral margin strongly convex. Beaks very slightly in front of the vertical midline. Lunule very small, escutcheon narrow, long, ligament sunken and of same length. Surface with numerous, coarse, prominent, quite regular commarginal lamellae, still more prominent on the postero-dorsal slope. Posterior angle obsolete. Periostracum thin, pale yellowish brown, dull, translucent. Outside white, with generally few pale reddish radial rays, often interrupted at growth stages. Inside white, with irregular, more or less pale reddish radial flames, originating under the beaks. Reddish streak on the hinge plate just in front of the beaks.

Distribution. Western Sahara (Rio de Oro, 24°N) to Ghana (Takoradi); Cape Verde Islands.



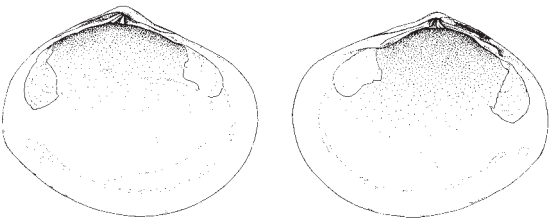
Biotope. In mixed, medium and coarse sand, also with calcareous algae, gravel and shell debris, from about 10 to 60 m, rare.

Remarks. This species, which superficially looks like a large *Semele*, differs from the European *A. crassa* (Pennant, 1777), the type species of the genus, by its larger size, the more rounded outline and the conspicuous lamellate sculpture. *Arcopagia crassa* occurs from northern Scotland to the Strait of Gibraltar. A large lot of *A. crassa* in the MNHN collection supposedly originates from the Cape Verde Islands but is most likely mislabelled.



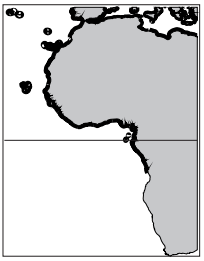
13.53. ***Arcopagia richardi*** **Dautzenberg & Fischer, 1906. A-C**, Mauritania, 20°35'N, 17°50'W, 15-20 m (56.2 mm). **D**, Palmeira, Sal, Cape Verde Islands (Iv, 18.3 mm, MNCN). **E**, Joal, Petite Côte, Senegal, 30-40 m (69.6 mm). **F-J**, same locality (60.2 mm).

Arcopella balaustina (Linnaeus, 1758)



13.54. S of Dakar, Senegal, 14°20'N, 17°17.5'W, 41 m (11.7 mm).

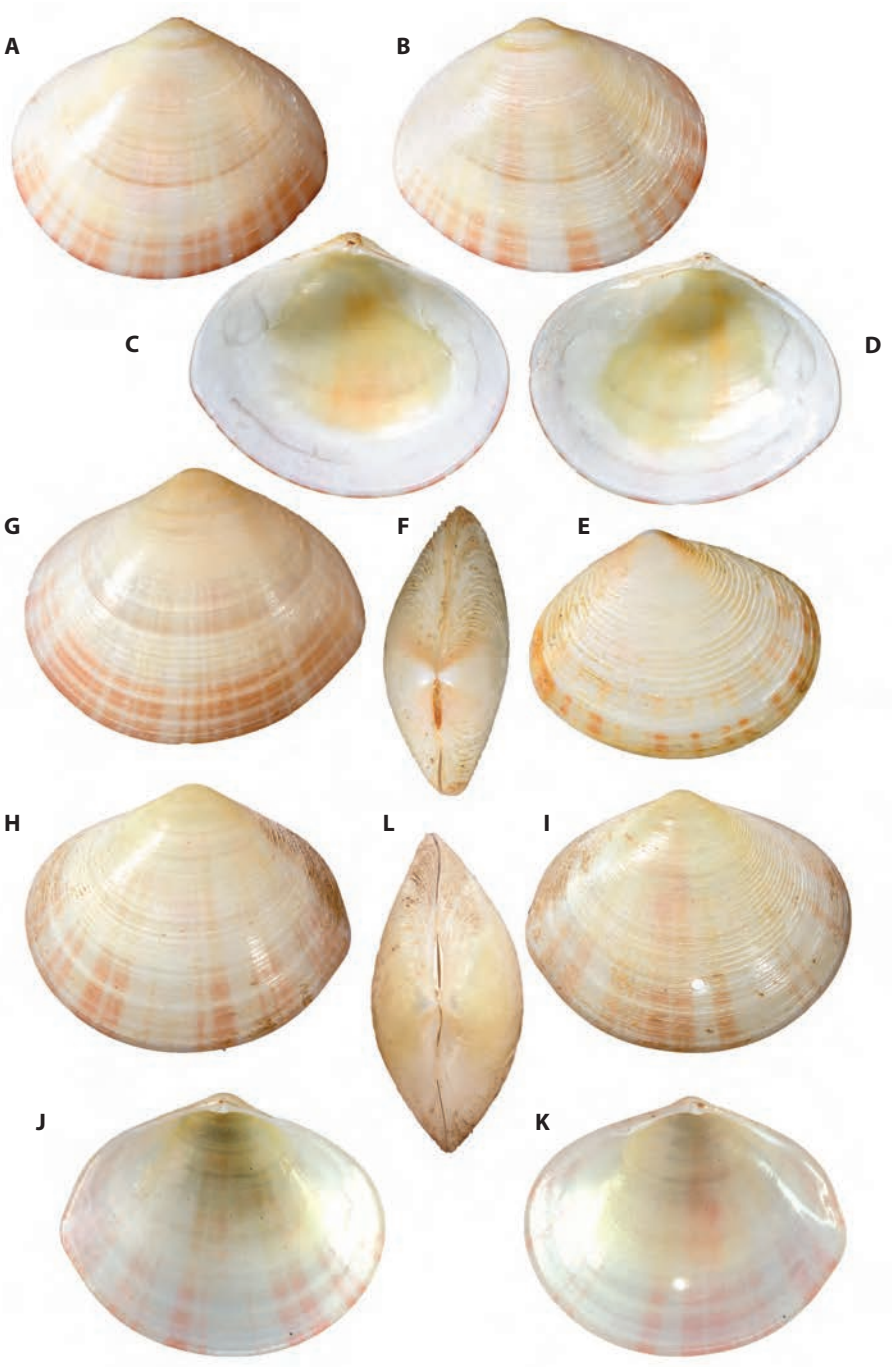
Shell small, up to 18 mm long, variable in shape, size and sculpture, subcircular-oval, thin, inflated. Anterior margin broadly rounded, posterior margin narrowly rounded with an indistinct, rounded corner, which is very slightly bent to the right. Ventral margin strongly convex. Beaks very slightly in front of or on the vertical midline. Lunule small and more or less deep, escutcheon narrow, ill-defined, ligament not sunken. Surface smooth, with fine, thin, evenly spaced commarginal lamellae, which very often are broken off, leaving only fine striae. Interspaces with extremely fine commarginal threads, only visible under a lens (x 10-20). Posterior angle rounded, indistinct. Periostracum thin and pale brownish, generally persisting only on the posterior marginal area. Pallial sinus remarkably larger in the left valve than in the right valve. Outside cream to pale yellowish, with light reddish to brownish red radial rays, often interrupted by growth stages. Inside whitish, pale yellowish towards the beaks, the external pattern showing through.



Distribution. East and West coast of Scotland, western and south-western Ireland southward to Ghana; Congo Brazzaville to northern Angola (Luanda, rare); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

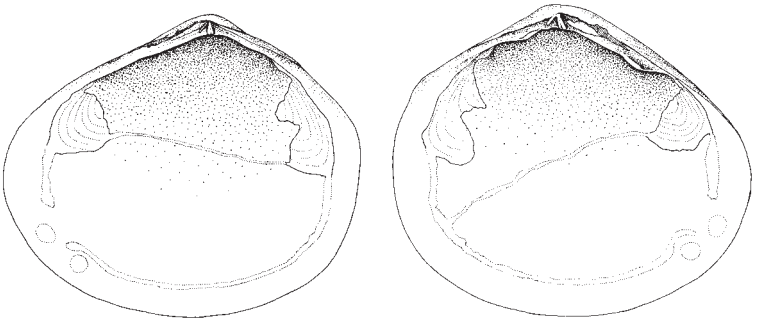
Biotope. In fine muddy sand and fine sand, also with shell debris, from 30 to 250 m, population maximum between 50 and 150 m. In the Mediterranean also in sand with *Posidonia* in shallower water, from 1-3 m downward. Common in the Mediterranean, becoming uncommon from Dakar southward.

Remarks. This species shows a considerable variety of biotopes and habitat differences between the Mediterranean and the Atlantic including West Africa, where, in contrast to the Mediterranean, it does not occur in shallow water. However, specimens from the different habitats do not show any constant differences and are considered conspecific. The species shows a continuous distribution from Europe to the atypical tropical zone but is absent from the southern typical tropical zone. *Arcopella britannica* (Tomlin, 1934), reported from the British Isles, seems to fall into the variability of *A. balaustina* but the discrepant habitat of the Mediterranean and Atlantic population suggests that two cryptic species could be involved. A sibling Indo-West Pacific species is *A. isseli* (H. Adams, 1870) which has a wide range from the Red Sea (Oliver 1992) and Southern Arabia (Oliver 1995) to New Caledonia (material in MNHN).



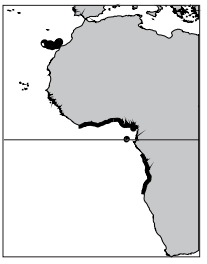
13.55. ***Arcopella balaustina*** **(Linnaeus, 1758).** **A**-**D**, Mauritania, 17°42′N, 16°28′W, 104 m (12.3 mm). **E**-**F**, S of Gorée, Senegal, 65 m (11.2 mm). **G**, off Abidjan, Côte d'Ivoire (14.9 mm). **H**-**L**, same locality (14.2 mm).

Strigilla (*Aeretica*) *splendida* (Anton, 1838)



13.56. Senegal, MNHN, old coll. (17.0 mm).

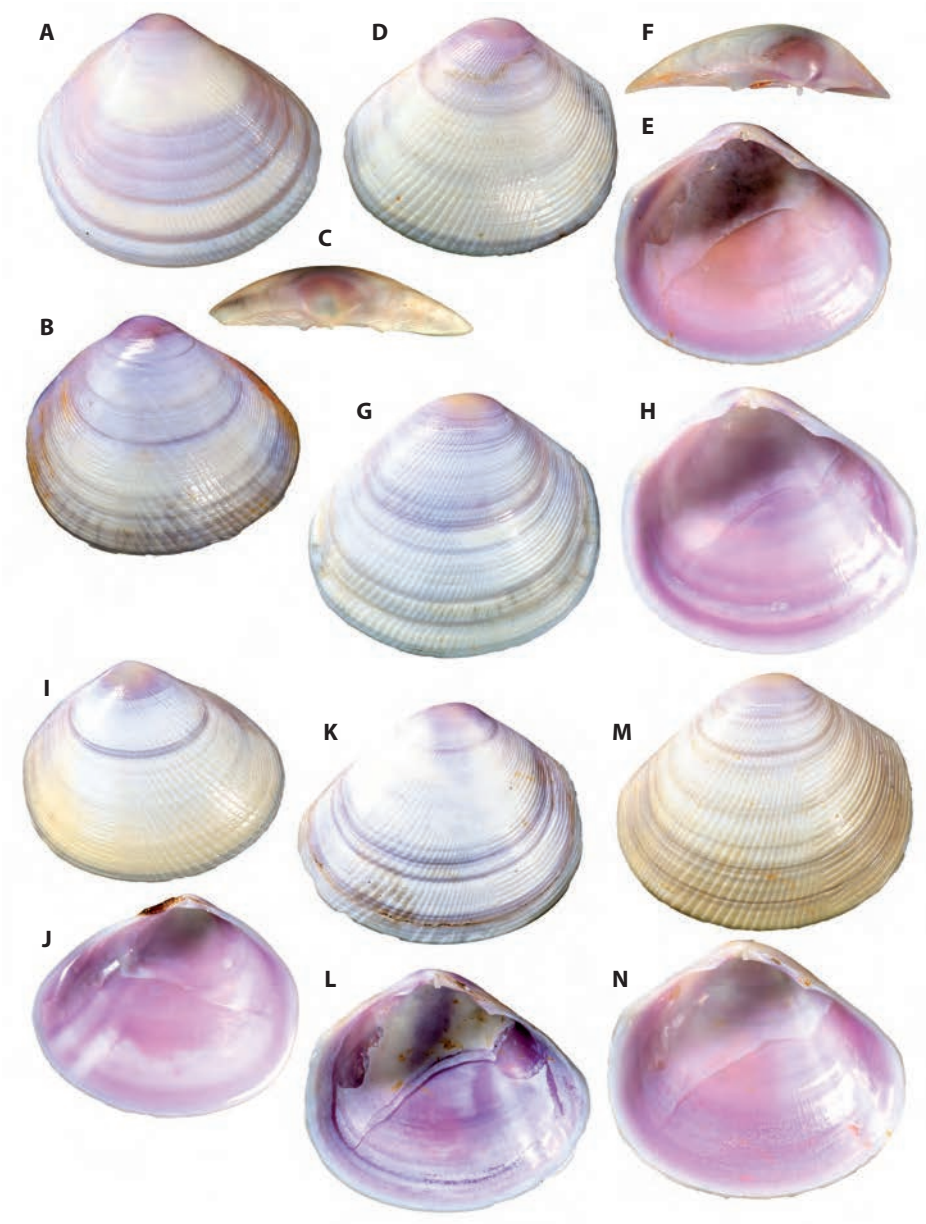
Shell small, up to 25 mm long, subcircular, quite thin but solid, somewhat inflated. Anterior margin broadly rounded, posterior margin narrowly rounded. Surface on the anterior part with strong, regular, subcommarginal ridges, not entirely parallel to the margin. On a sharp limit going from the beaks nearly vertically to the ventral margin, these ridges bend abruptly down and descend towards the ventral margin. On the rounded posterior "angle" they turn sharply upwards again and then finally bend to nearly commarginal on the postero-dorsal slope. Periostracum thin, very light greyish brown and translucent. Outside greyish white with some greyish violet growth zones to pale violet with darker violet growth zones. Inside white or pale to deep violet.



Distribution. Senegal (Casamance, one valve only), Canary Is.; Côte d'Ivoire to Cameroon, Congo Brazzaville (Pointe-Noire) to southern Angola (Moçâmedes, Namibe province); São Tomé, Ilha do Principe (Tomlin & Shackleford 1914-1915).

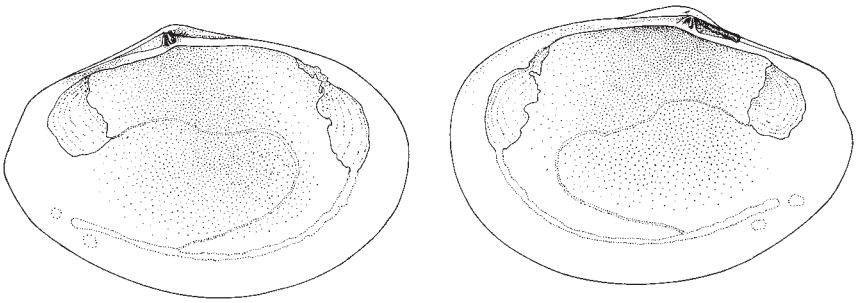
Biotope. In sand in shallow water (about 1-6 m), uncommon to rare.

Remarks. Because of its rarity, the distribution of this species is still poorly known and seems to be patchy. There is no record from Guinea-Bissau to Liberia and only one from Victoria/Limbe, Cameroon, the next one to the South is from Congo Brazzaville (Pointe-Noire). The species has long been known as *Tellina senegalensis* Hanley, 1844 (*non* Gmelin, 1791) and *Strigilla polyaulax* Tomlin & Shackleford, 1915, both of which are synonyms (see also E.A. Smith 1915). It is the only West African representative of the subgenus *Aeretica*. Empty valves are occasionally cast ashore.



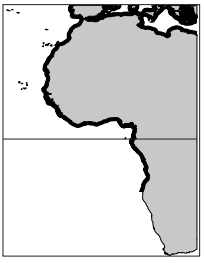
13.57. *Strigilla (Aeretica) splendida* (Anton, 1839). **A**, off Abidjan, Côte d'Ivoire (lv, 16.2 mm). **B**-**C**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (12.7 mm). **D**-**F**, same locality (12.7 mm). **G**-**H**, Palmeirinhas, Luanda prov., N-Angola (14.4 mm). **I**-**J**, Moçâmedes, Namibe Prov., S-Angola, 0-2 m (13.3 mm). **K**-**L**, same locality (13.3 mm). **M**-**N**, same locality (15.0 mm).

Macomopsis cumana (O.G. Costa, 1830)



13.58. Pointe-Noire, Congo, Plage Mondaine, fine muddy sand, 1-3 m (45.4 mm).

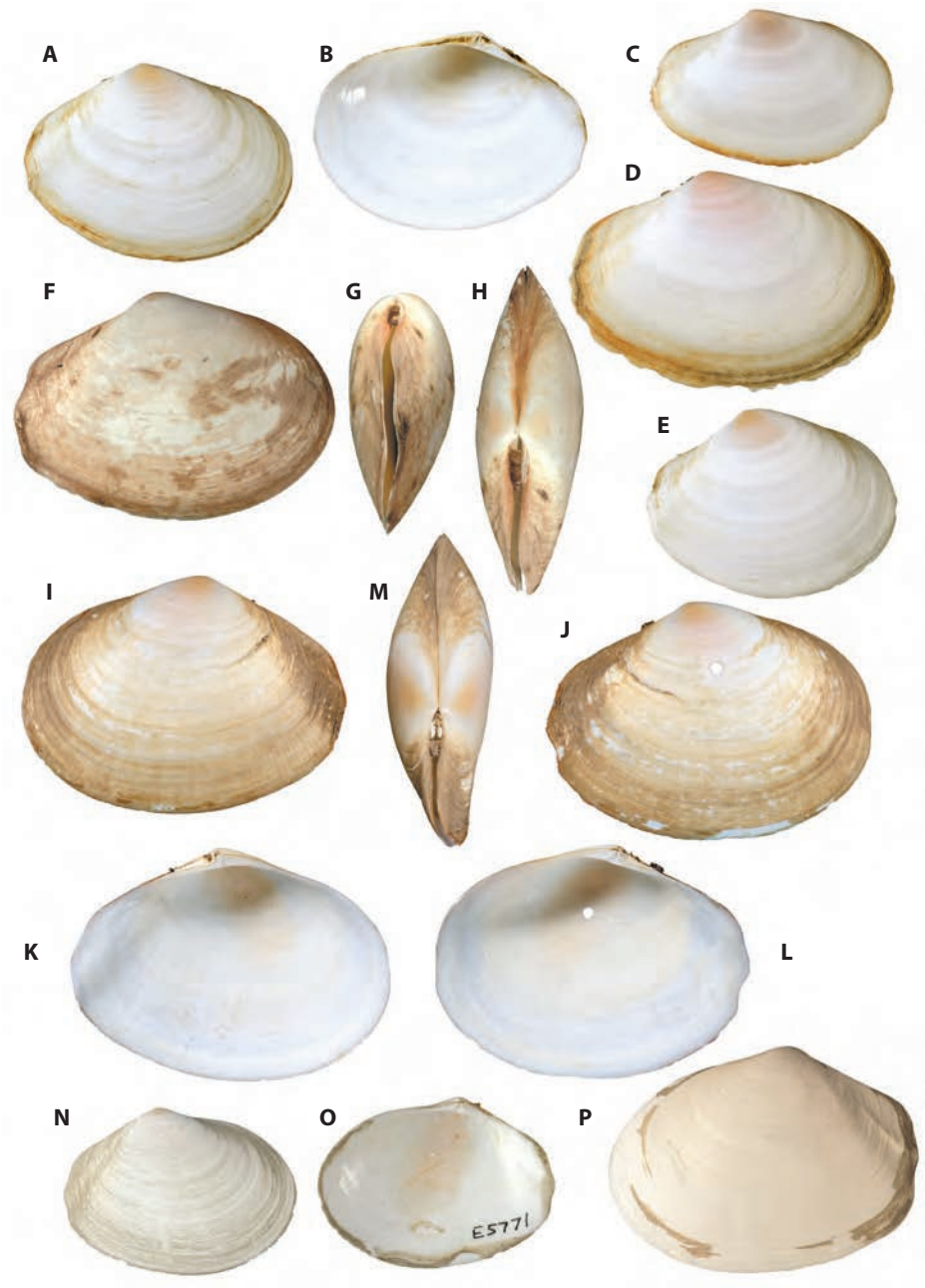
Shell up to 52 mm long, very variable in shape and tumidity, more or less oblong-oval, thin and fragile, somewhat compressed. Anterior margin broadly rounded, posterior margin rounded-truncated, weakly bent to the right and occasionally slightly undulate. Ventral margin evenly convex. Beaks behind the vertical midline. Escutcheon narrow, over the whole length of the postero-dorsal margin, ligament short. Cardinal teeth small, reaching only half way across the cardinal platform. Surface smooth, dull, with numerous irregular growth lines and coarser growth stages. Posterior angle indistinct. Periostracum thin, pale greenish brown, persistent mostly on the marginal part of the valves. Outside white to cream, usually with pale salmon to orange red on the umbonal zone, but occasionally almost entirely white. Inside with same colour.



Distribution. Strait of Gibraltar to southern Angola (Moçâmedes, Namibe province); throughout the Mediterranean.

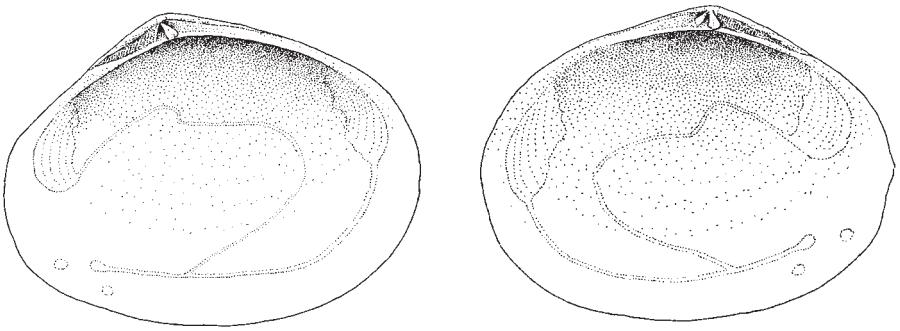
Biotope. In fine muddy sand and fine sand, from shallow water (1-6 m) to about 20 m, occasionally deeper; abundant.

Remarks. This species shows a high variability, especially in size, height and tumidity. The larger, more compressed and sometimes more oblong specimens have been named *M. senegalensis* Bertin, 1878, however, all kinds of intermediate forms lead to place this name into synonymy of *M. cumana*. *Macomopsis schultzei* (Thiele, 1910), described from Namibia and W South Africa, is similar but differs in being more rounded and having a shorter pallial sinus; it is considered a separate species. Empty shells and valves are frequently washed ashore on many beaches. The name *Macomopsis pellucida* (Spengler, 1798) is used by Huber *et al.* (2015: 721-723) but was declared *nomen oblitum* by Cosel & Gofas (2018).



13.59. *Macomopsis cumana* (O.G. Costa, 1830). **A**-**B**, Kafountine, Casamance, Senegal, beach drift (35.1 mm). **C**, same locality (30.5 mm). **D**, same locality (42.7 mm). **E**, same locality (29.8 mm, spm. close to *M. hanleyi*, see next entry). **F**-**H**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, N of lighthouse, in sand bank at low water (42.2 mm). **I**-**M**, Barra do Dande, Bengo prov., N-Angola, low tide (40.2 mm). **N**-**O**, Walfishbay, Namibia, lagoon, in sandy mud flats (27.0 mm, Natal Museum). **P**, same locality (39.0 mm).

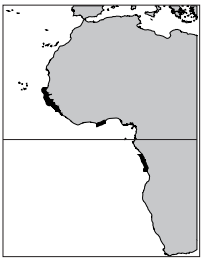
Macomopsis hanleyi (Dunker, 1853)



13.60. Casamance, Senegal, 10-20 m (33.0 mm).

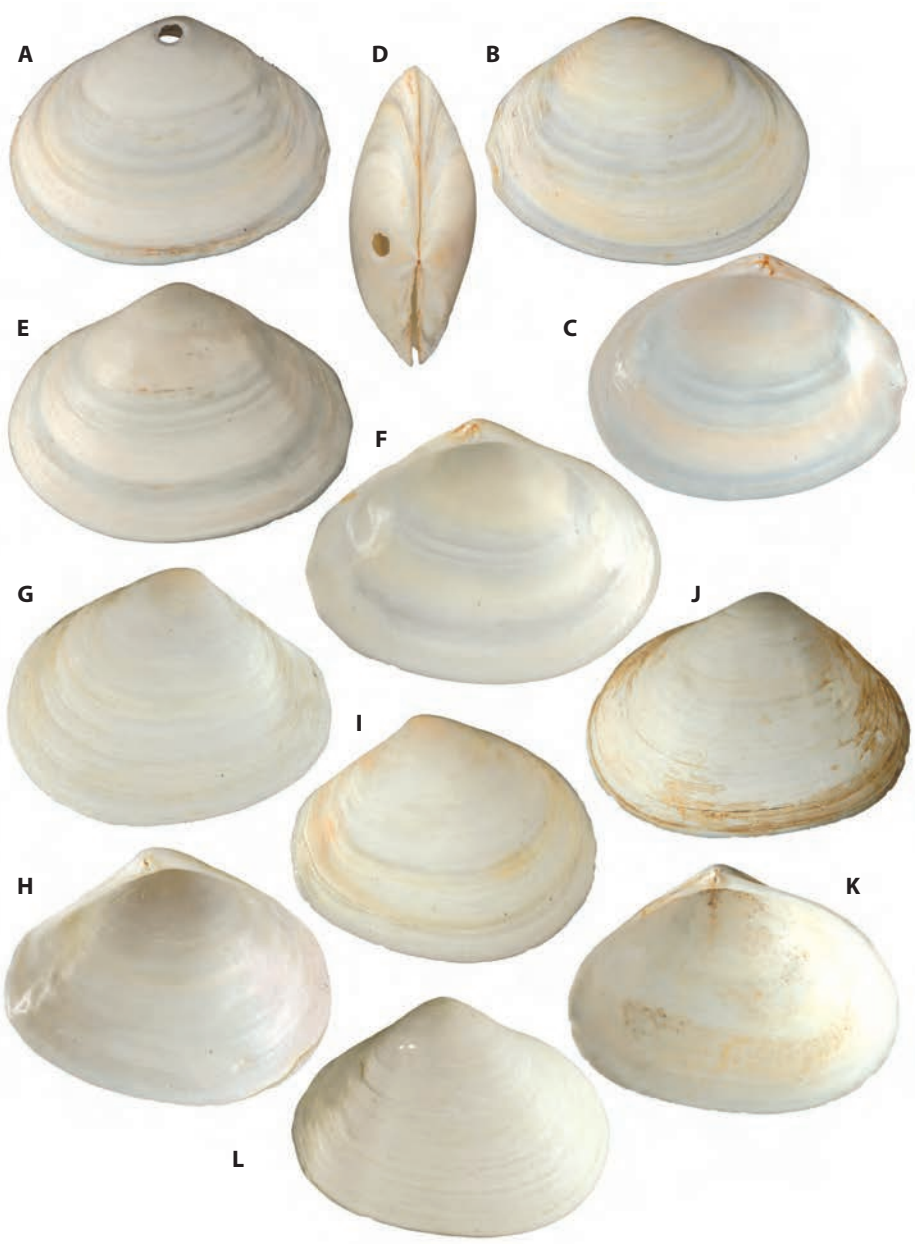
Shell up to 36 mm long, variable in shape, suboval-triangular, thin but somewhat solid, slightly compressed. Anterior margin broadly rounded, posterior part tapering, posterior margin rounded-truncated, occasionally somewhat oblique, weakly bent to the right and sometimes slightly undulate. Postero-dorsal margin straight. Ventral margin convex. Beaks prominent, situated slightly behind the vertical midline. Escutcheon narrow, ill-defined, ligament short. Surface smooth, dull, with numerous irregular growth lines and sometimes prominent coarser growth stages. Posterior angle rounded but distinguishable, especially in the left valve, in the right valve more indistinct. Periostracum thin, pale brown, mostly eroded, occasionally persistent on the marginal part of the valves. Valves uniform white to pale ivory.

Distribution. Senegal (Casamance); Guinea (9°30'N); Côte d'Ivoire to Ghana; Congo Brazzaville (Pointe-Noire) to northern Angola.



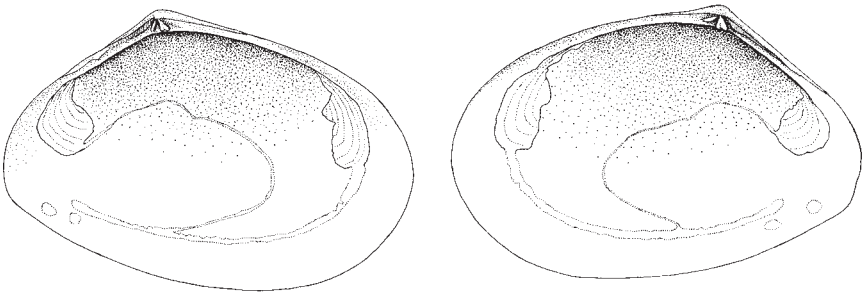
Biotope. Not known, but most probably fine sand, from shallow water (1-6 m) to about 20 m, the species seems to prefer calm bays, rare (most known specimens are beached shells).

Remarks. *Macomopsis hanleyi* is still somewhat problematic. It is very close to *M. cumana* and is found together with it but is much rarer. The main differences from *M. cumana* are the more triangular shape, the somewhat more prominent umbos, the shorter shell, the more irregular and often coarser growth stages and the almost entirely whitish colour. The shell is also slightly more tumid. Although intergrades between the two species with slight pale orange hue on the beaks may occasionally be found, *M. hanleyi* is considered here as a separate species beyond the variability of *M. cumana*. The species shows a distribution pattern restricted to regions with weaker seasonal upwelling but seems to avoid the typical tropical zones.



13.61. *Macomopsis hanleyi* (Dunker, 1853). **A**-**D**, Casamance, Senegal, 10-20 m (33.0 mm). **E**-**F**, same locality (36.3 mm). **G**-**H**, Assinie-Mafia, Côte d'Ivoire, beach drift W of mouth of Lagune Abi (30.4 mm). **I**, same locality (29.2 mm). **J**-**K**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 3-4 m (26.8 mm). **L**, Pointe-Noire, Congo Brazzaville, plage Mondaine, beach drift (29.5 mm).

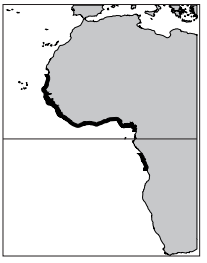
Macomopsis bruuni (Nicklès, 1955)



13.62. Côte d'Ivoire, 4°16.5'N, 7°30'W, 40 m (20.0 mm).

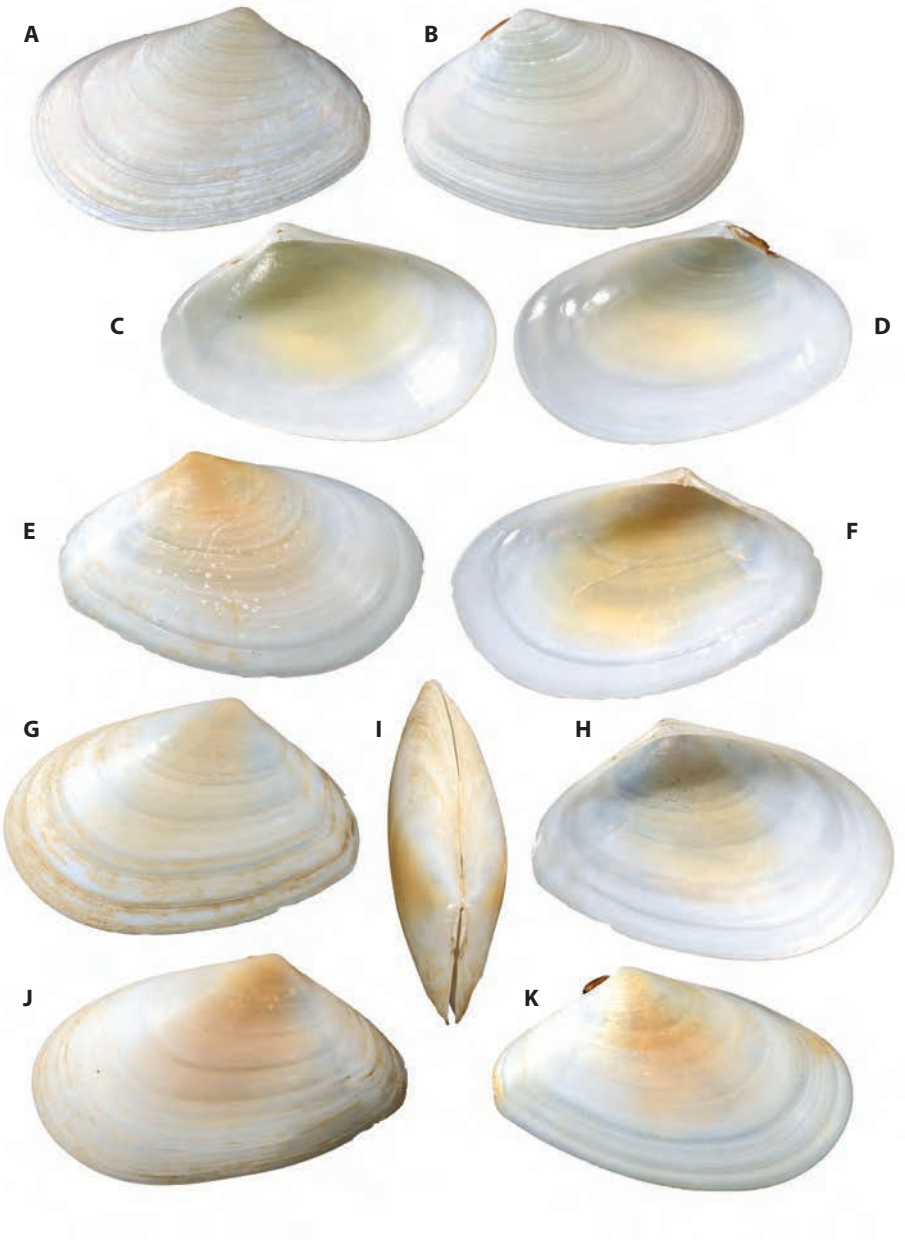
Shell up to 28 mm long, variable in shape, suboval, thin but rather strong, compressed. Anterior margin well rounded, posterior part tapering. Postero-dorsal margin more or less straight, posterior end pointed, bent to the right, posterior margin narrowly rounded. Beaks well behind the vertical midline. Escutcheon narrow, rather short and ill-defined, ligament short. Surface smooth and dull, with numerous irregular growth lines and coarser growth stages. Posterior angle very indistinct. Shallow radial depression on the postero-dorsal area of the left valve. Periostracum thin, dull, pale yellowish brown, persistent only on the marginal part of the valves. Outside white to cream, with a yellowish to more or less pale orange or orange-salmon umbonal zone. Inside with same colour.

Distribution. Mauritania (19°N) to northern Angola (Luanda). No records from Cameroon to the Congo.



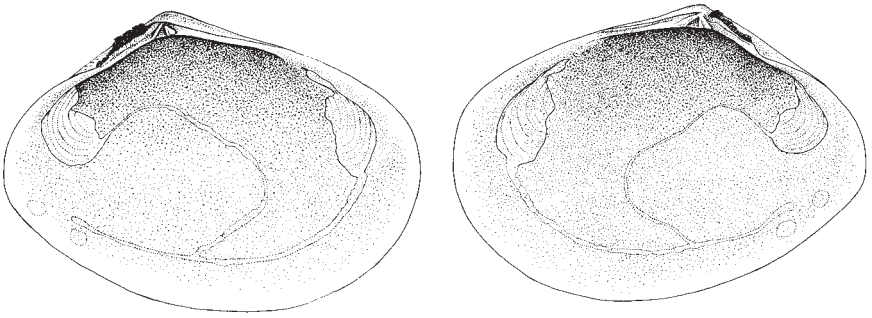
Biotope. In fine sand, also with calcareous algae and shell debris, offshore from about 30 to 200 m. Not uncommon, but not found on the beach and obtained by dredging only.

Remarks. This species differs from *M. cumana* by its smaller size, the more elongate outline, the more pointed posterior margin, the larger hinge teeth, the more yellowish or orange colour on the umbonal area and the different biotope. A slightly different form was found among the material of *M. bruuni* and could in most cases clearly be separated. It is distinguished from the species as described by Nicklès by its shorter shell, the surface sculpture with the very fine commarginal lamellae, the convex postero-dorsal margin and the quite strong flexure to the right; also the periostracum is less dull. This "form" is rather common off Côte d'Ivoire and was there often found together with *M. bruuni s. str.* in the same samples but some specimens are very difficult to be assigned to one or the other. The four species *M. cumana*, *M. hanleyi*, *M. bruuni* and the Namibian *M. schultzei* form a species complex which needs much more study before it can be thoroughly understood.



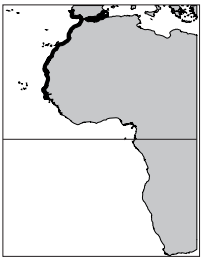
13.63. ***Macomopsis bruuni*** **(Nicklès, 1955)** [***s. str.***]. **A-D**, Mauritania, 19°30'N, 16°58'W, 104 m (15.7 mm). **E-F**, SW of Cap Manuel, Dakar, Senegal, 50 m (23.2 mm). **G-I**, Tabou, Côte d'Ivoire, 4°16.5'N, 7°30'W, 40 m (19.5 mm). **J**, Ilha de Luanda, Luanda prov., N-Angola, dredged, 40-60 m (21.1 mm). **K**, Praia Amelia, Moçâmedes, Namibe prov., S-Angola, dredged, 40-60 m (16.5 mm).

Macomopsis melo (G.B. Sowerby II, 1866)



13.64. Cap des Biches, Baie de Gorée, 10 m (21.1 mm).

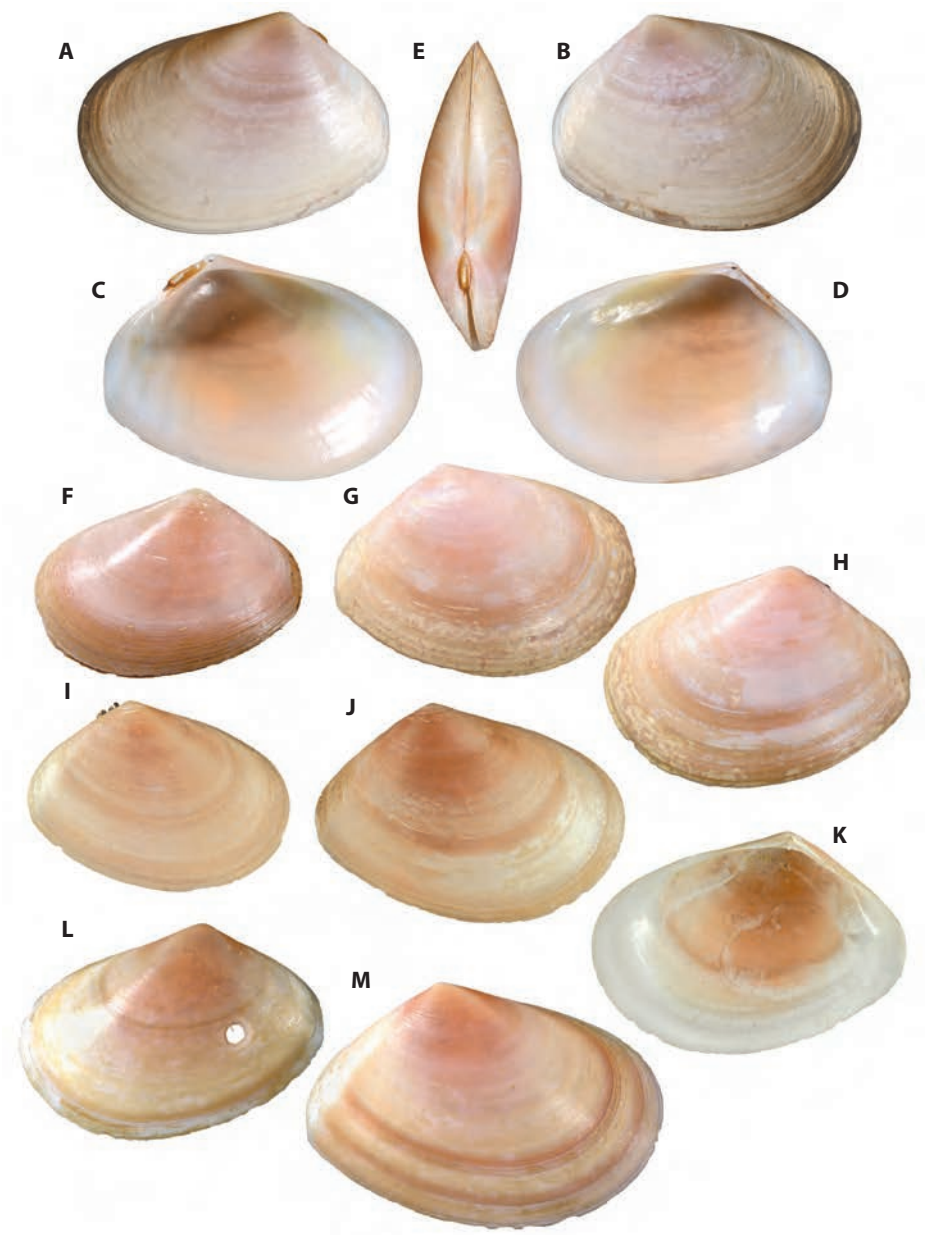
Shell up to 28 mm long, slightly variable in outline, broadly suboval, thin, compressed. Anterior margin well rounded, postero-dorsal margin straight. Posterior part tapering, posterior end more or less pointed and only very slightly bent to the right, posterior margin narrowly rounded. Ventral margin anteriorly more convex than posteriorly. Beaks well behind the vertical midline. Escutcheon small and narrow, ligament short. Surface smooth, with fine, irregular growth lines and occasionally few coarser growth stages. Posterior angle indistinct. Periostracum thin, very light brownish to nearly colourless, persistent over the whole valve or eroded only on the umbonal part, very finely and evenly wrinkled, giving the surface a typical half-dull sheen. Outside pale to rich salmon red, often with darker umbonal region or with darker growth bands, occasionally whitish with pale salmon hue on the umbos only. Postero-dorsal slope often white. Inside on the whole with same colour as outside.



Distribution. Southern Portugal (Olhão, Algarve) to Senegal (Casamance, Diembéring); extreme western Mediterranean (Málaga to Ceuta).

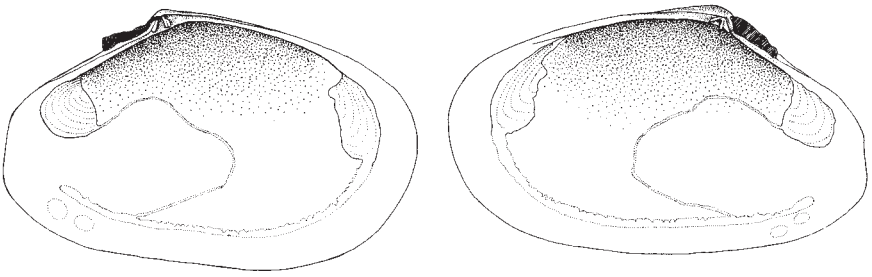
Biotope. In fine and mixed clean sand, also with calcareous algae and shell debris, from about 10 to 70 m, uncommon.

Remarks. This is another species with a strictly limited range covering most of the northern zones of permanent and seasonal upwelling and ending just eastward of the Strait of Gibraltar. From *M. cumana* it is distinguished by its colour which is more intensely reddish, the more elliptical outline, and by the cardinal teeth which reach all the way across the cardinal platform (half way in *M. cumana*); from *M. bruuni* (apart from the colouration) by the larger and higher shell.



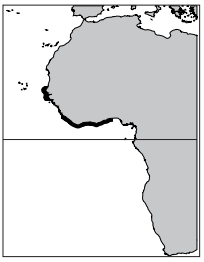
13.65. ***Macomopsis melo*** **(G.B. Sowerby II, 1866). A-E**, Mauritania, 20°00'N, 17°29'W, 72 m (21.7 mm). **F**, Mauritania, 18°12'N, 16°23'W, 70 m (12.3 mm). **G-H**, Baie de Gorée-Cap des Biches, Senegal, 10 m (21.0 mm). **I**, W of Yene, Baie de Gorée, Senegal, 14°37.6'N, 17°16.2'W, 25 m (rv, 20.5 mm). **J-K**, same locality (24.1 mm). **L**, Kafountine, Casamance, 12°46.9'N, 17°29.9'W, 45 m (24.7). **M**, same locality (29.0 mm).

Psammacoma pseudofallax (Cosel, 1995)



13.66. Off Gonzagueville, Côte d'Ivoire, 200 m (34.6 mm).

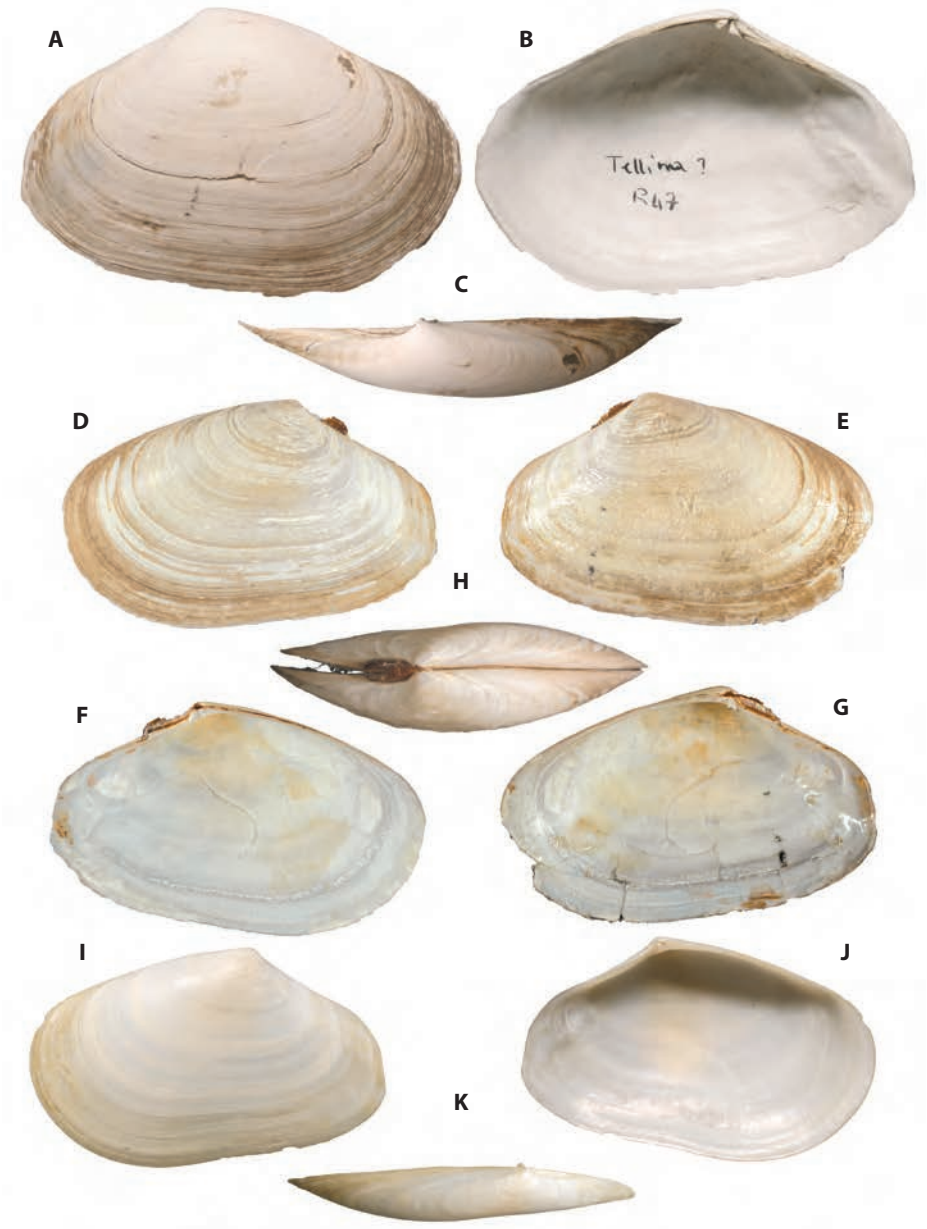
Shell up to 53 mm long, somewhat variable in outline, oblong-oval, rather thin and brittle, compressed. Anterior margin well rounded, posterior part only slightly tapering, posterior margin rounded-truncated, postero-dorsal margin straight, ventral margin straight in the central part. Posterior end weakly bent to the left. Beaks well behind the vertical margin. Escutcheon small and narrow, ligament short. Surface with irregular growth lines and coarser growth stages. Posterior angle broad and indistinct. Very shallow and broad radial depression on the postero-dorsal area of the right valve. Periostracum rather thick, pale brownish to brownish, persistent only on the marginal part of the valves, if at all. Outside dull and dirty whitish, occasionally with a pale yellowish to pale orange hue just on the umbonal area. Inside white, often with pale yellowish to orange under the beaks.



Distribution. Senegal (Kayar, Grande Côte to S of Dakar); Liberia (S of Marshall) to Côte d'Ivoire and Bénin (Ouidah). No record from Guinea to Sierra Leone. One record from off Namibia (*fide* Huber *et al.* 2015: 730).

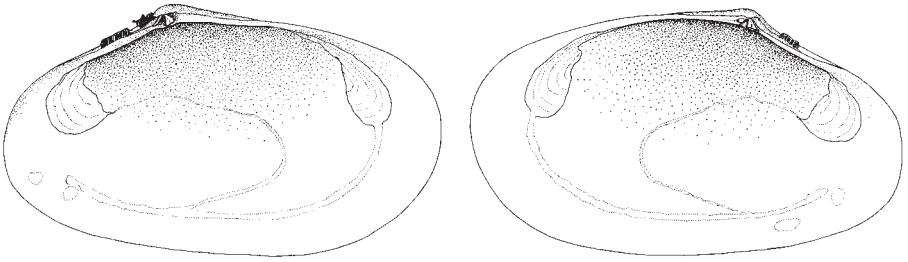
Biotope. In mud and muddy sand, from about 95 to more than 200 m, rare.

Remarks. *Psammacoma pseudofallax* is a rare species, readily distinguished from similar species (*e.g. P. inexpectata*, see next entry) by the flexure of the valves which is to the left (in dorsal view with anterior part above). This species, as well as the following one, has been cited in publications on West African molluscs as "*Macoma* (*P.*) *candida* (Lamarck, 1818)" (Nicklès 1955) or "*M.* (*P.*) *fallax* Bertin, 1878" (Gofas *et al.* 1985). However, the types of both species are different and at least *M. fallax*, described without locality, is an Indo-Pacific species: recently a few specimens were dredged off New Caledonia and could be compared with the type and with the West African material. As samples from the depth range of this species are very scarce, the known distribution pattern is most probably not definitive.



13.67. ***Psammacoma pseudofallax*** **(Cosel, 1995).** **A**-**C**, Abidjan region, Côte d'Ivoire (rv, 53.8 mm). **D**-**H**, off Gonzagueville, Côte d'Ivoire, 200 m (holotype, 32.2 mm, photo Manuel Caballer/Recolnat). **I**-**K**, off Ouidah, Bénin, 6°10'N, 2°05'E, 200 m (36.6 mm).

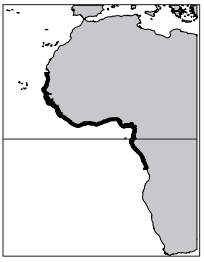
Psammacoma inexpectata (Cosel, 1995)



13.68. Abidjan region, Côte d'Ivoire (28.5 mm).

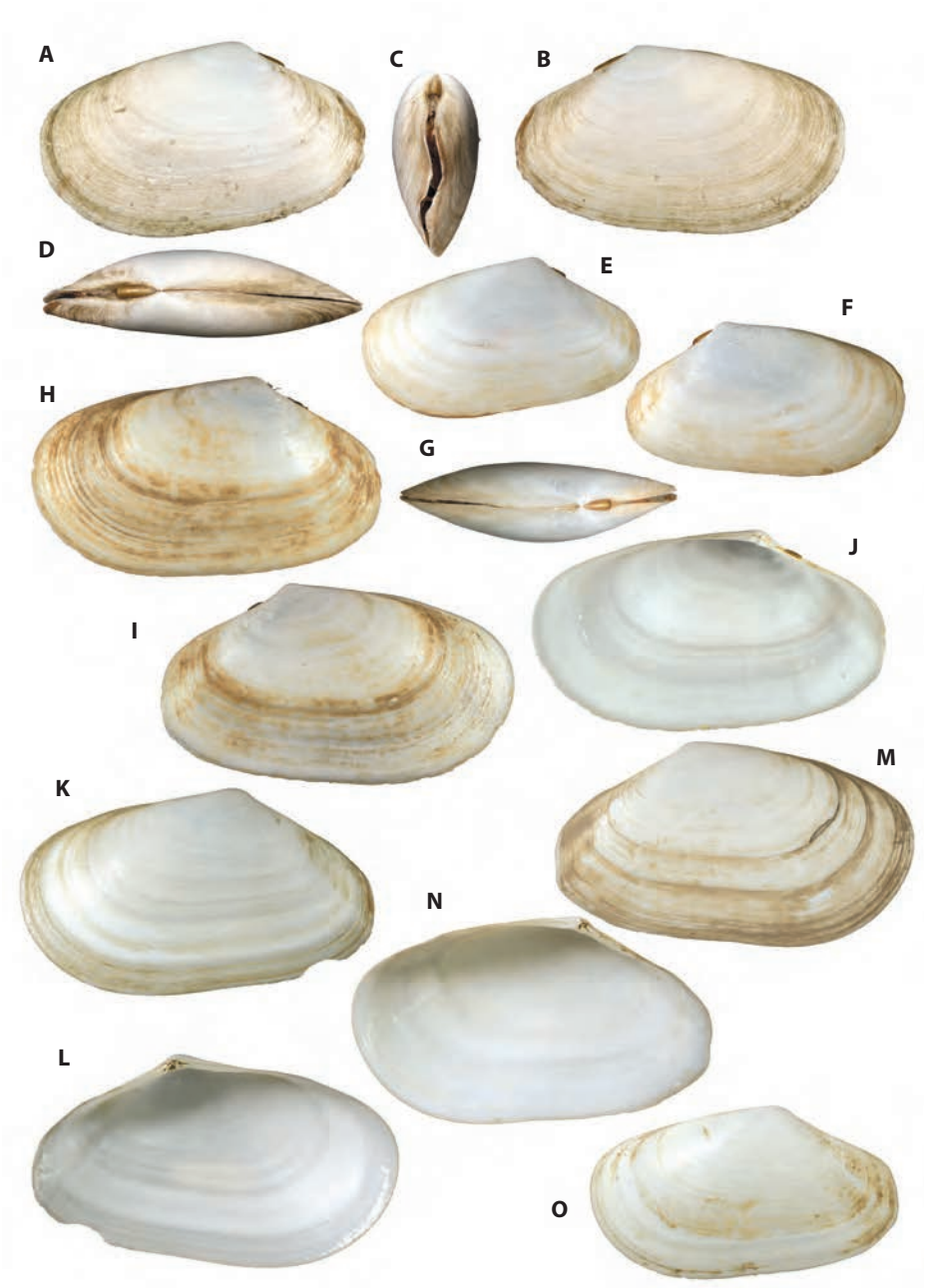
Shell up to 43 mm long, variable in length-height ratio, oblong-subquadrangular, thin and more or less fragile, compressed. Anterior margin well rounded, posterior part only slightly tapering, posterior margin rounded-truncated, postero-dorsal margin straight, ventral margin in its central part straight or even slightly concave. Posterior end bent to the right. Beaks well behind the vertical midline. Escutcheon small, narrow, rather deep, ligament short. Surface with irregular growth lines and coarser growth stages. Posterior angle broad and indistinct. Very broad and shallow radial depression on the postero-dorsal area of the left valve. Periostracum finely wrinkled, on the umbonal part of the valves thin, colourless and translucent, on the marginal part becoming thicker, with greenish brown colour, mostly along coarser growth stages, on fresh specimens persistent on nearly the whole valve. Outside dirty whitish, inside white with a few light greyish growth zones.

Distribution. Mauritania (19°40'N) to northern Angola (Luanda).



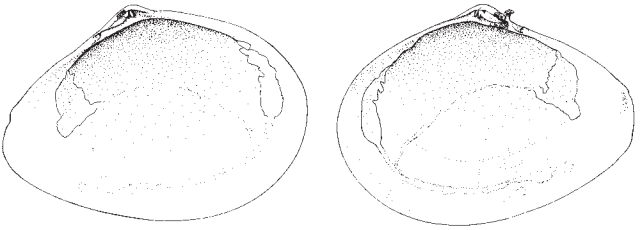
Biotope. In mud and fine, muddy sand, from 30 to more than 200 m; empty valves were found down to 360 m off Ambrizete, N-Angola. Uncommon.

Remarks. This species has also been mistaken for *Psammacoma fallax*; it is distinguished from *P. pseudofallax* principally by the slight flexure of the posterior end: not to the left like in *P. pseudofallax* but to the right like in several other *Psammacoma*. Other differences are the entirely white colour, the somewhat more elongate shell outline and the smaller size. The species is occasionally taken in shrimp trawls. The figured specimen from Senegal has a markedly undulate posterior margin (see figure) like *Macomopsis cumana*, whereas *P. inexpectata* normally has an almost continuous margin; perhaps another cryptic species may be involved.



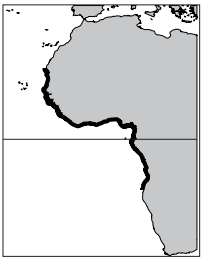
13.69. ***Psammacoma inexpectata*** **(Cosel, 1995).** **A**-**D**, off M'boro, Senegal, 246 m (34.5 mm, note the "wavy" posterior margin). **E**-**G**, W of Langue de Barbarie, Senegal, 15°52'N, 16°46'W, 65 m (20.0 mm). **H**-**J**, off Abidjan, Côte d'Ivoire (holotype, 28.2 mm, photo Manuel Caballer/Recolnat). **K**-**L**, Bota - Batoke, Cameroon, 5°39'N, 8°58'E, 45-50 m (34.8 mm). **M**-**N**, Ponta das Lagostas, N-Angola, mud, 30-50 m (43.2 mm). **O**, same locality (37.0 mm).

Austromacoma nymphalis (Lamarck, 1818)



13.70. Pointe-Noire, Plage Mondaine, sand-bank, low tide (41.0 mm).

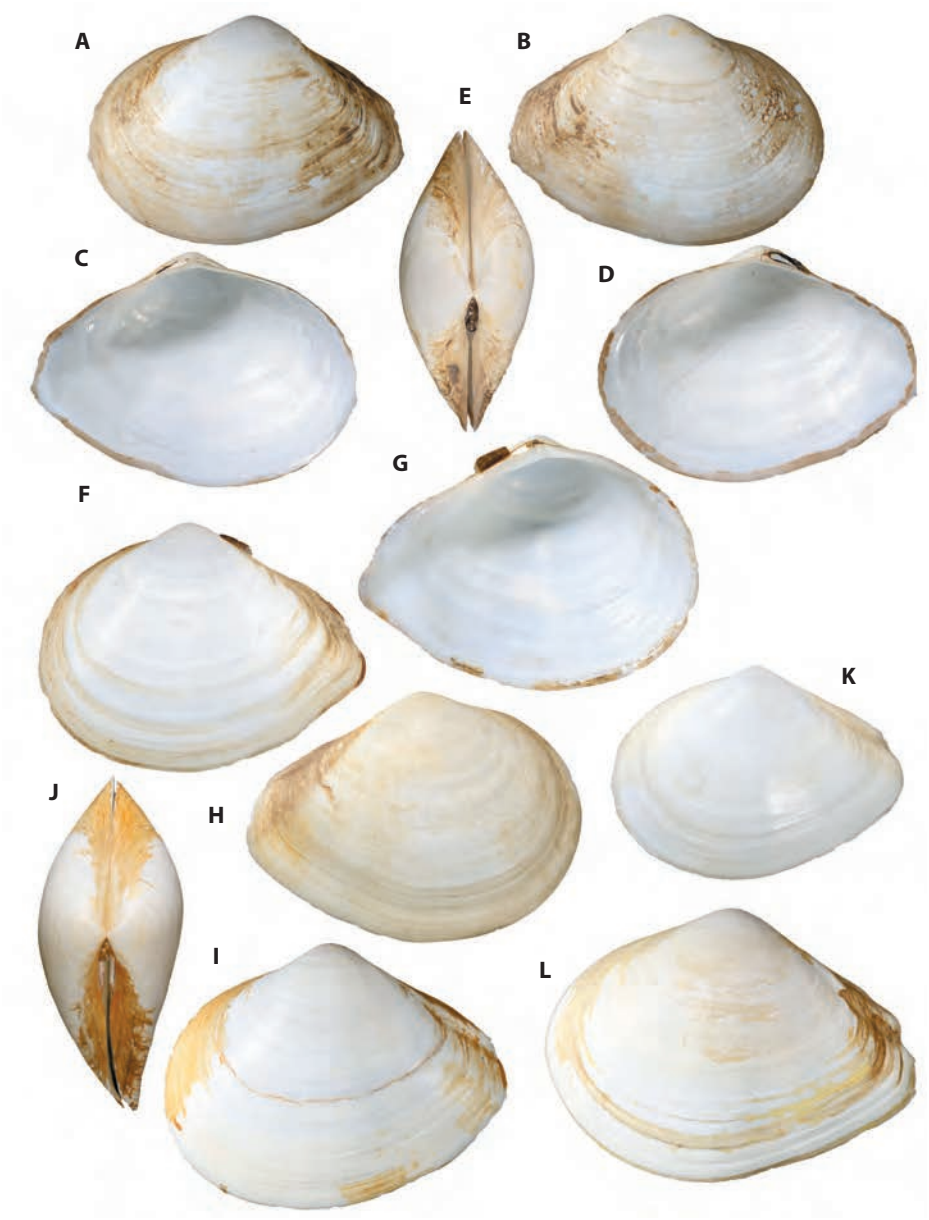
Shell up to 60 mm long, variable in shape, suboval, thin and fragile, moderately inflated. Anterior margin broadly rounded, posterior part tapering, posterior end pointed, slightly twisted to the right, posterior margin narrowly rounded-undulate. Beaks more or less median of the valve. Escutcheon very small and ill-defined, ligament short. Surface smooth, with mumerous faint, irregular growth lines and a few coarser growth stages. Posterior angle indistinct. Postero-dorsal area of the left valve with a shallow, more or less pronounced radial depression. Periostracum light greyish brown to yellowish brown, thin and translucent in the middle part, thicker and somewhat wrinkled on the postero-dorsal area or the whole marginal part, on the umbonal part mostly eroded. Pallial sinus large, confluent with pallial line, not touching the anterior adductor scar. Nymph rather broad. Outside and inside uniform white.



Distribution. On the whole West African coast from Mauritania (Cap Blanc) to southern Angola (Moçâmedes, Namibe province) but due to its habitat appearing more or less patchy.

Biotope. In muddy sand and fine sand, in sheltered bays, lagoons and inlets, often in the vicinity of mangroves, from low tide to about 5 m, locally abundant. The species tolerates reduced salinity as well as hypersalinity.

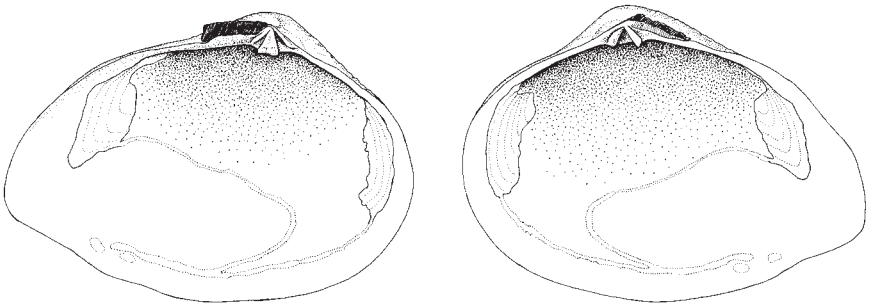
Remarks. Huber *et al.* (2015) designated one of the syntypes of *Macoma innominata* Bertin, 1878 as the neotype of *Tellina nymphalis* Lamarck, 1818, therefore making them objective synonyms. Together with his new species, Bertin (1878) also reported *Macoma nymphalis* from "Ile aux Oiseaux" near the mouth of the Gambia River and treated *Psammobia laevigata* Lamarck, 1818 as a synonym of *nymphalis*. In his writing, *M. innominata* is distinguished by having the pallial sinus not touching the anterior muscle scar, contrary to *M. nymphalis*. Examination of the lot from "Ile aux Oiseaux" cited by Bertin, still present in MNHN, shows that those specimens also have the sinus separate from the scar and therefore appear conspecific with his *Macoma innominata*. All examined specimens from mainland West Africa (several lots with over 200 specimens and valves) conform to this morphology and are deemed to represent a single species. Conversely, *Austromacoma laevigata* (Lamarck, 1818), treated by Huber *et al.* (2015) as a valid West African species characterized by a pallial sinus firmly touching the anterior adductor scar, was only represented by one syntype of unknown locality in the MNHN material. Two valves from São Tiago (Cape Verde Islands) approach this species in having the pallial sinus touching



13.71. *Austromacoma nymphalis* (Lamarck, 1818). **A**-**E**, Lagune Ebrié, Côte d'Ivoire, 4.5 m (34.3 mm). **F**-**G**, Baia de Ana Chaves, São Tomé, beach drift (39.4 mm). **H**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, sand bank N of lighthouse, low tide (39.7 mm). **I**-**J**, same locality (44.0 mm). **K**, same locality (35.5 mm). **L**, Moçâmedes, Namibe prov., S. Angola, beach (57.9 mm).

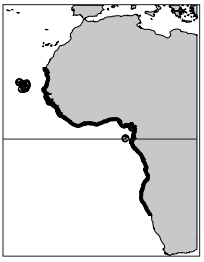
the anterior scar, but further material would be needed before this is claimed as a second West African species. Valves and complete shells of *Macoma nymphalis* are regularly washed ashore on beaches of calm bays.

Gastrana matadoa (Gmelin, 1791)



13.72. N'gor, Cap Vert (31.7 mm).

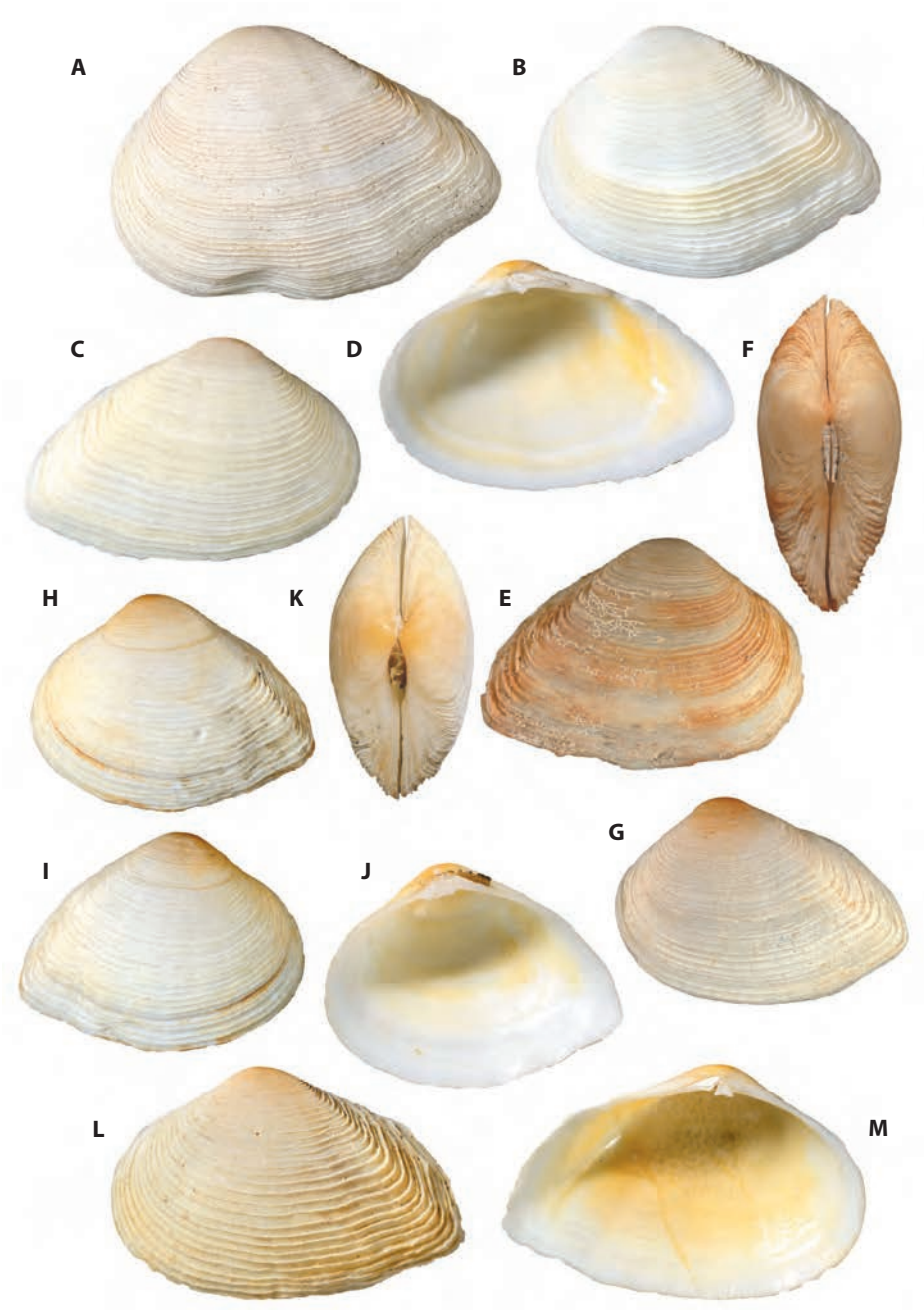
Shell up to 50 mm long, irregular and very variable in size and shape, in general suboval, thin but solid, rather inflated. Anterior margin well rounded, posterior part broadly tapering, with markedly convex postero-dorsal margin. Posterior end angular, very slightly bent to the right. Beaks well in front of the vertical midline. Escutcheon short, narrow, deep, but with rounded edges, ligament short. Surface with coarse, irregular, dense, commarginal lamellae and very fine, irregular radial striae, only visible under a lens (x 5-10). Posterior angle rounded. Very shallow, broad, radial depression anterior to the posterior angle, ending in a very slight sinuosity of the postero-ventral margin. Periostracum brownish, wrinkled, present only on the very marginal part of the valves. Outside whitish to pale yellowish, on the umbos often salmon to orange, occasionally yellow. Inside white or with pale orange to salmon hue posteriorly and occasionally anteriorly; umbonal part white with yellowish, pale salmon or orange.



Distribution. Mauritania (Cap Blanc) to Senegal (Casamance) and from Congo (Brazzaville) to Namibia (Walfish Bay) and South Africa (False Bay) to Moçambique; Cape Verde Islands. One single valve recorded from Ghana (Takoradi), in the atypical tropical region.

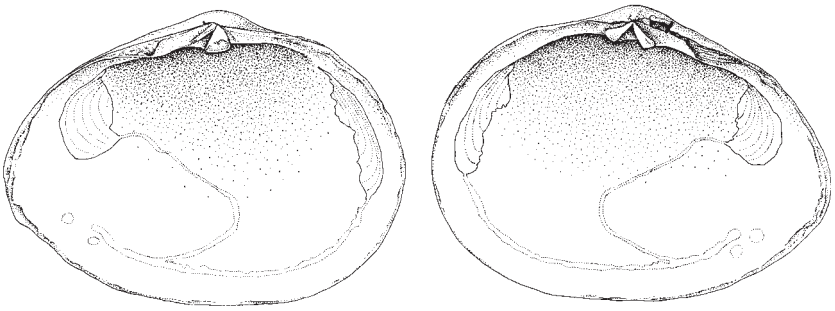
Biotope. Mostly in coarse sand, also with gravel and shell debris, as well as on hard bottom in coarse sandy patches and crevices between rocks and stones and even in empty bore holes of Pholadidae and *Lithophaga*, mostly in shallow water (1-3 m) but occasionally also deeper, not common everywhere.

Remarks. This species is also known as *G. guinaica* (Chemnitz, 1788, unavailable name), another synonym is *G. abildgaardiana* (Spengler, 1798). *Tellina polygona* Gmelin, 1791 is also this species, which is "Le Matadoa" of Adanson. It differs from the European *G. fragilis* (Linnaeus, 1758) by its much coarser commarginal lamellae and the often more irregular shell. *G. matadoa* is common in the areas with influence of upwelling. *Gastrana multangula* (Gmelin, 1791) is an apparently sibling species from the upwelling area along Southern Arabia, around Masirah Island (Oliver 1995).



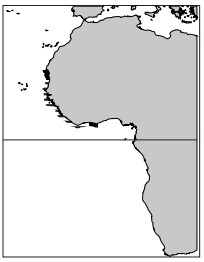
13.73. ***Gastrana matadoa*** **(Gmelin, 1791).** **A**, Baie de Gorée, Dakar, Senegal (48.3 mm). **B**, same locality (43.6 mm). **C**-**D**, same locality (42.3 mm). **E**-**F**, N'gor, Cap Vert, Senegal (37.9 mm). **G**, Takoradi, Ghana (25.0 mm). **H**-**K**, Futungo, Baia do Mussulo, Luanda prov., N-Angola (27.8 mm). **L**-**M**, Praia do César, Lucira, Namibe prov., S-Angola, dead maërl, 10 m (36.6 mm).

Gastrana orstomi Cosel, 1995



13.74. Abidjan, Côte d'Ivoire, "Trou sans fond" (submerged canyon), 175-270 m (21.1 mm).

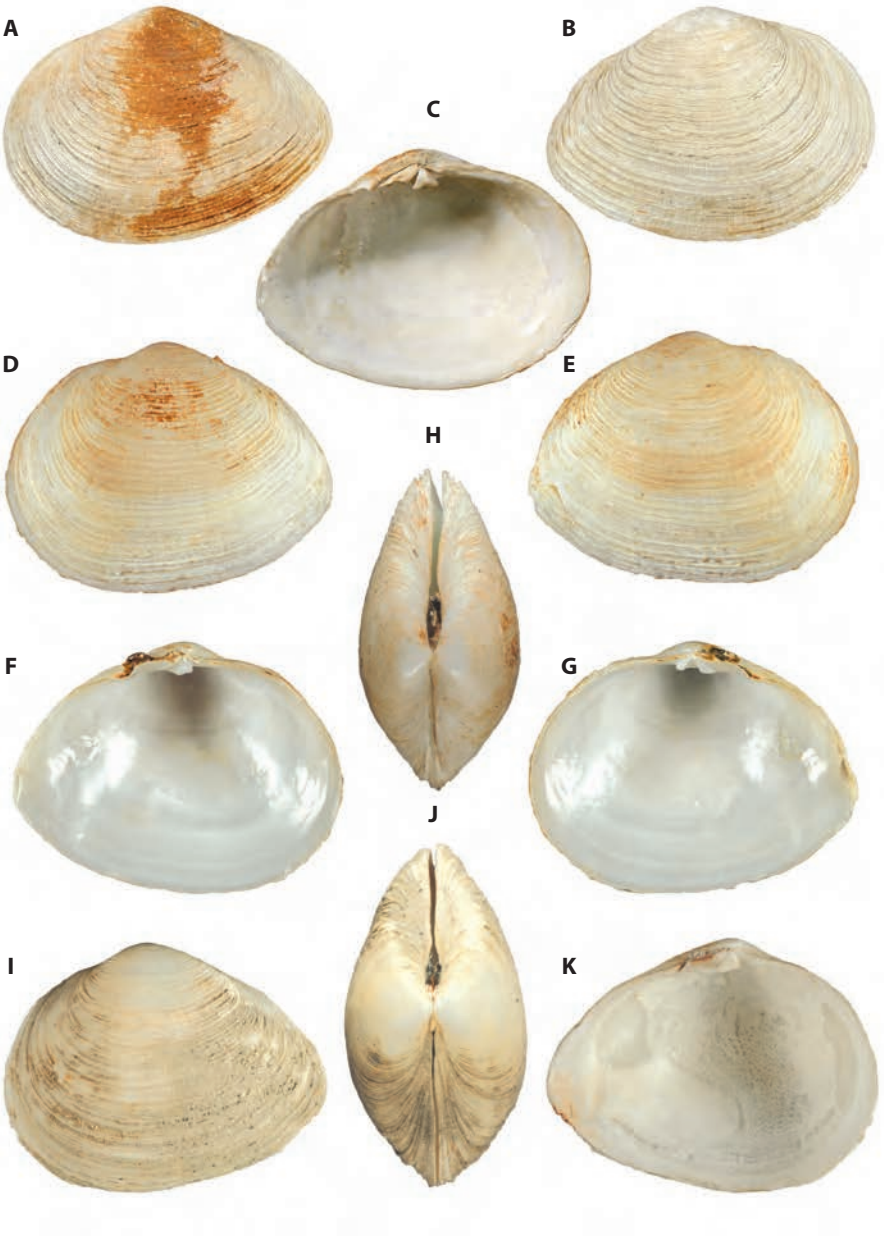
Shell small, up to 22 mm long, variable in shape, suboval, thin but solid, inflated. Anterior margin broadly rounded, posterior part somewhat tapering but with rather convex postero-dorsal and postero-ventral margin. Posterior margin narrowly rounded, posterior end not bent. Beaks on or just anterior to the vertical midline. Small, well-defined lunule, escutcheon short and very narrow, sharply delimited, ligament short. Surface with fine, densely spaced irregular commarginal lamellae and very faint, irregular, radial striae, only visible under a lens (x 5-10). Posterior angle rounded and ill-defined. No depression anterior to the posterior angle. Periostracum greyish brown, dull and slightly wrinkled, persistent mostly on the marginal part of the valves. Outside and inside dull white.



Distribution. To date only known from Côte d'Ivoire (Abidjan region, Canyon du Trou sans Fond) and from one dredging station off the Mauritanian coast (19°N).

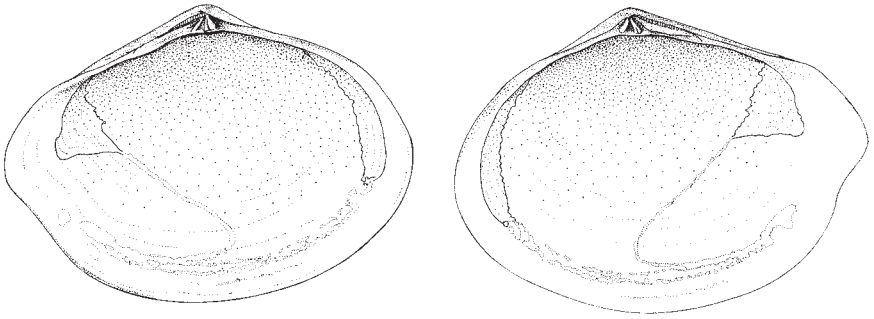
Biotope. In mud and perhaps also sandy mud, in deeper water mainly between 80 and 425 m, but occasionally also shallower, one fresh shell was dredged at 20 m. Not common.

Remarks. This species is distinguished from G. *matadoa* by its smaller, more oval and pure white shell with finer and much denser commarginal lamellae, well defined lunule and escutcheon, more centrally situated beaks and the lack of the shallow posterior radial depression which is typical for *G. matadoa*. *Gastrana orstomi* is common in the muddy bottom of the famous "Trou sans fond" (which means "bottomless hole"), a submarine canyon in the shelf of Côte d'Ivoire off Abidjan with a depth of over 300 m very close to the coast. Huber *et al*. (2015) questioned the validity of *G. orstomi* a separate species, however, they admit that DNA analysis would be necessary.



13.75. ***Gastrana orstomi*** **Cosel, 1995. A-C**, off Mhairett, Mauritania, 19.4°N, 16°50'W, 425 m (16.6 + 16.7 mm). **D-H**, Abidjan, Côte d'Ivoire, "Trou sans Fond" canyon, 175-270 m (holotype, 20.8 mm, photo Manuel Caballer/ Recolnat). **I-K**, same locality (paratype, 20.0 mm).

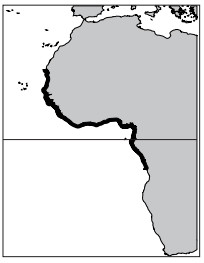
Rostrimacoma largillierti (Philippi, 1851)



13.76. W Rio Yomponi, Guinea, 10°24'N, 14°50'W, 22 m (53.0 mm).

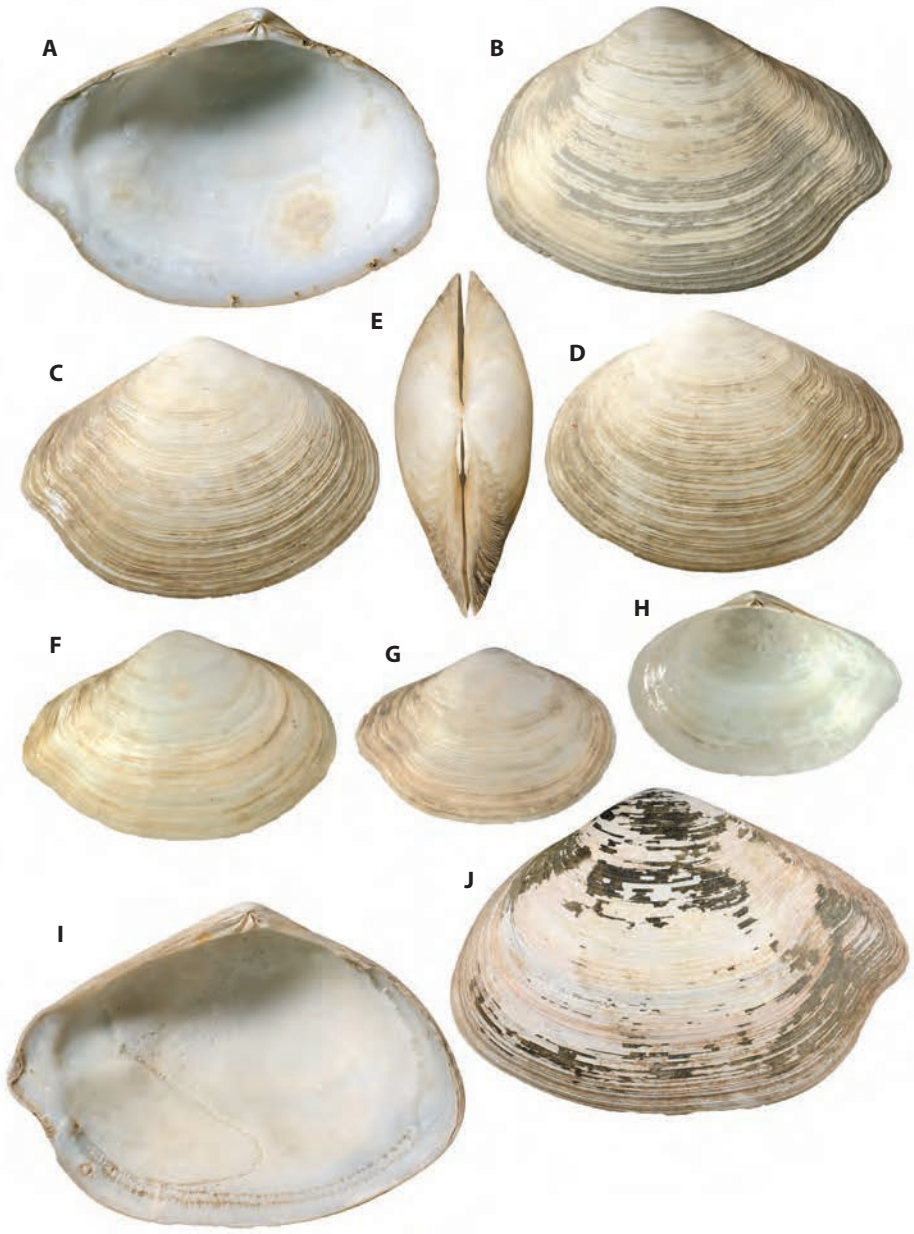
Shell up to 91 mm long, slightly variable in outline, broadly suboval, thin and rather fragile (except very large specimens), inflated. Anterior margin rather narrowly rounded, posterior part broad, with a deep sinuosity on the postero-ventral margin. Posterior end pointed, rounded-truncated, not twisted or bent, slightly gaping. Ventral margin gently convex. Beaks more or less in front of or nearly on the vertical midline. Escutcheon narrow, deep, with rounded edges, ligament rather short. Surface with fine, irregular, dense, commarginal lamellae and irregular growth lines, occasionally very faint radial striae on the postero-ventral part of the valve. Posterior angle rounded. Periostracum thin, light greyish brown, dull, on the posterior part of the valves wrinkled, in older specimens persistent only on the marginal part of the valves. Outside dirty white, inside white

Distribution. Mauritania (20°N) to northern Angola (Barra do Cuanza, Luanda).



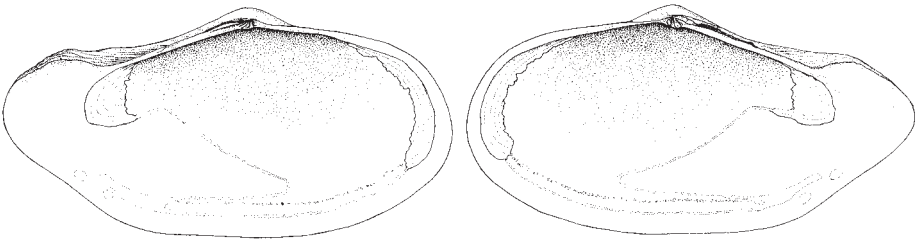
Biotope. Deeply buried in sandy mud and fine, quite muddy sand, in shallow water from about 3 to 20 m, occasionally deeper, to 70 m, not common everywhere.

Remarks. Live specimens are difficult to obtain due to the habitat of the species. Beached shells are occasionally found at some places. *Tellina ventricosa* Deshayes, 1855, *Tellina inflata* G.B. Sowerby II, 1867 (*non* Gmelin, 1791) and its replacement name *Tellina chudeaui* Dautzenberg, 1910 are synonyms, the latter one best known.



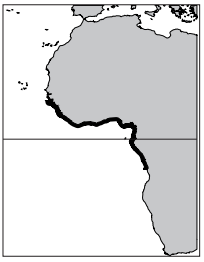
13.77. *Rostrimacoma largillierti* (Philippi, 1851). **A**-**B**, Golfe d'Arguin, Mauritania, 19°41'N, 16°59'W, 71 m, mud (68.4 mm. coll. Marum, Bremen). **C**-**E**, W Rio Yomponi, Guinea, 10°24'N, 14°50'W, 22 m (52.7 mm). **F**, W Ile Kakossa, Guinea, 9°25'N, 13°39'W, 12 m (49.5 mm). **G**-**H**, same locality (41.5 mm). **I**-**J**, Abidjan region, Côte d'Ivoire (91.3 mm).

Rostrimacoma cancellata (G.B. Sowerby II, 1873)



13.78. Canal de Jeta, Guinea-Bissau, 11°67.5'N, 16°2'W, 7 m (136.3 mm).

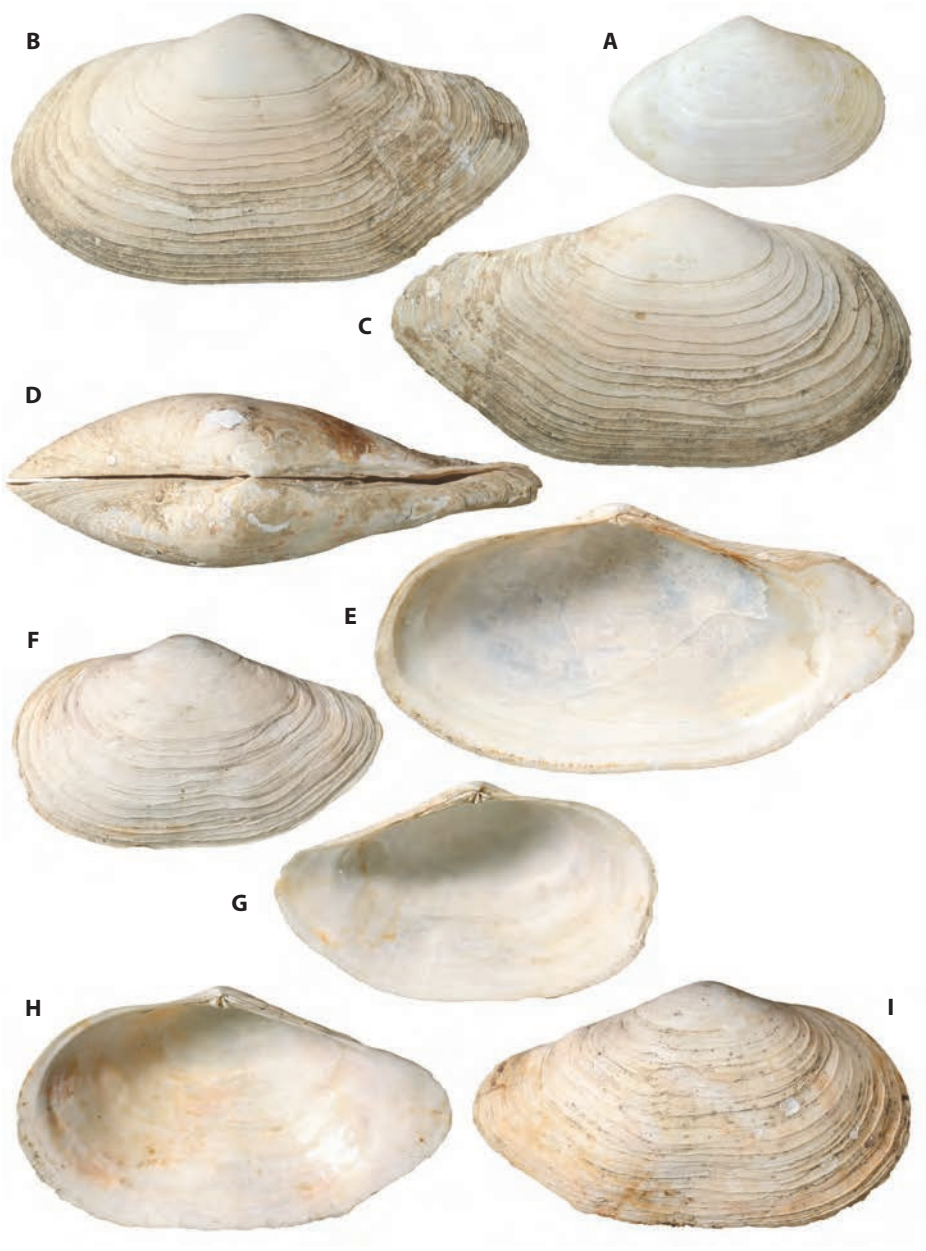
Shell very large, 80-155 mm long, somewhat variable in shape, oblong, thin and brittle, large specimens, however, may become rather solid, moderately inflated. Anterior margin well rounded, posterior part tapering, posterior end rostrate, weakly pointing upwards, twisted and slightly gaping. Ventral margin in its central part nearly straight or slightly concave. Beaks just anterior to the vertical midline. Escutcheon long, narrow and deep, ligament rather long. Surface with irregular growth lines and fine, very irregular, commarginal lamellae which can be wavy and which are not always following the growth lines. There are also fine, irregular, radial striae, mostly on the ventral half of the valves. Umbonal area with growth lines only. Periostracum rather thin but not translucent, brownish, persistent on the marginal parts of the valves only, usually entirely eroded on beached shells. Outside and inside dirty yellowish white.



Distribution. Senegal (Casamance: Kafountine) to northern Angola (Barra do Cuanza, Luanda). Huber *et al*. (2015) found it common on the coast of Ghana, while several shells and valves were collected on the "Grand Plateau de Géba", a vast area with soft mud off Guinea-Bissau.

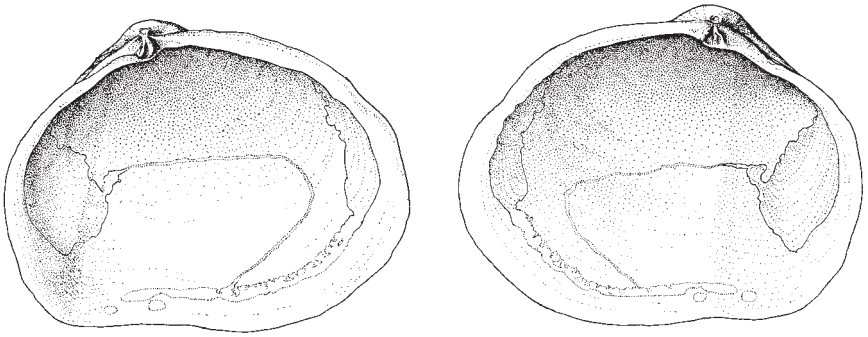
Biotope. Deeply buried in soft mud or very muddy sand, in shallow water from about 2 to 10 m, not common.

Remarks. Due to its mode of life, live-taken specimens of this peculiar species are extremely difficult to obtain; fresh valves and shells are occasionally taken in trawls; most beached shells are worn. The species, which is the type species of the genus *Rostrimacoma*, was for a long time erroneously treated as *Panopea cancellata,* its correct systematic position was first recognized by Tomlin (1930). *Tellina wroblewskyi* Bock, 1878 is a synonym. This is the largest known living tellinid and is comparatively close to *Gastrana* (*fide* Huber *et al*. 2015).



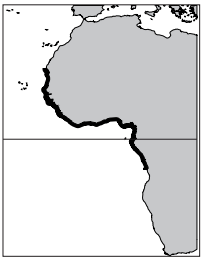
13.79. *Rostrimacoma cancellata* (G.B. Sowerby II, 1873). **A**, Cap Skirring, Casamance, Senegal, 3-5 m (22.5 mm). **B**-**C**, Canal de Jeta, Guinea-Bissau, 11°67.5'N, 16°2'W, 7 m (151 mm). **D**-**E**, same locality (141 mm). **F**-**G**, Cap Esterias, Gabon, tidal flat, (68.3 mm). **H**-**I**, same locality (80.6 mm).

Leporimetis papyracea (Gmelin, 1791)



13.80. Baie de Hann, Dakar, Senegal, 10-20 m (66 mm).

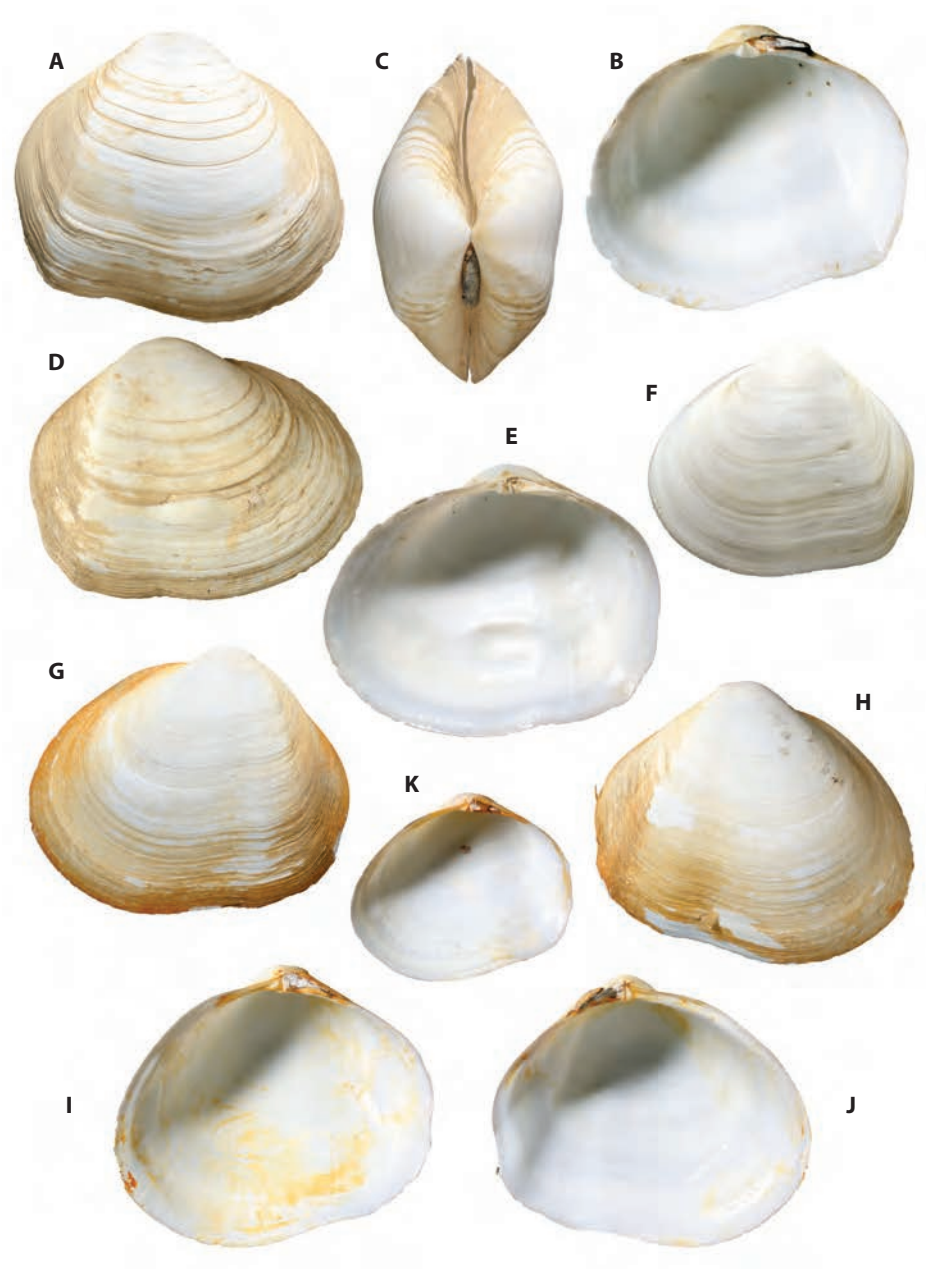
Shell up to 83 mm long, variable in shape, suboval-rectangular, inflated, thin and fragile as juveniles, becoming more solid when fully grown. Anterior margin broadly rounded, posterior margin broadly rounded-truncated, posterior part strongly twisted to the right. Antero-dorsal margin convex, postero-ventral margin more or less concave. Beaks just behind the vertical midline. Escutcheon narrow and ill-defined, ligament short. Surface uneven, with numerous irregular commarginal growth lines and coarser growth stages. There are also very fine, faint radial striae, generally visible only under a lens (x 5-10). Posterior angle rounded and prominent on the right valve, broadly rounded on the left valve. Postero-dorsal angle on the right valve with one shallow radial depression, on the left valve with two very shallow depressions. Right valve with a broad radial depression going from the beaks to the sinuosity on the ventral margin. Periostracum pale greyish brown, dull and slightly wrinkled, persistent on the postero-dorsal and marginal area only. Outside and inside dirty white.



Distribution. Mauritania (Cap Blanc) to northern Angola (Palmeirinhas, Luanda).

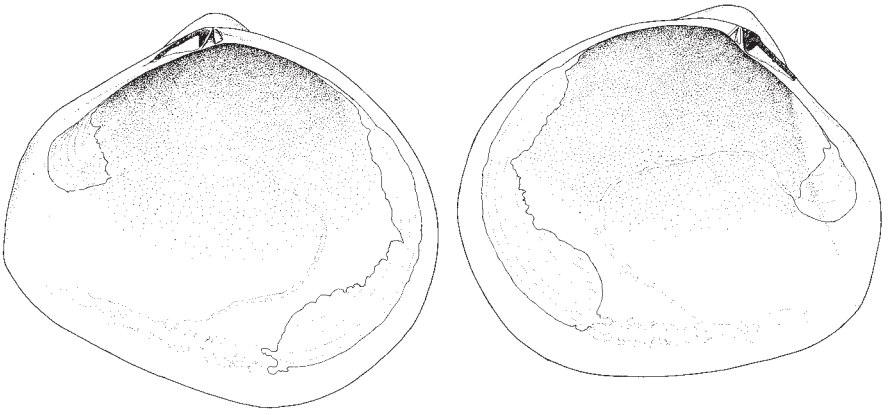
Biotope. In fine and mixed sand as well as in gravel, also with calcareous algae, from about 3 to 20 m, not common everywhere.

Remarks. This species was commonly known as *Apolymetis* or *Capsa lacunosa* (Dillwyn, 1817), which is a synonym. Beached shells are not common and mostly broken or worn. This is the type species of *Pilsbrymetis* Afshar, 1969. A similar species is found in the Pleistocene of the Red Sea (Erythrea), it is probably unnamed (see Nardini 1937: 269, pl. 18, fig. 18).



13.81. *Leporimetis papyracea* (Gmelin, 1791). **A**-**C**, Baie de Hann, Dakar, Senegal, 10-20 m (58.5 mm). **D**-**E**, off Guinea, 10°27'N, 15°43.5'W, 20 m (47.0 mm). **F**, W Barre Dangara, Guinea, 10°07' N, 14°42' W, 18 m (43.0 mm). **G**-**J**, Punta do Mussulo, Luanda prov., N-Angola, beach drift (65.7 mm). **K**, same locality (46.3 mm).

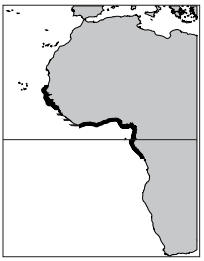
Leporimetis elouardi (Rosso, 1976)



13.82. Senegal (53.1 mm).

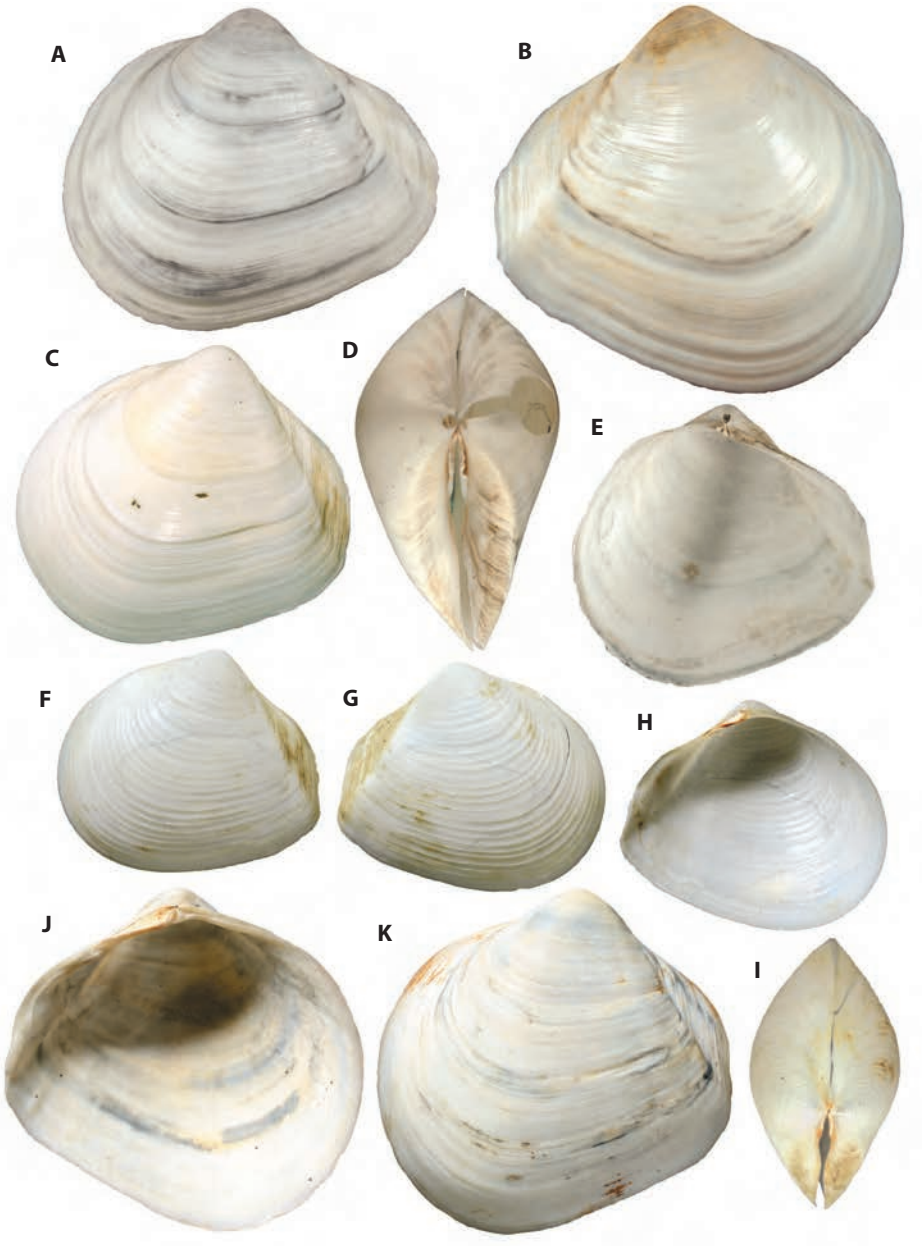
Shell up to 78 mm long, variable in shape, oval-subtriangular, anteriorly inflated, rather thin and brittle. Anterior margin broadly rounded, posterior part tapering, posterior end pointed and strongly bent to the right, posterior margin slightly angulate. Antero-dorsal margin convex, postero-ventral margin straight or with a very faint sinuosity. Beaks just anterior to, on or just behind the vertical midline. Escutcheon very narrow and ill-defined, ligament rather short. Surface on the first umbonal 10-13 mm with fine, irregular, commarginal waves which then disappear, leaving only commarginal growth lines and coarser growth stages on the rest of the valves. There are also very fine, faint radial striae, only visible under a lens (x 5-10) except on the postero-dorsal area where they are slightly coarser. Posterior angle on the left valve low, on the right valve prominent and keeled. Periostracum dull, thin and nearly colourless, persistent mostly only on the postero-dorsal area. Outside and inside dirty white.

Distribution. Senegal (Grande Côte, St. Louis) to Guinea (Iles de Los); Côte d'Ivoire; Cameroon; Congo Brazzaville (Pointe-Noire).



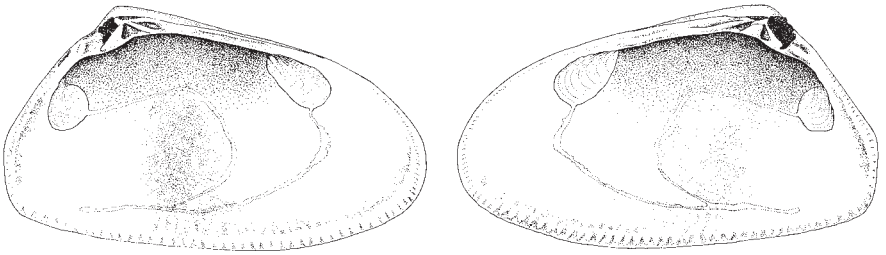
Biotope. In fine, muddy sand, from shallow water (3-5 m) to about 20 m, rare.

Remarks. This little-known species remained undescribed until recently, although a few specimens were encountered in old collections. To our knowledge it has not yet been obtained alive, also fresh shells are extremely rare; valves and fragments are occasionally washed ashore. The most similar species are from the Western hemisphere.



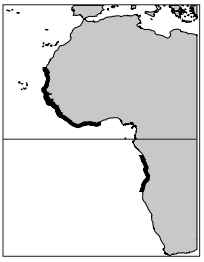
13.83. *Leporimetis elouardi* (Rosso, 1976). **A**, Saint-Louis, Senegal, Langue de Barbarie (paratype, 57.5 mm, photo Manuel Caballer/Recolnat). **B**, same locality (holotype, 69.5 mm). **C-D**, Senegal (55.1 mm), old coll. MNHN. **E**, W Ile Kakossa, Guinea, 9°25'N, 13°39'W, 12 m (48.1 mm). **F-I**, W of Rio Morébaya, Guinea, 9°24'N, 13°38'W, 12 m (16.8 mm). **J-K**, off Côte d'Ivoire (64.8 mm).

Donax (*Donax*) *rugosus rugosus* Linnaeus, 1758



13.84. Nouakchott, Mauritania, on beach (29.6 mm).

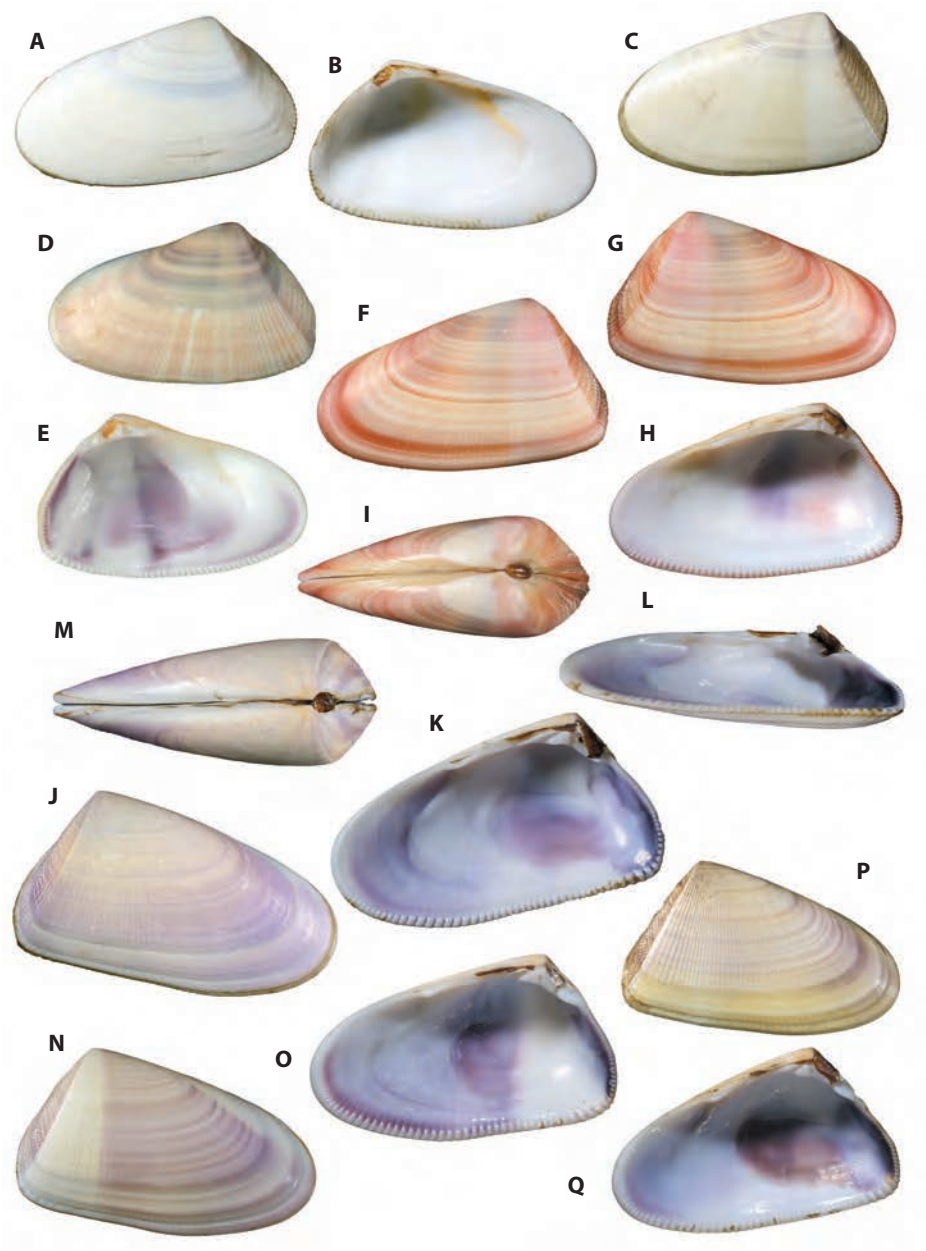
Shell up to 45 mm long, wedge-shaped, thick and solid, somewhat inflated. Anterior margin rounded, ventral margin slightly convex, in its posterior part more or less straight. Posterior margin in its upper part straight, in its lower part convex. Beaks in the posterior third. No lunule and escutcheon. Surface with very faint radial striae, posterior area with dense, irregular commarginal wrinkles, crossed by fine radial ridges, forming dense granulations. Posterior angle rather sharp, more marginally slightly rounded. Periostracum light brown to olive, persistent mostly on the marginal part of the posterior area only. Interior of ventral and posterior margin strongly denticulate. Ligament thick and strong, on a deeply sunken nymph in a pit, not passing over the shell surface. Posterior cardinal merged with nymphal plate. Outside colour very variable, whitish to yellowish, often with more or less broad violet rays, or brownish-, orange- or reddish-violet, with darker growth bands. Inside white, often with yellow, orange, pink or violet rays or zones.



Distribution. Mauritania (S of Baie d'Arguin) to Ghana (Takoradi); northern Angola (Cacuaco) to southern Angola (Baia dos Tigres).

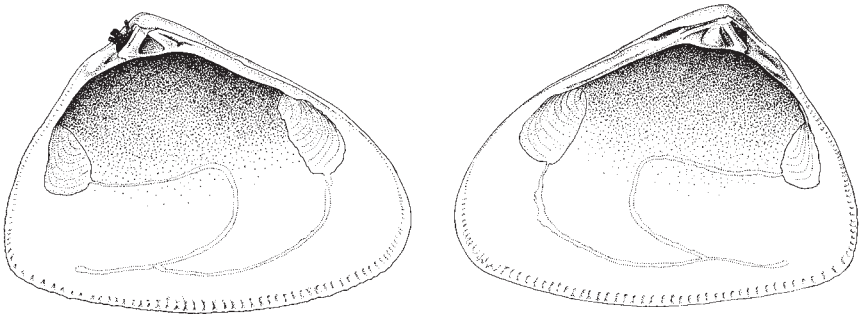
Biotope. In mixed and coarse sand in the surf zone of open beaches, locally abundant.

Remarks. This species is very variable in size, depending on the region, the nominate subspecies has a disjunct distribution with a gap between Nigeria and the Congo, where it is replaced by the subspecies *D. rugosus interruptus* (see next entry). *D. rugosus* is fished and consumed in several countries, in Dakar as "cébette", in Angola as "quiteta". On some beaches, valves of this species form a major component of the drift line. *D. rugosus* is type species of the genus *Donax*. This is "Le Pamet" of Adanson.



13.85. *Donax (Donax) rugosus rugosus* Linnaeus, 1758. **A**-**B**, Nouakchott, Mauritanie, Grande Plage, beach drift (31.0 mm). **C**, same locality (29.8 mm). **D**-**E**, Lomé, Togo (19.3 mm). **F**-**I**, Assinie, Côte d'Ivoire, old coll. MNHN (29.0 mm). **J**-**M**, Cabo Ledo - São Bras, Bengo prov., N- Angola, beach drift (48.8 mm. ventral inside view showing deeply sunken ligament pit). **N**-**O**, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (44.8 mm). **P**-**Q**, same locality (40.6 mm).

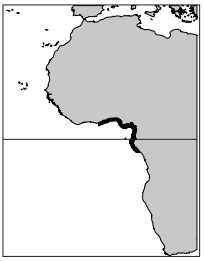
Donax (*Donax*) *rugosus interruptus* Deshayes, 1855



13.86. Morton Bay, Victoria/Limbe, Cameroon, on beach (22.5 mm).

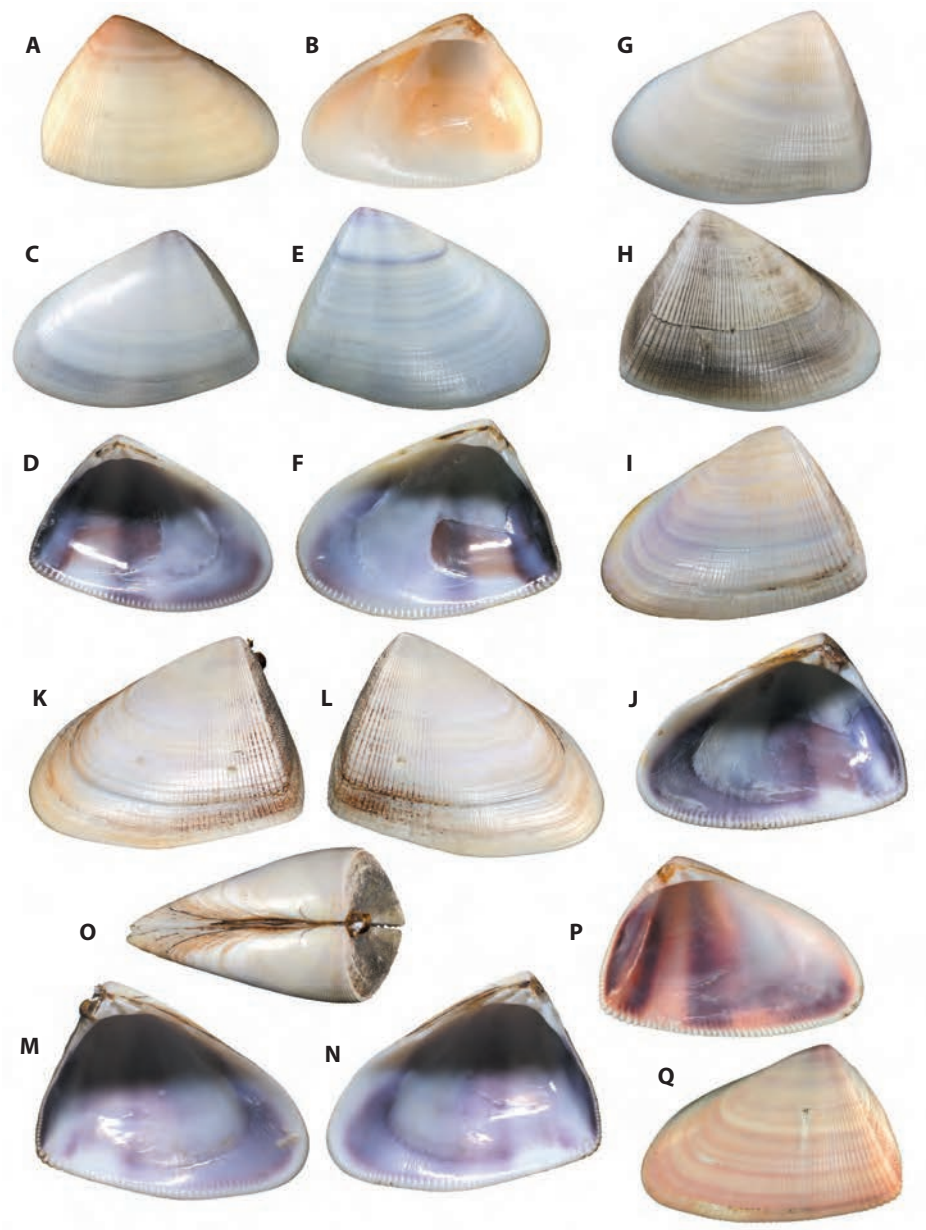
Shell up to 35 mm long, rather short, wedge-shaped, thick and solid, inflated. Anterior margin more or less narrowly rounded, ventral margin gently convex. Posterior margin very slightly convex. Beaks in the posterior third. No lunule and escutcheon. Surface with very faint radial striae, posterior area with fine, dense radial ribs, crossed by very fine, dense, irregular, commarginal wrinkles, forming small granules and pits. Posterior angle sharp. Periostracum pale brownish, persistent only along or on the anterior and posterior margin, if at all. Outside whitish, pale yellowish, more or less pale violet or light pinkish, often with darker growth zones and occasionally with violet rays. Inside white, violet or pale pink. Ligament on a sunken nymph in a pit.

Distribution. Ghana (Takoradi region) to Congo Brazzaville (Pointe-Noire).



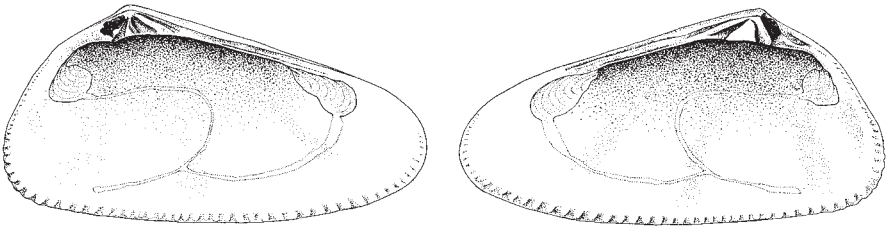
Biotope. In fine, mixed and coarse sand, in the surf zone and in shallow water to about 3 m, on open coasts, but also in sheltered bays, locally common.

Remarks. This form is treated here as a geographical subspecies of *D.* (*D.*) *rugosus*, as in Nicklès' classic guide. It is distinguished from *D.* (*D.*) *r. rugosus* by its shorter, higher and slightly more inflated valves, the somewhat sharper posterior angle, the abrupt and nearly straight postero-dorsal margin and the much finer sculpture on the posterior area. This form replaces *D.* (*D.*) *r. rugosus* between Nigeria and the Congo. In Ghana, and northern Angola (Cacuaco), both have been found either sympatric and with intermediate forms or only *D. rugosus* with intermediates. Only DNA analysis would finally fix the status of this taxon.



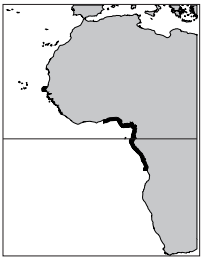
13.87. *Donax (Donax) rugosus interruptus* Deshayes, 1855. **A**-**B**, Lagos, Nigeria (16.5 mm). **C**-**D**, Morton Bay, Victoria (now Limbe), Cameroon, beach drift (25.2 mm). **E**-**F**, same locality (26.8 mm). **G**, Pointe du Phare, Port-Gentil, Gabon, 0°38'S, 8°42.1'E, beach drift (27.1 mm). **H**, same locality (26.7 mm). **I**-**J**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (27.8 mm). **K**-**O**, same locality (28.0 mm). **P**-**Q**, Cacuaco, Bengo prov., N-Angola, sand, low tide (18.0 mm).

Donax (*Donax*) *pulchellus* Hanley, 1843



13.88. Near Accra, Ghana, on beach (9.9 mm).

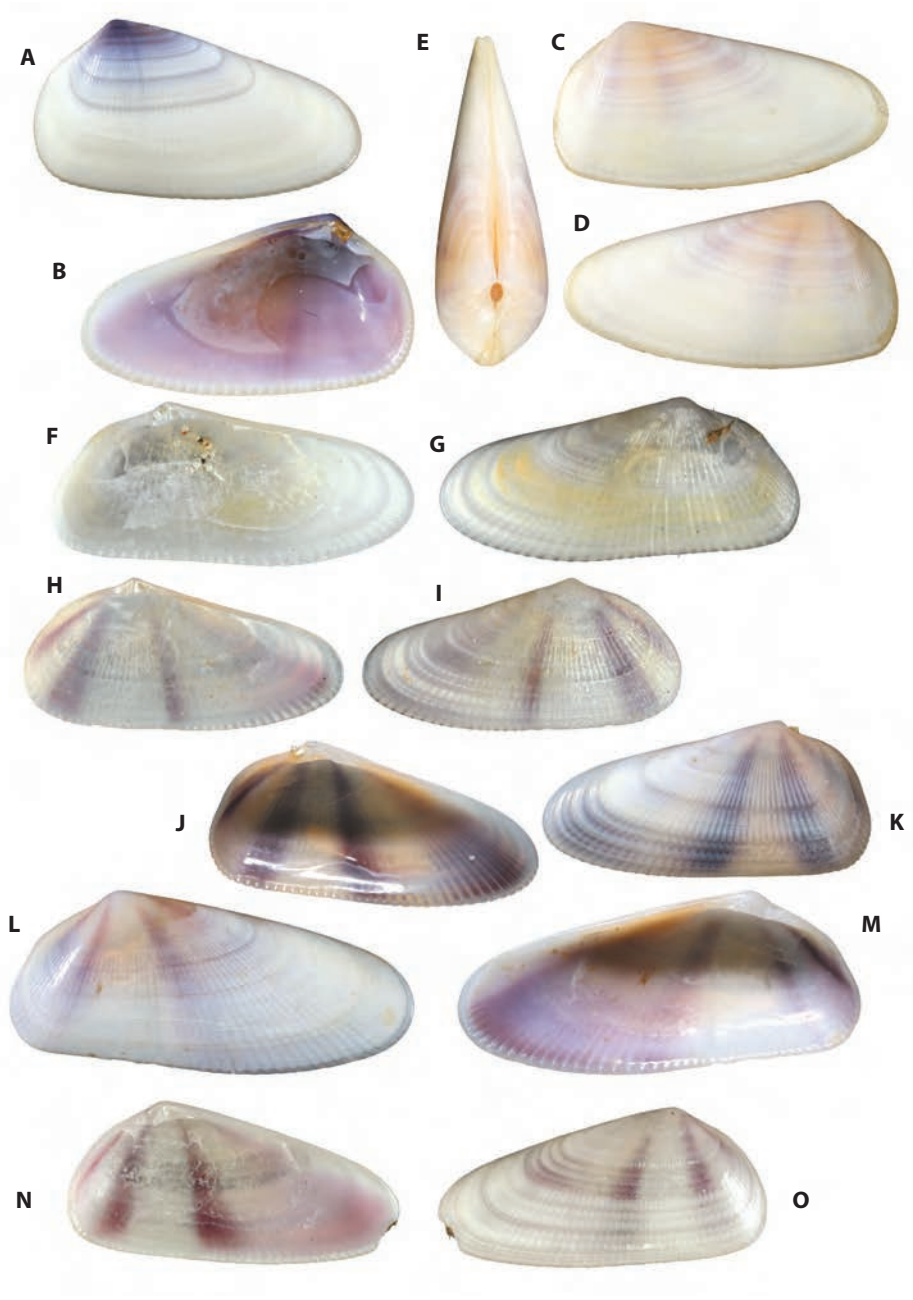
Shell up to 18 mm long, quite variable in shape and colour, elongate-wedge-shaped, rather solid, inflated. Anterior margin rather narrowly rounded, ventral margin anteriorly slightly convex, more posteriorly straight or even sligtly concave. Posterior margin rounded-truncated. Beaks within the last third of the valves. Lunule long, very narrow and ill-defined, no escutcheon. Surface with fine, regular, radial striae and faint growth lines; no difference between the posterior area and the rest of the shell. Posterior angle rounded. Periostracum light straw-coloured, usually absent, in few specimens persistent on the very marginal parts only. Interior of ventral and posterior margin with strong denticulations, coarser on the anterior part, becoming finer towards posterior and especially on the posterior margin. Ligament on a deeply sunken nymph in a pit and not passing beyond the shell surface. Outside colour very variable, mostly whitish to yellowish or pale violet, often with yellow, orange, brownish, reddish or even dark blue umbonal zone (mostly northern specimens) or with two narrow violet rays going from the beaks to the ventral margin below and slightly diverging (predominantly southern specimens). Inside whitish to violet or violet with orange, with outside markings more intense.



Distribution. Senegal (north coast of Cap Vert Peninsula); Côte d'Ivoire (eastern part), Ghana (Takoradi) to northern Angola (Luanda). Not yet recorded in the northern tropical zone between Senegal (Petite Côte) and western Côte d'Ivoire.

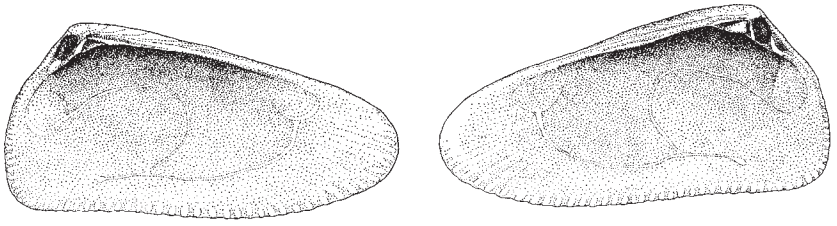
Biotope. In fine to mixed sand, from low water mark to about 1 m, locally not uncommon.

Remarks. This very variable species is also known as *D. spiculum* Reeve, 1854; under this name specimens from Senegal collected by R. Sourie were separated by Fischer-Piette (1957) from the more southern specimens, pointing out the longer posterior part, the more rounded anterior margin, the longer pallial sinus, the ventral margin concave in its posterior part and the more fragile shell of *D. pulchellus*. However, *D. spiculum* is a similar looking Indian Ocean species that is slightly shorter and grows somewhat larger (*fide* Huber 2010). Empty shells and valves are occasionally found on beaches.



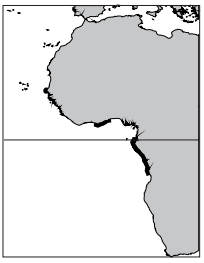
13.89. ***Donax (Donax) pulchellus*** **Hanley, 1843. A-B**, N-side of Cap Vert Peninsula, Dakar, Senegal (rv, 10.7 mm), leg. Sourie 1956. **C-E**, same locality (12.1 mm). **F-G**, Assinie - Mafia, eastern Côte d'Ivoire, beach drift (lv, 12.2 mm). **H-I**, Lagos, Nigeria, lagoon (8.6 mm). **J-K**, Pointe Odene, Port-Gentil, Gabon, 0°37.3'S, 8°43.2'E, clean sand (10.8 mm). **L-M**, Pointe-Noire, Congo Brazzaville, Plage Sauvage (14.5 mm). **N-O**, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (11.0 mm).

Donax (*Donax*) *pusillus* Philippi, 1849



13.90. Pointe-Noire, Congo Brazzaville, Plage Raffinerie, 0-2 m (12.0 mm).

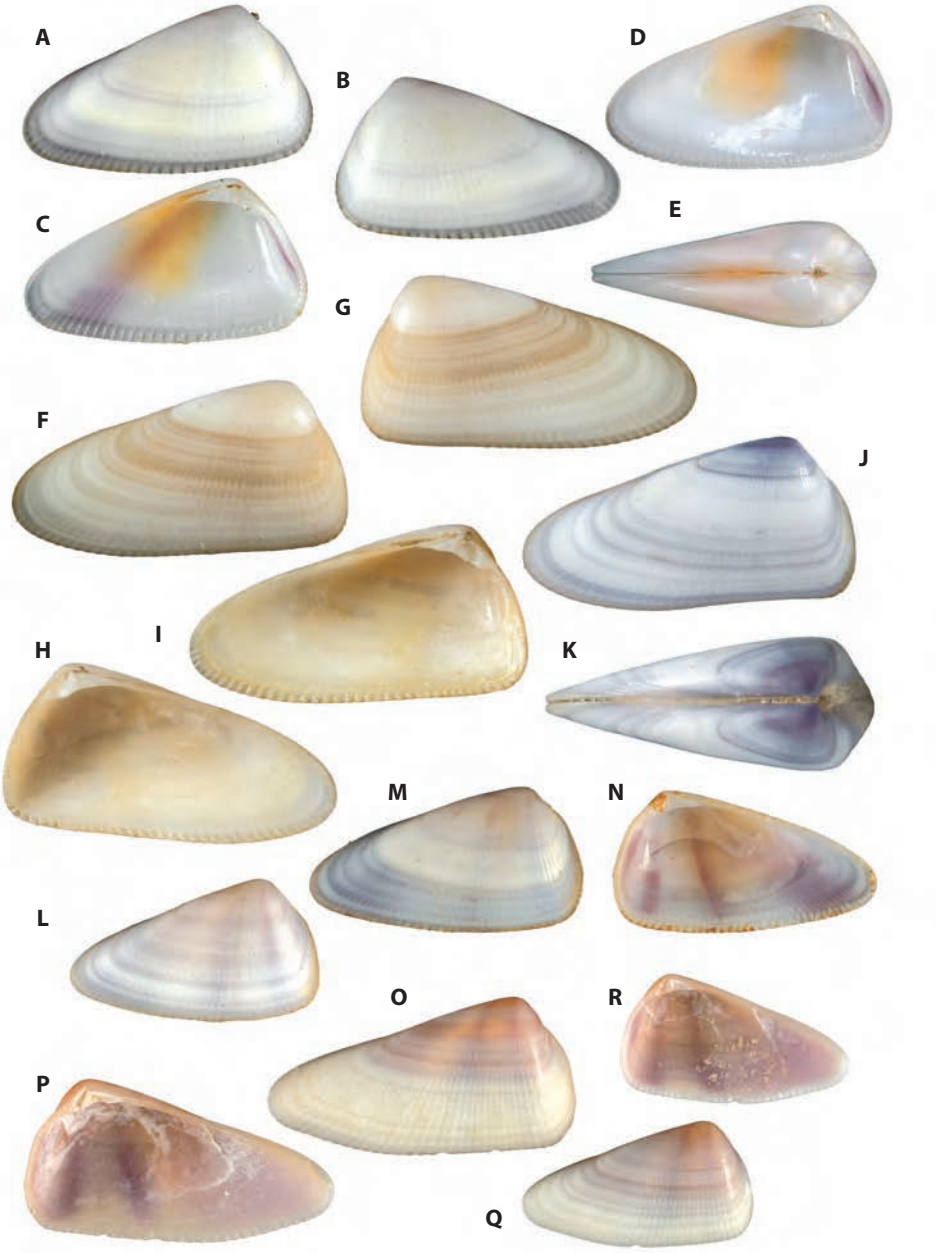
Shell up to 13 mm long, somewhat variable in shape, more in colour, wedge-shaped, rather solid, posteriorly very inflated. Anterior margin narrowly rounded, ventral margin anteriorly slightly convex, more posteriorly straight or, in fully grown specimens, occasionally very slightly concave. Posterior part very short, posterior margin well truncated and only slightly convex. Beaks within the last fourth to sixth of the valves. Lunule long, very narrow and ill-defined, no escutcheon. Surface with fine, regular, radial striae and faint growth lines; no difference between the posterior area and the rest of the shell. Posterior angle rounded. Periostracum light straw-coloured, usually absent, often persistent on the very marginal parts only. Interior of ventral and posterior margin with strong denticulations, broader along the ventral margin, becoming narrower on the posterior margin. Ligament very short, on a deeply sunken nymph in a pit and not passing beyond the shell surface. Outside colour very variable, mostly whitish to yellowish or pale violet, often with yellow, orange, brownish, reddish or even dark blue umbonal zone or with two narrow and often ill-defined violet rays going from the beaks to the ventral margin below and slightly diverging. Occasionally also commarginal pale violet bands following groth lines. Inside whitish to violet or violet with yellowish or orange, with outside markings more intense.



Distribution. Senegal (*fide* Huber 2010); Côte d'Ivoire (eastern part) to Ghana (Takoradi), Gabon to northern Angola (Luanda). Not yet recorded in the northern tropical zone between Senegal and western Côte d'Ivoire and from Cameroon.

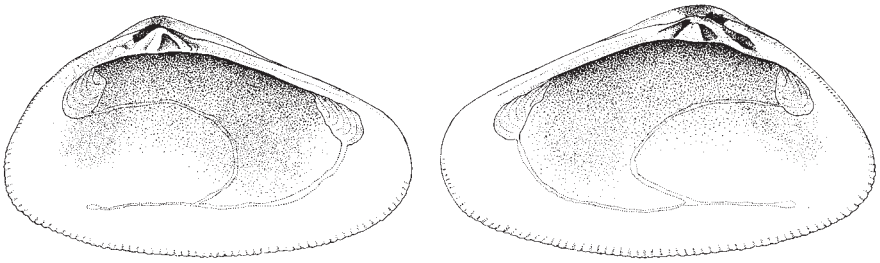
Biotope. In fine, mixed and more coarse sand, at low water mark and just below, not common but can be locally abundant.

Remarks. This species is very close to *D. pulchellus* and in the past they were often united as one very variable species. However, *D. pusillus* is distinguished by its shorter and more wedge-shaped shell, its broad and extremely short posterior part and the even more narrowly rounded anterior margin. Both species are frequently found together (*e.g.* in Côte d'Ivoire and Congo Brazzaville) and their biotopes seem to be close.



13.91. *Donax (Donax) pusillus* Philippi, 1849. **A**-**C**, Assinie–Mafia, eastern Côte d'Ivoire, sandy beach W of river mouth, surf zone and beach drift (9.7 mm). **D**-**E**, same locality (10.0 mm). **F**-**I**, Pointe-Noire, Congo Brazzaville, Plage Raffinerie, 0-2 m (13.0 mm). **J**-**K**, same locality (12.0 mm). **L**, Pointe-Noire, Congo Brazzaville, Plage Raffinerie, beach drift (7.3 mm). **M**-**N**, same locality (8.0 mm). **O**-**P**, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (13.0 mm). **Q**-**R**, same locality (9.6 mm).

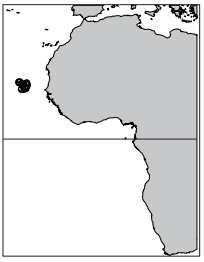
Donax (*Donax*) *verdensis* Cosel, 1995



13.92. Baia Mordeira, Ilha do Sal, Cape Verde Islands, on beach (10.9 mm).

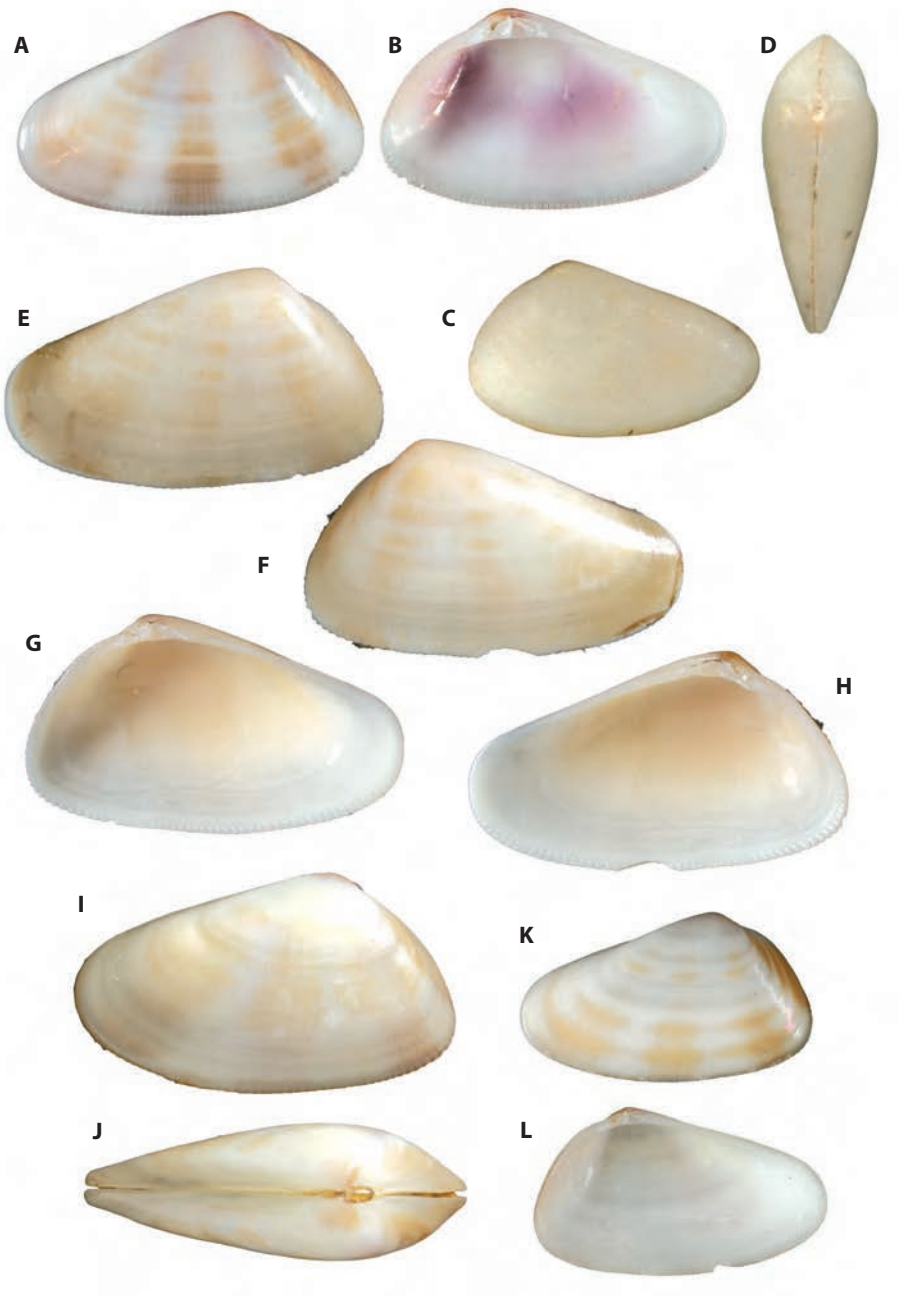
Shell up to 19 mm long, very variable in shape and size, wedge-shaped, thick and solid, rather inflated. Anterior margin more or less narrowly rounded, posterior margin narrowly rounded, postero-dorsal margin convex in its upper part, ventral margin weakly convex, posteriorly slightly raised. Beaks at the beginning or within the last third of the valves. Lunule long, narrow and ill- defined, no escutcheon. Surface with fine, regular radial striae and faint growth lines; no difference between the posterior area and the rest of the shell. Posterior angle rounded. Periostracum not seen in the studied specimens. Interior of ventral and posterior margin with fine, regular denticulations. Ligament on a moderately sunken nymph, slightly passing beyond shell surface. Outside colour variable, mostly whitish, pale yellow or pale bluish violet, frequently with three brownish radial rays, beaks occasionally dark bluish violet. Inside white, light yellow, pink or violet, with white on the very marginal part.

Distribution. Cape Verde Islands, endemic.



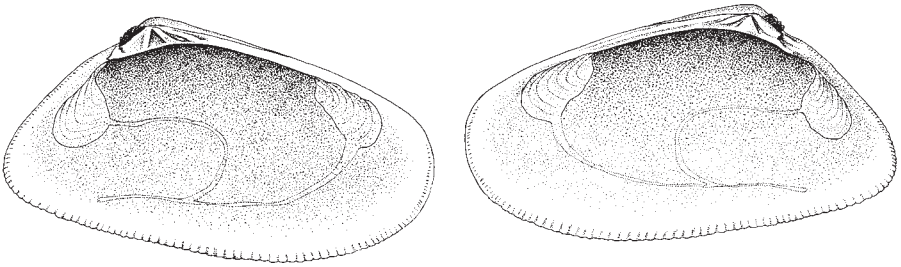
Biotope. Most probably in coarse sand in shallow water, not uncommon.

Remarks. This species is close to *D. pulchellus* from the continental shore and belongs to the same group. However, it is thicker, shorter and higher and has a longer posterior part than that species. Single valves are commonly washed ashore.



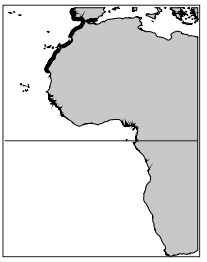
13.93. *Donax (Donax) verdensis* Cosel, 1995. **A**-**B**, Baia Mordeira, Ilha do Sal, SE-side, beach drift (holotype, 10.2 mm, photo Manuel Caballer/Recolnat). **C**-**D**, same locality (paratype, 7.2 mm). **E**-**F**, same locality (paratype, 14.2 mm). **G**-**H**, Santa Maria, Sal, Cape Verde Islands (10.8 mm, MNCN). **I**-**J**, Guindo do Minho, Sal, Cape Verde Islands (9.2 mm, MNCN). **K**-**L**, Near Mindelo, São Vicente (9.4 mm).

Donax (*Cuneus*) *vittatus* (da Costa, 1778)



13.94. Port Etienne (Nouadhibou), Mauritania (22.8 mm).

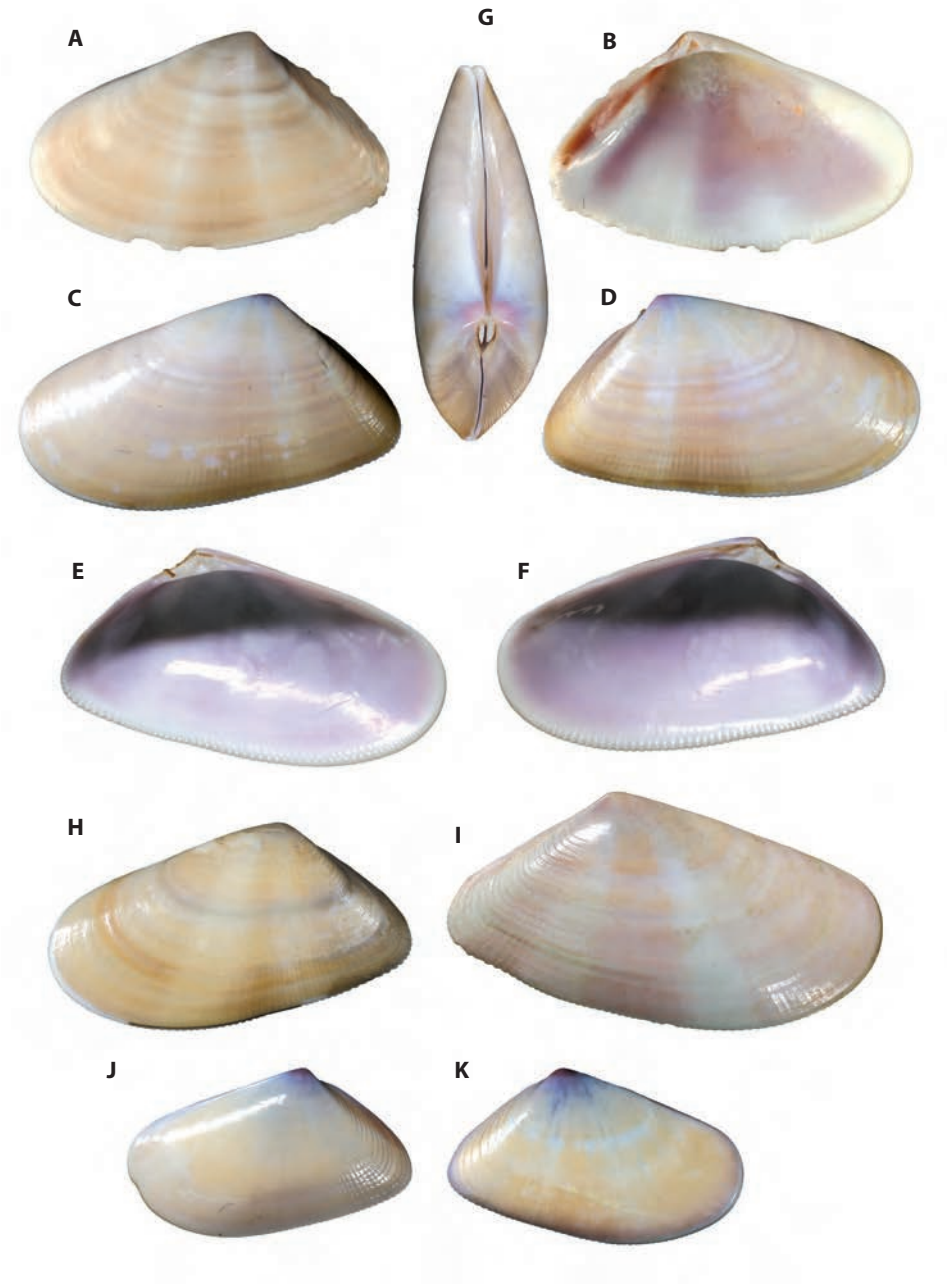
Shell up to 30 mm long (in Europe up to 46 mm), variable mostly in size and colouration, elongate-wedge-shaped, rather thick and solid, somewhat inflated. Anterior margin rounded, ventral margin slightly to gently convex. Posterior part tapering, posterior end pointed, posterior margin narrowly rounded. Beaks well behind the vertical midline, about at the end of the second third of the valves. Lunule long, narrow, ill-defined. Surface with commarginal growth lines, coarser growth stages and numerous, fine, evenly spaced radial striae, becoming obsolete towards anterior. There are also occasionally irregular commarginal grooves on the posterior area and the posterior angle, mostly in West African specimens reaching also over the posterior part and not always parallel to the growth lines. Posterior angle broad and rounded. Periostracum yellowish, greenish yellow or brownish, thin and glossy, occasionally eroded only on the very early part of the valves. Interior of ventral and posterior margin finely denticulate. Outside whitish, yellowish or brownish, often with broad brownish to yellowish rays or darker bands along the growth stages. Inside whitish to yellowish or more or less deep violet.



Distribution. Norway (58.5N) and Scotland, Ireland, North Sea, Channel southward to Mauritania (Cap Blanc), Alboran Sea but not further inside the Mediterranean; the limit in the extreme south-western part of the Mediterranean is unclear (*fide* Gofas *et al.* 2011).

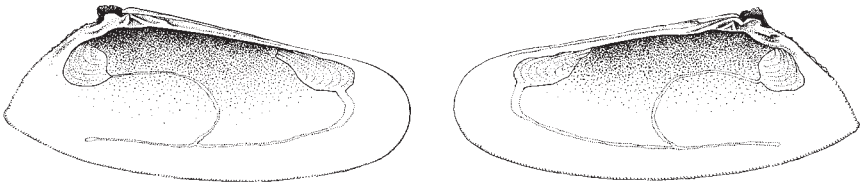
Biotope. In clean fine and mixed sand on open coasts, from low tide to about 20 m, abundant in Europe, becoming more uncommon in Mauritania.

Remarks. This is a northern-temperate species which can survive in the extreme northern part of tropical West Africa only due to the permanent cold upwelling in that region.



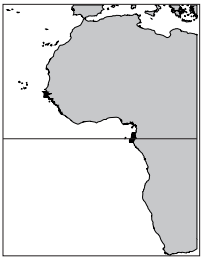
13.95. *Donax (Cuneus) vittatus* (da Costa, 1778). **A**-**B**, Cap Blanc, Mauritania, beach drift (14.2 mm). **C**-**G**, Baie de Cansado, Port-Etienne (now Nouadhibou), Mauritania (22.3 mm). **H**, same locality (24.2 mm). **I**, same locality (29.2 mm). **J**, same locality (14.2 mm). **K**, same locality (15.1 mm).

Donax (*Machaerodonax*) *acutangulus* Deshayes *in* Reeve, 1854



13.96. Senegal, MNHN old coll. (10 mm).

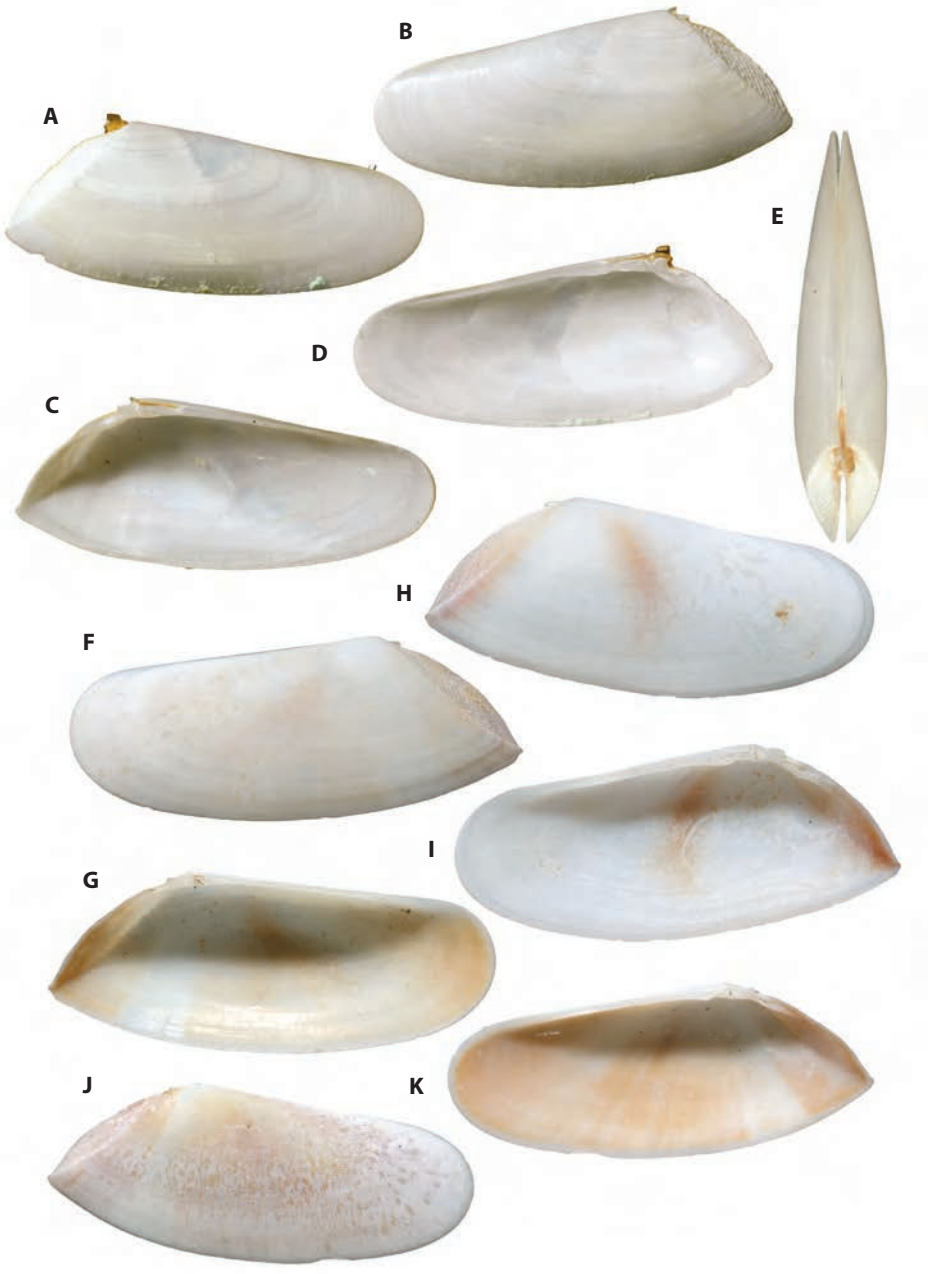
Shell up to 26 mm long, slightly variable in shape, oblong-knife-shaped and often slightly curved, rather thin, somewhat compressed, not much gaping anteriorly and posteriorly. Anterior margin broadly rounded, ventral margin strongly convex, antero-dorsal margin straight to weakly concave. Posterior margin somewhat curved, rather long; beaks at the beginning or within the last third of the valves. Long, narrow and ill-defined lunule, no escutcheon. Surface smooth, with fine, irregular growth lines and very faint, irregular radial striae, only visible under a lens (x 10-20). Posterior angle sharp and slightly protruding as a ridge over the posterior area. This latter with very fine radial ridges, crossed by regular, fine, prominent, commarginal lamellae. Periostracum very light greyish brown, usually absent, occasionally persistent just along the margins. Interior of ventral and posterior margin very finely denticulate, visible only under a lens (x 10-20). Outside cream-white, often with light brown on the anterior and posterior part, leaving an indistinct, more or less broad, white ray from the umbos to the ventral margin. Inside white, with same brownish markings as on the outside, but more intense.



Distribution. Senegal (the only "modern" record known to date is a single juvenile specimen from Ouaran, Petite Côte); possibly Gabon (type locality, doubtful, no "modern" record).

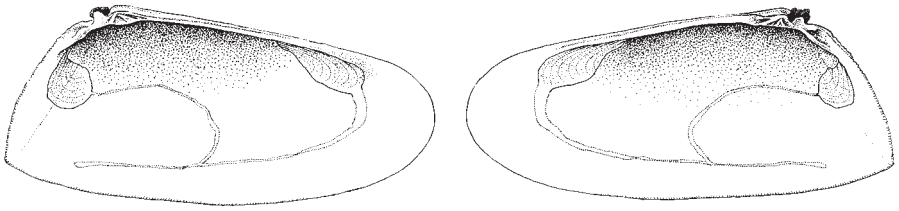
Biotope. In clean, fine sand, apparently in rather calm water, rare.

Remarks. With the above cited exception, all studied material of this "classical" form (including the holotype) comes from old museum collections; fresh and well localized fully grown specimens have not yet been available. The name was originally spelled *acutangula*, but the subsequent spelling *acutangulus* is in prevalent usage and is here retained.



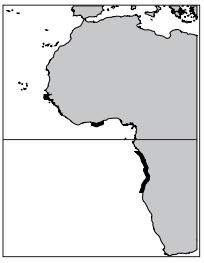
13.97. *Donax (Machaerodonax) acutangulus* Deshayes *in* Reeve, 1854. A-E, Ouaran, Petite Côte, Senegal, fine sand in shallow water (9.9 mm). F-G, Senegal, old coll. MNHN (17.8 mm). H-I, same locality (18.8 mm). J-K, same locality (18.6 mm).

Donax (*Machaerodonax*) *pseudacutangulus* Cosel & Gofas, 2018



13.98. Praia Santiago, Bengo, N-Angola, sand, 1-2 m (10.5 mm).

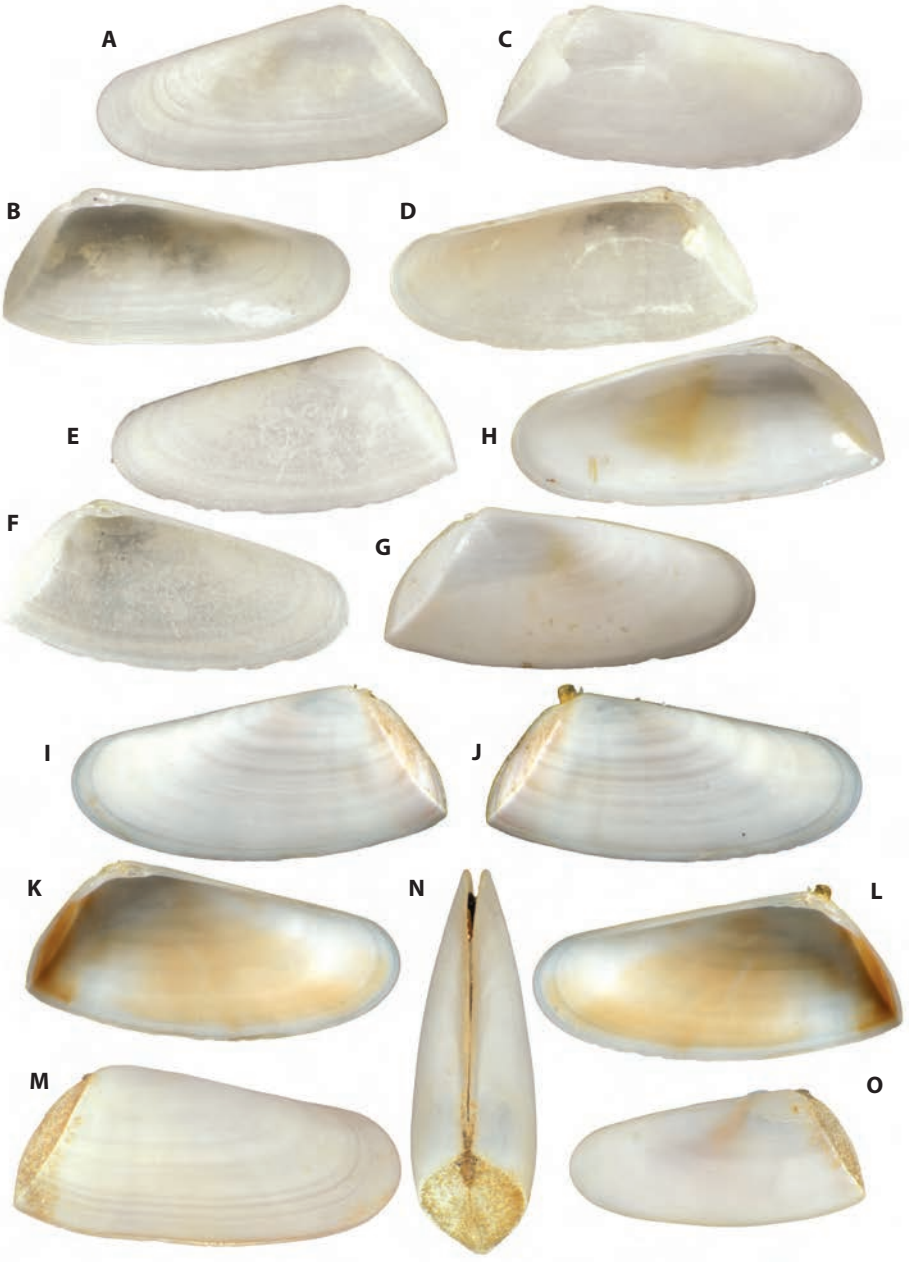
Shell small, up to 16 mm long, little variable in shape, elongate-wedge-shaped, thin but solid, rather inflated, hardly gaping anteriorly and posteriorly. Anterior margin well rounded, ventral margin slightly to gently convex, antero-dorsal margin straight and never markedly concave. Posterior part short, posterior margin rather steep, either arched in the upper part or more or less evenly convex. Ventral margins of the closed valves discordant: left valve very slightly overlapping the right valve. Beaks within the last third or at the beginning of the last fourth of the valves. Long, narrow and ill-defined lunule, no escutcheon. Surface smooth with fine, irregular growth lines and very faint, irregular radial striae, visible only under a lens (x 10-20). Posterior angle sharp and slightly protruding as a ridge over the posterior area. The latter with very fine radial ridges, crossed by regular, fine, prominent, commarginal lamellae. Periostracum very thin, glossy and transparent. Interior of ventral and posterior margin very finely denticulate, only visible under a lens (x 10-20). Valves white or often with colouration.



Distribution. Senegal (Cap Skirring, Casamance); Côte d'Ivoire (Grand Bassam); Congo Brazzaville (Pointe-Noire) to southern Angola (Moçâmedes, Namibe province). No records from the two tropical zones.

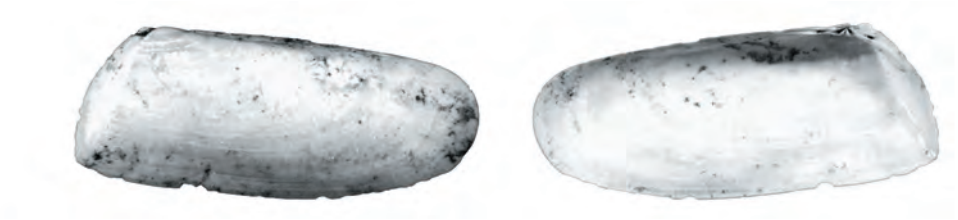
Biotope. In clean, fine sand. Most specimens were found in the transition zone between an open coast and a sheltered bay, from just below low water to about 5 m. Might be locally common, otherwise uncommon to rare.

Remarks. This species is distinguished from *D. acutangulus* by its considerably smaller size, the more tumid and more elongate shell which is tapering towards anterior, with a markedly shorter posterior part. From the Casamance record, which geographically is quite close to the only known precise locality (Ouaran, Petite Côte) of *D. acutangulus*, the existence of two separate species might be inferred. Huber (2010: 320) treats this species as *D.* (*M.*) *phariformis* Cosel, 1995, which, in fact, is another separate species (see following entry) which raises the number of *Donax* (*Machaerodonax*) in the eastern Atlantic to three species. There is so far no record of *D.* (*M.*) *pseudacutangulus* from Guinea-Bissau to Equatorial Guinea; this might indicate a distribution gap. Beached shells are extremely rare.



13.99. *Donax (Machaerodonax) pseudacutangulus* Cosel & Gofas, 2018. **A-B**, Cap Skirring, S. Casamance, beach drift (10.4 mm). **C-D**, same locality (9.9 mm). **E-F**, Baie de Pointe-Noire, Congo Brazzaville, 4°43.25'S, 11°49.07'E, 8-9 m (11.1 mm). **G-H**, Pointe-Noire, Congo Brazzaville, Plage Sauvage, beach drift (11.0 mm). **I-L**, Cacuaco, Foz de Bengo, Bengo prov., N-Angola, 0-2 m at river mouth (holotype, 12.5 mm). **M-N**, Chapeu Armado, Namibe prov., S-Angola, sand in surf zone (14.0 mm). **O**, same locality (10.7 mm).

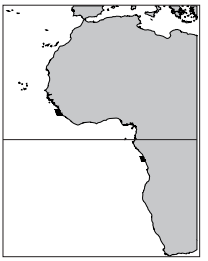
Donax (*Machaerodonax*) *phariformis* Cosel, 1995



13.100. W of Ile Tannah, Guinea, 9°12.5'N, 13°27'W, 3 m (13.0 mm).

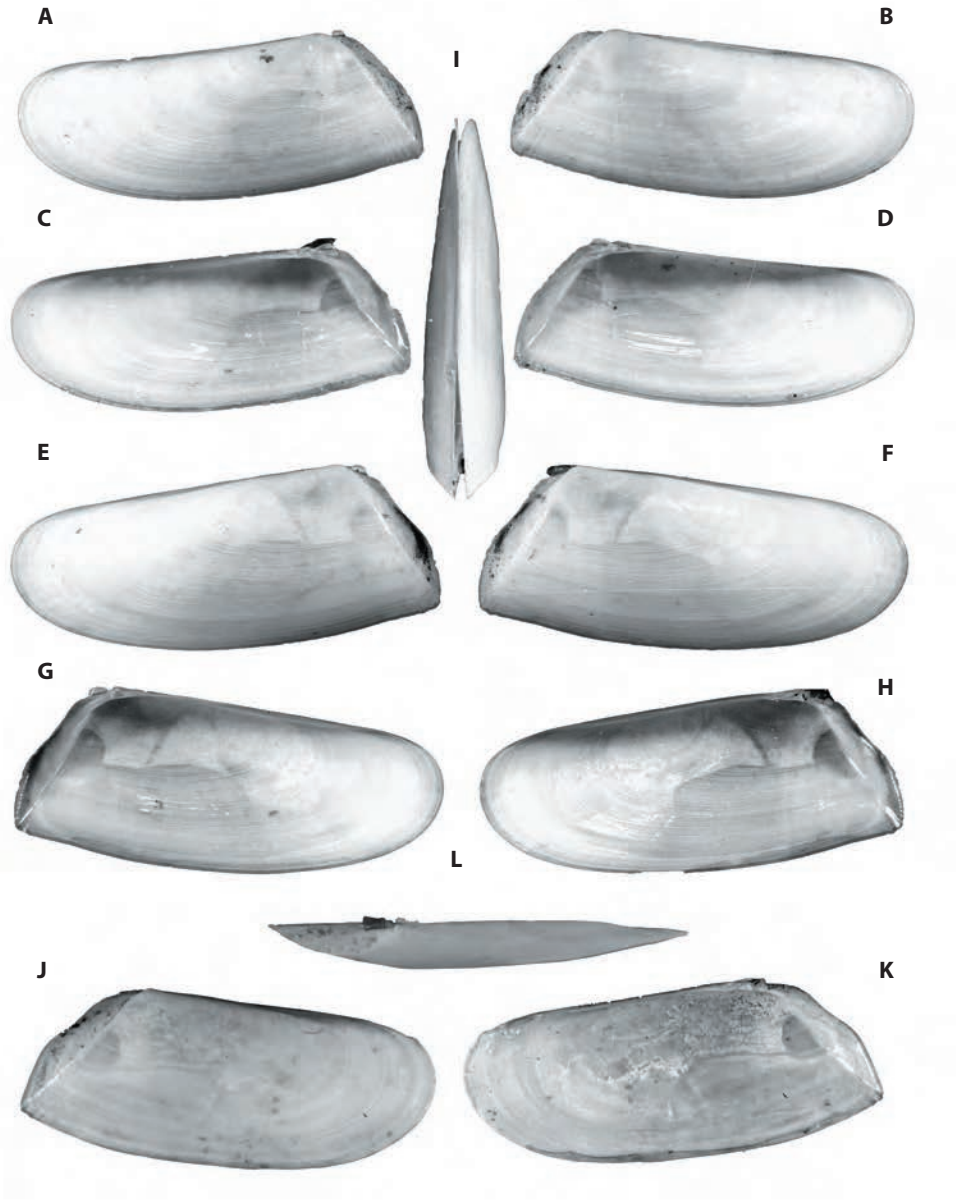
Shell small, up to 18 mm long, slightly variable in shape, elongate-knife-shaped, for a *Donax* very thin, light and fragile, somewhat translucent, compressed, well gaping anteriorly and posteriorly. Anterior margin evenly rounded, ventral margin gently convex, towards posterior less convex. Antero-dorsal margin straight to very slightly concave. Posterior margin arched in its middle part, often somewhat concave in its upper part. The ventral margin of the right valve seems very slightly overlap the left valve. Beaks situated at the beginning or within the last fourth of the valves. Lunule long, narrow and ill-defined, no escutcheon. Surface smooth, with fine, irregular growth lines and very faint, irregular radial striae, visible only under a lens (x 10-20). Posterior angle sharp. Posterior area with very fine, dense radial ridges, crossed by regular, fine, very close-set commarginal lamellae, resulting in a cancellate sculpture. Periostracum glossy and nearly transparent, only very pale greyish straw-coloured. Interior of anterior and posterior margin very finely denticulate, visible only under a lens (x 10-20); ventral margin appearing smooth. There are one or two weak but slightly broader and wider spaced denticles on the postero-ventral margin immediately in front of the postero-ventral corner; these denticles correspond to 1-3 on the outer surface not or hardly marked ribs parallel to the posterior angle. Ligament on a short but widely protruding nymphal plate which is as high or even higher than the beaks. Valves entirely white, the earlier part occasionally nearly transparent.

Distribution. Recorded only from Guinea (one empty valve dredged near the Sierra Leone border in a depth of 3 m) and from the mouth of the Congo River (Banana, type locality, several shells, see Cosel 1995).



Biotope. Unknown, but most probably in fine muddy sand in shallow water; the thin shells suggest that the species lives in calm water and perhaps also slightly reduced salinity. Very rare.

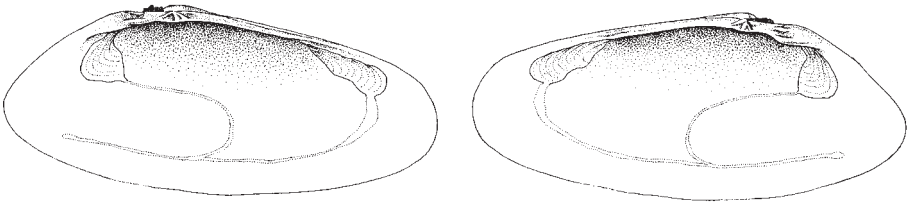
Remarks. This species is characterized by its valves which are thin-shelled like in small Pharidae; it is distinguished from *D.* (*M.*) *acutangulus* by its more elongate, knife-shaped shell without any anterior taper, the more backwards placed beaks, the much denser commarginal lamellae on the posterior slope, the more compressed valves and the entirely white colour. The ribs parallel to the posterior angle and the corresponding margin denticles are absent in *D.* (*M.*) *acutangulus*. *Donax* (*M.*) *pseudacutangulus* is smaller and considerably more tumid. There does not yet exist any record of *D.* (*M.*) *phariformis* from south of Guinea to



13.101. *Donax (Machaerodonax) phariformis* Cosel, 1995. A-D, Banana, Congo Kinshasa (holotype ANSP, 16.6 mm). E-H, same locality (paratype ANSP, 16.2 mm). I, same locality (ANSP, associated specimen, 14.7 mm). J-L, same locality (paratype MNHN, 17.8 mm).

the Congo, that may indicate a large distribution gap. Records of empty valves on the beach are not known to us and seem to be unlikely.

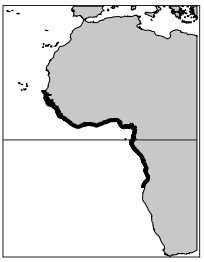
Donax (*Tentidonax*) *owenii* Hanley, 1843



13.102. Grand Bassam, Côte d'Ivoire, 15 m (25.9 mm).

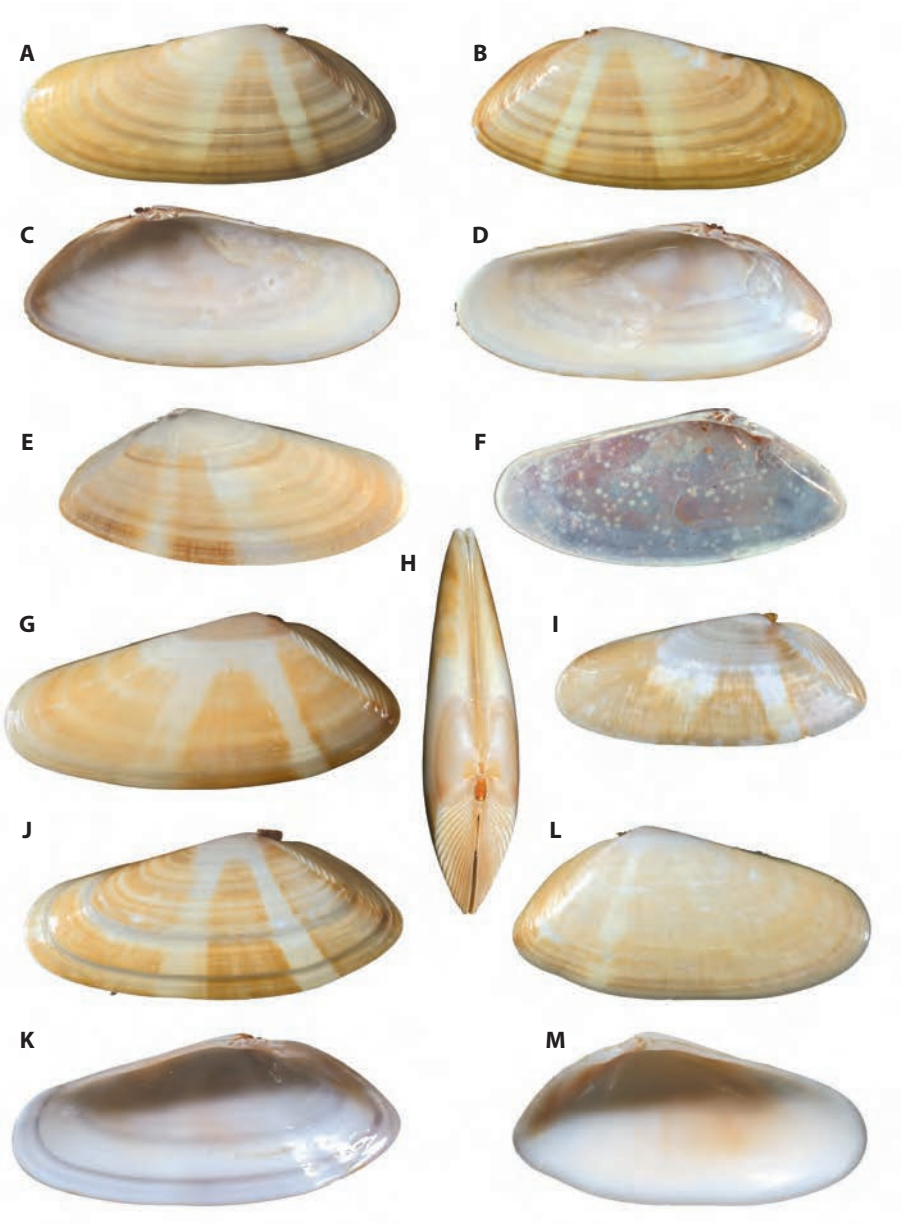
Shell up to 32 mm long, elongate, variable in shape, quite thin but solid, moderately compressed. Anterior margin well rounded, posterior part tapering, posterior end pointed, with narrowly rounded margin; ventral margin gently convex. Beaks at the end of the second third of the valve. Lunule very long, narrow and ill-defined. Surface smooth with faint growth lines and few coarser growth stages. Posterior area with regular, dense, commarginal ridges. Posterior angle rather sharp near the beaks, towards the margin becoming more rounded. Periostracum thin, glossy and transparent, light straw-coloured to colourless, persistent on the greater part of the valves. Outside mostly light brownish with two whitish to pale yellowish radial rays from the beaks to the ventral margin; occasionally ground colour dark violet brown. Inside white with orange to light violet or brownish hue.

Distribution. Senegal (Dakar) to southern Angola (Chapeu Armado, Namibe province).



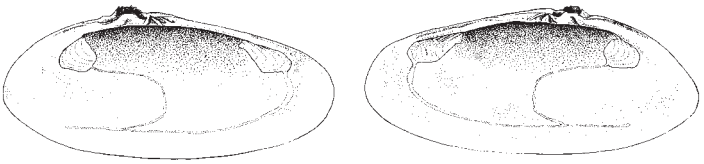
Biotope. In fine muddy sand and fine sand, mostly in sheltered bays, from 1 to 20 m, densest populations between 4 and 10 m, locally not uncommon.

Remarks. Some specimens of this quite variable species have a markedly raised postero-dorsal margin which gives them a somewhat different outline; intergrades to the "normal" form exist. Empty valves are occasionally found in the beach drift.



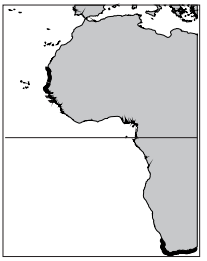
13.103. ***Donax (Tentidonax) owenii*** **Hanley, 1843. A-D**, Joal, Petite Côte, Senegal, 10-15 m, dredged (23.2 mm). **E-F**, Essoukoudiak Bôlon, S-Casamance, Senegal, 4-6 m (rv, 14.4 mm). **G-H**, Grand Bassam, Côte d'Ivoire, 15 m (24.0 mm). **I**, Côte d'Ivoire, 5°07'N, 3°22'W, 20 m (16.8 mm). **J-K**, same locality (24.7 mm). **L-M**, Ponta do Mussulo, Luanda prov., N-Angola (24.2 mm).

Donax (*Tentidonax*) *burnupi* G.B. Sowerby III, 1894



13.104. Cap Blanc, Mauritania, 20°33.5'N, 17°01.5'W (21 mm).

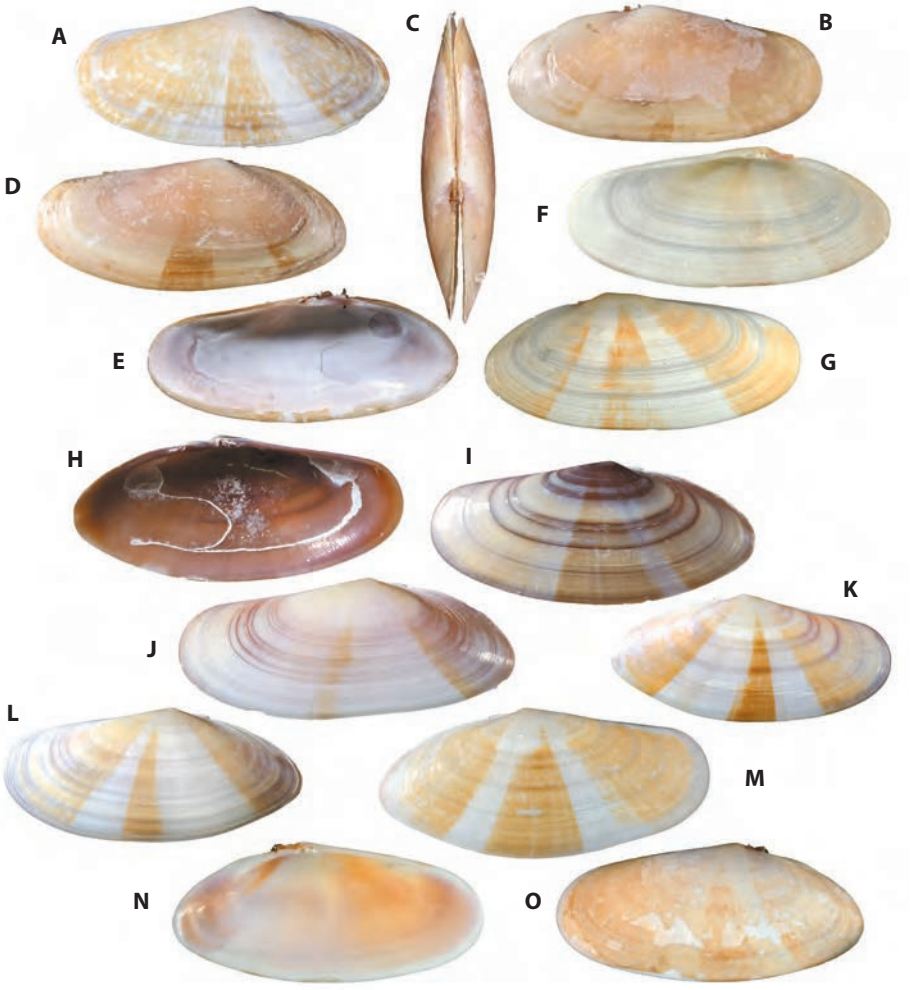
Shell up to 30 mm long, variable in shape and colour, elongate, quite thin but solid, compressed. Anterior margin well rounded, posterior part rounded-tapering, posterior margin narrowly rounded. Ventral margin gently convex, posteriorly raised. Beaks in comparison to other *Donax* only a short distance behind the vertical midline. Lunule very narrow and ill-defined. Surface smooth, with faint growth lines and occasionally coarser growth stages. Posterior area smooth or with a few oblique grooves. Posterior angle broadly rounded. Periostracum thin, glossy, pale brownish to straw-coloured, persistent on the greater part of the valves. Outside colour very variable, usually whitish to cream with broad brown rays, more rarely deep violet. Inside whitish to yellowish or violet, outside markings showing through. Hinge plare behind the hinge teeth dark brownish or violet within the ligament length.



Distribution. West Sahara (Bay of Dakhla and Cruise Poseidon 366, Michel, pers. comm. 2010) and Mauritania (Cap Blanc, 20°31'N) to Senegal (Petite Côte) and Casamance (rare); subrecent valves are found more southward, down to Guinea (9°28'N). South Africa from False Bay to the Natal coast but recently collected live on the south coast of Madagascar which enlarges its Indian Ocean range considerably towards the North (see below).

Biotope. In fine sand, mixed sand and coarse sand, also with shell grit, offshore as well as in more or less sheltered bays, from shallow water (occasionally low water of neap tide) to about 40 m, common in Rio de Oro and Mauritania (live-collected by hand *e.g.* at Dakhla; off Banc d'Arguin, dredged at about 22 m, R/V *Tyro*, Mauritania II Exp.; see also Michel. *et al.* 2011, becoming rarer towards the south.

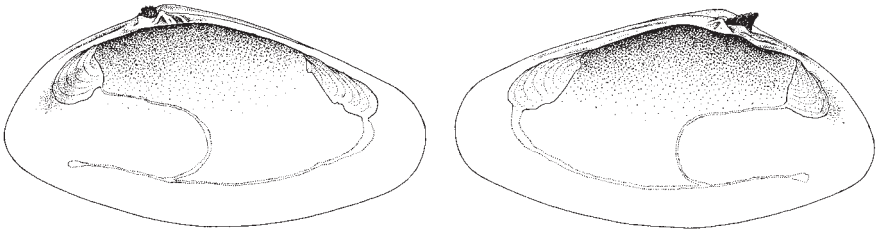
Remarks. This species is figured in Nicklès (1952) as "*Donax oweni*", however a few years later, the author realized that it is a different species and gave it a name which was never published. Only now, with much more material at hand, could the conspecificity with the South African *D. burnupi* be confirmed (see Fig. 13.105N-O). It differs from *Donax owenii* in being even more compressed and more oval. The species is confined to the regions with strong upwelling in the north and temperate influence in the south, with a long distribution discontinuity comprising the whole of the tropical zone, the southern alternant region and the southern permanent upwelling zone. Recent specimens from Senegal south of Dakar and Casamance have thinner shells. Dense shell concentrates, obviously subfossil, along Guinea-Bissau and the northern part of Guinea between Iles Tristão and Cap Verga at about 15-20 m show that the species has been extinct there most probably at the end of the last ice-age because of the withdrawal



13.105. *Donax (Tentidonax) burnupi* G. B. Sowerby III, 1894. **A**, Mauritania, 20°12'N, 17°04'W, 8 m (24.8 mm). **B**-**C**, Mauritania, 20°33.5'N, 17°01.5'W (19.3 mm). **D**-**E**, same locality (23.5 mm). **F**-**G**, Diembéring, N-Casamance, Senegal, 12°33'N, 17°15'W, 19-20 m (21.0 mm). **H**-**I**, W of Bel-Air (Koundinde), Guinea, 10°15'N, 15°04'W, 14 m (24.2 mm). **J**, same locality (23.2 mm). **K**, same locality (23.0 mm). **L**, same locality (24.4 mm). **M**, same locality (27.1 mm). **N**-**O**, False Bay, South Africa, in natural swimming pool (25.0 mm).

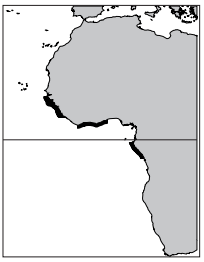
of the zone of strong upwelling more to the north (Le Loeuff & Cosel 1998). During the expedition Atimo Vatae ("Grand South", April-June 2010) of MNHN on the extreme south coast of Madagascar, subrecent shell concentrates prevailingly of *Donax burnupi* looking similar to those off Mauritania were dredged in the regions of Fort-Dauphin and Lavanono at about 20-30 m depth, at Fort Dauphin together with scattered live specimens. These concentrates present the same aspect as those found between Cap Verga and Iles Tristão. Like NW Africa, the extreme southern coast of Madagascar is characterized by upwelling phenomena with often strong swell, abundant algae vegetation and high endemism in the mollusc fauna.

Donax (*Tentidonax*) *domaini* Cosel, 1995



13.106. Casamance, 12°40.5'N, 17°10.5'W, 18 m, fine clean sand, holotype (13.2 mm).

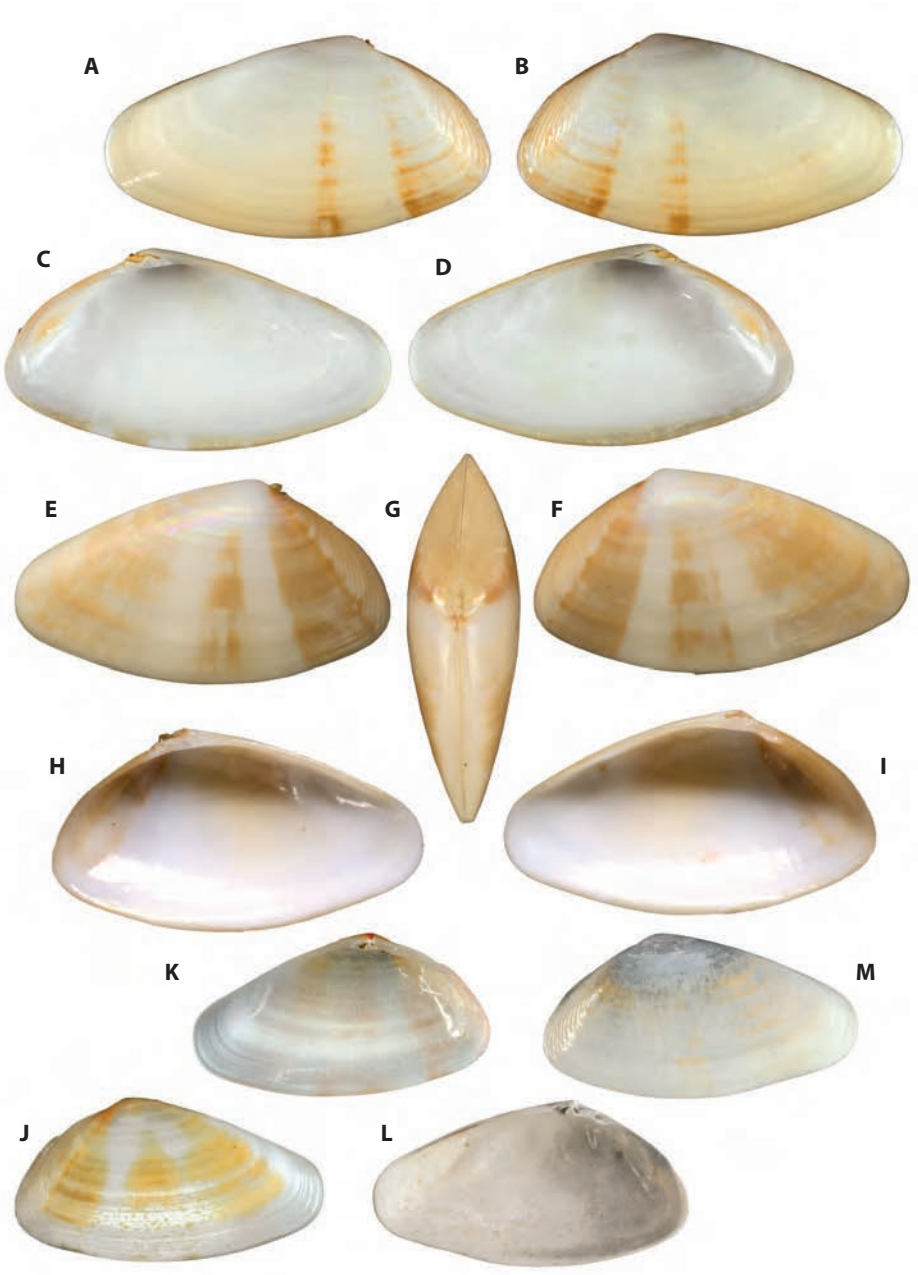
Shell up to 14 mm long, elongate-trigonal, thin but solid, not very compressed. Anterior margin narrowly rounded, posterior part tapering, posterior margin narrowly rounded; ventral margin convex in the middle, nearly straight in the anterior and posterior part. Beaks just anterior to the end of the second third of the valves. Lunule long and ill-defined. Surface smooth and glossy, with very fine growth lines and few coarser growth stages. Posterior area with strong, slightly irregular, dense, commarginal ridges. Posterior angle rounded. Periostracum thin, light greyish brown, light straw-coloured or nearly colourless, thin and glossy, persistent on the greater part of the valves. Inner margin smooth. Ligament very short, on a small, not protruding nymph. Outside white, mostly with an irregular brownish radial ray on the posterior part and occasionally with more brownish rays or zones on the anterior part; few specimens entirely white. Inside whitish with exterior colouration slightly showing through, occasionally a reddish brown spot on the postero-dorsal area.



Distribution. Senegal (Casamance: Abéné) to Guinea (9°N); Côte d'Ivoire to Ghana; Gabon (Port Gentil) to Congo Kinshasa (Banana).

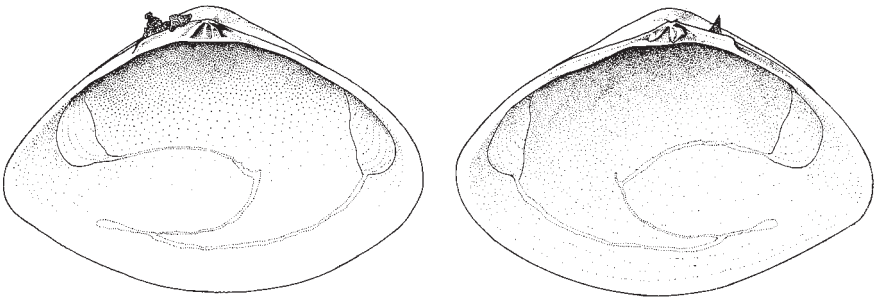
Biotope. In fine, mixed or rather coarse sand, offshore from about 15 to 30 m, uncommon.

Remarks. This species is characterized by its rather short shell with the middle part of the ventral margin convex in outline. *D.* (*T.*) *domaini* is predominantly tropical but needs slight influence of seasonal upwelling; distribution gaps in the typical tropical zones are probable. In Guinea Recent specimens have been found on the shell concentrates with subfossil *D.* (*T.*) *burnupi*. Generally not found on the beach and only to be obtained by dredging.



13.107. ***Donax (Tentidonax) domaini*** **Cosel, 1995. A-D**, Ile de la Goëlette, N- Casamance, 12°40.5'N, 17°10.5'W, 18 m (holotype, 13.1 mm). **E-I**, Guinea, W of Ouendi, 9°54'N, 15°19'W, 23 m (13.0 mm). **J-K**, Côte d'Ivoire, 5°48.1'N, 2°41.1'W, 20 m (11.6 mm). **L-M**, Port-Gentil, Gabon, "Torpille" drilling site, 0°55.9'S, 8°44.6'E, 30 m (12.4 mm).

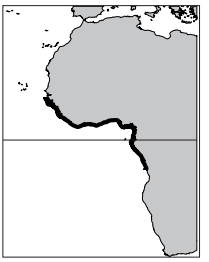
Iphigenia laevigata (Gmelin, 1791)



13.108. Victoria (Limbe), Cameroon, Morton Bay, on beach at low tide (58 mm).

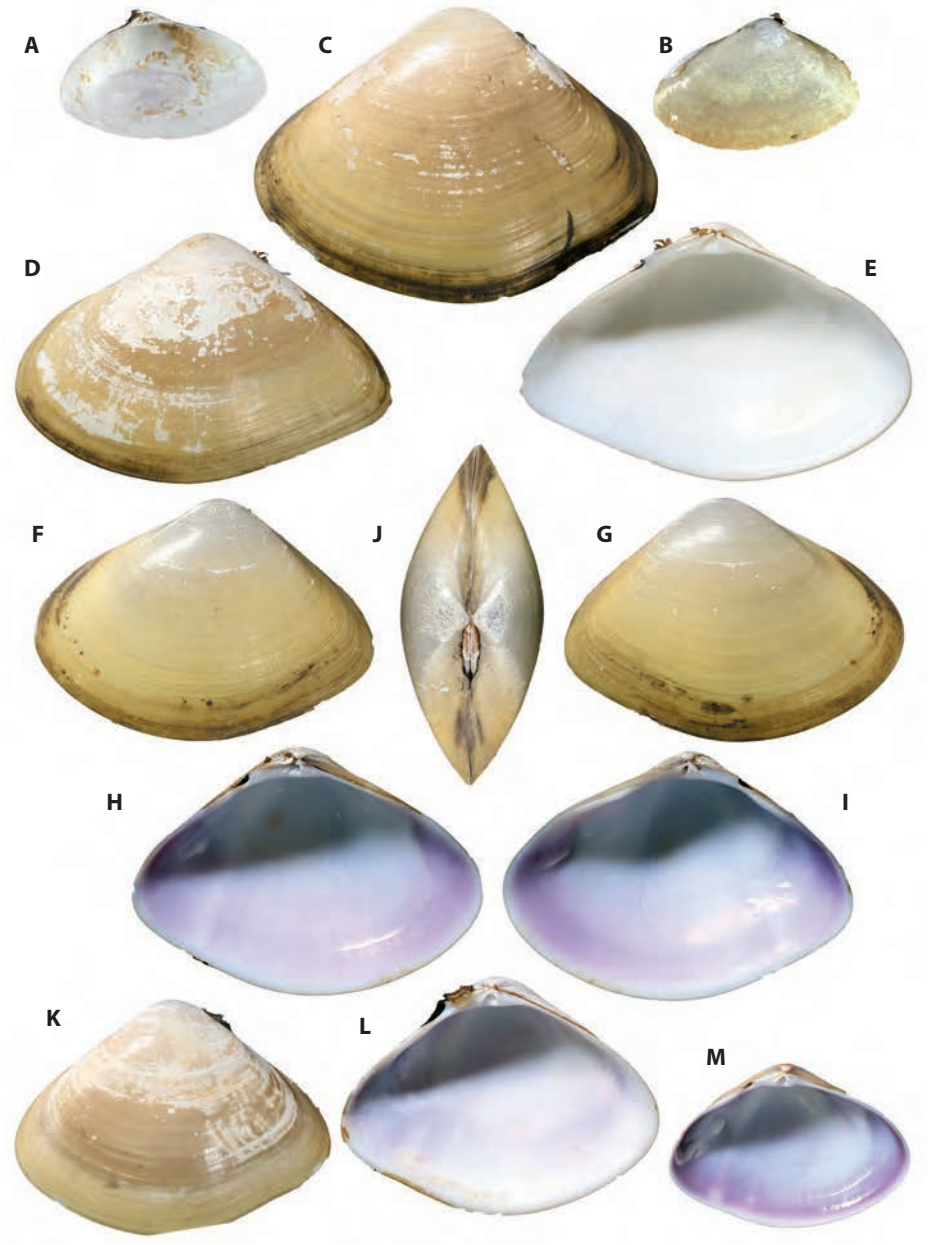
Shell up to 85 mm long, variable in shape, size and colour, narrowly suboval-subtriangular, rather thick and solid, quite inflated. Anterior margin narrowly rounded, posterior part tapering, posterior margin still more narrowly rounded than anterior margin. Ventral margin in or just behind the middle, strongly convex, anteriorly less convex, posteriorly straight or even very slightly concave. Beaks in the middle or only very slightly behind the vertical midline. Surface smooth, with irregular growth lines and few coarser growth stages. Posterior angle rounded. Periostracum thin but strong, olive green, often eroded on the umbonal area. Outside whitish to cream, mostly with light violet beaks, inside white or light to darker violet.

Distribution. Senegal (Casamance) to northern Angola (Mussulo, Luanda).



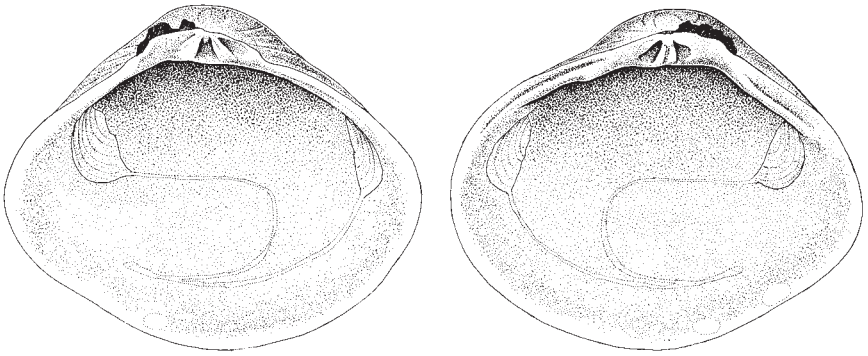
Biotope. In fine sand in calm bays, often with slightly reduced salinity, as well as in estuaries and inlets, in shallow water from low tide to a few metres, locally common.

Remarks. This species has often been separated from *I. rostrata* Römer, 1869, the latter being more elongated, more tapering posteriorly and entirely white. However, as all kinds of intermediates are found and a clear separation of the two forms is not possible, *I. rostrata* is considered a variety and conspecific with *I. laevigata* which is the type species of the genus *Iphigenia*. A sibling species in the Caribbean is *I. brasiliana* (Lamarck, 1818).



13.109. ***Iphigenia laevigata*** **(Gmelin, 1791). A**-**B**, Ourong Bôlon, N of Katakalous, S-Casamance, 2-4 m (13.1 mm). **C**, Rotuma, Guinea (66.7 mm). **D**-**E**, same locality, "form *rostrata*" (68.9 mm). **F**-**J**, Victoria (now Limbe), Cameroon, Morton Bay, beach drift (55.1 mm). **K**-**L**, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (25.1 mm). **M**, same locality (40.0 mm).

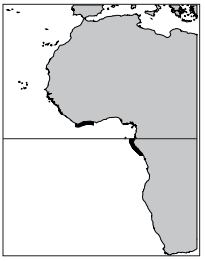
Iphigenia curta (Dunker, 1867)



13.110. Port-Gentil, Gabon (19.3 mm).

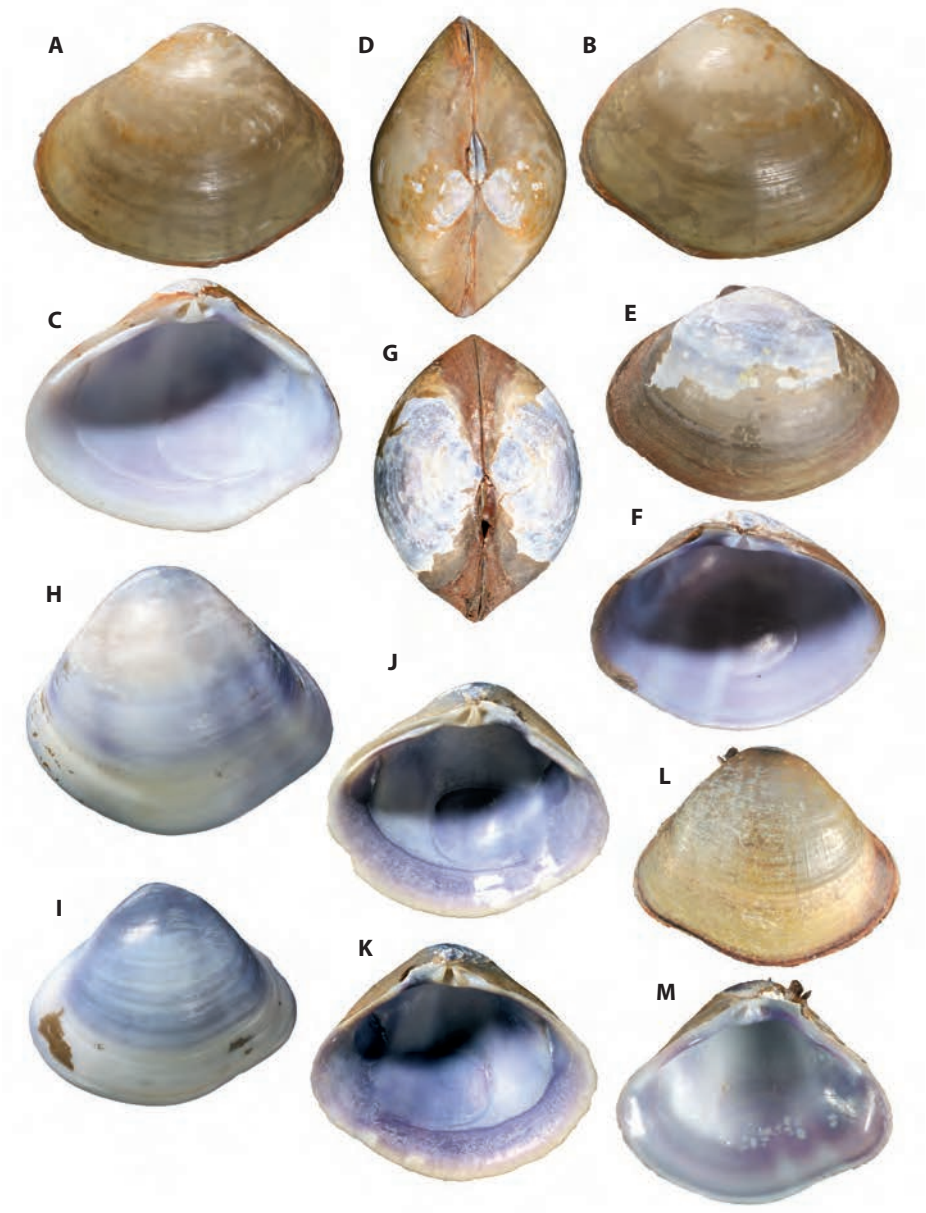
Shell small, up to 30 mm long, variable in shape, triangular to suboval, rather solid, very inflated. Anterior margin more or less broadly rounded, posterior margin narrowly rounded. Ventral margin strongly convex, with a very weak postero-ventral sinuosity. Beaks more or less median or slightly behind the vertical midline. Surface smooth with irregular growth lines and coarser growth stages. Very shallow, broad, radial depression on the posterior part of the valves. Posterior angle not marked. Periostracum thin, dark olive, in adult specimens mostly eroded on the umbonal area. Outside whitish, often with violet umbonal zone, or violet. Inside white to dark violet.

Distribution. Known from Côte d'Ivoire, Gabon (Port Gentil) and Congo Kinshasa (Congo estuary).



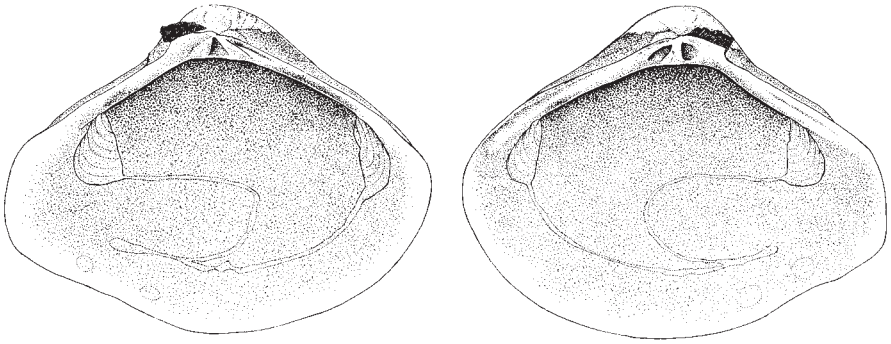
Biotope. In sand on sandbanks at low tide, most probably in reduced salinity, locally common.

Remarks. This species is distinguished from *I. laevigata* by its small and very inflated shell. Little is known on its life history. Synonyms are *I. tumida* (Martens, 1877) and *I. globosa* (Preston, 1909). *Iphigenia lenzi* (Dautzenberg, 1891) might also be this species (Pilsbry & Bequaert 1927; Daget 1998).



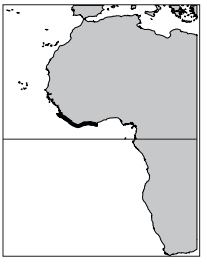
13.111. ***Iphigenia curta*** **(Dunker, 1867).** **A**-**D**, Port-Gentil, Gabon (15.2 mm). **E**-**G**, "Moyen Congo" on label (15.1 mm), old coll. MNHN. **H**, Ile aux Pigeons, Port-Gentil, Gabon, 0°40.2'S, 8°45.8'E, on sandbank (18.5 mm). **I**, same locality (16.3 mm). **J**-**K**, Port-Gentil, Gabon (18.9 mm). **L**-**M**, Barre des Portugais, Gabon, 1°18'S, 9°00'E, mangrove near *Avicennia* at low water (20.4 mm).

Iphigenia delessertii (Bernardi, 1860)



13.112. Abidjan, Côte d'Ivoire, coastal lagoon (23.6 mm).

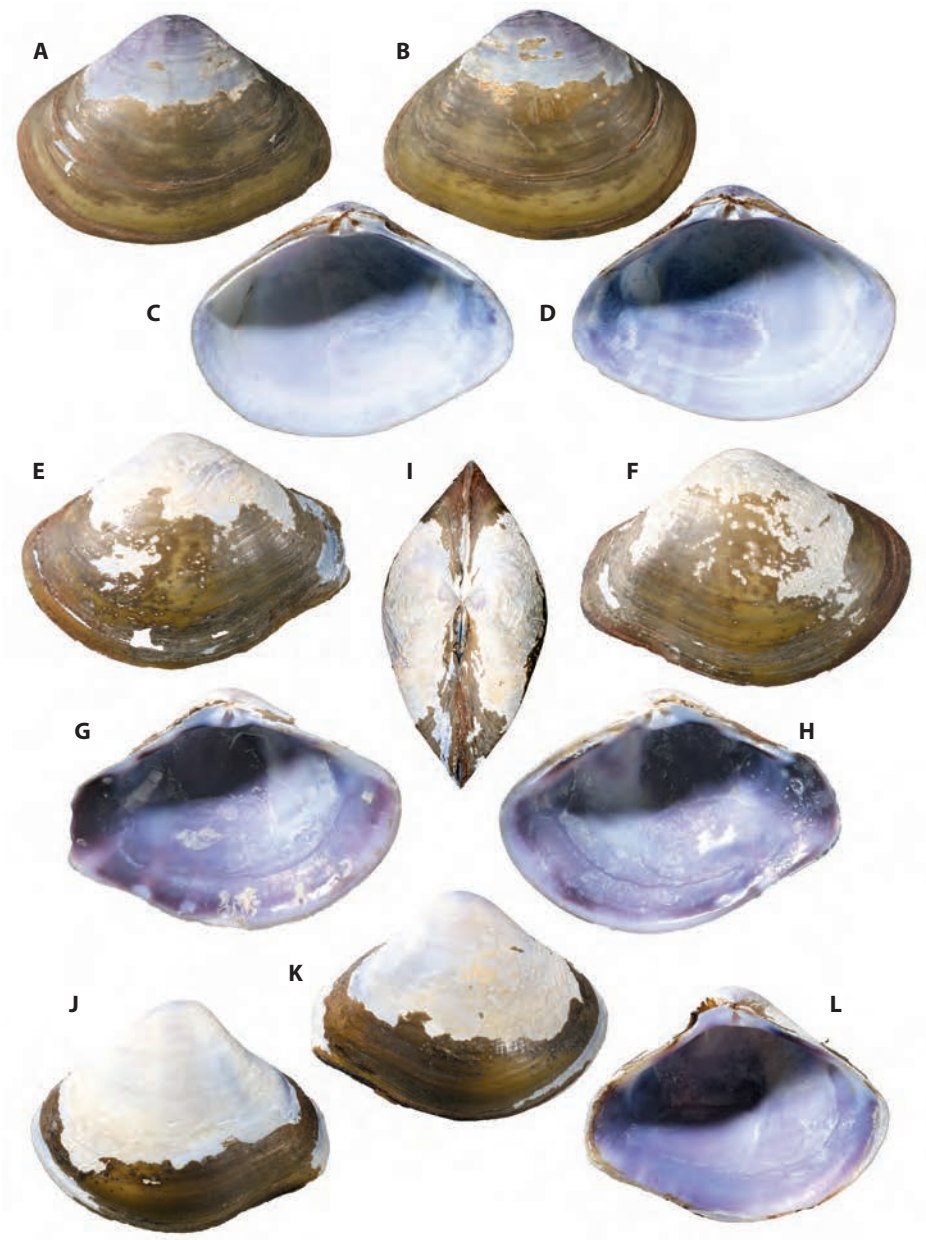
Shell up to 30 mm long, variable in outline and shape, triangular-suboval, rather thin but solid to thick, inflated. Anterior margin rounded, posterior part tapering, with narrowly rounded posterior margin. Ventral margin gently convex, occasionally weakly more so in the middle, postero-ventral margin slightly concave to straight. Beaks more or less median of the valves. Surface smooth, with fine, irregular growth lines. Postero-dorsal area clearly separated by a rounded posterior angle. Periostracum thin, olive-green, on adult specimens eroded on the beaks. Outside bluish violet on the umbonal area, towards the margins lighter violet to whitish, occasionally with darker radial rays. Inside strong violet.



Distribution. Known from Sierra Leone to Côte d'Ivoire. A sample from Congo Kinshasa may also belong to this species.

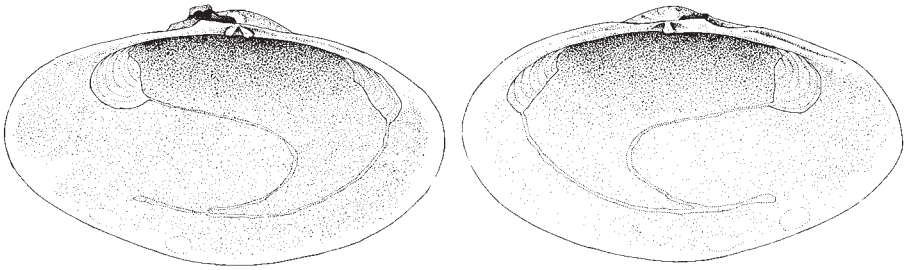
Biotope. Most probably fine sand under estuarine conditions in shallow water. Might be locally common.

Remarks. This species seems to be close to *I. curta*. From this, it is distinguished by its more oblong shell and the more tapering posterior part. However, the delimitations to *I. curta* and *I. messageri* are not always very clear. *Iphigenia truncata* (Martens, 1877) is a synonym according to Daget (1998); life history traits were described by Yoloye (1977).



13.113. *Iphigenia delessertii* (Bernardi, 1860). A-D, Casamance River, Senegal (20.8 mm), old coll. MNHN. E-I, Abidjan, Côte d'Ivoire (22.3 mm). J-L, Abidjan, Côte d'Ivoire (23.6 mm).

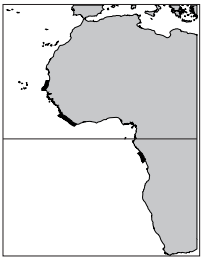
Iphigenia messageri (Preston, 1909)



13.114. Senegal, MNHN old coll. (24.8 mm).

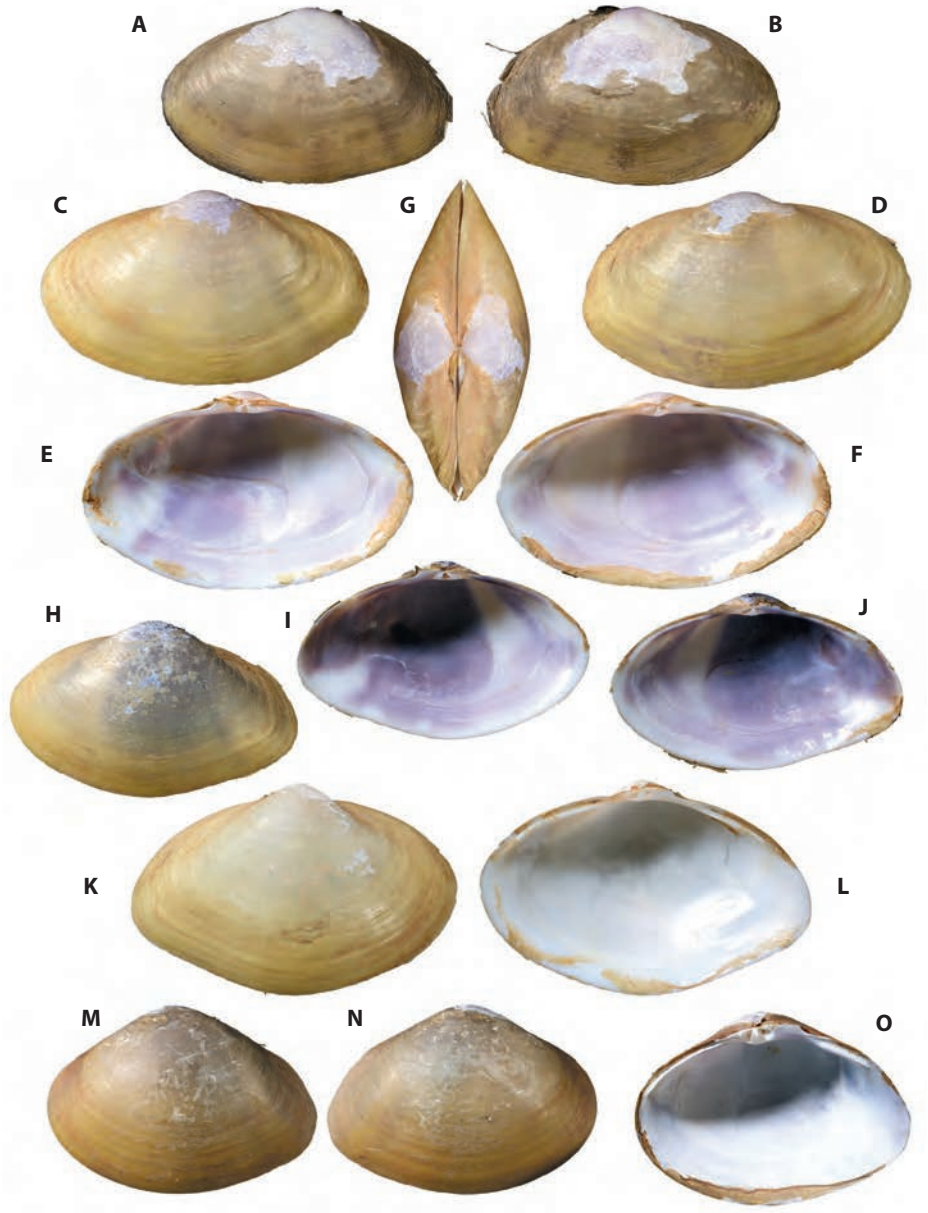
Shell up to 27 mm long, variable in shape, narrowly suboval, thin but rather strong, somewhat inflated. Anterior and posterior margin more or less narrowly rounded, ventral margin gently convex, only occasionally more so in the middle. Beaks in the middle or just in front of the vertical midline. surface smooth, with fine growth lines and occasional coarser growth stages or growth waves. Posterior angle very indistinctly rounded or nearly missing. Periostracum thin and olive-green to dark brown, in adult specimens often eroded on the beaks. Outside whitish or pale violet, mostly tinged with bluish violet on the umbonal area, occasionally with a lighter radial ray on the posterior part. Interior white or light to dark violet.

Distribution. Reported from Senegal (Senegal River), Liberia and the Congo River.



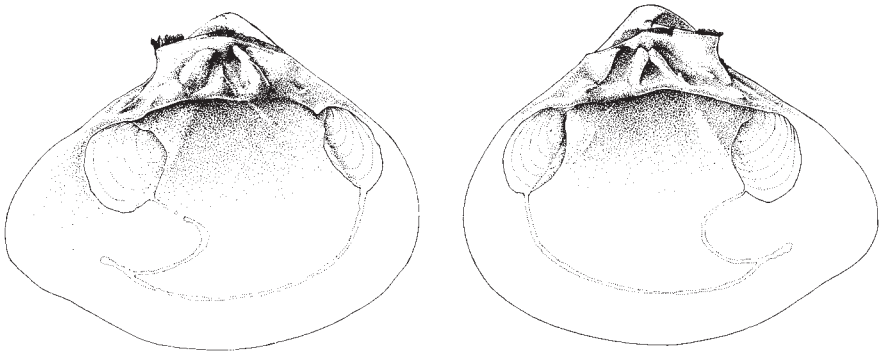
Biotope. Most probably in fine, muddy sand high up in estuaries, only locally common.

Remarks. This species is close to *I. delessertii*, but distinguished by its more oval shell with broader and more rounded posterior part. *Iphigenia approximans* (Preston, 1909) and most probably also *I. congo* Pilsbry & Bequaert, 1927 are synonyms (Daget 1998).



13.115. *Iphigenia messageri* (Preston, 1909). **A**-**B**, Senegal (16.6 mm), old coll. (Messager). **C**-**G**, Liberia (25.1 mm), old coll. MNHN (H. Fischer). **H**-**J**, same locality (23.0 mm). **K**-**L**, same locality (26.1 mm). **M**-**O**, representative of ssp. *congo* Pilsbry & Bequaert, 1927, "Moyen Congo" on label, old coll. MNHN (C. Boettger) (20.7 mm).

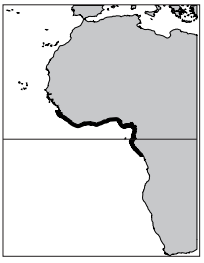
Galatea paradoxa (Born, 1778)



13.116. Grand Lahou, Côte d'Ivoire (89 mm).

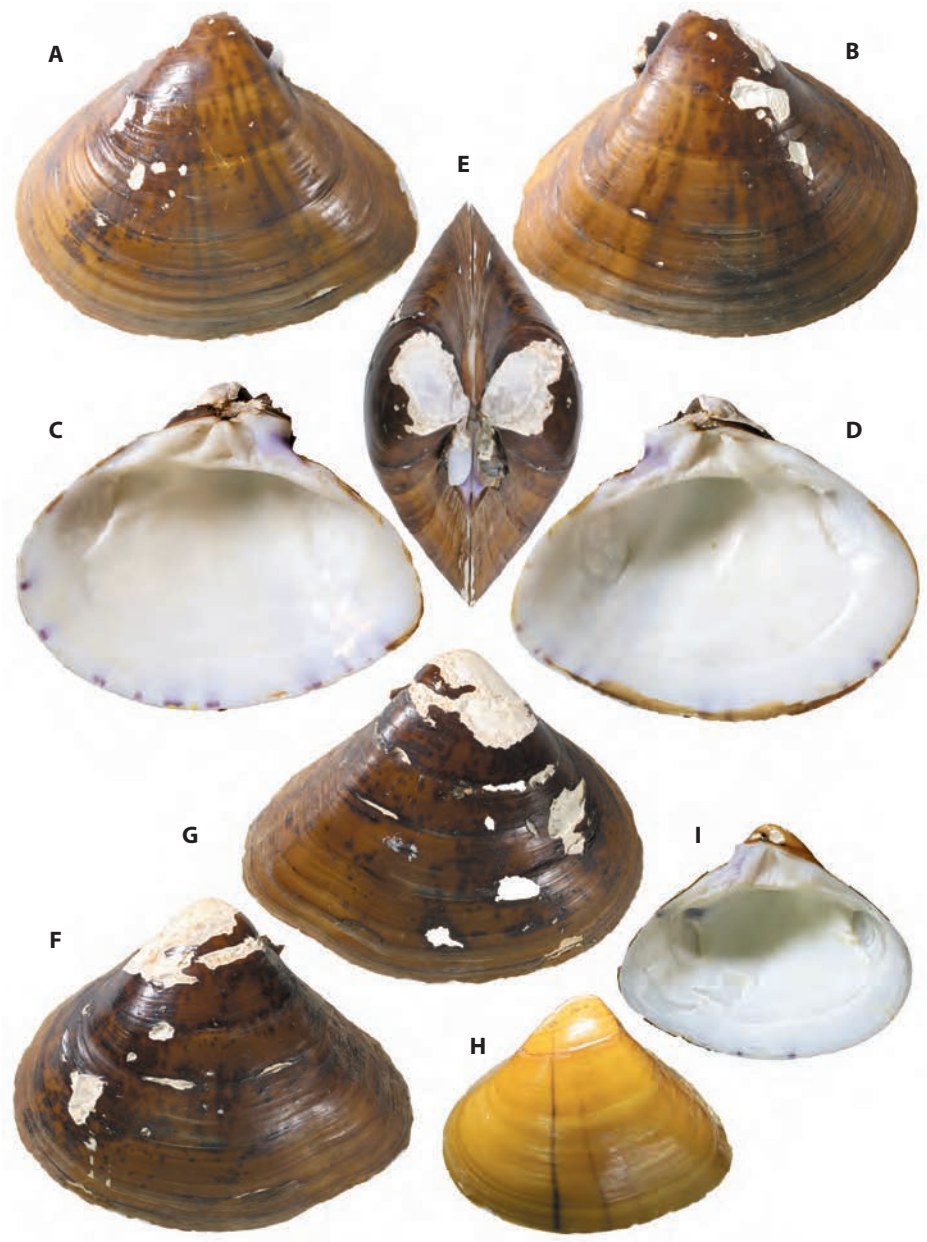
Shell up to 90 mm long, variable, suboval-triangular, very thick and heavy, inflated. Anterior margin rounded, posterior part tapering, posterior margin narrowly rounded. Ventral margin gently convex, often with a very slight postero-ventral sinuosity. Beaks very prominent and on or just in front of the vertical midline. Surface with well developed irregular growth lines and coarser growth stages. Shallow and broad radial depression on the posterior part, often obsolete. posterior angle rounded, posterior area sometimes with a broad radial ridge. Periostracum thick, strong, dark brown, eroded on the beaks. Outside whitish, with irregular violet radial rays. Inside white, with the violet rays visible on the marginal area or with irregular violet zones, mostly on the adductor scars.

Distribution. Known from Guinea to Congo (Kinshasa).



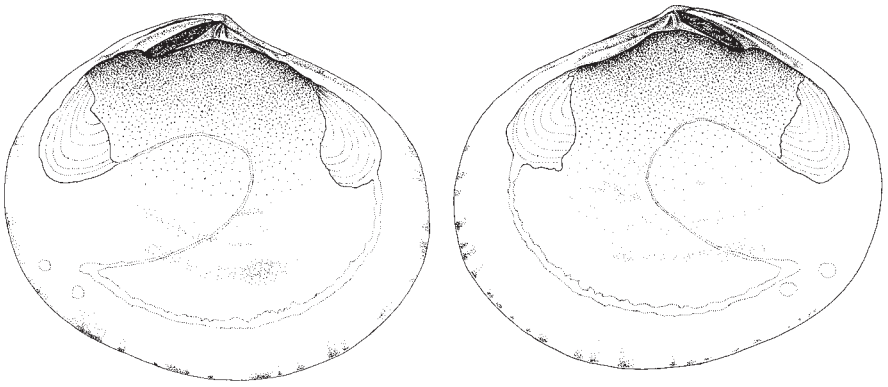
Biotope. On muddy bottoms, in rivers at the upper limit of regular salinity influence. The habitat in Ghana has recently been described by Obirikorang *et al.* (2013).

Remarks. Some of the larger species of *Galatea* are consumed in certain regions. Growth and population structure in Nigeria were studied by Moses (1990). The shells, mostly from subfossil deposits, are used in the lime industry. *Galathea radiata* Lamarck, 1804 (originally described in error from India and Ceylon), *Galatea truncata* Dunker, 1867, *Galatea biangulata* G.B. Sowerby II, 1868, *Galateia pseudoradiata* Brito Capello, 1878 and *Galateia aguiarii* Brito Capello, 1878 are among the synonyms (Daget 1998).



13.117. ***Galatea paradoxa*** **(Born, 1778). A-E**, Grand Lahou, Côte d'Ivoire (82.1 mm), old coll. MNHN. **F-G**, same locality (85.7 mm). **H-I**, Sanaga Estuary, Cameroon (43.0 mm).

Semele lamyi Nicklès, 1955

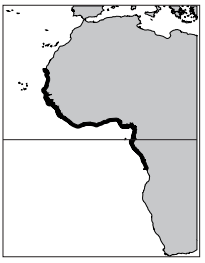


13.118. Pointe-Noire, Congo, off the Orstom station, coarse sand with stones, 5-7 m (26.6 mm).

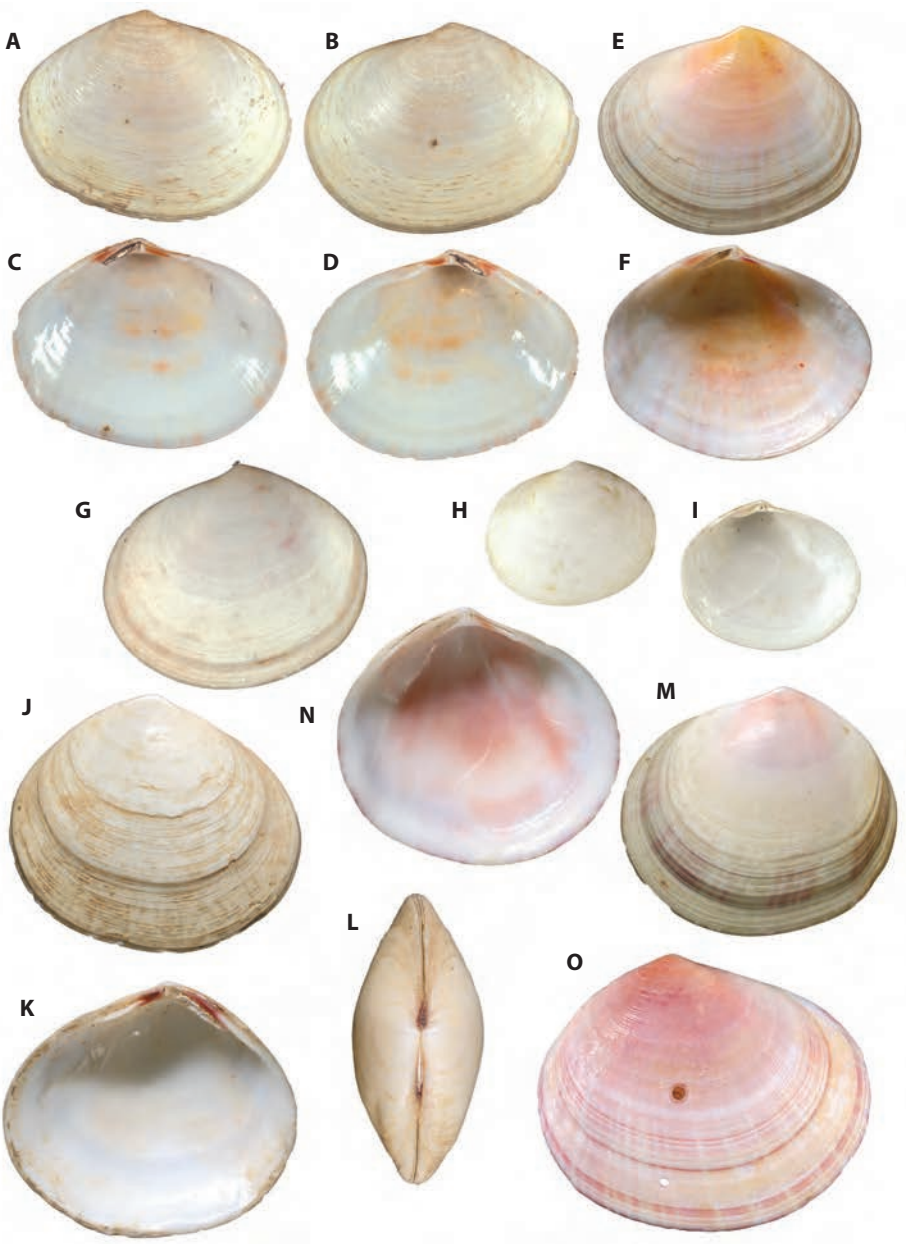
Shell up to 31 mm long, slightly variable in outline, broadly suboval to nearly subcircular, moderately thick and solid. Anterior and posterior margin broadly rounded, ventral margin strongly convex. Beaks shortly behind the vertical midline. Surface with commarginal growth lines, some coarser growth stages and very fine and fragile, more or less regular, commarginal lamellae, which are eroded on the umbonal part of the valves and which frequently are persistent only on the very marginal part. There are also very fine radial striae, only visible under a lens (x 10-20). Periostracum very thin and pale grey, eroded on the umbonal part. Outside whitish to cream, either uniform or with yellowish or pink to salmon reddish umbonal part and often also with reddish radial rays, interrupted at growth stages and disappearing on the umbonal area. Inside white or with bright pink or orange zones, the external rays showing through.

Distribution. Mauritania (Cap Blanc) to northern Angola (Luanda).

Biotope. In mixed and coarse sand, also with shell debris, or on sand patches between stones and rocks, from extreme low tide to about 30 m, not uncommon.

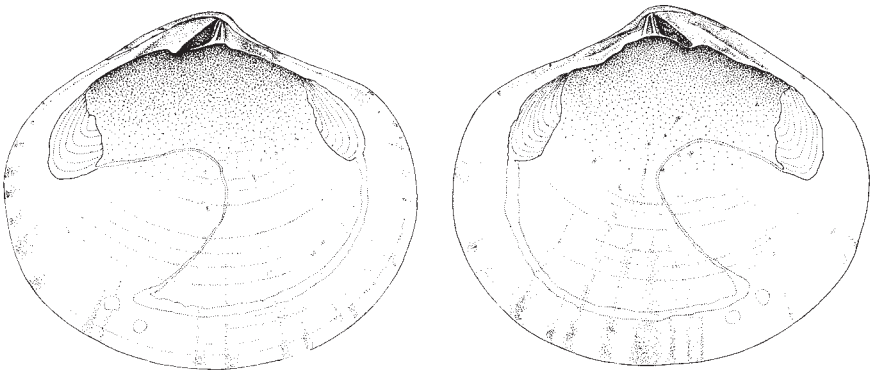


Remarks. This species had been united with the Caribbean *S. purpurascens* (Gmelin, 1791) until Nicklès recognized its difference. It is slightly shorter and higher than *S. purpurascens*, has a smaller pallial sinus and is less coloured. Another close Caribbean species is *S. proficua* (Pulteney, 1799).



13.119. *Semele lamyi* Nicklès, 1955. **A**-**D**, Rio Grande, Guinea-Bissau (holotype, 23.3 mm, photo Manuel Caballer/Recolnat). **E**-**F,** W Barre Dangara, Guinea, 10°07′ N, 14°42′ W, 18 m (25.0 mm). **G**, Takoradi, Ghana (19.2 mm). **H**-**I**, Victoria (now Limbe), Morton Bay, on beach (13.1 mm). **J**-**L**, Cacuaco, Bengo prov., N-Angola, between rocks at low tide (31.3 mm). **M**-**N**, same locality (29.3 mm). **O**, Praia de Buraco, Palmeirinhas, Luanda prov., N-Angola (30.6 mm).

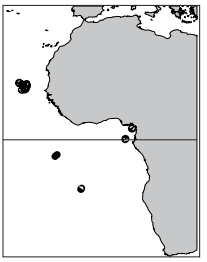
Semele modesta (Reeve, 1853)



13.120. Guadalupe, Praia das Conchas, São Tomé, between rocks at low tide (25.9 mm).

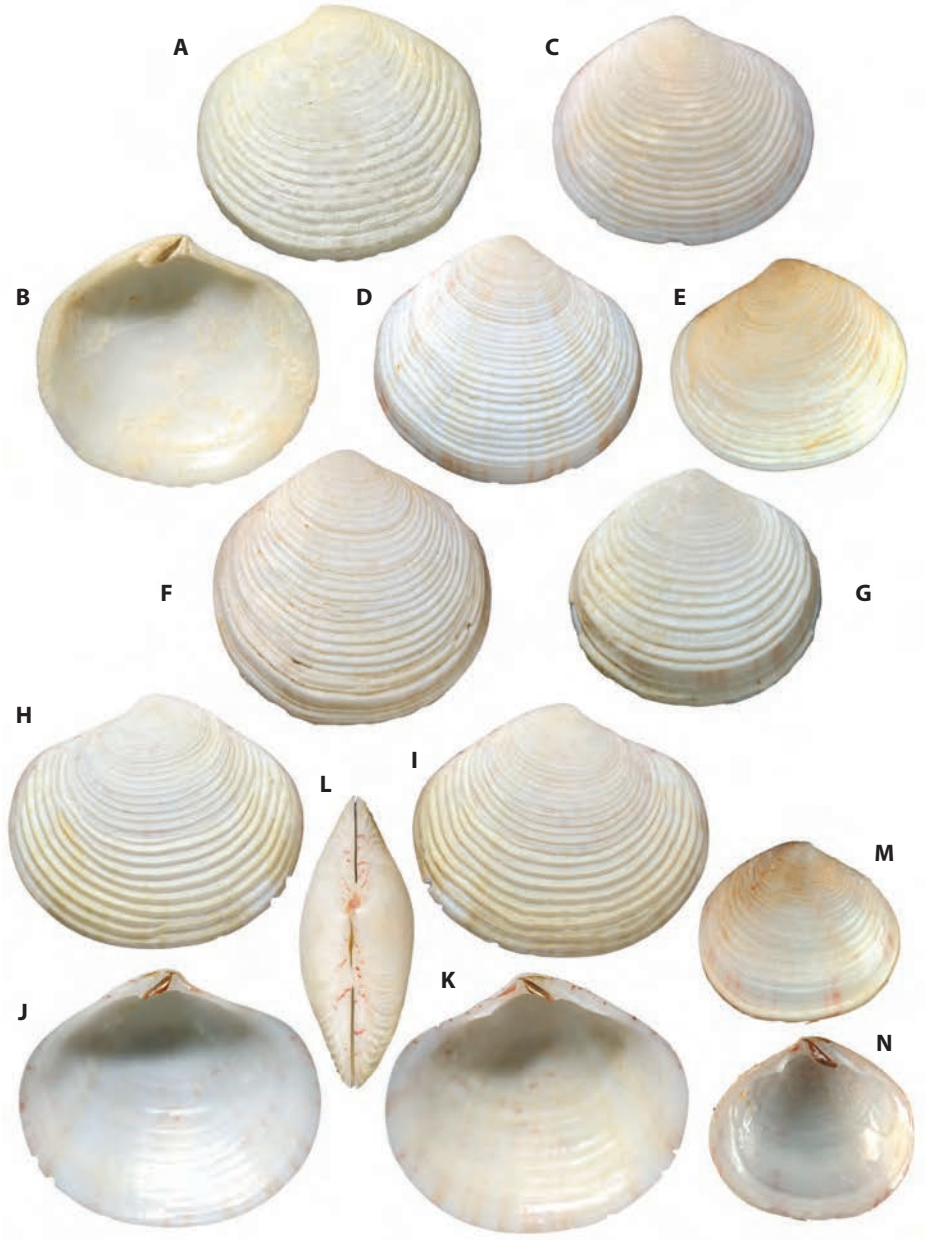
Shell up to 30 mm long, somewhat variable in outline, broadly suboval to nearly circular, rather thin and fragile. Anterior and posterior margin broadly rounded, ventral margin strongly convex. Beaks in the middle or just in front of the vertical midline. Surface with coarse, slightly irregular, wave-like commarginal ribs, a few bifurcating at the limit of the posterior area. Interspaces with extremely fine, dense, radial striae, visible only under a lens (x 20-30). Exterior sculpture slightly reproduced on the inside. Periostracum pale yellowish grey, thin and dull. Outside whitish to cream, often with very faint, pale pinkish radial rays which disappear towards the umbos. Inside whitish te cream, marginal zone occasionally very pale salmon, radial rays on the outside showing through.

Distribution. Cape Verde Islands, São Tomé, Ilha do Principe; Liberia (*fide* Nolf 2011), Gabon (Cap Esterias to Port-Gentil); Ascension, St. Helena.



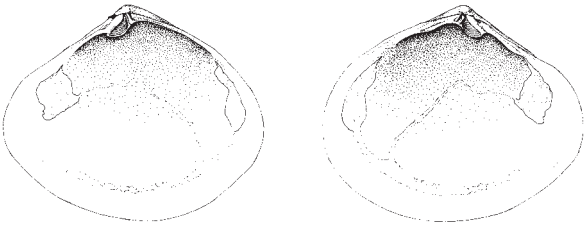
Biotope. In coarse sand and gravel, predominantly on rocky coasts on sand patches between stones and rocks, from low water to about 5 m, rare.

Remarks. This species is one of those which mainly inhabits the offshore islands and reaches the continent only at Gabon due to the special current conditions in that area. It is rather difficult to obtain and seldom seen in collections. The species recorded under this name from Brazil (Abrolhos Islands and Bahia, Rios (1985), see also Boss (1972)) is in fact a different species, *S. martinii* (Reeve, 1853), with a much larger shell, to about 60 mm, and which lives well offshore, to 120 m (Nolf 2011).



13.121. ***Semele modesta*** **(Reeve, 1853).** **A**-**B**, Cerro Negro, Ilha do Sal, Cape Verde Islands, on beach (26.4 mm). **C**, Cap Esterias, Gabon (22.4 mm). **D**, same locality (23.1 mm). **E**, Ile Banié, Baie de Corisco, Gabon, 2-3 m (24.3 mm). **F**, Praia Emilia, São Tomé, rocky intertidal platform (24.7 mm). **G**, same locality (21.1 mm). **H**-**L**, Praia das Conchas, São Tomé, between rocks, intertidally (25.4 mm). **M**-**N**, same locality (12.4 mm).

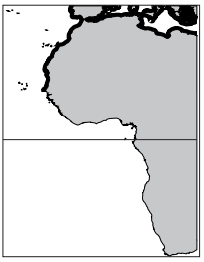
Abra tenuis (Montagu, 1803)



13.122. Baie de l'Etoile (21°N), mud and seagrass at low tide (6.3 mm).

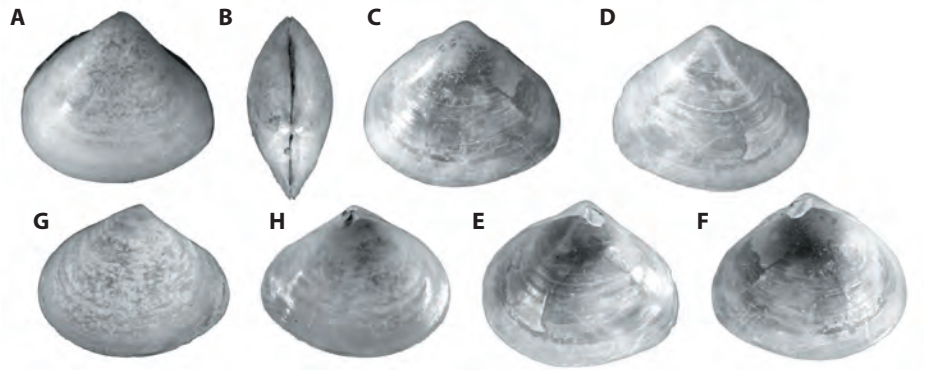
Shell very small, up to 12 mm (West African specimens smaller, to 9 mm), quite variable in shape, suboval-triangular, thin and fragile, somewhat inflated. Anterior margin well rounded, posterior margin rounded-truncated to more or less rounded, ventral margin gently convex. Beaks median or very slightly behind the vertical midline. Surface smooth, with dense, irregular growth lines. Posterior angle present, but rounded and very ill-defined. Periostracum very thin and pale greyish brown, persistent only near the margins and in growth stages. Outside and inside entirely white.

Distribution. East coast of Scotland (Firth of Forth) to the SW-North Sea, Irish Sea, West coast of Ireland, English Channel to Mauritania (Cap Timiris, 20°00N); throughout the Mediterranean.



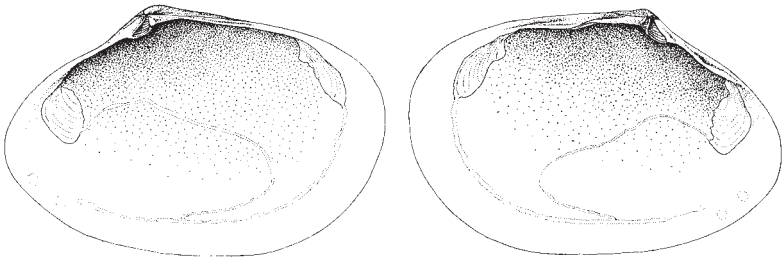
Biotope. In sandy mud and muddy sand, also with seagrass, from low tide to shallow water, locally abundant.

Remarks. *Abra tenuis* is a northern temperate species which does not pass southward beyond the zone of permanent upwelling. It is the type species of the genus *Abra*.



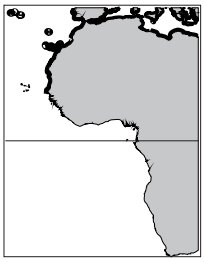
13.123. *Abra tenuis* (Montagu, 1803). A-B, Baie de l'Etoile, Nouadhibou, Mauritania (5.6 mm). C-F, El Manghar (Cape Timiris), Mauritania (6.5 mm). G-H, Baie de l'Etoile, Mauritania, 21°N, intertidal muddy bottom with seagrass (7.4 mm).

Abra alba (W. Wood, 1802)



13.124. Baie de Cansado, Mauritania, 10 m (15.2 mm).

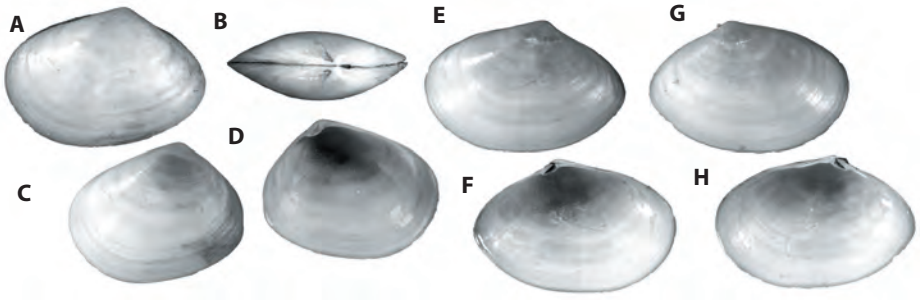
Shell up to 25 mm long (West African specimens only up to 15 mm), slightly variable in outline, suboval, thin and fragile, rather compressed. Anterior margin well rounded, posterior part somewhat tapering, posterior margin narrowly rounded. Ventral margin less convex in the middle than anteriorly and posteriorly. Beaks well behind the vertical midline. Surface smooth, with very fine, irregular growth lines. Posterior angle obscure. Periostracum very thin and colourless to very light greyish, persistent mostly near the margins. Outside and inside entirely white.



Distribution. Norway (67.5°N), Shetlands, Baltic Sea, North Sea and British Isles southward to Mauritania (Baie de Cansado, 20.5°N); Azores, Madeira, Canary Islands; throughout the Mediterranean, Black Sea.

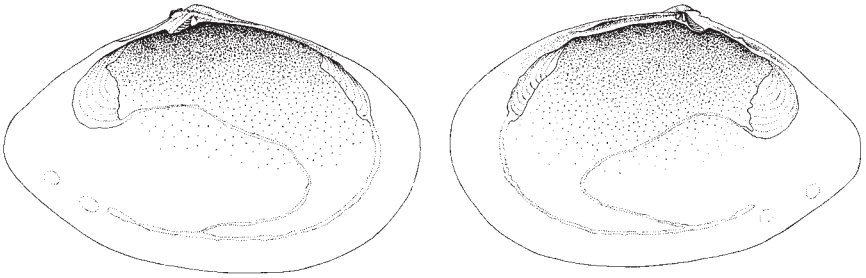
Biotope. In muddy sand and fine sand, also in gravel with mud, from shallow water (3-10 m) to about 65 m, abundant in many places.

Remarks. This is one of the most abundant marine bivalve species in Europe, and as for *A. tenuis*, its southern limit is marked by the limit of permanent upwelling.



13.125. *Abra alba* (W. Wood, 1802). A-B, Baie de Cansado, Mauritania (14.3 mm). C-D, same locality (12.4 mm). E-H, same locality (15.5 mm).

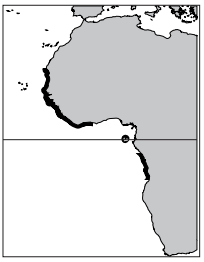
Abra pilsbryi (Dautzenberg, 1912)



13.126. Sine-Saloum, Senegal, mangroves (16.9 mm).

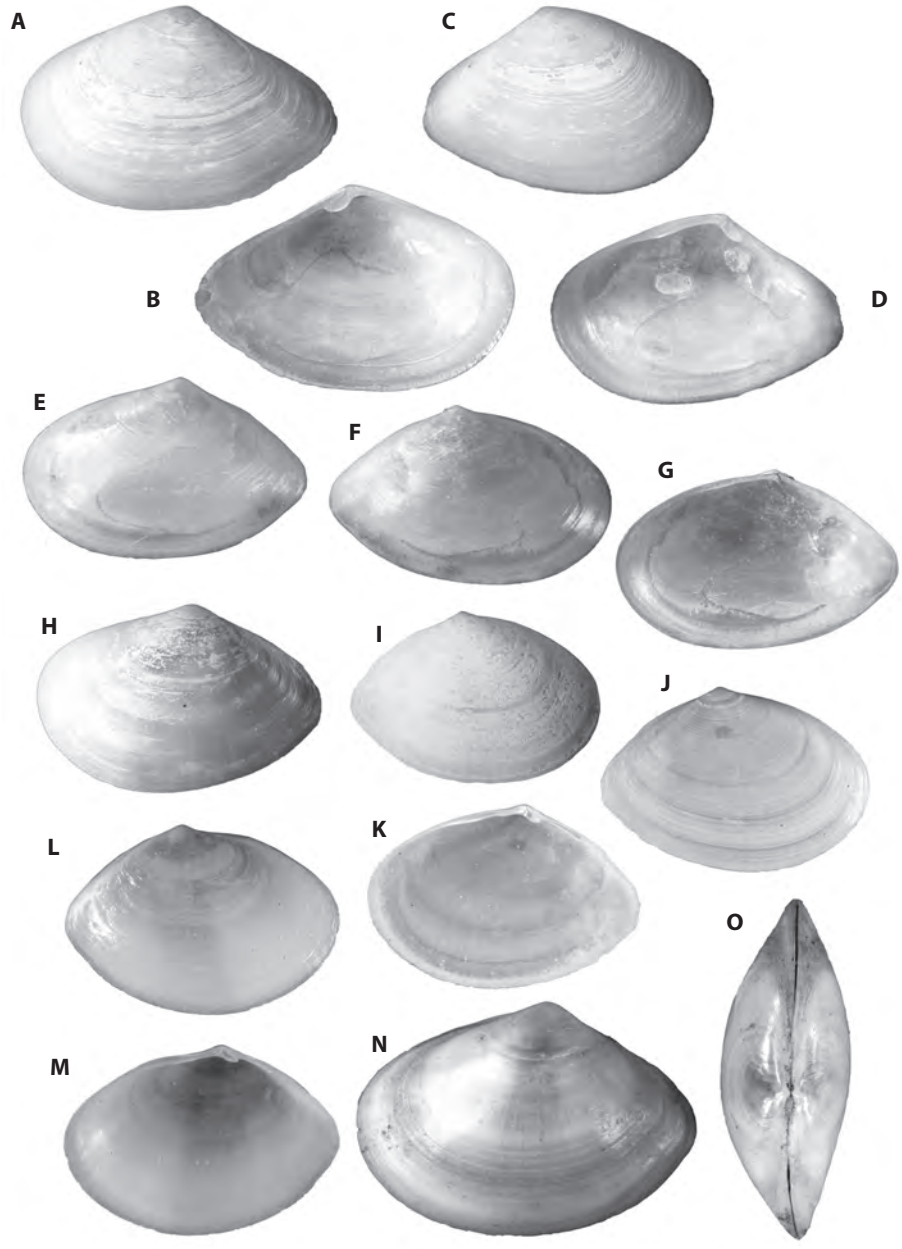
Shell up to 13 mm long, variable in outline, suboval, thin and fragile, rather inflated, with left valve slightly more inflated than right valve. Anterior margin well rounded, posterior part tapering, with convex to straight postero-dorsal and convex postero-ventral margin, posterior end tapering, with posterior margin narrowly rounded. Ventral margin strongly convex, in its middle part occasionally less convex, slight postero-ventral sinuosity, frequently indistinct or obsolete. Beaks behind the vertical midline. Surface smooth, only with fine, irregular growth lines. Periostracum very thin, light brownish, persistent only near the margins, if at all. Outside and inside entirely white.

Distribution. Mauritania (20°N) to Côte d'Ivoire; Congo Brazzaville (Pointe-Noire) to southern Angola (Santo Antonio, Benguela); São Tomé, Ilha do Principe.



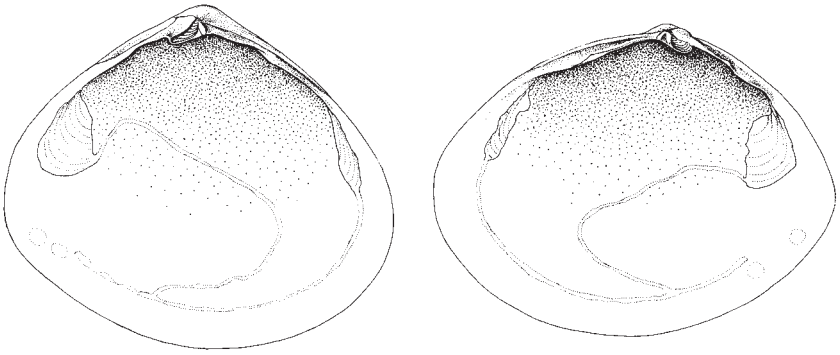
Biotope. In fine, muddy sand, mostly in sheltered or half-open bays, lagoons, inlets and "bôlons", often with slightly reduced or higher salinities, but also offshore, from 2 to about 50 m, common. The species is often found together with *Lembulus montagui*, *Scissodesma micronitida* and *Pitar longior.*

Remarks. This is the most common shallow water and upper shelf *Abra* of tropical West Africa. It was not encountered from Ghana to Gabon, where in part it is replaced by *A. elata* (see next entry). *Abra kraemmeri* Nicklès, 1955 was described from few specimens dredged off Gambia, Liberia, Gabon and off the Congo River mouth, between 12 and 50 m. It differs from typical *A. pilsbryi* in having a slightly longer posterior part, however, it is here considered falling within the variability of *A. pilsbryi*, and only DNA analysis may confirm its conspecificity or not.



13.127. *Abra pilsbryi* (Dautzenberg, 1912). **A**-**D**, Port-Etienne (now Nouadhibou) region, Mauritania, 20°10'N, 16°30'W, 16 m ("form *kraemmeri* Nicklès, 1955", 17.4 + 15.6 mm). **E**-**G**, Sine-Saloum, Petite Côte, Senegal (8.5 mm). **H**, Ziguinchor, Fleuve Casamance, 3-5 m, dredged in fine muddy sand (10.5 mm). **I**, same locality (9.6 mm). **J**-**K**, Ile de Roume, Iles de Los, Guinea, beach drift (10.1 mm). **L**-**M**, Grand Lahou, Abidjan, Côte d'Ivoire, 22 m (10.0 mm). **N**-**O**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 5 m (11.9 mm).

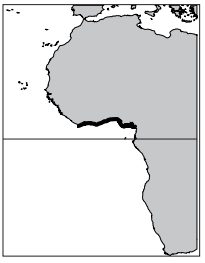
Abra elata Nicklès, 1955



13.128. Nigeria, off the Niger Estuary, 4°03'N, 6°12'E, 32 m, two specimens (lv, 10.0 mm; rv, 9.9 mm).

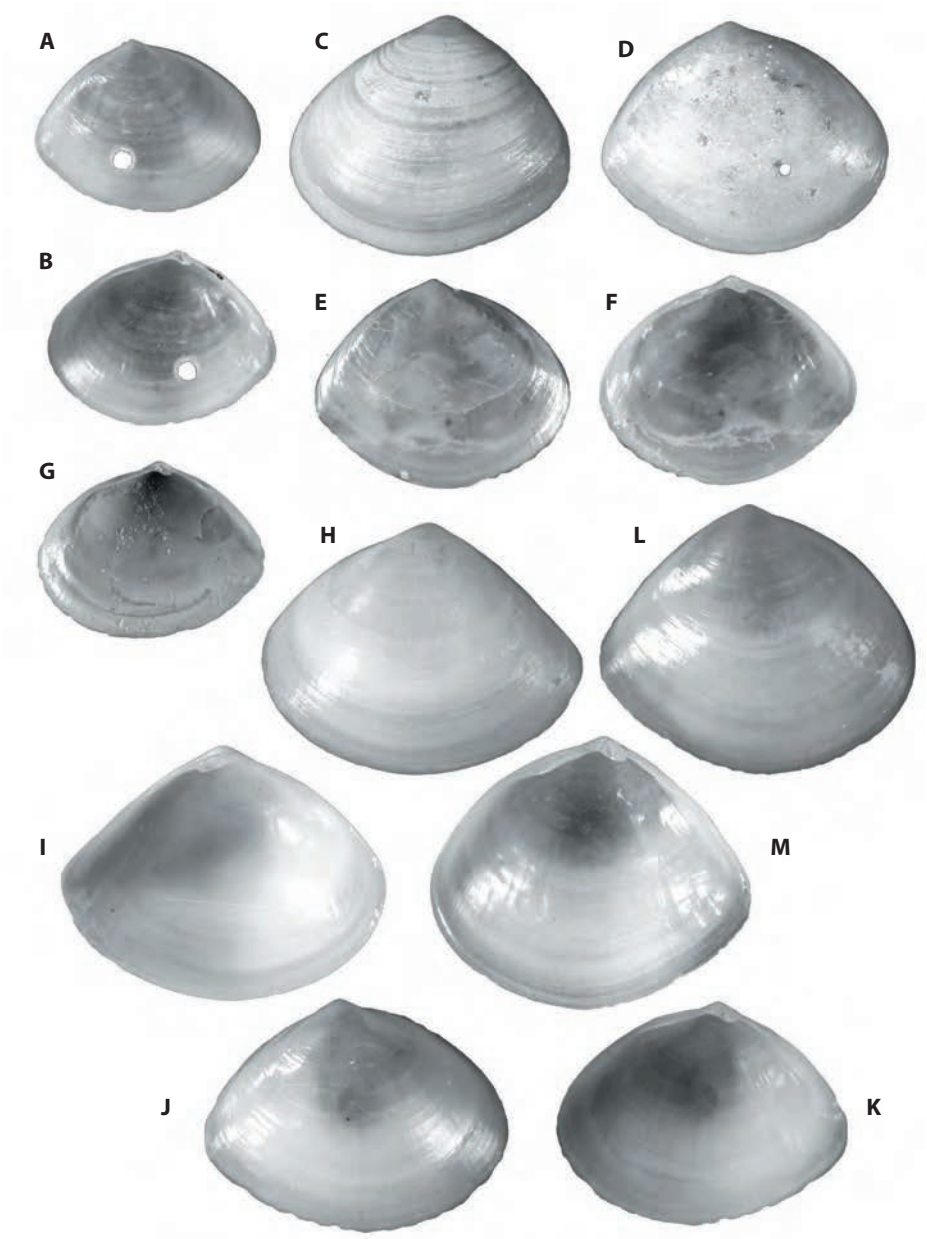
Shell up to 10 mm long, variable in outline, triangular-suboval and quite short, thin and fragile, left valve more inflated than right valve. Anterior margin more or less narrowly rounded, posterior part tapering to a blunt angle, ventral margin strongly convex. Beaks only very slightly behind the vertical midline. Surface smooth, with fine, commarginal growth lines. Posterior angle well marked, rounded. Periostracum very thin and nearly colourless, persistent only at the margins, if at all. Outside and inside entirely white.

Distribution. Known from Liberia to Cameroon, perhaps also more southward.



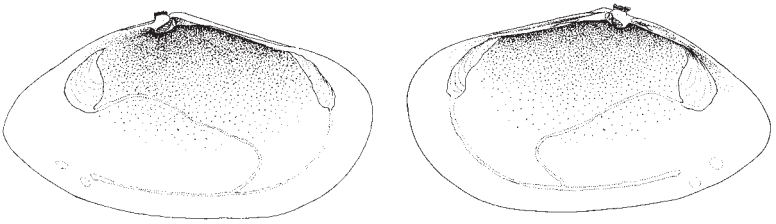
Biotope. In fine muddy sand or fine sand, from about 10 to 50 m, not common.

Remarks. This species is very close to *A. pilsbryi*, and it has been described as a subspecies of this. *Abra elata* is considerably higher and shorter as *A. pilsbryi*, with more narrowly rounded anterior margin. There are no intergrades known.



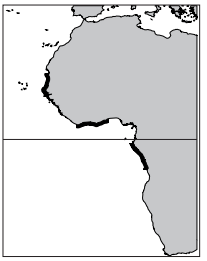
13.129. ***Abra elata*** **Nicklès, 1955. A-B**, Robertsport, Liberia, 6°40'N, 11°23'W, 51 m (8.0 mm). **C**, off mouth of Niger, Nigeria, 4°03'N, 6°12'E, 32 m (9.8 mm). **D**, same locality (10.1 mm). **E-F**, Cameroon, 4°12.2'N, 8°22.8'E, 40 m (8.6 mm). **G**, same locality (7.2 mm). **H-I**, Victoria (now Limbe)-Bota, Cameroon, 8-10 m (11.6 mm). **J-K**, same locality (10.0 mm). **L-M**, Cameroon, 3°44'N, 9°11'E, 24 m (10.3 mm).

Abra lecointrei Nicklès, 1955



13.130. Abidjan region, Côte d'Ivoire, 80-150 m (13.4 mm).

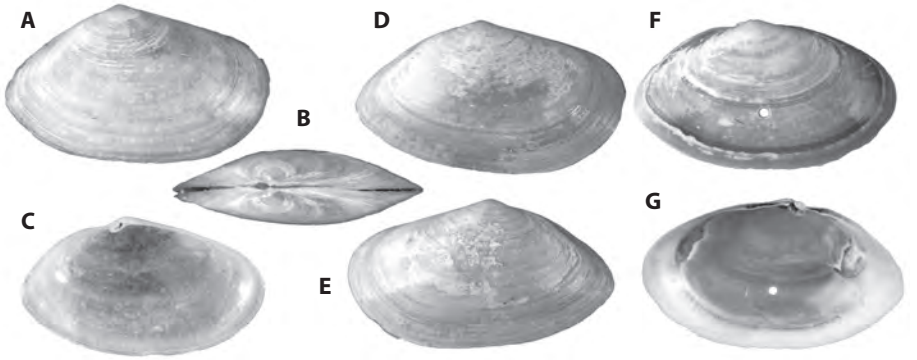
Shell up to 16 mm long, quite elongate, elliptical, thin and fragile, rather compressed. Anterior margin well rounded, posterior margin subangulate, narrowly rounded. Ventral margin anteriorly and posteriorly more convex than ventrally. Postero-ventral sinuosity ill-defined or obsolete. Beaks somewhat behind the vertical midline. Surface smooth and glossy, with very fine, irregular growth lines. Posterior angle not marked. Periostracum very thin, pale yellowish grey, persistent only at the margins, if at all. Outside and inside entirely white.



Distribution. Mauritania (19°50'N) to Casamance (12°46'N); Côte d'Ivoire to Ghana; Gabon (2°S) to northern Angola (Luanda).

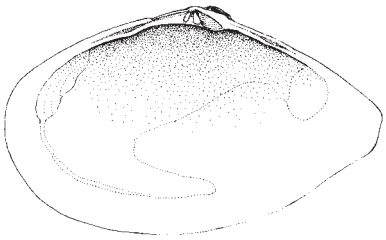
Biotope. On muddy bottoms, offshore from 30 to about 200 m, not very common.

Remarks. This species is distinguished from all other West African *Abra* by its longer shell with rather convex postero-dorsal margin. The absence of records in the two typical tropical zones may indicate distribution gaps. As the preceding species, *A. lecointrei* is not found on the beach and can be obtained by dredging and bottom-grabbing only.



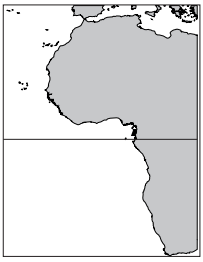
13.131. *Abra lecointrei* Nicklès, 1955. **A-B**, off Mauritania, 19°42'N, 17°06'W, 202 m (11.5 mm). **C**, Kafountine, Casamance, Senegal, 12°46.9'N, 17°29.9'W, 45 m (8.5 mm). **D-E**, Abidjan, Côte d'Ivoire, 150 m (13.3 mm). **F-G,** same locality (9.6 mm).

Abra jarli Nicklès, 1955



13.132. Equatorial Guinea, 02°9'N, 09°27'E, 260-650 m, holotype ZMC, redrawn from Nicklès 1955 (26.4 mm from scale).

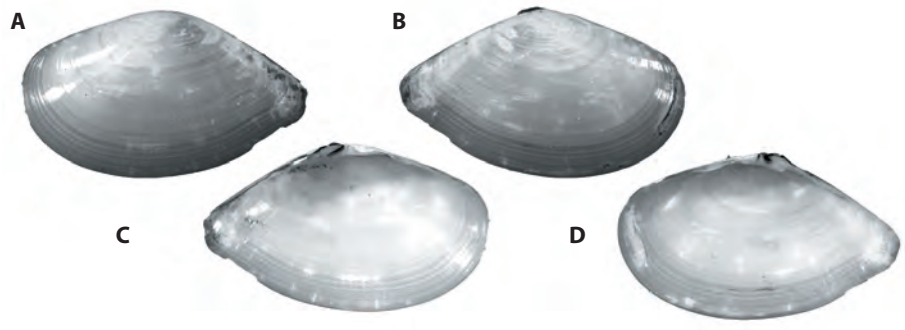
Shell 27 mm long, oblong-oval, thin and fragile, with inflated left valve and slightly less inflated right valve. Anterior margin well rounded, posterior part tapering, posterior margin acuminate and narrowly obliquely truncated. Ventral margin anteriorly more convex than posteriorly, with slight postero-ventral sinuosity. Beaks more or less median. Posterior end slightly twisted to the right. Surface smooth, glossy and iridescent, with fine, irregular commarginal growth lines. There are also extremely fine, wavy, radial striae, only visible under a lens (x 10-20). Periostracum very thin, transparent and nearly colourless. Outside and inside entirely white.



Distribution. Known only from off Equatorial Guinea, but most probably wider spread.

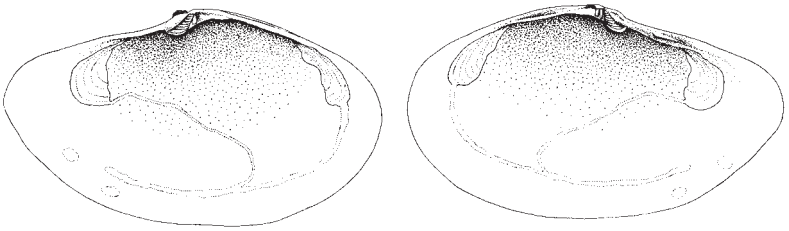
Biotope. On muddy bottoms on the continental slope, from about 250 to 700 m and perhaps deeper, rare.

Remarks. This species is only known from the type lot, of which only the holotype could be studied. It belongs to a group of quite large, more or less elongate *Abra* from the deeper shelf and slope. Two other similar species are treated in the following entries.



13.133. *Abra jarli* Nicklès, 1955. A-D, Equatorial Guinea, 02°9'N, 09°27'E, 260-650 m (holotype ZMC, 27.0 mm), dredged R/V *Atlantide*, 1945.

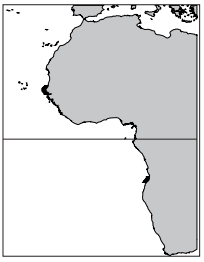
Abra pini Cosel, 1995



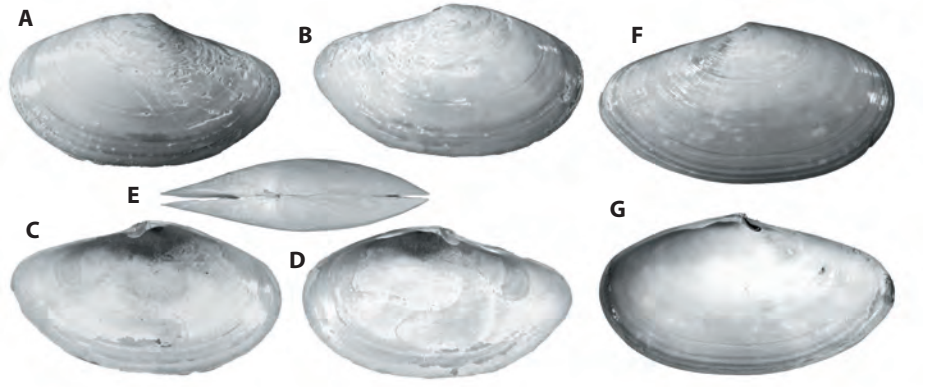
13.134. Off Longa, Senegal, 600 m (18.2 mm).

Shell up to 22 mm long, narrowly suboval, thin and fragile, nearly equivalve, rather compressed. Anterior margin well rounded, posterior end tapering, to a narrowly rounded posterior margin. Ventral margin anteriorly and posteriorly more convex than in the middle. Beaks in the middle or very slightly behind the vertical midline. Surface smooth and glossy, with fine, irregular growth lines and very faint radial waves on the marginal part, only visible under a lens (x 10-20). Periostracum very thin, transparent, at the margins with a pale yellowish hue. Outside and inside entirely white.

Distribution. Known from Senegal, but a specimen from Angola (11°55'S, 13°20'E, 545-552 m, leg. A. Crosnier 1968, ANSP 334511) was found conspecific.

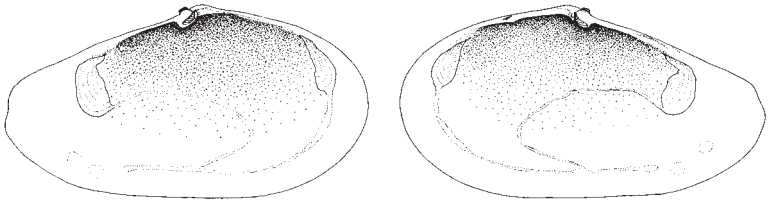


Remarks. This species is close to *A. jarli*, but has a less pointed posterior part and a more horizontal middle part of the ventral margin. The European *A. longicallus* (Scacchi, 1835) is broader and has the beaks well behind the vertical midline. *A bra profundorum* (E.A. Smith, 1885) is larger, up to 30 mm, and lives in much greater depths. It is also recorded from off West Africa.



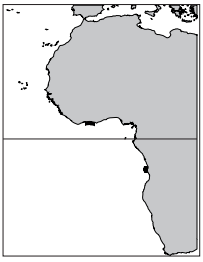
13.135. *Abra pini* Cosel, 1995. A-E, off Longa, Senegal, 600 m (holotype, 18.0 mm). F-G, N of Lobito, Benguela prov., S-Angola, 11°55'S, 23°20'5"E (23.3 mm, ANSP 334511).

Abra intesi Cosel, 1995



13.136. Off Abidjan, 100-250 m (22.9 mm).

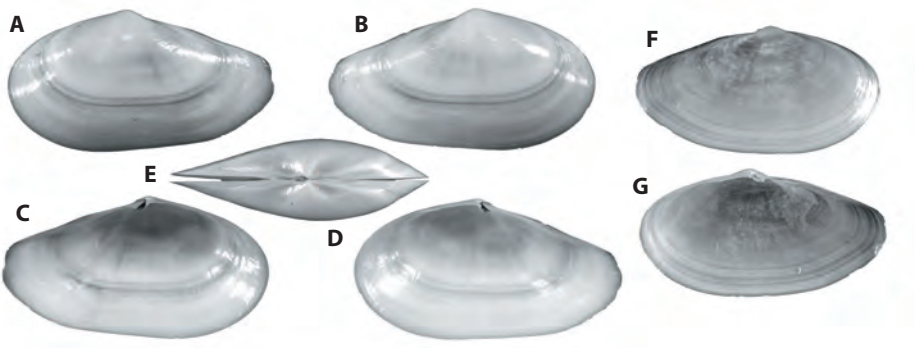
Shell up to 24 mm long, narrowly suboval, thin and fragile, equivalve, somewhat inflated. Anterior margin well rounded, posterior part tapering to a narrowly rounded, somewhat truncated posterior margin. Ventral margin straight, raising posteriorly, occasionally with a very weak postero-ventral sinuosity. Beaks slightly in front of the vertical midline. Surface smooth and glossy, with faint, irregular, commarginal growth lines, a few coarser growth stages and extremely fine, irregular radial striae, mostly visible only under a lens (x 10-20). Periostracum very thin, transparent, colourless to very pale yellowish, visible mostly at the margins and the coarser growth stages. Outside and inside white, often with more translucent commarginal bands along the growth stages.



Distribution. Known only from Côte d'Ivoire (Abidjan region) and from northern Angola (off Ilha de Luanda, 1 specimen).

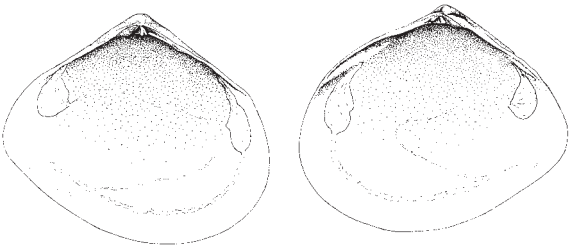
Biotope. On muddy bottoms, from about 75 to 250 m and perhaps deeper, not common.

Remarks. This species is close to the two preceding species, it has a smaller and finer hinge than *A. pini* and *A. jarli* and is more elongate. *A. jarli* has a more tapering posterior half.



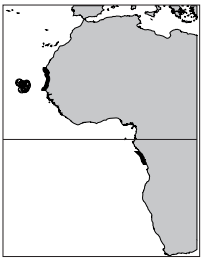
13.137. *Abra intesi* Cosel, 1995. A-E, off Abidjan, 100-250 m (holotype, 22.2 mm). F-G, Ilha de Luanda, Luanda prov., N-Angola, 75-80 m (12.5 mm).

Abra demosia (Dautzenberg & Fischer, 1906)



13.138. Mauritania, 19°54'N, 16°47'W, 200 m (8.8 mm).

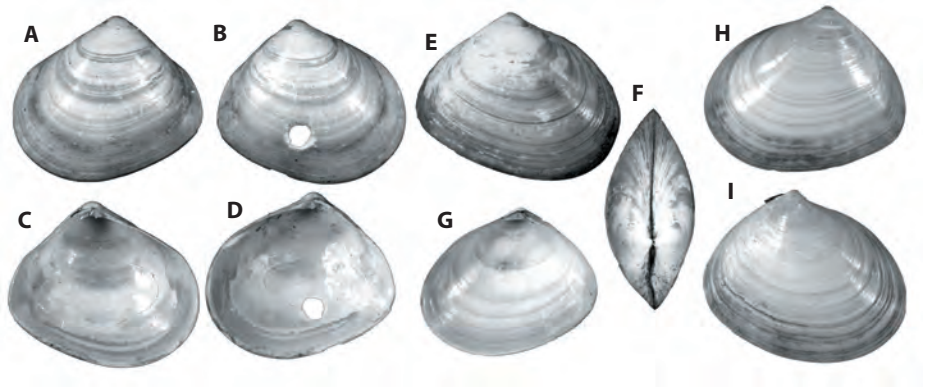
Shell small, up to 15 mm long, somewhat variable, broadly suboval-triangular, thin and fragile, very slightly inequivalve, rather inflated. Anterior margin well rounded, posterior margin pointed and rounded-truncated, posterior end somewhat bent to the right. Ventral margin anteriorly well rounded, posteriorly straight and ascending. Beaks very slightly behind the vertical margin. Surface smooth, with fine, irregular growth lines and coarser growth stages. Periostracum thin, colourless to very pale yellowish brown, visible mostly on the posterior area and at the growth stages. Outside and inside entirely white.



Distribution. Mauritania (21°15'N) to Senegal (Dakar region); Congo Brazzaville (5°02'S) to northern Angola (7°55'S); Cape Verde Islands.

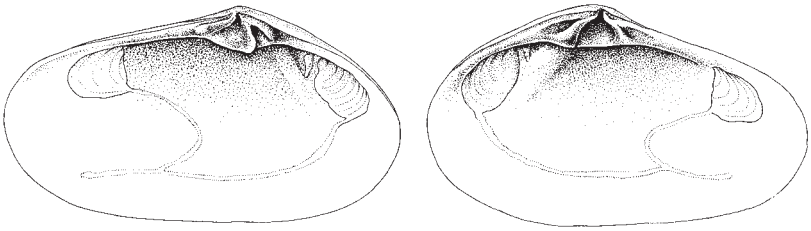
Biotope. On muddy bottoms, from about 150 to about 700 m and perhaps deeper, uncommon.

Remarks. This species is most close to *A. elata* with which it has in common the unequal pallial sinus in right and left valve. *A. demosia* is more triangular with more tapering posterior part. There is apparently a distribution discontinuity between Senegal and the Congo. Compare with *A. tenuis.*



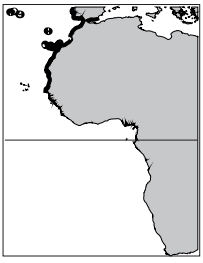
13.139. *Abra demosia* (Dautzenberg & Fischer, 1906). **A-D**, off Mauritania, 17°12'N, 16°43'W, 200 m (7.2 mm). **E-F**, off Longa, Sénégal, 600-1000 m (12.8 mm). **G**, same locality (12.1 mm). **H-I**, S of Pointe-Noire, Congo Brazzaville, 5°08'S, 11°24'E (13.8 mm, ANSP 334514).

Ervilia castanea (Montagu, 1803)



13.140. Cap Blanc, Mauritania, 20°34'N, 17°47'W, 90 m (14.6 mm).

Shell up to 15 mm long, very variable in outline, size and tumidity, narrowly suboval, thick and solid, somewhat compressed to inflated. Beaks in front of the vertical midline. Anterior and posterior margin well rounded, ventral margin slightly convex. Surface smooth, glossy, with irregular growth lines and a few coarser growth stages. Periostracum thin, glossy, pale yellow to nearly colourless, often almost entirely eroded. Outside light reddish brown, darker on the postero-dorsal slope and often with a darker and a lighter radial ray in the middle. Inside brownish with external markings showing through.



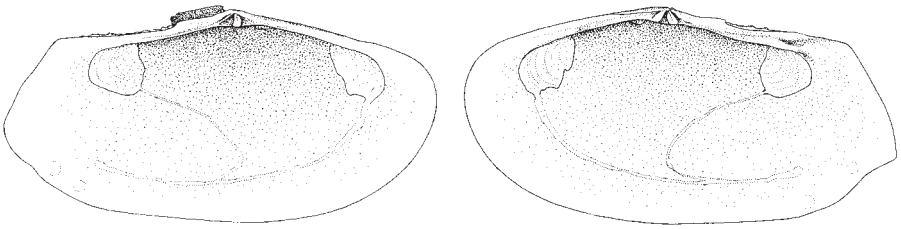
Distribution. SW-Ireland and SW-England (Cornwall) to Mauritania and Senegal (Dakar); Azores, Madeira, Canary Islands.

Biotope. In coarse sand and gravel, from shallow water to about 40 m, more or less common, but abundant in certain places such as around the Azores. In West Africa probably extinct: only subrecent-looking empty shells and valves have yet been found in deeper water from 40 m to 200 m. They might most probably originate from a sunken Pleistocene strandline.

Remarks. Very large specimens have been taken off Morocco and Mauritania, the specimens from Senegal are quite small, also the size of the pallial sinus is variable. For biology, see Moreno (1998), for anatomy, Morton (1990).

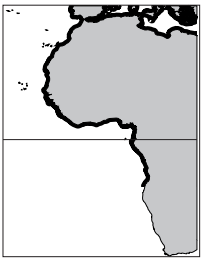
13.141. *Ervilia castanea* (Montagu, 1803). A-B, Mauritania, 20°34'N, 17°47'W, 90 m (13.1 mm). C-D, same locality (14.9 mm). E-F, Mauritania, 20°25'N, 17°41'W, 155 m (10 mm). G-H, off Cap Vert Peninsula, Senegal, 170-200 m (8.3 mm).

Gari (*Psammobia*) *fervensis* (Gmelin, 1791)



13.142. W Ile Kabak, Guinea, 9°18'N, 13°45'W, 21 m (27.6 mm).

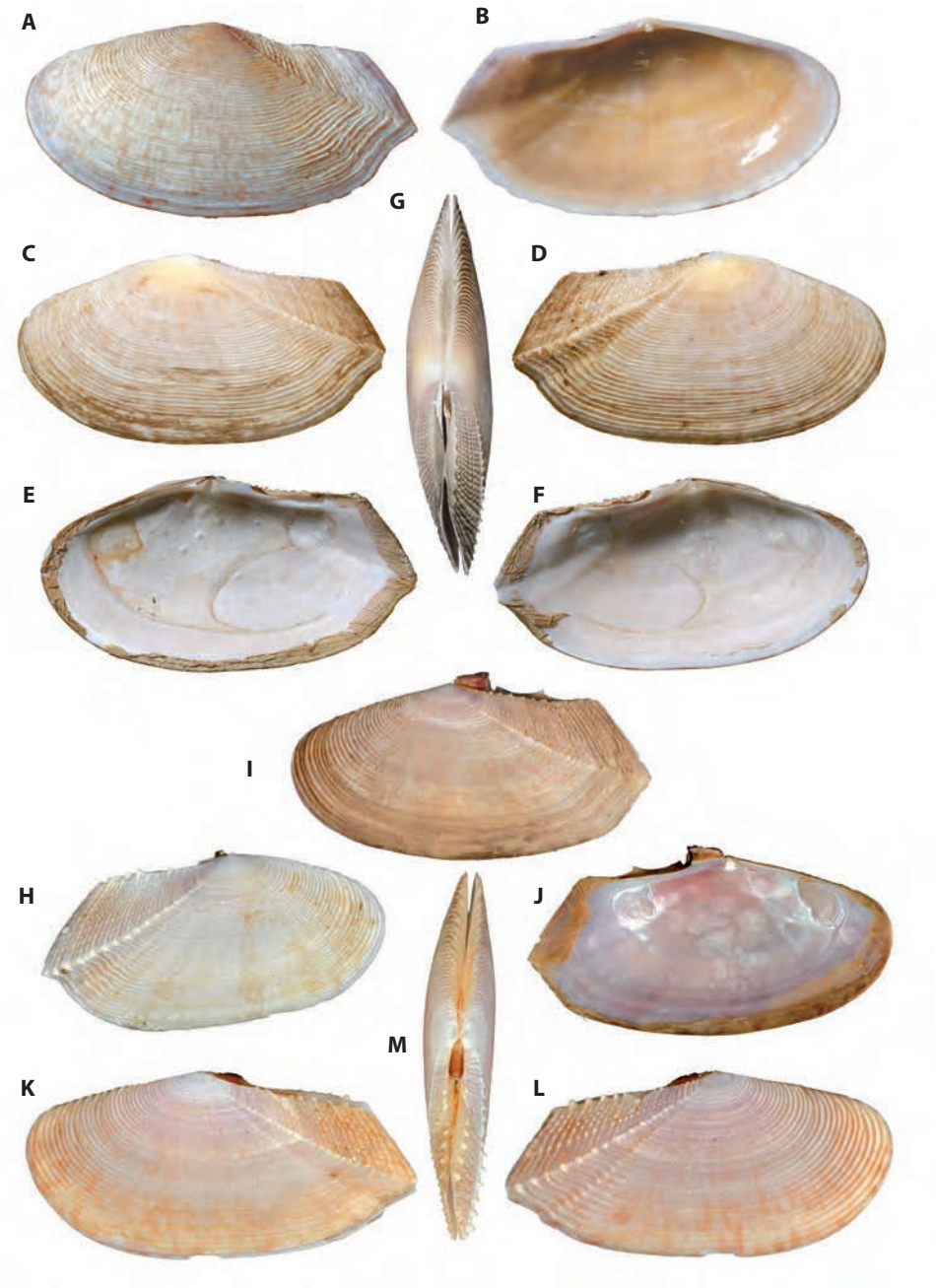
Shell up to 53 mm long (West African specimens only up to 33 mm), somewhat variable in size and outline, more or less elongate, rather thin but solid, compressed. Anterior margin rounded, posterior margin obliquely truncated, with sharp angles. Ventral margin gently convex, with a postero-ventral sinuosity. Beaks just in front of the vertical midline. Surface with numerous, fine commarginal ridges, occasionally becoming obsolete on the left valve. Posterior angle sharp. Posterior area with about eight radial ribs crossing the commarginal ridges and producing so a cancellate sculpture. Periostracum on European specimens strong and brown to olive, on West African specimens very thin and transparent. Outside whitish to pale violet, with light to darker brownish, reddish or violet radial rays, often with lighter mottlings on them. Inside light to dark violet, occasionally light brownish to yellowish, in Mauritanian specimens often bright yellow.



Distribution. Iceland (valves only), Faroe, Norway (70°N) and British Isles southward to southern Angola (Lucira, Namibe province); throughout the Mediterranean.

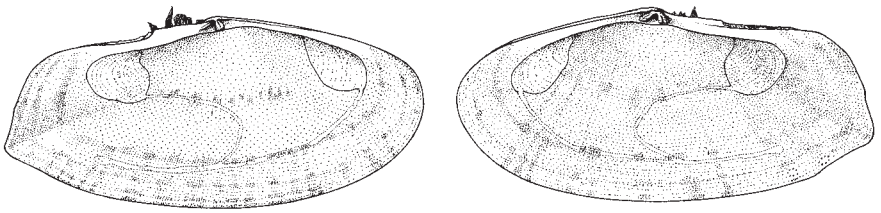
Biotope. In clean fine to coarse sand, also with calcareous algae or shell debris, from extreme low water to about 40-50 m. In West Africa only offshore from 10 m to about 20-30 m, not uncommon.

Remarks. The West African specimens of *Gari fervensis* are considerably smaller and often somewhat shorter and broader than specimens from Northern Europe, and the postero-ventral sinuosity is deeper. As the transition between the large northern specimens and the smaller and thinner subtropical and tropical specimens is continuous, there is no reason for separating both forms. Other spellings of the name are *ferroensis* auct., *faeroeensis* auct. or *feroensis* auct.



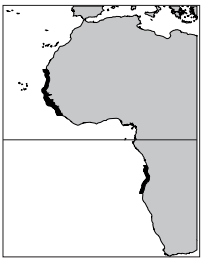
13.143. ***Gari (Psammobia) fervensis*** **(Gmelin, 1791). A-B**, Baie de Cansado, Mauritania, 10 m (31.0 mm). **C-G**, 3 miles W of Ile Kiaoné, Mauritania, 20°02'N, 16°22'W 6 m (22.8 mm). **H**, Abidjan, Côte d'Ivoire (18.1 mm). **I-J**, same locality (22. 4 mm). **K-M**, Cacuaco, Bengo prov., N-Angola, 5-10 m (20.3 mm).

Gari (*Psammobia*) *jousseaumeana* Bertin, 1880



13.144. Casamance, Senegal, 12°43'N, 17°21.2'W, 34 m (44 mm).

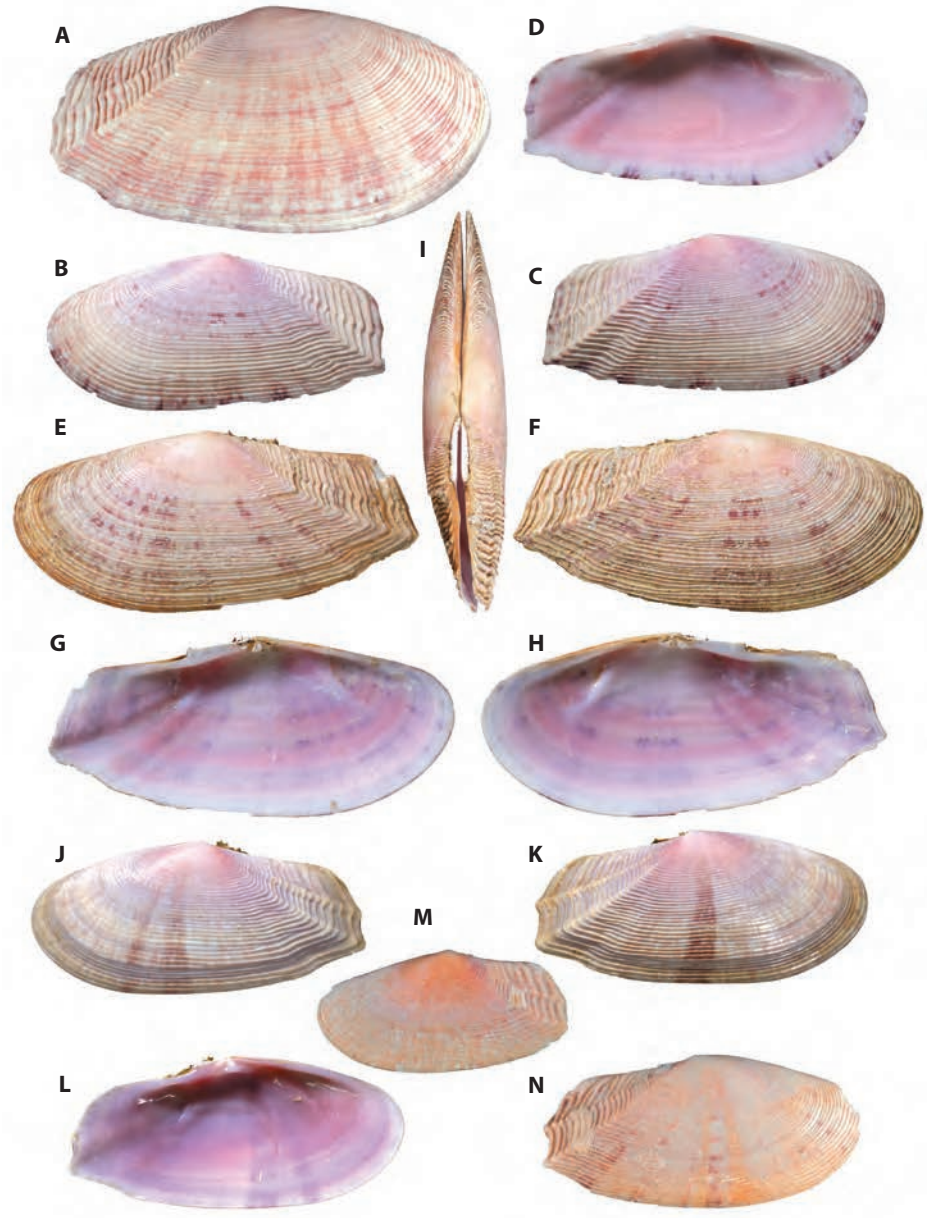
Shell up to 65 mm long, slightly variable in outline and size, elongate, moderately thick (fully grown specimens), compressed. Anterior margin well rounded, posterior margin obliquely truncate. Ventral margin gently convex, with a very shallow postero-ventral sinuosity and ending in a sharp angle to the posterior margin; dorsal angle to the posterior margin rounded. Beaks more or less median or only very slightly in front of the vertical midline. Surface with numerous, regular, prominent, commarginal ridges, which on the posterior half become slightly oblique and thus subcommarginal; a few of them also uniting on the posterior part. Posterior angle sharp. Posterior area with particularly coarse commarginal sculpture, crossed by one conspicuous radial rib. Periostracum thin and pale brownish, persistent only on the marginal part of the valves. Outside whitish, light yellowish or violet, with irregular purple, violet, pinkish or light brownish radial rays, streaks or zigzags, with intense colour only on growth zones. Inside pinkish or pale to deep violet, with intensely coloured parts of external pattern showing through.



Distribution. Mauritania (Cap Blanc) to southern Guinea (Sierra Leone border); northern and southern Angola (Luanda to Lucira, Namibe province).

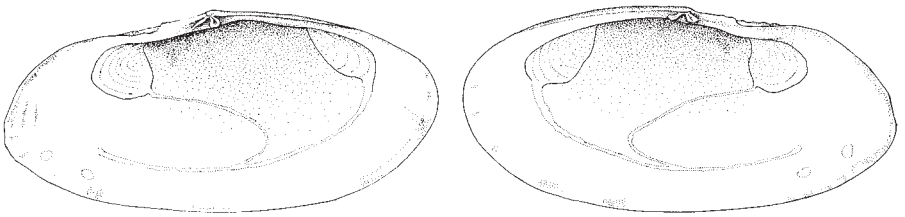
Biotope. In mixed clean sand, also with calcareous algae and shell debris, from 10 to about 50 m, mostly between 35 and 45 m, not common.

Remarks. This species differs from *G. fervensis* by its larger size, the more pronounced and coarser sculpture, the often slightly more elongate shell, the rounded dorsal corner of the posterior truncation and the single radial rib crossing the commarginal sculpture on the postero-dorsal part. The colouration in general is more vivid than in *G. fervensis*. The localities of the studied material indicate a large distribution gap from Sierra Leone to the Congo. Slight differences in size and shell form, expressed in outline, colouration and form of the pallial sinus, suggest that the two populations may represent two allopatric species or subspecies.



13.145. *Gari (Psammobia) jousseaumeana* Bertin, 1880. **A**, Mauritania, 20°20'N, 16°22'W, 10 m (64.5 mm). **B**-**D**, Baie de Gorée, Senegal (32.6 mm). **E**-**I**, W of Ouendi, Guinea, 9°54'N, 16°01.5'W, 39 m (51.4 mm). **J**-**L**, Baia de Corimba, Luanda prov., N-Angola (24.3 mm). **M**, Santa Marta, Lucira, Namibe prov., S-Angola, 40 m (17.6 mm). **N**, same locality (32.3 mm).

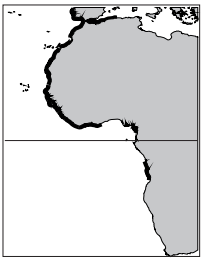
Gari (*Psammobia*) *pseudoweinkauffi* Cosel, 1990



13.146. W Rio Morébaya, Guinea, 9°24'N, 14°21'W (21.4 mm).

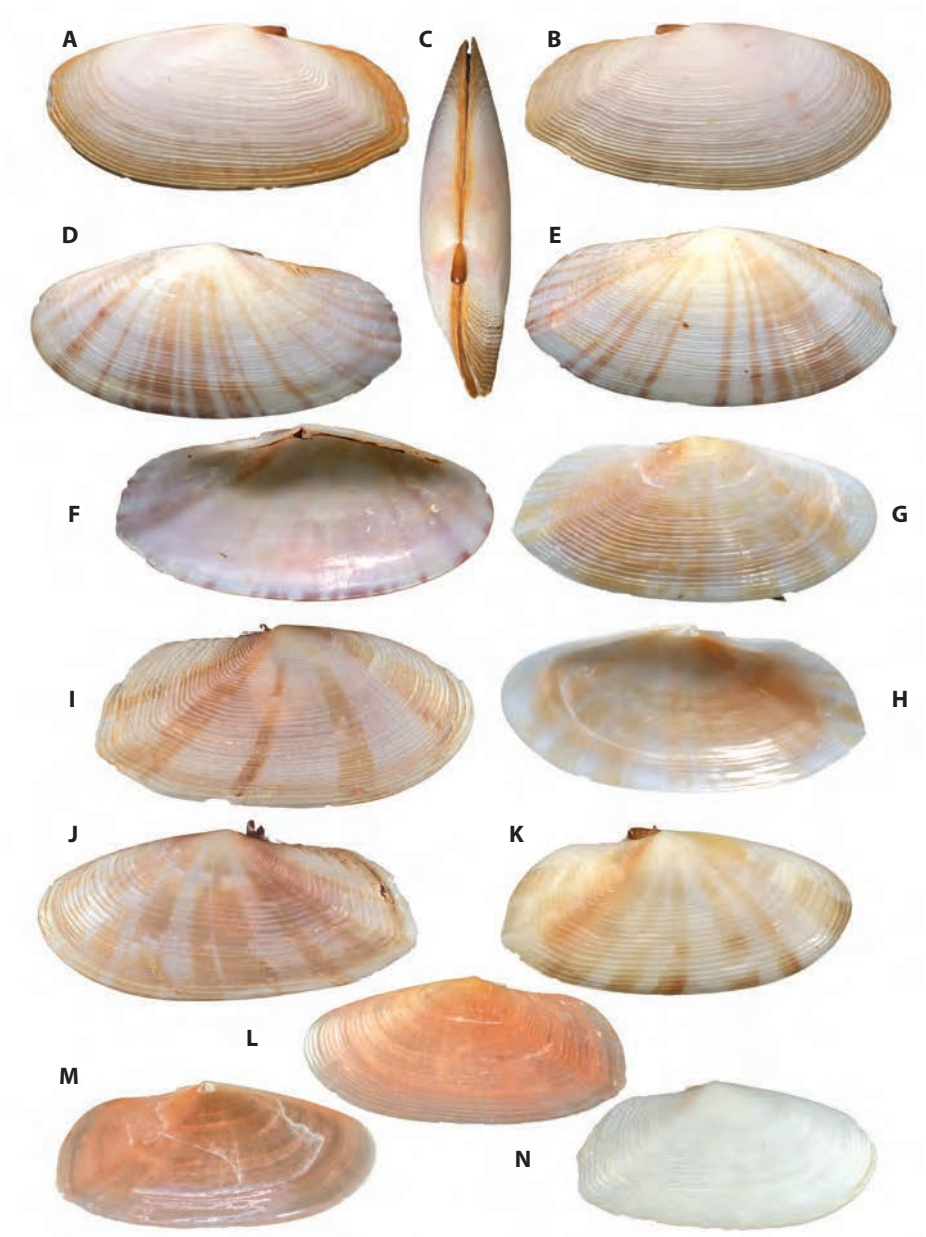
Shell small, up to 32 mm long, oblong, quite solid, moderately compressed. Anterior margin rounded, posterior margin oblique, postero-dorsally gently rounded, postero-ventrally with a rounded corner. Ventral margin gently convex, postero-ventral sinuosity very ill-defined or absent. Beaks more or less median or very slightly behind the vertical midline. Surface with numerous commarginal ridges, on the anterior part flat, broad and touching each other, from the middle towards posterior gradually separating and becoming narrow and more lamellar, especially on the posterior area. Posterior angle rounded. Posterior area often with fine, irregular radial threads on the commarginal sculpture. Periostracum not seen. Outside white to pink or pale violet, often with brownish or reddish brown radial rays or isolated streaks and spots or (rarer) zigzags. Inside white to pink or pale violet, exterior colouration showing through. Often a pink spot under the ligamental area.

Distribution. Extreme south-western Mediterranean (Alboran Sea, Algeria and Morocco); Strait of Gibraltar to Côte d'Ivoire. Further east-and southward, there is only one record from Cameroon and two from northern Angola (Ambrizete and Palmeirinhas).



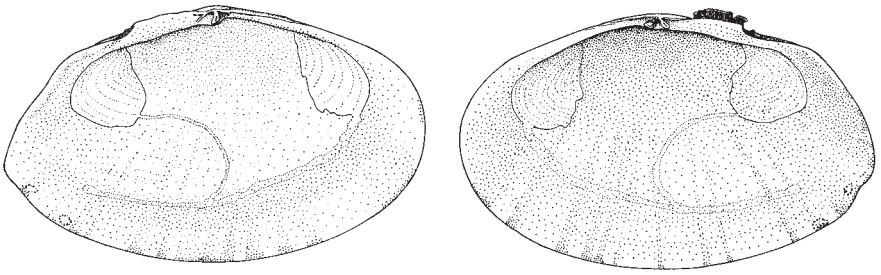
Biotope. In clean fine to coarse sand, offshore from 20 to 70 m, occasionally deeper, most common between 30 and 45 m. Not uncommon in the northern tropical zone, becoming rarer towards the south.

Remarks. The name *G. weinkauffi* Crosse, 1864 had often been erroneously used for this species, probably on the base of the erroneous type locality "Algeria" of *G. weinkauffi*, which, however, is an Indo-Pacific species (for details, see Willan 1993).



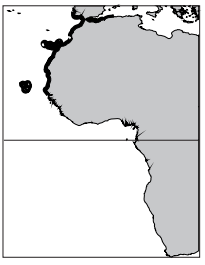
13.147. *Gari (Psammobia) pseudoweinkauffi* Cosel, 1990. **A**-**C**, Mauritania, 18°00'N, 16°14'W, 30 m (20.6 mm). **D**-**F**, Dakar region, Senegal, (24.1 mm). **G**-**H**, W of Ile Kabak, Guinea, 19°18.5'N, 14°54'W, 43 m (16.3 mm). **I**-**J**, W of Iles de Los-Conakry, Guinea, 9°30'N, 15°00.4'W, 37 m (paratype, 20.2 mm, photo Manuel Caballer/Recolnat). **K**, W of Iles de Los-Conakry, Guinea, 9°30'N, 15°26.6'W, 44 m (14.6 mm). **L**-**M**, Ambrizete, Zaire prov., N-Angola, 7°04'S, 12°21'E, 80 m, box corer (16.3 mm). **N**, same locality (15.3 mm).

Gari (*Gobraeus*) *virgata* (Lamarck, 1818)



13.148. M'Bour, Petite Côte, Senegal, 10-20 m (46.8 mm).

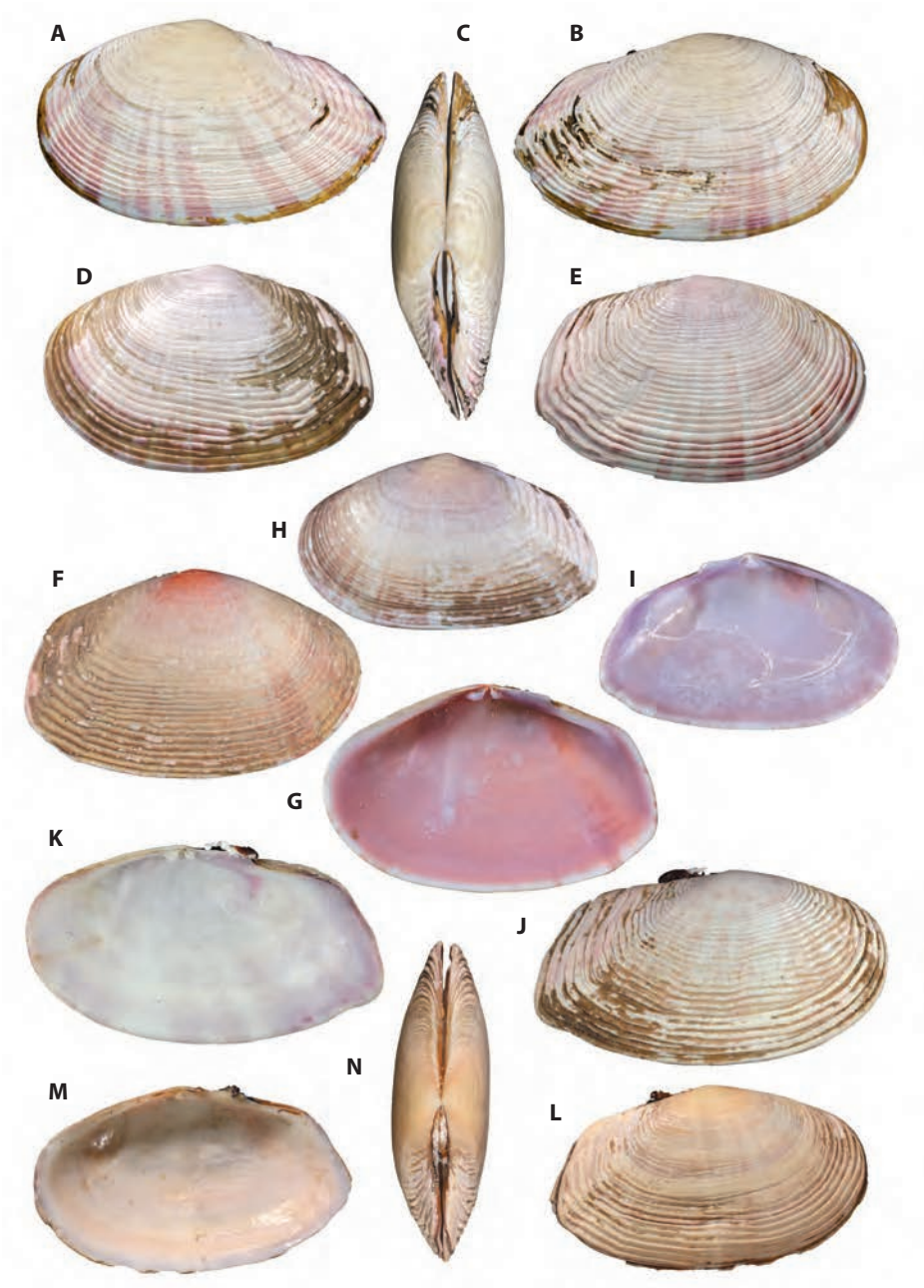
Shell up to 60 mm long, variable in outline, suboval to suboval-oblong, rather thick and solid, quite inflated. Anterior margin rounded, posterior margin oblique, with rounded angles. Ventral margin gently convex, postero-ventral sinuosity short and indistinct. Beaks more or less median of the valves. Surface with conspicuous, coarse, irregular, wave-like commarginal ribs, some bifurcating on the postero-dorsal area. Umbonal area smooth, with irregular growth lines. Posterior angle rounded and weak. Periostracum strong, olive greenish to greyish brown, often eroded on the umbonal part of the valves. Outside whitish to pale pink, with slightly darker commarginal zones and pinkish radial rays. Inside mostly pale violet to pinkish, occasionally deep violet or reddish, external colouration showing through, mostly along the ventral margin.



Distribution. Portugal (Setubal) and Alboran Sea to Senegal (M'Bour, 14°N); Canary Islands, Cape Verde Islands, extreme south-western Mediterranean to Alger.

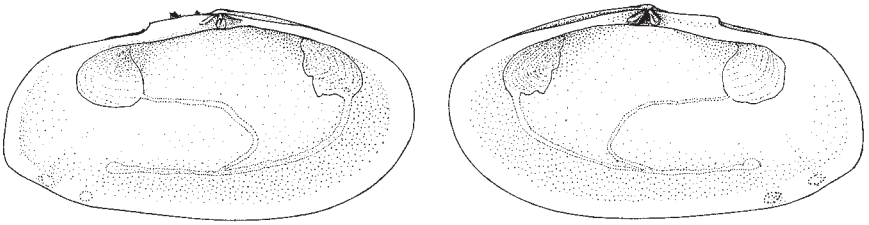
Biotope. In mixed and coarse sand, also with shell debris, from 1 to about 25 m, common.

Remarks. This species was long known as *Psammobia intermedia* Deshayes, 1855, which is a synonym. Willan (1992) noted its earlier valid name and selected a lectotype in MHNG. Another synonym is *Psammobia costata* Hanley, 1842. This subtropical species is endemic to the NW-African upwelling zone and has its distribution pattern in common with *e.g. Ungulina rubra* (see there). In the north of its range (extreme SW-Mediterranean), *G. pseudoweinkauffi* has the same distribution as *G. virgata* but continues also into the tropical zone. This is "Le Gatan" of Adanson.



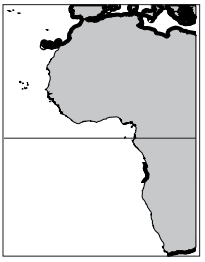
13.149. ***Gari (Gobraeus) virgata*** **(Lamarck, 1818). A-C**, Port-Etienne (now Nouadhibou), Mauritania (54.7 mm). **D-E**, same locality (42.2 mm). **F-G**, Baie de l'Etoile (21°N), Mauritania, intertidally (37.0 mm). **H-I**, same locality (33.1 mm). **J-K**, Baia Matiota, Mindelo, São Vicente, Cape Verde Islands, 2-3 m (52.1 mm). **L-N**, Dakar, Senegal (38.9 mm), old coll. MNHN.

Gari (*Gobraeus*) *depressa* (Pennant, 1777)



13.150. Baia do Lobito, Angola, Mission Gruvel (51 mm).

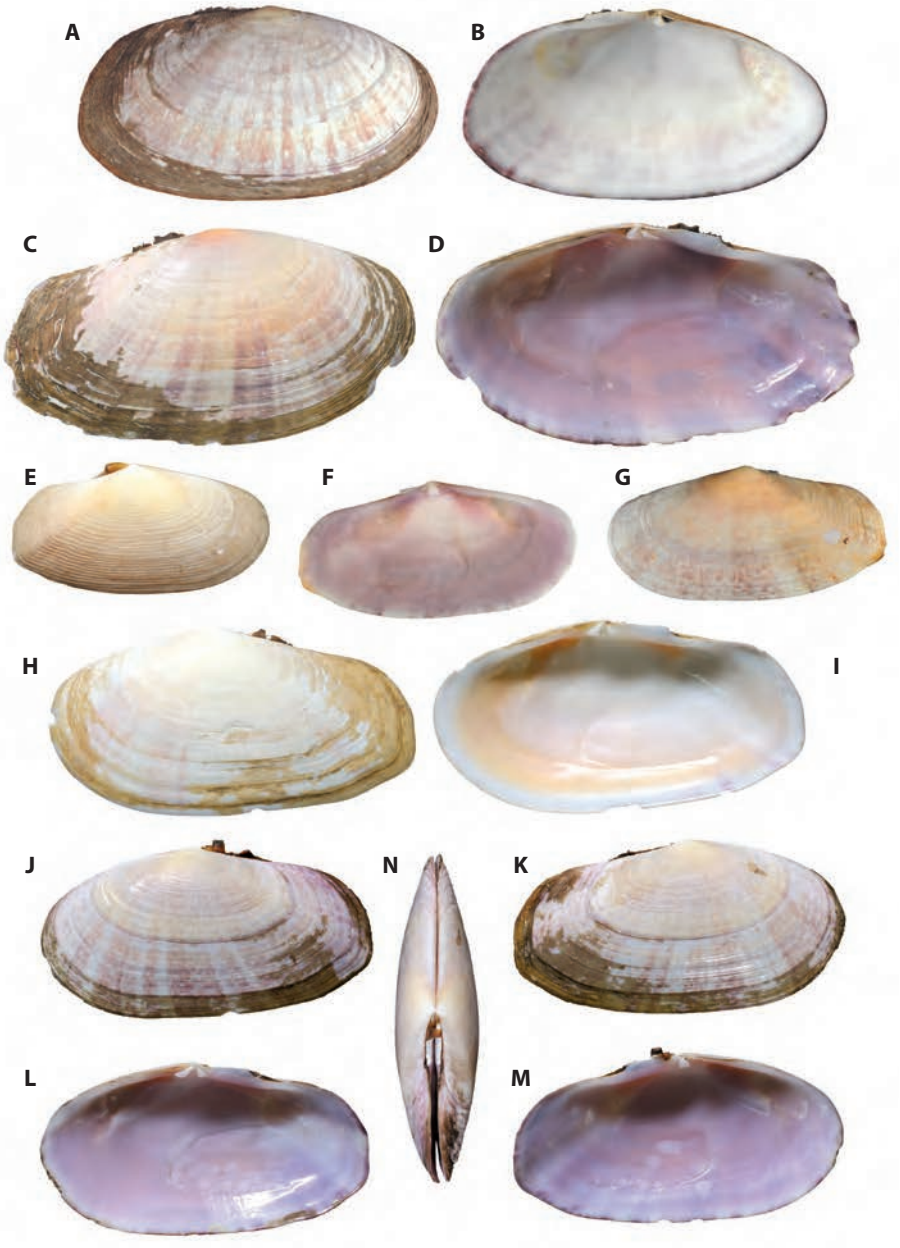
Shell up to 60 mm long, slightly variable in outline, oblong-oval, rather solid, compressed. Anterior margin rounded, posterior margin more or less rounded. Ventral margin gently convex, postero-ventral sinuosity indistinct or absent. Beaks just in front of the vertical midline. Surface smooth, with irregular commarginal growth lines and few coarser growth stages. Posterior angle rounded. Posterior area near the beaks with faint radial ridges, visible only under a lens and becoming obsolete towards the margin. Periostracum strong, brownish to olive green, mostly persistent on the marginal part of the valves only. Outside whitish to cream-yellowish or light pink, often with darker commarginal zones and with purple, lilac or light brownish radial rays. Inside whitish, cream, light orange or light to dark violet, occasionally with yellowish zones or rays, exterior pattern showing through, mostly along the margins.



Distribution. Norway (66-67°N), West coast of Scotland and Ireland, English Channel southward to Morocco (Essaouira/Mogador); northern and southern Angola (Cacuaco-Santa Maria, Benguela); Canary Islands; throughout the Mediterranean; South Africa (False Bay-Port Alfred).

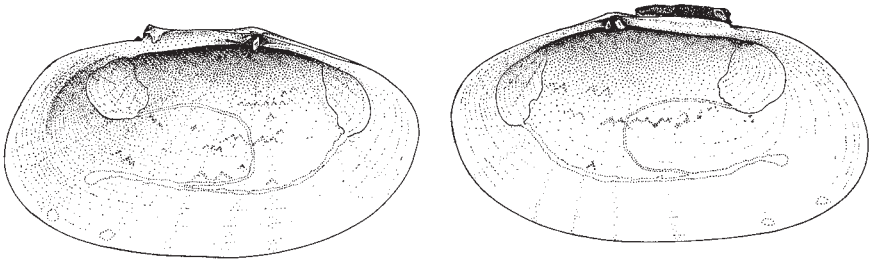
Biotope. In mixed and coarse sand, from 1 to about 50 m, rarely exposed at spring tide low water. Common in Europe, uncommon in Angola.

Remarks. This species is cold- to warm-temperate and has a pronounced bipolar distribution with a very large gap comprising the southern part of the NW-African upwelling zone as well as tropical West Africa. There are slight differences between the northern and the southern population of *G. depressa*: the southern form is somewhat more elongate with a more truncated posterior margin, whereas the European form is slightly higher and more rounded posteriorly. These differences seem to be in the same degree as those in *G. jousseaumeana* and only DNA analysis would prove if a separation on species or subspecies level may be justified. Synonyms are *G. vespertina* (Gmelin, 1791) and *Psammobia florida* Lamarck, 1818. A very close looking species is *G.* (*G.*) *stangeri* (Gray, 1843) from New Zealand.



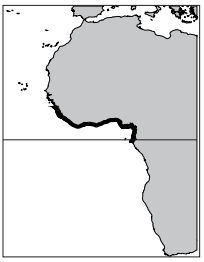
13.151. *Gari (Gobraeus) depressa* (Pennant, 1777). **A**-**B**, Lanzarote, Canary Islands (54.7 mm). **C**-**D**, Futungo, Luanda prov., N-Angola, beach drift, low water (rv, 60.0 mm). **E**, Baia da Corimba, Luanda prov., N-Angola, dredged, 10-20 m (16.6 mm). **F**-**G**, same locality (19.4 mm). **H**-**I**, Baia do Lobito, Benguela prov., S-Angola, beach drift (50.6 mm). **J**-**N**, Baia de Santa Maria, Benguela prov., S-Angola, 1-2 m (36.7 mm).

Gari (*Gobraeus*) *castrensis* (Spengler, 1794)



13.152. Ile Banié, N-Gabon, sand, 3-7 m (47 mm).

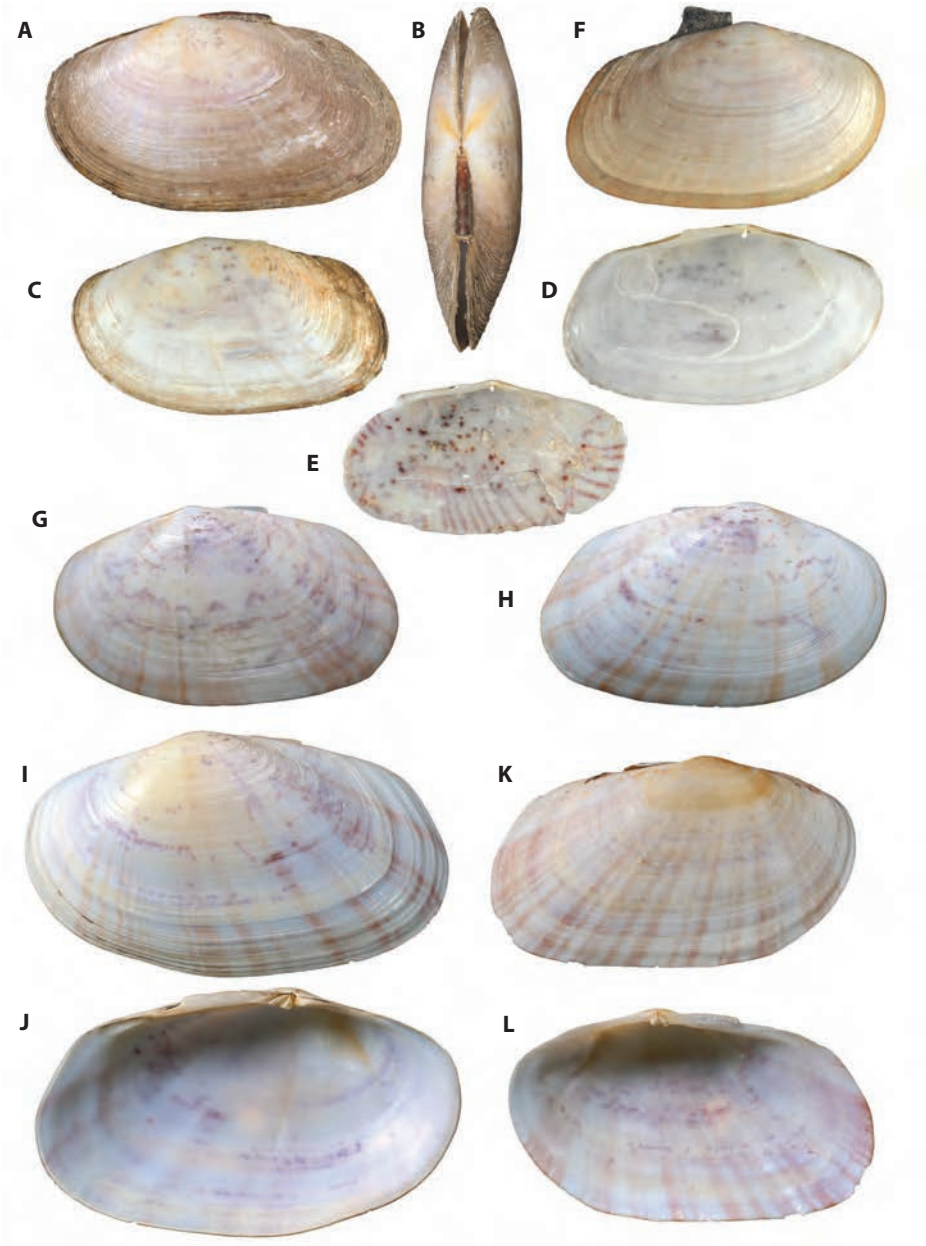
Shell up to 60 mm long, somewhat oblique, suboval, thin but strong, rather compressed. Anterior margin rounded, dorsally more convex than ventrally, postero-ventral margin well rounded, postero-dorsal margin with a rounded angle, no postero-ventral sinuosity. Beaks just in front of the vertical midline. Surface smooth, with very fine, dense, irregular growth lines. Posterior area with fine but more prominent commarginal ridges. Posterior angle rounded and indistinct. Periostracum light greenish brown to dark brown, very thin or missing on the earlier part of the valves, thicker on the marginal part, with wrinkles close to the margins. Outside whitish to irregularly pale pink or lilac, with slightly darker brownish-pink radial rays, isolated purple points and spots and purple commarginal zigzag lines forming the typical tented pattern which, however, occasionally is absent. Often a short, narrow, oblique light orange ray on the antero-dorsal slope just anterior to the umbos. Inside whitish, external colouration well showing through.



Distribution. Guinea (Company Bancs) southward to Gabon (Port Gentil).

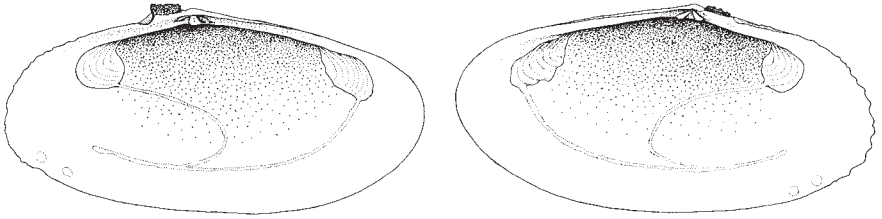
Biotope. In mixed and coarse sand, also with gravel or shell debris, from about 3 to 50 m, most common between 10 and 25 m, locally not uncommon.

Remarks. This species does not penetrate into the regions with seasonal upwellings north- and southward of the tropical zone but is present in the atypical tropical region (off Ghana) with weaker upwelling. It differs from *G. depressa* in being higher, more oval and thinner and in having the conspicuous tent-markings; the beaks are placed further forward. There is a sibling species in the tropical Indo-Pacific, *G. oriens* (Deshayes, 1855), which is known from East Africa to New Caledonia; it is treated by Willan (1993) as a subspecies of *G. castrensis*.



13.153. *Gari (Gobraeus) castrensis* **(Spengler, 1794). A-B**, W of Ile Yomboya, Guinea, 10°27'N, 15°37.5'W, 39 m (53.6 mm). **C-D**, same locality (46.8 mm). **E**, same locality (26.7 mm). **F**, W of Cap Verga, Guinea, 10°12'N, 13°06'W, 20 m (44.2 mm). **G-H**, Ile Banié, Baie de Corisco, Gabon (53.1 mm). **I-J**, Port-Gentil, Gabon, near oil terminal, 0°38'S, 843'E, 0-5 m (65.7 mm). **K-L**, same locality (56.8 mm).

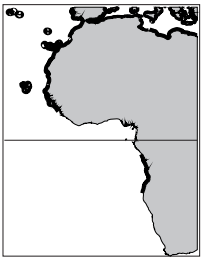
Gari (*Psammobella*) *costulata* (Turton, 1822)



13.154. W Ile Kabak, Guinea, 9°18'N, 15°09'W, 50 m (12.3 mm).

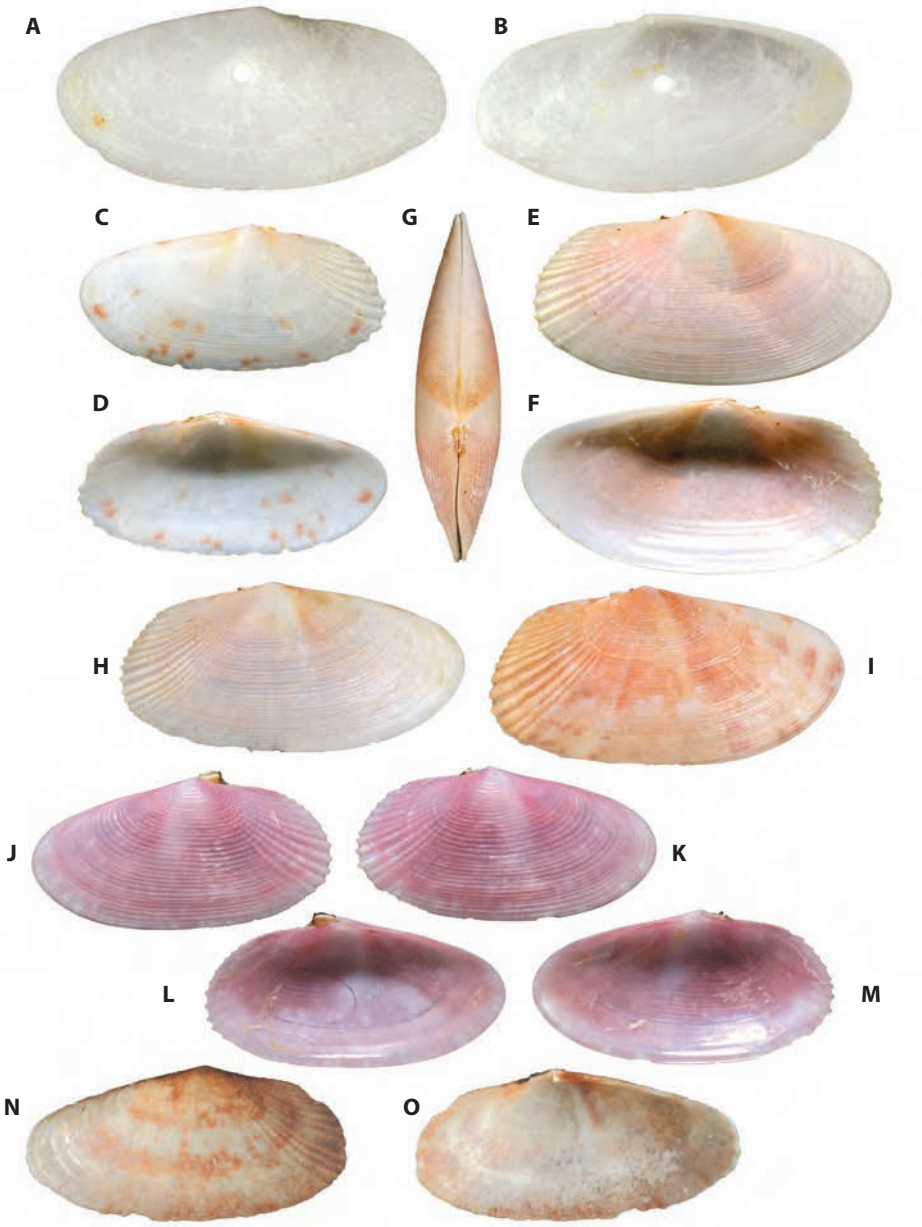
Shell small, up to 25 mm long (West African specimens only up to 18 mm), variable in shape, oblong-suboval, quite solid, moderately inflated. Anterior margin rounded, posterior margin rounded and slightly undulate, corresponding to the radial ribs on the posterior area. Ventral margin gently convex. Beaks in the middle of the valves or somewhat behind the vertical midline. Surface with fine commarginal ridges. Posterior area with 9-13 rather prominent radial ribs, delimited by the rounded posterior angle. Periostracum thin, nearly colourless, persistent only on the marginal area. Outside uniform white to pink, reddish, orange or violet, often mottled with pale brownish or with radial rays of the same colour. Umbonal region mostly whitish or yellowish, frequently delimited by a vertical reddish to violet zone anteriorly only or both anteriorly and posteriorly. External colouration visible on the inside in the same intensity.

Distribution. Faeroes (shells only), Shetlands, west coast of the British Isles southward to Guinea (9°00'N); northern Angola (Ambrizete, rare) to southern Angola (Namibe province); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean; South Africa from False Bay to Natal.



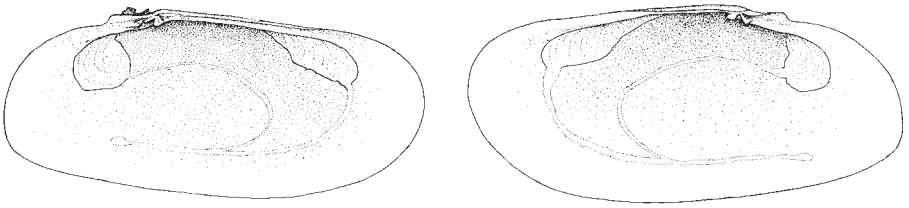
Biotope. In mixed sand, coarse sand and gravel, from 5 to about 150 m, most common between 35 and 60 m. Fairly common in the north, rarer in Angola.

Remarks. This species has not been recorded from Sierra Leone to Angola north of the Moçâmedes Province, and nearly the whole known West African distribution pattern lies within the influence of seasonal or permanent upwelling, it is quite similar to that of *G. jousseaumeana*.



13.155. *Gari (Psammobella) costulata* (Turton, 1822). **A**-**B**, Dakar region, Senegal, 129-150 m (18.1 mm). **C**-**D**, W of Ile Tannah, Guinea, 9°11.5'N, 14°46.5'W, 50 m (9.7 mm). **E**-**G**, same locality (12.2 mm). **H**, W of Ile Tannah, Guinea, 9°12'N, 14°40.5'W, 46 m (11.6 mm). **I**, same locality (12.1 mm). **J**-**M**, W of Ile Kabak, Guinea, 9°18'N, 14°39'W, 39 m (8.3 mm). **N**-**O**, Praia Amelia, Namibe prov., S-Angola, 60-80 m (12.2 mm).

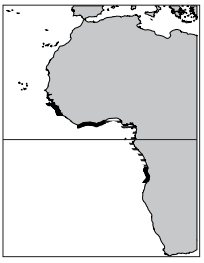
Gari (*Psammodonax*) *gofasi* Cosel, 1990



13.156. Punta de Mussulo, N-Angola, on beach, paratypes, two specimens (lv, 12.9 mm; rv, 14.6 mm).

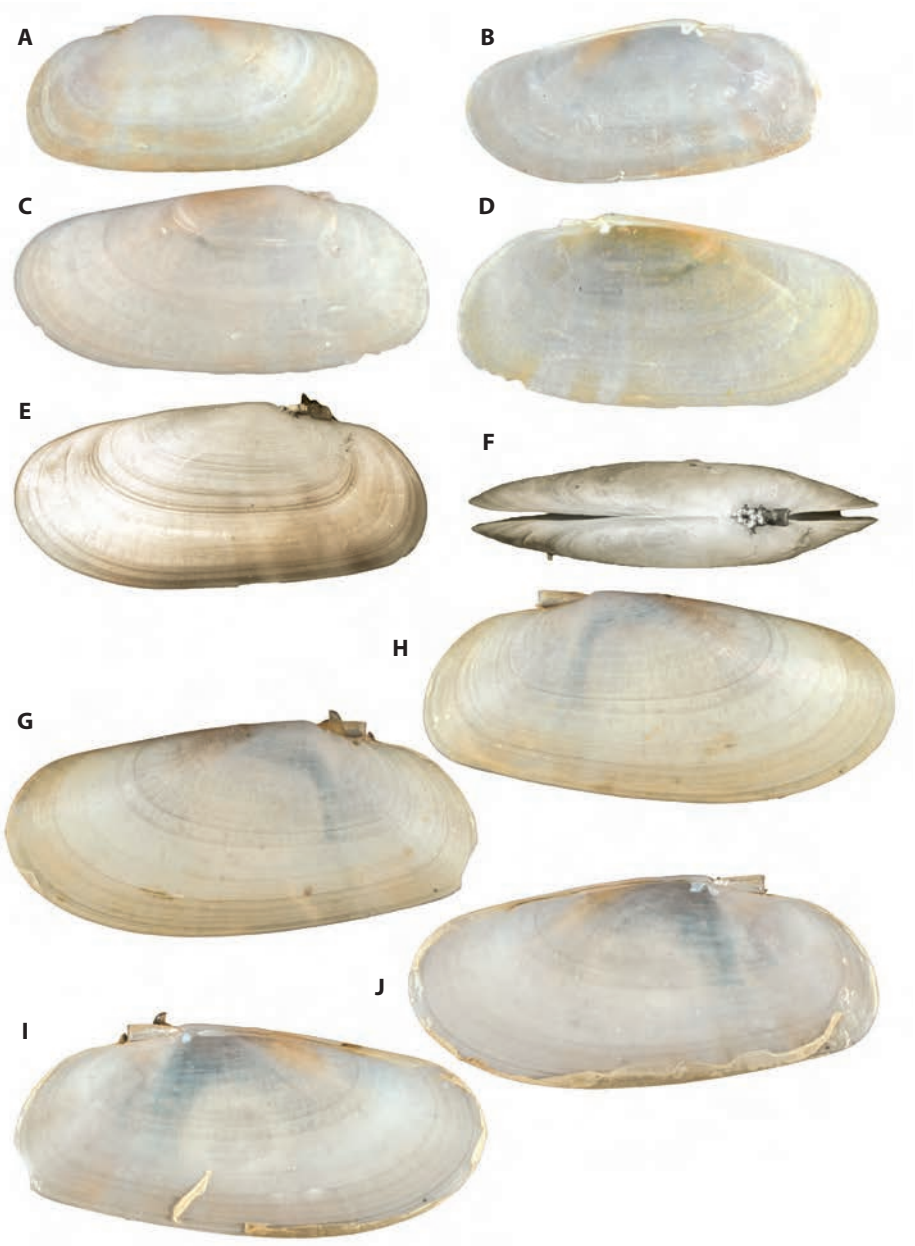
Shell small, up to 15 mm long, elongate-oval, thin but solid, moderately compressed. Anterior margin well rounded, posterior margin in its postero-dorsal part gently rounded, postero-ventrally forming a rounded corner. Ventral margin anteriorly evenly convex, in the middle and posteriorly nearly straight. Beaks at the end of the second third of the valve. Surface smooth, with very fine, irregular growth lines, on the posterior area a few shallow waves. Posterior angle rounded. Periostracum very thin, very light greyish brown or straw-coloured and translucent, dull, well folding over the margin, more persistent on the marginal part of the valve. Pallial sinus very deep and broadening towards anterior, the ventral limb confluent with the ventral pallial line over most of its length. Outside whitish to pale yellowish, occasionally with orange hue or some orange in front of the beaks, or pale violet to violet with two lighter rays running from the beaks to the ventral margin. Inside with external colouration showing through.

Distribution. Guinea (Cape Verga-Sierra Leone border); Côte d'Ivoire to Ghana; northern Angola (Luanda).



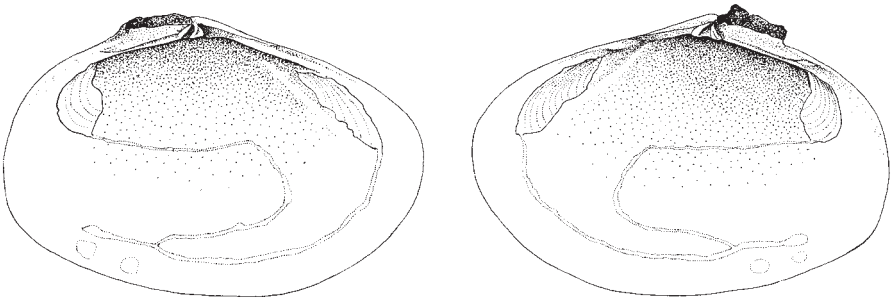
Biotope. In more or less clean sand, in Angola most probably in shallow water, judged from the fresh shells in the beach drift. In Ghana found in fine sand at 5-10 m in a bay, in Guinea encountered only offshore on the vast shelf between 15 and 40 m, on mixed and coarse sand; rare except in very localized populations.

Remarks. This species has not been recorded from Sierra Leone and Liberia nor from Bénin to the Congo: the existence of distribution gaps in the typical tropical zones is possible. A close-looking Miocene fossil is *G. biali* Cossmann & Peyrot, 1911 from the Aquitanian Basin. The only comparable Recent species are Indo-Pacific: *G.* (*P.*) *gracilenta* (E.A. Smith, 1884) and *G.* (*P.*) *rasilis* (Melvill & Standen, 1899), both from tropical northern Australia (see Willan 1993). They are less elongate and their pallial sinus is confluent with the ventral pallial line for a short distance only.



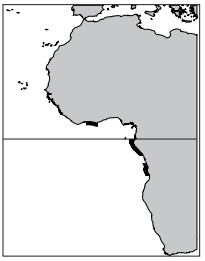
13.157. *Gari (Psammodonax) gofasi* Cosel, 1990. **A-B**, W of Ouendi, Guinea, 9°54'N, 14°58'W, 37 m (10.5 mm). **C-D**, W of Baie de Sangarea, Guinea, 9°42'N, 15°15'W, 33 m (10.7 mm). **E-F**, Mia Mia Bay, Ghana, 5-10 m (12.6 mm). **G-J**, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (holotype, 11.3 mm, photo Manuel Caballer/Recolnat).

Heterodonax parvus Dunker, 1853



13.158. Punta de Mussulo, N-Angola, on beach (13.2 mm).

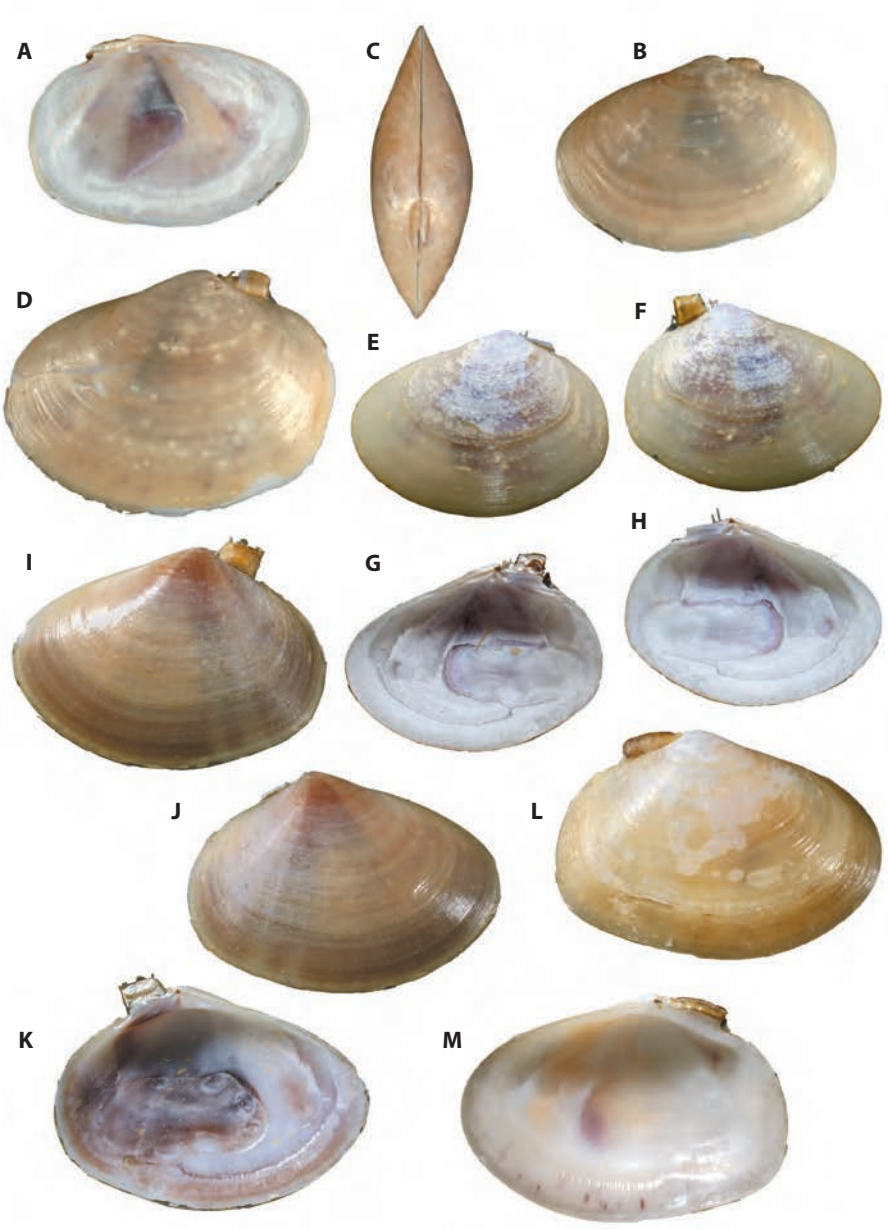
Shell up to 13 mm long, quite variable in shape and thickness, broadly suboval, usually quite thick and solid but occasionally thinner, compressed. Anterior margin rather narrowly rounded, posterior margin broadly rounded-truncate. Ventral margin anteriorly more convex than posteriorly. Beaks just behind the vertical midline. Surface smooth, with faint, irregular growth lines. Posterior angle broad and rounded. Periostracum thin, translucent and glossy, pale straw-coloured, in adult specimens persistent only on the marginal part of the valves. Outside whitish, with few radial rays, streaks or spots of pale to deep violet, occasionally valves uniform violet. Inside whitish to yellowish, with irregular deep violet rays, spots, streaks or zones.



Distribution. Known from a short coastal strip in northern Angola around Luanda, a single worn valve from the Congo (Pointe-Noire) and a few specimens from Gabon (Port-Gentil) and Côte d'Ivoire (Lagune Ebrié).

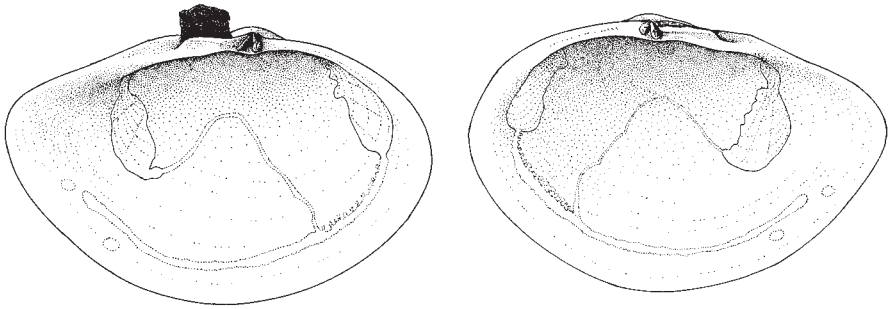
Biotope. In sandy bottom, occasionally with rocky parts, from shallow water to about 10-20 m, not uncommon. The species lives in calm water and seems to have a slight tendency towards somewhat reduced salinity.

Remarks. The southernmost and largest population of this species seems to be restricted to the northern part of the southern alternant region. Details about the isolated population with thinner shells at Côte d'Ivoire are not yet known. Other *Heterodonax* species are: *H. bimaculatus* (Linnaeus, 1758) in the Caribbean, *H. pacificus* (Conrad, 1837) in the Panamic Faunal Province and *H. ludwigii* (Krauss, 1848) in South Africa.



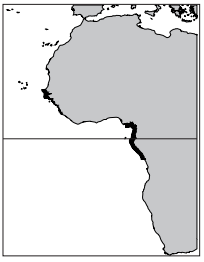
13.159. *Heterodonax parvus* Dunker, 1853. **A**-**C**, Ile Boulay Sud, Lagune Ebrié, Côte d'Ivoire (10.3 mm). **D**, same locality (12.1 mm). **E**-**H**, Port-Gentil, Gabon, Plage de la Sogara (7.3 mm). **I**-**K**, Ponta do Mussulo, Luanda prov., N-Angola (11.6 mm). **L**-**M**, same locality (11.6 mm).

Sanguinolaria achatina (Spengler, 1798)



13.160. Pointe Noire, Congo, Plage Mondaine, on beach (51.3 mm).

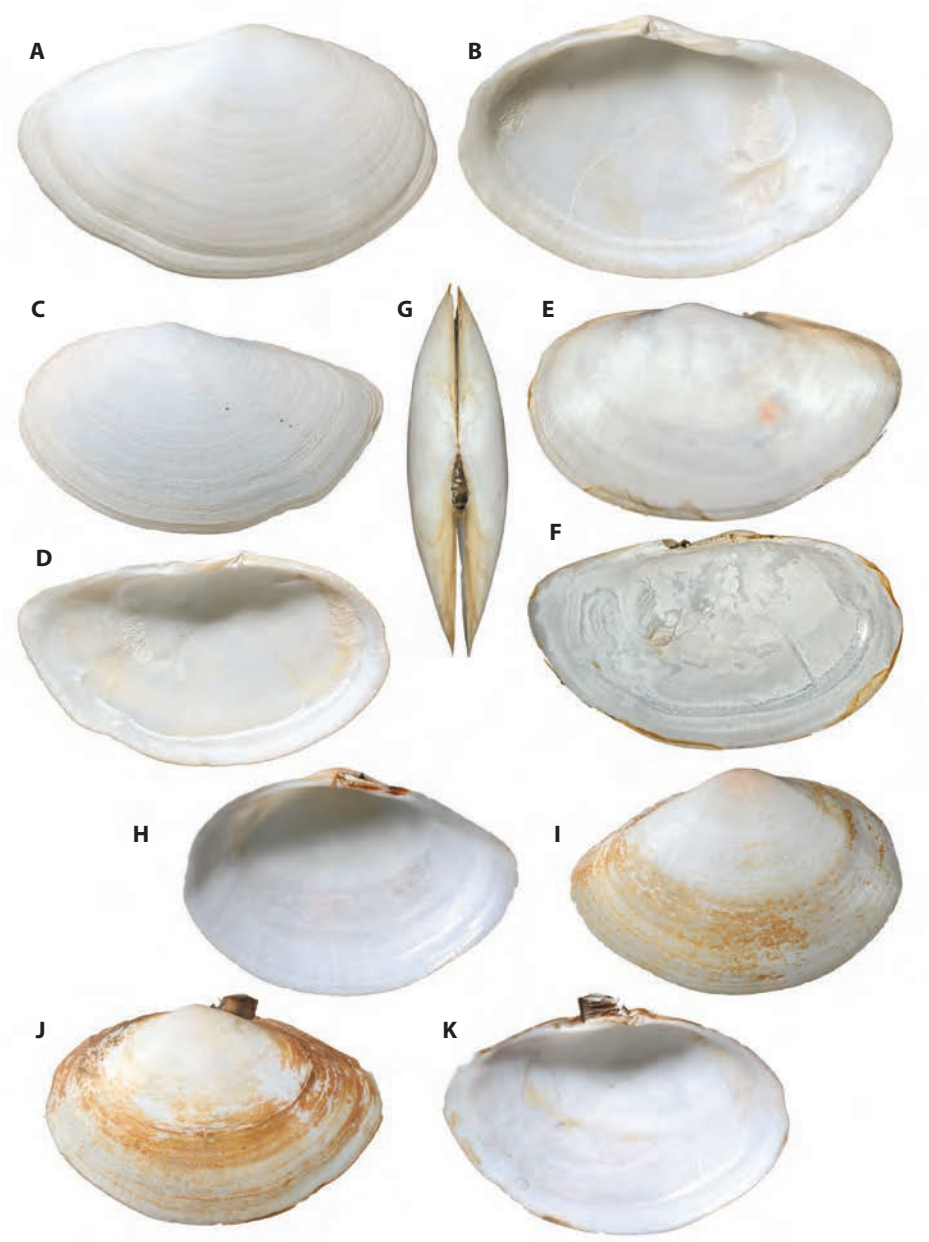
Shell up to 68 mm long, variable in shape and thickness, more or less narrowly suboval, quite thin (fully grown specimens may occasionally be thicker), rather inflated. Anterior margin broadly rounded, with a small sinuosity at the end, posterior part tapering, with posterior margin narrowly rounded. Ventral margin markedly convex, often with a very slight, broad sinuosity postero-ventrally. Beaks slightly in front of the vertical midline. Surface smooth, with irregular commarginal growth lines and some coarser growth stages. Faint broad radial striae on the anterior fourth of the valve, more pronounced marginally. Slight broad radial depression on the posterior half. Periostracum thin, very pale yellowish grey to nearly colourless, persistent only on the marginal part. Outside white, occasionally with light salmon orange on the umbonal area which very rarely extends more ventrally. Inside white, sometimes with orange-salmon hue on the margins.



Distribution. Senegal (Petite Côte, M'Bour to Casamance, Kafountine); Ghana (*fide* Huber, 2°10), Cameroon (Victoria/Limbe) to Congo Brazzaville (Pointe-Noire). No records from the northern typical tropical zone and the atypical tropical zone of Côte d'Ivoire.

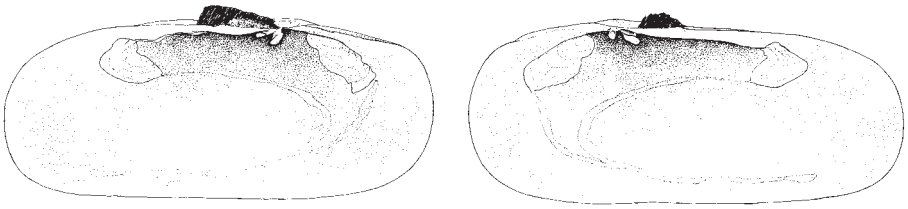
Biotope. In sandy bottom, most probably fine and mixed sand, in shallow water, in semi-sheltered calm bays, locally not uncommon.

Remarks. This little-known species had frequently been united with *S. sanguinolenta* (Gmelin, 1791), a Caribbean species. The latter is smaller than *S. achatina*, somewhat higher and has a vivid pink colour on the umbonal part and the whole inside except a white marginal rim. It has been misidentified by Nicklès (1952) as *Sanguinolaria vitrea* Deshayes, 1855, an Indian Ocean species. Valves and shells are regularly found on certain beaches. This is *S. aureocincta* Martens, 1879 and *S. africana* Cosel, 1990. A close Panamic-Pacific species is *S. tellinoides* A. Adams, 1850.



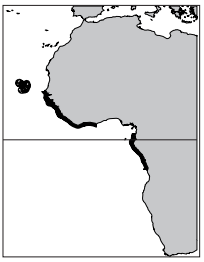
13.161. *Sanguinolaria achatina* (Spengler, 1798). **A**-**B**, M'Bour, Petite Côte, Senegal, on beach between tides (64.8 mm). **C**-**D**, Kafountine, Casamance, beach (50.7 mm). **E**-**G**, Morton Bay, Victoria (now Limbe), Cameroon, beach drift at low tide (holotype of *S. africana* Cosel, 1989, 50.0 mm, photo Manuel Caballer/Recolnat). **H**-**I**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (52.7 mm). **J**-**K**, same locality (51.3 mm).

Solecurtus afroccidentalis Cosel, 1989



13.162. Ile Banié, N-Gabon, 2-4 m (56 mm).

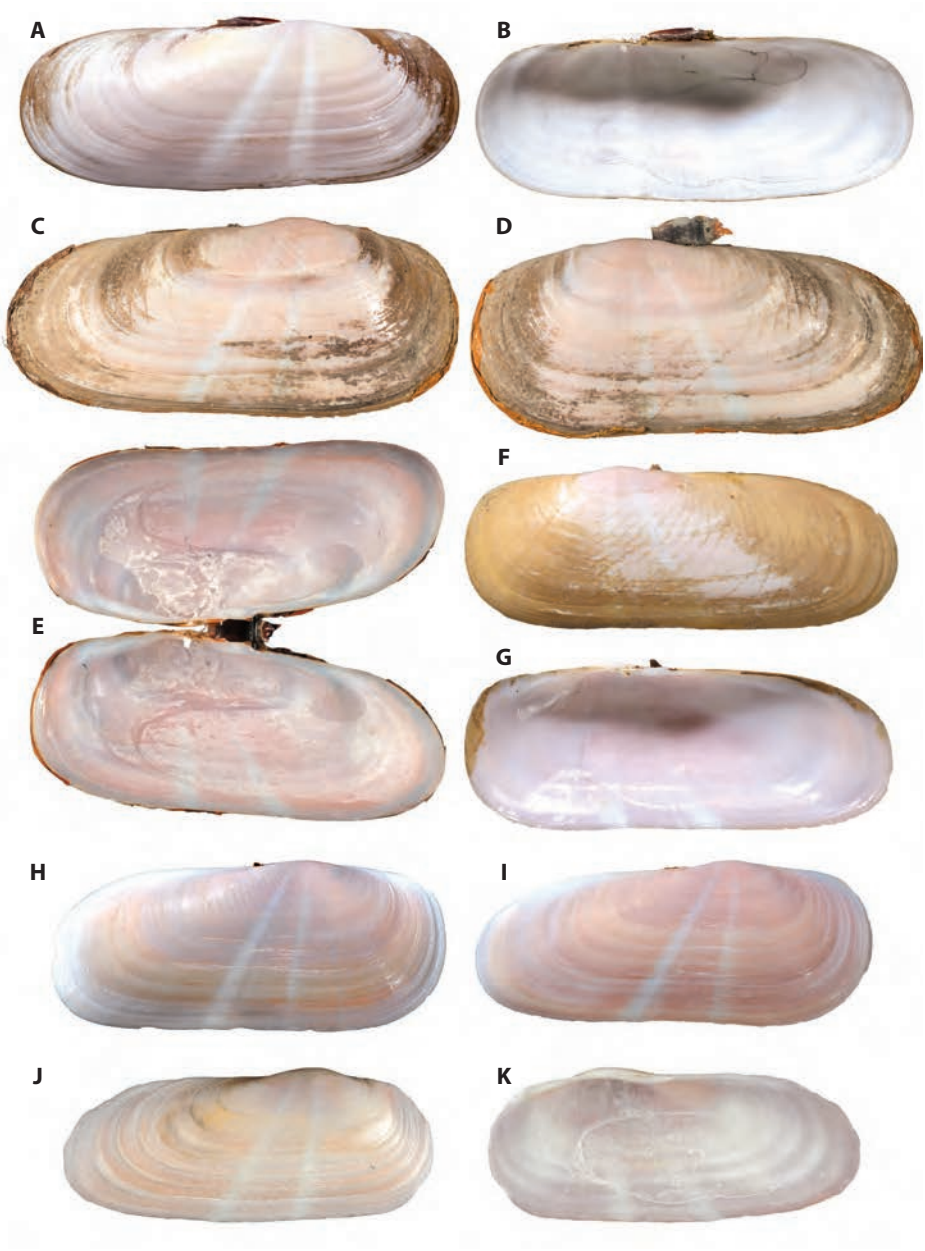
Shell up to 82 mm long, somewhat variable in outline and size, oblong-rectangular, slender, solid but not thick, equivalve (but occasionally valves with slightly unequal length), inflated, widely gaping at both ends. Anterior and posterior margin well rounded, posterior part often very weakly tapering. Ventral margin slightly convex, straight or even very faintly concave. Beaks well in front of the vertical midline. Surface with quite strong commarginal growth lines, coarser growth stages and very fine, more or less oblique, irregular, incised lines running from the postero-dorsal margin towards the ventral margin, on the marginal part often becoming obsolete, missing on the anterior part of the valves in front of the umbos. Anterior and posterior part with very faint, radial striae. Periostracum yellowish brown to dark brown, sometimes eroded only on the beaks, sometimes persistent only on the margin. Outside salmon pink to very pale pink with two radial rays, the first one nearly vertical or only slightly inclined towards posterior, the second one oblique and reaching the ventral margin behind the vertical midline. Inside whitish to pinkish, the radial rays showing through.



Distribution. Senegal (Dakar) to Côte d'Ivoire; Gabon (Ile Banié) to northern Angola (Luanda); Cape Verde Islands. No records from Bénin to Cameroon.

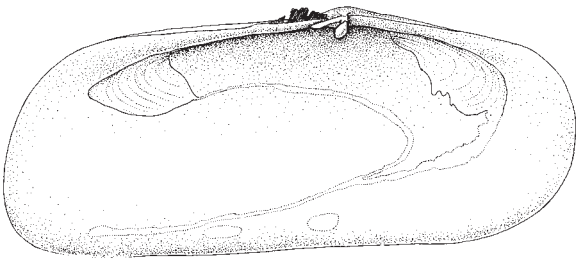
Biotope. In fine, medium, mixed and coarse sand, also with calcareous algae and shell debris, from shallow water (about 1-5 m) to about 45 m, regular, but not very common.

Remarks. This species had always been mistaken as the European *S. strigilatus* (Linnaeus, 1758), although Bucquoy *et al.* (1887-1898) had already noted its difference. Records of the latter from West Africa refer to the present species. *Solecurtus afroccidentalis* is distinguished from *S. strigilatus* by being more elongate with the beaks placed more forward, and in having a salmon colour instead of pink. Specimens of *S. afroccidentalis* from the Cape Verde Islands are much paler than most specimens from continental West Africa. *Solecurtus afroccidentalis* is a tropical species with northern limit in the Cape Verde Islands and on the continent the southern part of the Cap Vert Peninsula. This is "Le Golar" of Adanson.



13.163. *Solecurtus afroccidentalis* Cosel, 1989. **A**-**B**, Baia Matiota, São Vicente, Cape Verde Islands (72.4 mm, MNCN). **C**-**E**, W of Ouendi-Taboria, Guinea, 9°55.5'N, 12°47'W, 18 m (paratype, 54.4 mm, photo Manuel Caballer/Recolnat). **F**-**G**, SW Vridi, Côte d'Ivoire, 45 m (66 mm). **H**, Pointe Chapuis, Port-Gentil, Gabon, 0°39.3'S, 8°45.5'E, 0-2 m (61.4 mm). **I**, same locality (60.8 mm). **J**-**K**, Praia de Buraco, Palmeirinhas, Luanda prov., N-Angola, beach drift (54.8 mm).

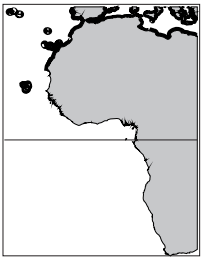
Solecurtus scopula (Turton, 1822)



13.164. Cape Verde Islands, 15°55'N, 23°06'W, 110 m, RMNH (28.5 mm).

Shell up to 70 mm long (studied West African specimens only up to 42 mm), considerably variable in size and outline, oblong-rectangular, thin but solid, equivalve, more or less inflated and gaping at both ends. Anterior and posterior margin rounded to broadly rounded, ventral margin straight to very slightly convex or concave, posterior dorsal margin sloping, making a definite angle with the anterior dorsal margin. Beaks somewhat in front of the vertical midline. Surface with commarginal growth lines, many coarser growth stages and numerous, more or less oblique, slightly curved, fine, irregular incised lines, absent only on the anterior area. These lines are oblique on the anterior part, become gradually less oblique towards posterior, are vertical at the beginning of the posterior third of the valves and, on the posterior area, form an angle with the more or less abrupt change of direction near the rounded posterior edge. Anterior part with very faint, irregular striae. Periostracum pale greyish or yellowish brown to dark brown, in adult specimens becoming somewhat wrinkly and surpassing the margins. Outside and inside entirely dirty white to cream.

Distribution. Shetlands, Orkneys, Scotland (shells only), Irish Sea, west coast of England and Ireland southward to Mauritania (20°34'N); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

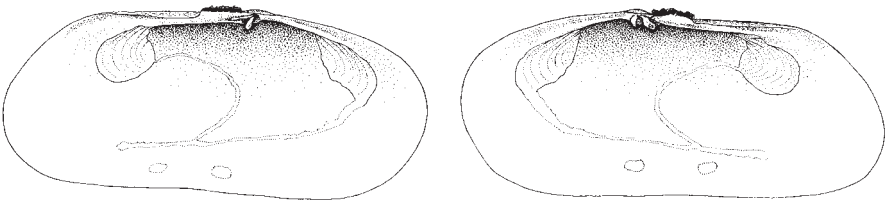


Biotope. In clean coarse sand or gravel, also with shell debris, mostly offshore from about 15 to 110 m and perhaps deeper, occasionally also shallower, *e.g.* in sand with eelgrass (*Zostera*), about 3-10 m, not common, rare in West Africa.

Remarks. This species is northern-temperate and reaches the real tropical zone only at Cape Verde Islands where it occurs in deeper water. Oliver *et al.* (2010) have shown that the mostly Mediterranean species commonly reported under this name is a different species, *S. candidus* (Brocchi, 1814) which differs in being larger, more rectangular with a dorsal margin more parallel to the ventral ones and the striae forming a less abrupt angle in the posterior part of the shell. However, juveniles are indistinguishable. Synonyms are *S. albus* Blainville, 1827 and *S. multistriatus* (Scacchi, 1835).

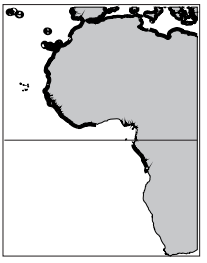
13.165. ***Solecurtus scopula*** **(Turton, 1822).** **A**-**B**, Mauritania, 15°55'N, 23°06'W, 110 m (28.4 mm, RMNH). **C**-**D**, same locality (28.5 mm, RMNH). **E**-**F**, Mauritania, 20°34'N, 17°47'W (42.6 mm). **G**-**J**, ***Solecurtus candidus*** **(Brocchi, 1814)** illustrated for comparison, Olhão, Algarve, Portugal, 3-7 m, sand with *Zostera*, (59.1 mm).

Azorinus chamasolen (da Costa, 1778)



13.166. Sassandra, Côte d'Ivoire, 50 m (26.9 mm).

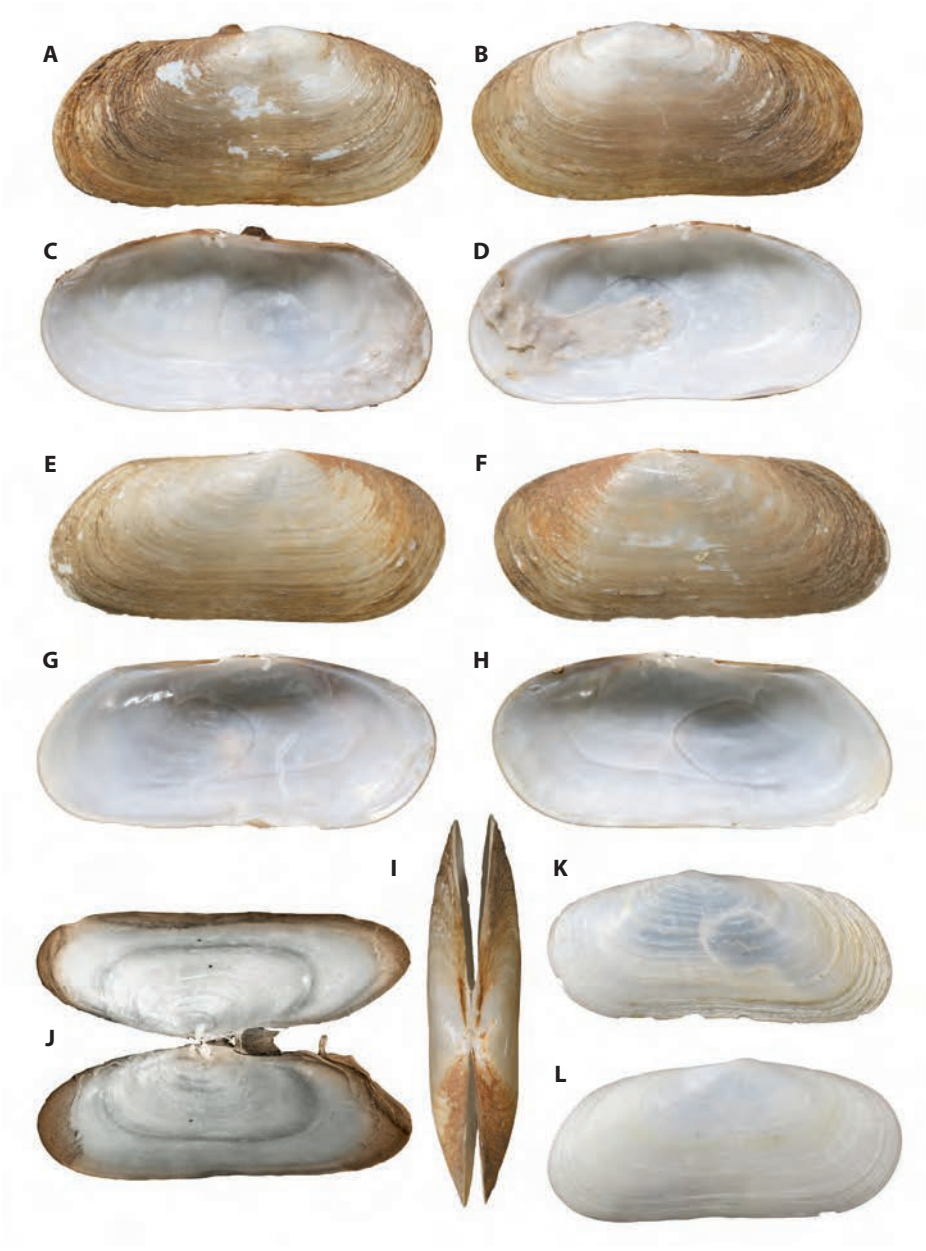
Shell up to 63 mm long (West African specimens only to about 30 mm), variable in outline, oblong-subrectangular, thin but solid, equivalve, rather compressed, moderately gaping. Anterior margin well rounded, posterior margin ventrally more narrowly rounded. Ventral margin more or less straight. Beaks in front of the vertical midline. Surface with dense, coarse, irregular commarginal growth lines and few ill-defined growth stages. Periostracum thick and strong, greenish brown to dark brown, dull, wrinkled on the more marginal part of the valves. Inside and outside uniform white to cream.



Distribution. Southern Norway (?, subfossil?), West Coast of the British Isles and Irish Sea southward to Côte d'Ivoire; Gabon to northern Angola (Luanda); Madeira, Canary Islands; throughout the Mediterranean.

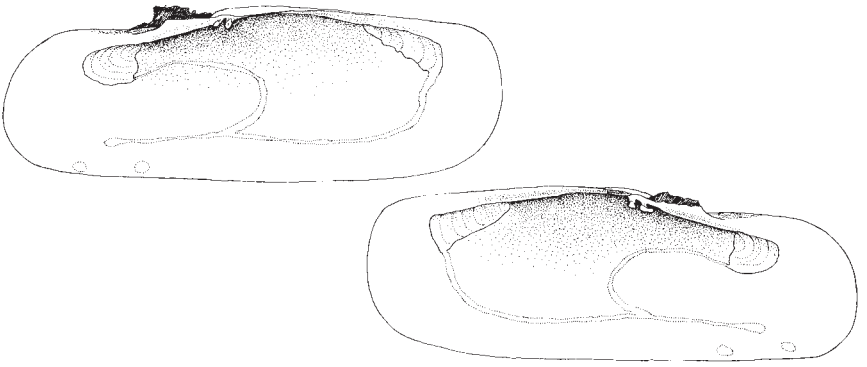
Biotope. In mud, muddy sand, fine sand or muddy gravel, also with shell debris, from about 5 m to 150 m and deeper, not uncommon in Europe, rarer and only in deeper water (50-150 m) in West Africa.

Remarks. This species seems to have a continuous distribution from Northern Europe to Côte d'Ivoire (Abidjan), more east- and southward, however, it was to date signalized only from Gabon (2°S, Nicklès, 1955) and northern Angola (Ambrizete and Luanda). *Solen antiquatus* Pulteney, 1799 and *Solen coarctatus* Renier, 1804 (invalid; *non* Gmelin, 1791) are synonyms.



13.167. ***Azorinus chamasolen*** **(da Costa, 1778). A-D**, Mauritania, 20°34'N, 17°47'W, 90 m (25.7 mm). **E-I**, Sassandra, Côte d'Ivoire, 50 m (26.2 mm). **J**, Abidjan, Côte d'Ivoire, 60 m (11.0 mm). **K**, Liberia, 5°21.5'N, 9°54.5'W, 73-80 m (22.2 mm). **L**, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (22.8 mm).

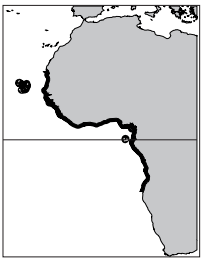
Tagelus adansonii (Bosc, 1801)



13.168. Essoukoudiak Bôlon, Casamance, near border of Guinea-Bissau, sandbank low tide (46 mm).

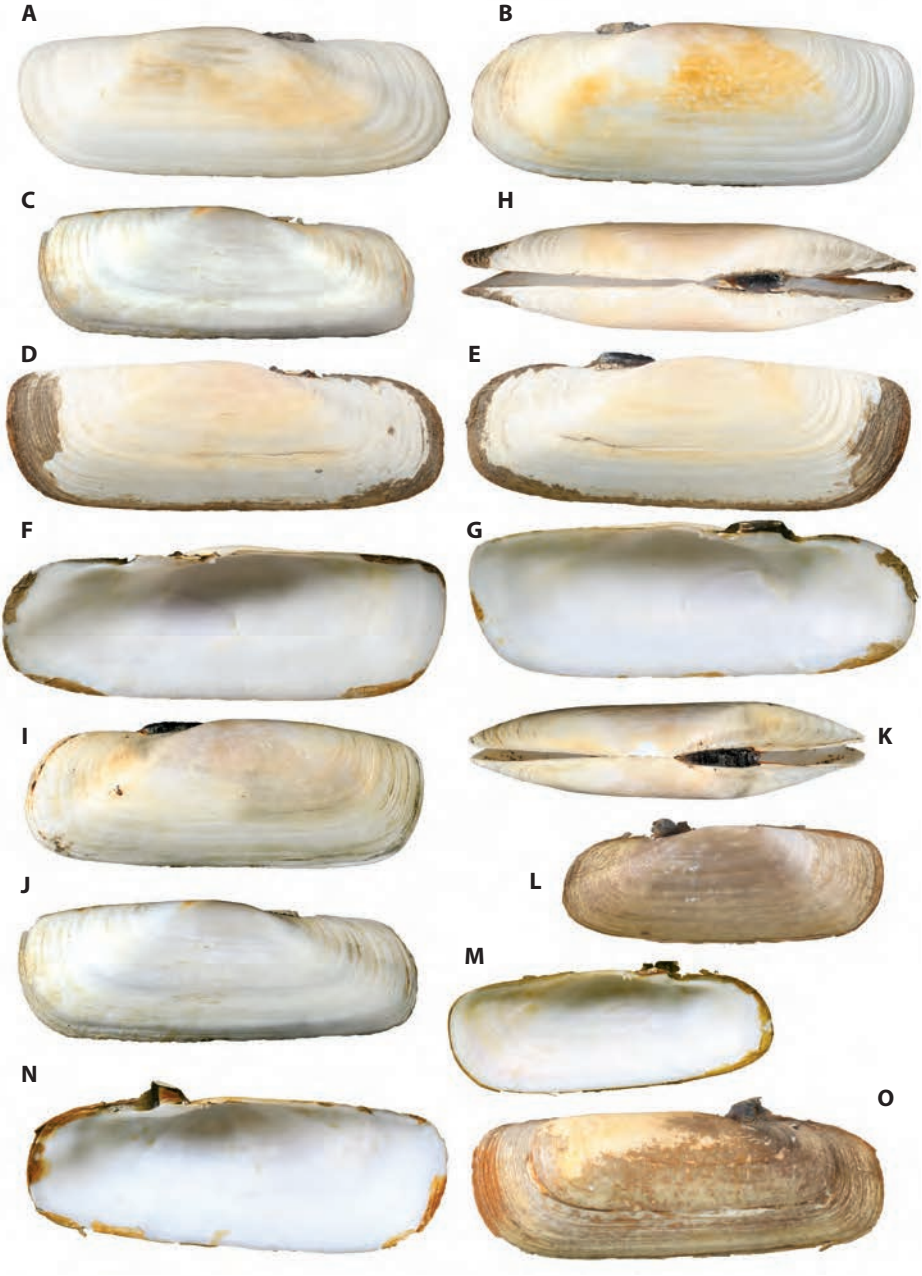
Shell up to 70 mm long, variable in size and outline, elongate-subrectangular, solid, inflated. Anterior margin rounded-angulate, posterior margin well rounded, ventral margin straight or (rarely) slightly concave. Anterior part somewhat higher than posterior part. Beaks behind the vertical midline. Surface smooth, with fine, irregular growth lines, becoming coarser on the anterior and posterior area. Periostracum olive to dark brown, often persistent only near the margin and on the coarser growth stages, but occasionally eroded only on and close to the beaks. Hinge teeth often also eroded or even completely absent in fully grown specimens as is often the case in bivalves inhabiting brackish water and mangrove areas. Outside dirty whitish, umbonal area occasionally pale brownish, inside white.

Distribution. Mauritania (Banc d'Arguin) to southern Angola (Moçâmedes, Namibe province); Cape Verde Islands (São Tiago); São Tomé, Ilha do Principe.



Biotope. In fine muddy sand and fine sand, in lagoons, inlets, estuaries and creeks ("bôlons"), often with changing salinity, from the intertidal zone to about 2 m. In more or less oblique burrows which at the upper part are Y-shaped to lodge the long, separate siphonal tubes (see also Mikkelsen & Bieler 2007). Locally abundant.

Remarks. *T. adansonii* is the only Eastern Atlantic species of the genus *Tagelus*, which is represented by several species in the Western Atlantic and Eastern Pacific. The closest species in the Western Atlantic is *T. plebeius* (Lightfoot, 1786). This is *Solen guineensis* W. Wood, 1815, *Solecurtus angulatus* G.B. Sowerby II, 1874, and "Le Tagal" of Adanson. The species is consumed in certain regions such as the Bijagos Archipelago (Guinea-Bissau).



13.169. *Tagelus adansonii* (Bosc, 1801). **A**, Ile Tidra, Banc d' Arguin, Mauritania (77.3 mm). **B**, same locality (78.6 mm). **C**, W of Ponta da Achada da Baleia, São Tiago, Cape Verde Islands, 0-1 m (60.8 mm). **D**-**H**, Wellington Wreck, Sierra Leone River, Sierra Leone, 10 m (69.9 mm). **I**-**K**, Baia de Ana Chaves, Ilha de São Tomé, beach drift (61.0 mm). **L**-**M**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (47.5 mm). **N**-**O**, same locality (64.8 mm).

Superfamily **SOLENOIDEA**

Family **SOLENIDAE**
Genus ***Solen*** Linnaeus, 1758 – 2 species

Family **PHARIDAE**
Genus ***Pharus*** Brown, 1844 – 1 species
Genus ***Nasopharus*** Cosel, 1993 – 2 species
Genus ***Sinupharus*** Cosel, 1993 – 5 species (4 treated)
Genus ***Sinucultellus*** Cosel, 1993 – 1 species
Genus ***Phaxas*** Leach *in* Gray, 1852 – 1 species
Genus ***Ensis*** Schumacher, 1817 – 1 species

Superfamily **HIATELLOIDEA**

Family **HIATELLIDAE**
Genus ***Hiatella*** Bosc, 1801 – 2 species
Genus ***Panopea*** Ménard de la Groye, 1807 – 1 species

Superfamily **GASTROCHAENOIDEA**

Family **GASTROCHAENIDAE**
Genus ***Rocellaria*** Blainville, 1828 – 1 species

Superfamilies Solenoidea, Hiatelloidea and Gastrochaenoidea

It is only recently that phylogenetic reconstruction using molecular characters has endorsed the grouping proposed long ago by Cossmann & Peyrot (1909) of the sand-dwelling razor shells (Solenoidea) and of the predominantly rock-boring Hiatelloidea. The Gastrochaenoidea are a group of very modified bivalves whose phylogenetic affinities are unclear, placed here because of similar habitat with boring Hiatelloidea.

Superfamily SOLENOIDEA

Shells small to very large, elongate-oval, elongate or extremely long and narrow, rarely almost rounded-circular, gaping at both ends, very thin and fragile to rather thick, compressed to nearly cylindrical. Beaks terminal, subterminal or more towards subcentral. Hinge with one cardinal in each valve or with two cardinals in the right valve and four cardinals in the left valve. Periostracum thin to rather strong, folding over the margins to the inside. Animal with strong foot, either cylindrical or compressed. No cruciform muscle. The worldwide species number is now estimated between 125 and 135. The systematic arrangement follows Cosel (1990b; 1993, 2009).

The Solenoidea are highly specialized infaunal bivalves, they inhabit all kinds of soft bottom and live in more or less vertical position in the sediment. When disturbed they can descend very rapidly in their burrow holes or bury in untouched sediment. In the free water, many species are capable to "leap" by jet-propulsion or mechanically by rapidly bending the extended foot. The depth range is from intertidal to about 80 m. In Europe, the most used vernacular name for this group is "razor shells"; in America it is "jackknife clams", the name "razor clams" being restricted to the non-eastern Atlantic genus *Siliqua*.

The living species of Solenoidea are very unequally distributed in the worldwide seas: most species in the Indo-West Pacific belong to the Family Solenidae, whereas the Pharidae are represented there by about 21-23 species in 7 genera (*Cultellus*, *Ensiculus*, *Siliqua*, *Sinonovacula, Neosiliqua*, *Orbicularia*, *Pharella*).

Contrary to the tropical and temperate Eastern Pacific (Coan *et al*. 2000; Coan & Valentich-Scott 2012), the Pharidae of the Atlantic are largely exceeding in number the Solenidae. The latter are represented in the Eastern Atlantic by 2 species only, and in the whole Western Atlantic by only 5-6 species. In fact, most ecological niches of Solenoidea in the Atlantic and especially in the Eastern Atlantic are occupied by Pharidae: from the large- to very large-growing *Ensis* species in northern Europe and to a lesser extent in northern America to the rather numerous smaller Pharidae along the coast of tropical West Africa. The Pharidae species are represented in the Eastern Atlantic by 19 species in total (including the introduced Western Atlantic *Ensis leei* Huber, 2015), and by 24 species in the whole Atlantic (1 *Siliqua*, 10 *Ensis*, 3 *Phaxas*, 2 *Pharus*, 2 *Nasopharus*, 5 *Sinupharus*, 1 *Sinucultellus*).

Family SOLENIDAE

Shells small to very large, elongate to very elongate, square to somewhat curved or knife-shaped, in shape cylindrical, gaping at both ends, thin and fragile to quite thick and solid, with terminal or slightly subterminal beaks. Hinge with one cardinal in each valve, no laterals. Pallial sinus very short, anterior adductor scar elongate to very elongate, posterior adductor scar small, separated from or united with the pallial sinus. Animal with cylindrical, club-shaped foot and short and entirely fused siphons. – There are 70 species currently known worldwide, most from the Indo-West Pacific (Cosel, 1990b), two only from West Africa; for a more detailed account on these see Cosel (1993).

Genus *Solen* Linnaeus, 1758. Characters of the family. Shells with truncated or more or less rounded ends, terminal beaks and with or without a furrow parallel to the anterior margin.

Species treated (2)
Solen marginatus Pulteney, 1799; *Solen guinensis* Hanley, 1842.

Family PHARIDAE

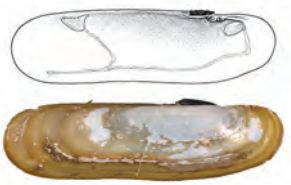
Shells small to very large, from subcircular or short and oval to very long and slender, more or less laterally compressed, gaping at both ends, straight to curved, with beaks terminal, subterminal or more towards the middle. Interior with or without ridges (reinforcements or buttresses) in front of and behind the hinge area. Pallial sinus moderately deep to very short. Left valve with two vertical and two posterior subhorizontal cardinals, right valve with one vertical and one subhorizontal cardinal, no laterals. Animal with laterally compressed foot, anteriorly obliquely truncated, with a flattened terminal surface surrounded by a keel. Siphons separate or fused, short to rather long. - The family was long known as Cultellidae, but with the reinstatement of the Pharinae within the family (Cosel 1990b), the name Pharidae has priority. The worldwide species number is 71, from West Africa, 11 species are known. The West African Pharidae have long been neglected. In many ecological works (*e.g.* Buchanan 1958 and Longhurst 1958, to start with), the small, superficially look-alike species frequently were mixed up under the name *Cultellus tenuis* (Gray, 1834). For a detailed revision of the eastern Atlantic species, see Cosel (1993 and 2009). A worldwide supraspecific revision of the family is long overdue. As already mentioned above, in West Africa, the small Pharidae occupy the same ecological niches inhabited by small Solenidae in the Indo-West-Pacific realm.

Genus *Pharus* Brown, 1844. Shells large, very elongate, compressed, with rounded to semi-circular ends and with rather short pallial sinus. Beaks at the end of the first third of the valves or still more backwards. Interior at the hinge area with a reinforcement both anterior and posterior of the anterior adductor scar, which is very long and narrow. Animal with moderately long,

separate, retractible tubular siphons. Blood containing haemoglobin, the live animal is stained reddish.

Genus *Nasopharus* Cosel, 1993. Shells small, elongate, thin and fragile, with subterminal beaks, rounded ends and very short pallial sinus. Hinge and ligamental region not bent upwards. Inside with anterior reinforcement only, posterior buttress absent. Anterior adductor scar narrow, curved and more or less elongate. Animal with short, separate, small and not very much retractible, tubular siphons. Blood with haemoglobin, the live animal stained reddish.

Genus *Sinupharus* Cosel, 1993. Shells small to medium-sized, straight or slightly curved, with subterminal beaks. Anterior margin more or less semicircular, posterior margin bluntly rounded to semicircular. Inside with reinforcement both anterior and posterior of the anterior adductor scar, the posterior one occasionally somewhat reduced. Anterior adductor scar very long and narrow to rather short, narrow and curved. Pallial sinus moderately deep in its ventral part. Animal with rather long, retractible, separate tubular siphons. Blood containing haemoglobin, the live animal is stained reddish.



Genus *Sinucultellus* Cosel, 1993. Shells medium-sized, elongate, thin and fragile, straight, laterally compressed, gaping at both ends, with semi-circular anterior and posterior margins. Beaks subterminal. Interior with short anterior reinforcement, no posterior reinforcement. Pallial sinus in its ventral part quite deep. Anterior adductor scar short, oval and not curved. Animal with rather long, fused, retractible siphons. Also in this genus, the blood contains haemoglobin, the live animal is stained reddish.

Genus *Phaxas* Leach *in* Gray, 1852. Shells small to medium-sized, elongate, thin and more or less fragile, straight to curved, compressed, gaping at both ends. Anterior margin rounded to semicircular, posterior margin rounded to truncated. Beaks subterminal. Interior with short anterior reinforcement, no posterior reinforcement. Pallial sinus very short and broad, more or less rectangular. Anterior adductor scar narrow, more or less long, curved and anteriorly bent upwards. Animal with very short, separate and hardly retractible siphons.

Genus *Ensis* Schumacher, 1817. Shells medium-sized to very large, very elongate to extremely long and narrow, thin and fragile to rather thick and solid, straight to quite strongly curved, rather

compressed. Anterior margin rounded to truncate, posterior margin mostly more or less truncate. Hinge and ligamental area straight or bent upwards. Dorsal margin straight to concave, rarely slightly convex, ventral margin slightly to markedly convex. Beaks terminal. Interior without reinforcements. Pallial sinus very short and broad. Anterior adductor scar extremely long and narrow. Animal with very short, separate siphons which are fused at the base. For an overview of the Eastern Atlantic species, see Cosel (2009).

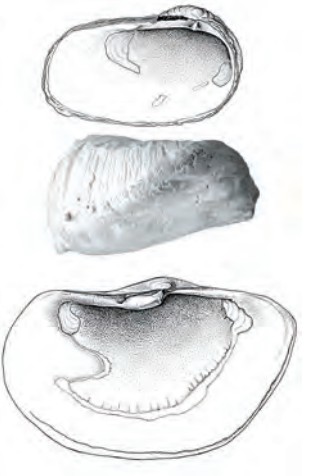
Species treated (10)
Pharus chenui Cosel, 1993; *Nasopharus nasutus* Cosel, 1993; *Nasopharus elegans* Cosel, 1993; *Sinupharus africanus* (Chenu, 1843); *Sinupharus bernardi* Cosel, 1993; *Sinupharus curtus* Cosel, 1993; *Sinupharus combieri* (Fischer-Piette & Nicklès, 1946); *Sinucultellus atlanticus* Cosel, 1993; *Phaxas tenellus* Cosel, 1993; *Ensis goreensis* (Clessin, 1888).

Other species reported in the area (1)
Sinupharus galatheae Cosel, 1993. Namibia (Cosel 1993).

Superfamily HIATELLOIDEA
Family HIATELLIDAE

Shells small to very large, more or less oblong, rectangular to trapezoidal or very irregular, thin to thick and solid, rather compressed to inflated. Beaks in the anterior half of the valves. Surface with irregular, commarginal sculpture, often with growth lines only. Hinge with one cardinal in each valve, occasionally only weakly developed, no laterals. Ligament on a nymphal plate. Pallial line continuous or interrupted to several separated muscle scars, pallial sinus obsolete to well developed. Periostracum thin to quite thick and strong. The worldwide species number is 21, of which 2 are living on the West African coast.

Genus *Hiatella* Bosc, 1801. Shells small, irregularly rectangular to trapezoidal, thin to rather thick and heavy, inflated, more or less narrowly gaping. Surface with irregular commarginal growth lines and undulations. Hinge with one cardinal in the right valve and one cardinal in the left valve, best developed in juveniles, in adults often obsolete. Periostracum thin. Pallial sinus deep. The genus has received several synonyms, *Saxicava* Fl. de Bellevue, 1802 being the best known.



Genus *Panopea* Ménard de la Groye, 1807. Shells large to very large, subrectangular to trapezoidal, rather thick and solid, inflated, widely gaping at both ends. Beaks more or less anterior to the vertical midline. Hinge with one cardinal in each valve. The animal is considerably larger as the shell and has very long, thick and fleshy, fused siphons which have nearly half the weight of the

whole specimen and which cannot completely be withdrawn into the shell. *Panope* Ménard de la Groye, 1807 (August) is an unjustified emendation of *Panopea* Ménard de la Groye, 1807 (April). Another misspelling is *Panopaea auct.* A brief overview of the recent species of the genus is given by Thomsen *et al.* (2009).

Species treated (2)
Hiatella arctica (Linnaeus, 1767); *Panopea glycimeris* (Born, 1778).

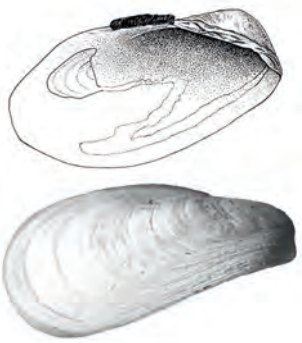
Superfamily GASTROCHAENOIDEA

The placement of this small superfamily, which includes very modified bivalves adapted for boring, is still unsettled. They are not Anomalodesmata although sometimes classified in this group.

Family GASTROCHAENIDAE

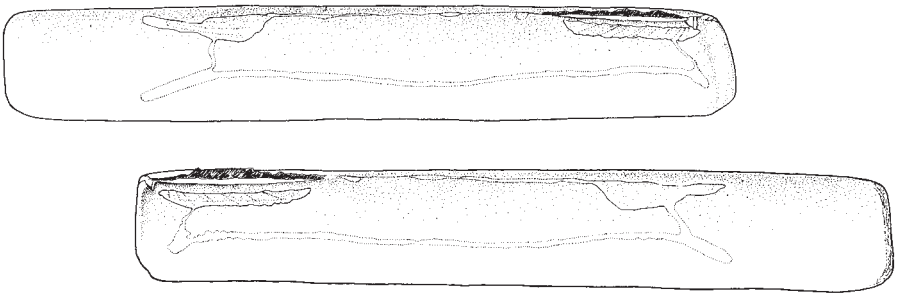
Shells small to medium-sized, equivalve, elongate to very elongate, widely gaping antero-ventrally, thin and rather fragile. Hinge without teeth. Surface mostly with growth lines only. Ligament external. The species are burrowing in wood, shell, rock or coral, the holes being irregularly curved to linear. For information on life history and evolution of this superfamily, see Carter (1978) and Carter *et al.* (2008). About 15 species are known worldwide, one in West Africa.

Genus *Rocellaria* Blainville, 1828. Shells rather small, elongate, triangular to rectangular, widely gaping antero-ventrally, thin, inflated. Beaks situated anteriorly, subterminal. Surface with growth lines only. The species burrow in hard substrate such as rock, shell or coral, they coat the inner surface of the flask-shaped bore-hole with a shell layer. In case the shell in which they burrow becomes too thin for the growing bivalve, the shell layer in their cavity is continued to be extend into the free space beneath. Inner part of pallial sinus acute and non-truncated, contrary to *Gastrochaena* Spengler, 1783 where it is rounded or truncated. *Rocellaria* also differs from *Gastrochaena* in more commonly secreting a free calcareous tube. This probably reflects the fact that *Rocellaria* more commonly inhabits warm-temperate regions, where thick coral substrates are rare and shell substrates are commonly too thin to entirely contain their boring (Carter *et al.* 2008).



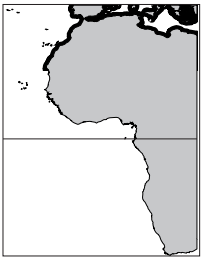
Species treated (1)
Rocellaria dubia (Pennant, 1777).

Solen marginatus Pulteney, 1799



14.1. Baie de Cansado, Pointe du Repos (lv, 111 mm; rv, 136 mm).

Shell 110-150 mm long (in Europe occasionally to 185 mm), very elongate-rectangular, 5.5 to 7 times longer than high, straight, with parallel dorsal and ventral margin. Anterior margin obliquely, posterior margin vertically truncated. Surface with irregular growth lines, a few coarser growth stages and a conspicuous furrow bordering the anterior margin. Periostracum light brownish to brownish green or pale greyish brown, often eroded on the umbonal part of the valves. Outside whitish, yellowish white to pale brownish, occasionally with darker growth zones. Inside whitish, with exterior coloration slightly showing through.



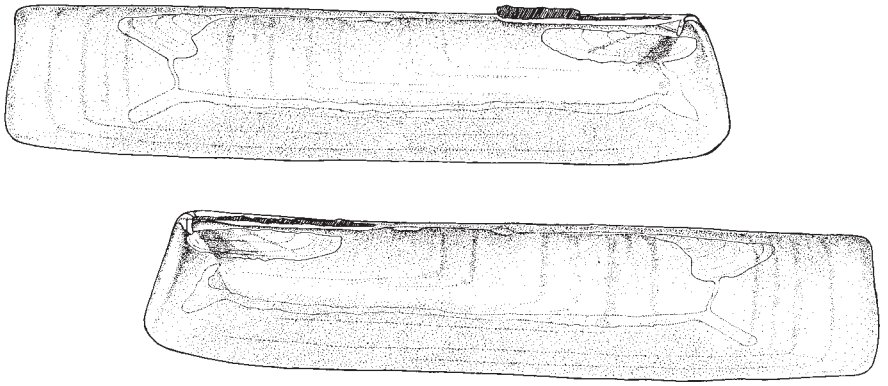
Distribution. West coast of Ireland, SW-Scotland, England and Wales, Channel, Atlantic southward to Mauritania (Banc d'Arguin); throughout the Mediterranean, Black Sea.

Biotope. In fine muddy sand and fine sand, from low tide mark to about 20 m, common.

Remarks. This species has often been cited as *Solen vagina* Linnaeus, 1758, however, the latter is a widespread Indo-Pacific species. There are two earlier available names for the European species: *Solen rotundatus* Spengler, 1794, and *Solen gladius* Röding, 1798 (*fide* Huber 2010), however only the name *S. marginatus* has been in common use for a long time. Therefore, under Article 23.9 of the Code [ICZN] *Solen rotundatus* Spengler, 1794 and *Solen gladius* Röding, 1798 were declared *nomina oblita* by Cosel *et al.* (2014) and *Solen marginatus* Pulteney, 1799, a *nomen protectum*. To our knowledge, the names *Solen rotundatus* and *Solen gladius* have not been used as valid after 1899. Empty shells are common on many beaches of Europe; in Mauritania it seems to be quite rare. *S. marginatus* is fished and consumed in southern Europe, mainly Spain, Portugal and Italy. Local names are: razor shell, couteau droit, longueirón.

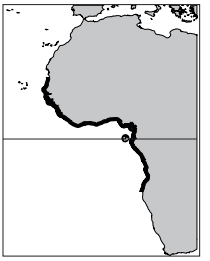
14.2. *Solen marginatus* Pulteney, 1799. A-D, Pointe du Repos, Baie de Cansado, Mauritania (111.1 mm), leg Mission Gruvel, 28.3.1908. E-F, same locality (137.3 mm). G-H, same locality (78.2 mm).

Solen guinensis Hanley, 1842



14.3. Pointe Noire, N of lighthouse, tidal flat (100 mm).

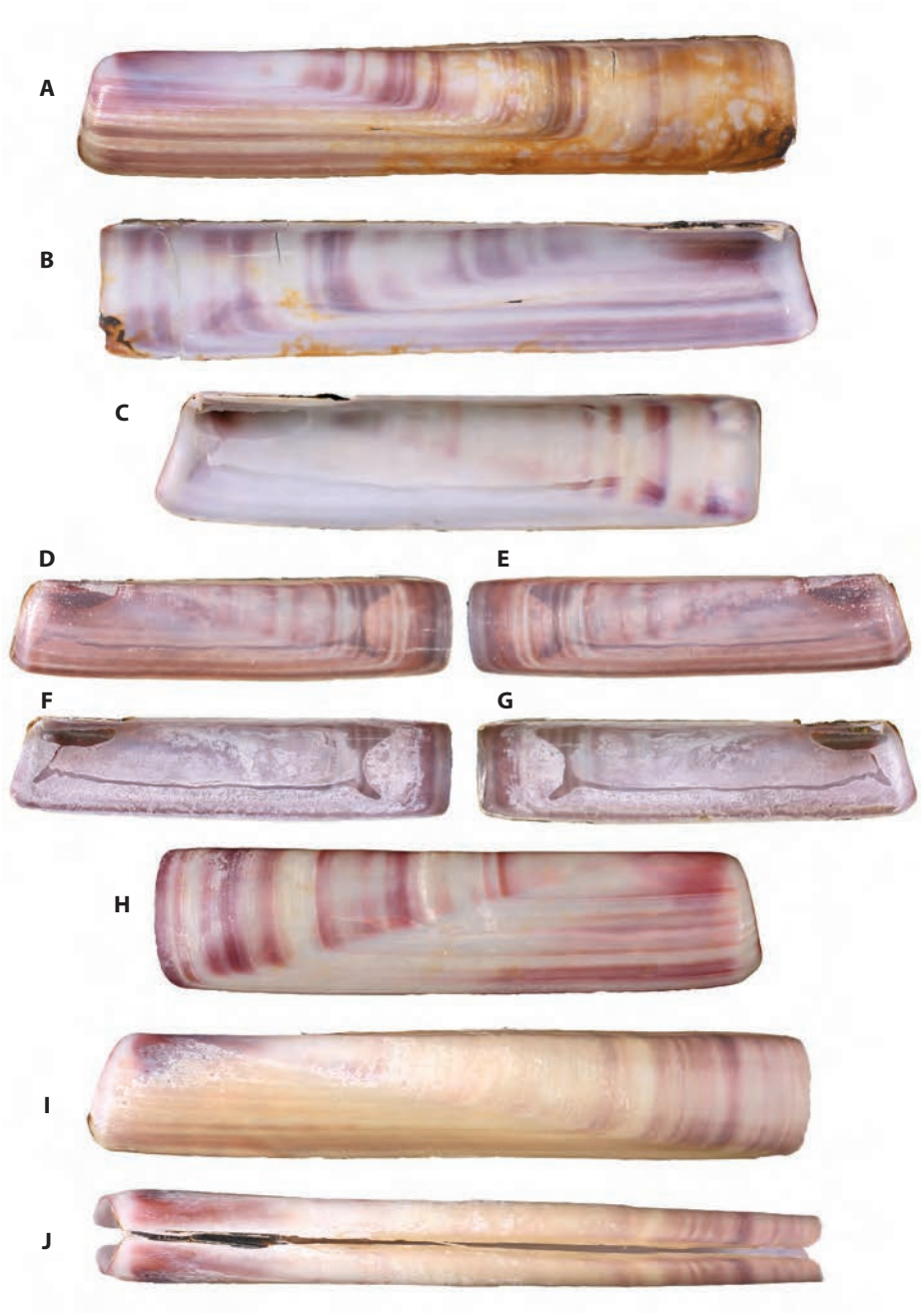
Shell up to 140 mm long, very elongate-rectangular, 4 to 5.4 times longer than high, straight, with parallel dorsal and ventral margin. Anterior margin obliquely truncated, posterior margin vertically truncated and slightly convex. Surface smooth, with faint growth lines and a narrow, shallow depression parallel to the anterior margin. Periostracum greyish yellow, glossy, thin and translucent, eroded on the very early part of the valves. Outside whitish, with conspicuous, more or less dense, pinkish-violet growth zones. Beaks brownish red. Inside white, with exterior colouration showing through.



Distribution. Mauritania (Nouakchott) to southern Angola (Moçâmedes).

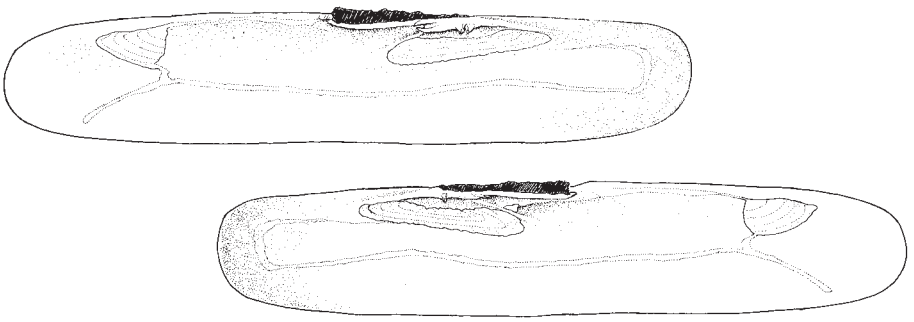
Biotope. In fine muddy sand and clean fine sand, mostly in more or less sheltered areas, from extreme low water to about 20 m. Not common everywhere, but in certain places occurring in dense populations; rare in the marginal parts of the range (Mauritania, Angola).

Remarks. This species had erroneously been renamed *S. guinaicus* Cosel, 1993 as replacement name for "*S. guineensis* Hanley, 1842" (*non* W. Wood, 1815), the commonly used name for this species. However, Hanley's name (*ex* Gray, ms.) was written with one "e" only and therefore remains valid; "*S. guineensis* Hanley" is a subsequent spelling. The *Solen guineensis* of Wood is a *Tagelus*, most probably *T. adansonii*. Empty shells are common in the drift line of certain beaches. In Gabon, *S. guinensis* is collected at extreme low tide by means of a hooked wire and consumed. In Guinea (north side of the Conakry peninsula), the species was found in slightly inclined holes, so it was not possible to collect it with salt. It is the only *Solen* in the tropical eastern Atlantic, with Indo-Pacific origin, the next close group is the *Solen vagina* Linnaeus, 1758-complex, living from the northern Indian Ocean to the Philippines, Singapore, Indonesia and southern China.



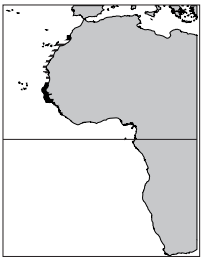
14.4. ***Solen guinensis*** **Hanley, 1842. A-B**, Chott Boul, Mauritania, on beach (43.2 mm). **C**, Cap Skirring-Diembéring, Casamance, beach drift (74.6 mm). **D-G**, Dixinn Port, Conakry, Guinea, in sand at low water (40.8 mm). **H**, Abidjan region, Côte d'Ivoire (62.1 mm). **I-J**, Morton Bay, Victoria (now Limbe), Cameroon, beach drift (87.8 mm).

Pharus chenui Cosel, 1993



14.5. Casamance, Diembering, 10-20 m (holotype, 127 mm).

Shell 110-151 mm long, very elongate, 4.7 to 5.4 times longer than high, thin but strong, jack-knife-shaped with anterior margin rounded or tending to be obliquely rounded-truncated. Posterior margin rounded. Beaks at the end of the first third of the valve or just behind. Surface glossy, with irregular growth lines and distinct short, irregular commarginal waves, arranged in a ray going from the beaks to the ventral margin under the beaks. Periostracum thin and yellowish green to dark greenish brown. Interior with very weak reinforcement posterior to the hinge teeth and the anterior adductor scar. Outside either uniform milky white or light brownish pink with anterior part pale reddish brown. Inside white or light brownish salmon.



Distribution. Southern part of Atlantic Morocco (Agadir); Mauritania (Nouadhibou, Mission Gruvel, no details); Senegal (St. Louis, Langue de Barbarie, leg. Rosso); Dakar (?); Casamance (*e.g.* off Diémbéring).

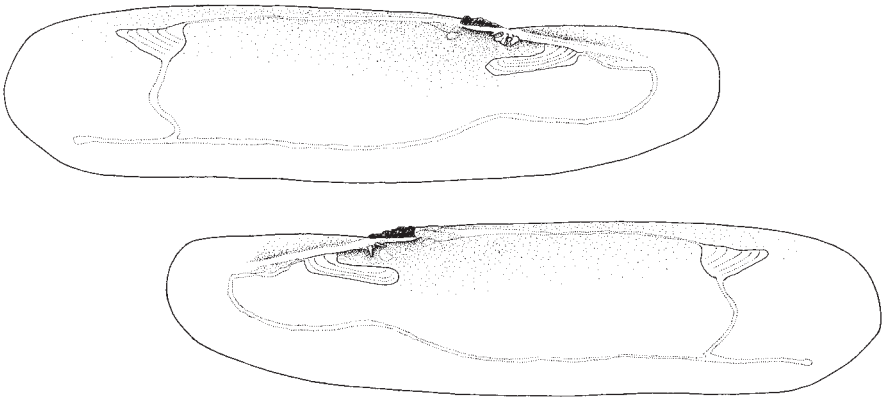
Biotope. In clean fine sand well offshore, mostly from 18 to 28 m, in Agadir shallower, apparently up to extreme low tide, not common in Casamance, very rare to rare elsewhere.

Remarks. Although already figured by Chenu (1843) in the "Illustrations Conchyliologiques", this species remained unnamed until recently, and the few known specimens were mistaken for *Pharus legumen* (Linnaeus, 1758) (Europe to Agadir, Atlantic Morocco). *P. chenui* is distinguished from *P. legumen* by the more forward position of the beaks, the less tapering anterior part, the more triangular pallial sinus and the different position of the ventral pallial line (see Cosel 1993). The reinforcement posterior to the anterior adductor scar is thinner and longer than in *P. legumen*, it descends at an angle of 15-35°, whereas in *P. legumen*, it is more vertical, with an angle of about 45-65°. The range of *P. chenui* is restricted to the northern zone of permanent and seasonal upwelling and seems to be patchy, most probably because of the special biotope required by this species. There are now three records known from Agadir, Atlantic Morocco, where it seems to be uncommon: one live-taken specimen (1976, sand at low tide, 151.7 x 28.0 mm, largest known spm., wet-preserved, in IRSNB) and two records of fresh empty beached shells, one with a single fresh shell in RMNH Naturalis Leiden (leg. A.W.

14.6. *Pharus chenui* Cosel, 1993. **A**-**C**, St Louis, Langue de Barbarie (106.2 mm). **D**-**E**, Casamance, 10-20 m (holotype, 127.0 mm). **F**-**H**, same locality (paratype, 122.0 mm).

Lacourt, 25.IV.1973) and another with two shells in MTD Dresden (March 1996, larger specimen 135 mm long). Both empty shell lots were taken together with shells of *P. legumen*, the only locality where both *Pharus* species were found co-occurring. However, from the Grande Côte of Senegal only one record is known, and none from the Mauritanian coast south of Nouadhibou, in spite of the extensive samplings by research vessels in these regions. Finally, off Casamance (13°05.6'N, 17°02.4'W, Abéne), a live specimen was dredged by the first author on board R/V *Louis Sauger* on 25.III.1988 at 19 m, but almost completely cut in 2 by the dredge (for anatomy the soft parts could be reconstituted, for details, see Cosel 1993: 234-235). On another station (off Diémbéring, 12°30.4'N, 17°16'W, 21 m), three specimens were completely cut, and only the hind ends remained. Empty shells are generally not found on the beach due to the large distance of the biotope from the shore, but are occasionally taken in trawls. This is the largest living *Pharus*, it is, with 155 mm, only slightly exceeded by *P. pliomagnus* Sacco, 1901, a very similar species from the Pliocene of Piemont (Northern Italy), which is the immediate ancestor of *P. chenui*.

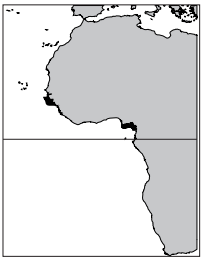
Nasopharus nasutus Cosel, 1993



14.7. Victoria/Limbe, Cameroon, 3°44'N, 9°11'E, fine grey sand 22-24 m (holotype, 40.5 mm).

Shell up to 40 mm long, elongate, 4 to 4.3 times longer than high, thin and fragile, nearly transparent. Anterior part slightly tapering and somewhat bent upwards, with narrowly rounded anterior margin. Posterior part broad, posterior margin broadly rounded, with a weak angle in the middle. Ventral margin in its anterior half convex, in its posterior part straight or even slightly concave. Beaks within the anterior third of the valve. Surface glossy, with faint irregular growth lines. Periostracum olive, thin and translucent. Valves translucent whitish brown.

Distribution. Guinea-Bissau; Cameroon (Victoria/Limbe area). Not yet recorded between these localities.

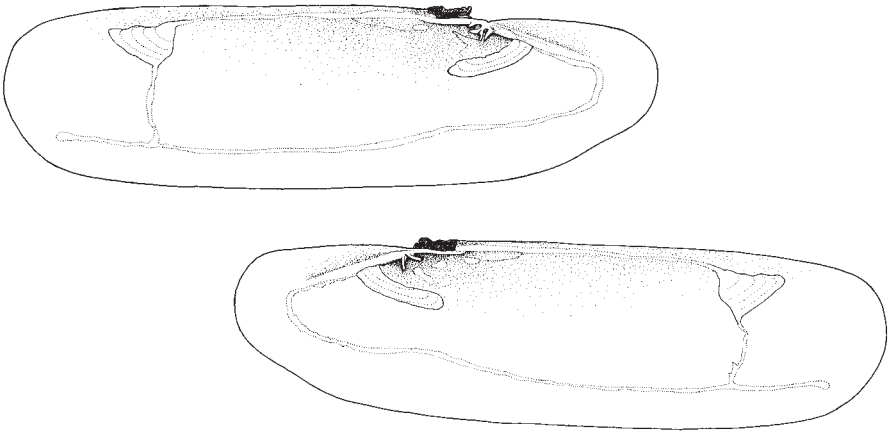


Biotope. In fine, quite muddy sand, offshore from about 15 to 30 m, only locally found and apparently restricted to their special habitat consisting of sediment with more muddy component than the biotope of *N. elegans* (see next entry), not common.

Remarks. This species remained unknown until 1985, when the first author found it in the try-net aboard a shrimptrawler working off Cameroon. It is very close to the following species, *N. elegans*, but larger and longer, with a more prolonged anterior part.

14.8. *Nasopharus nasutus* Cosel, 1993. **A**-**D**, Victoria (now Limbe), Cameroon, 3°44'N, 9°11'E, 22-24 m, fine grey sand (holotype, 40.5 mm, photo Manuel Caballer/Recolnat). **E**-**H**, Victoria (now Limbe), Cameroon, 3°50'N, 9°10'E, 28 m (paratype, 40.5 mm, photo Manuel Caballer/Recolnat).

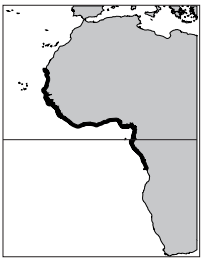
Nasopharus elegans Cosel, 1993



14.9. Pointe Noire, plage Orstom, dredged 5-6 m, fine slightly muddy sand (holotype, 23 mm).

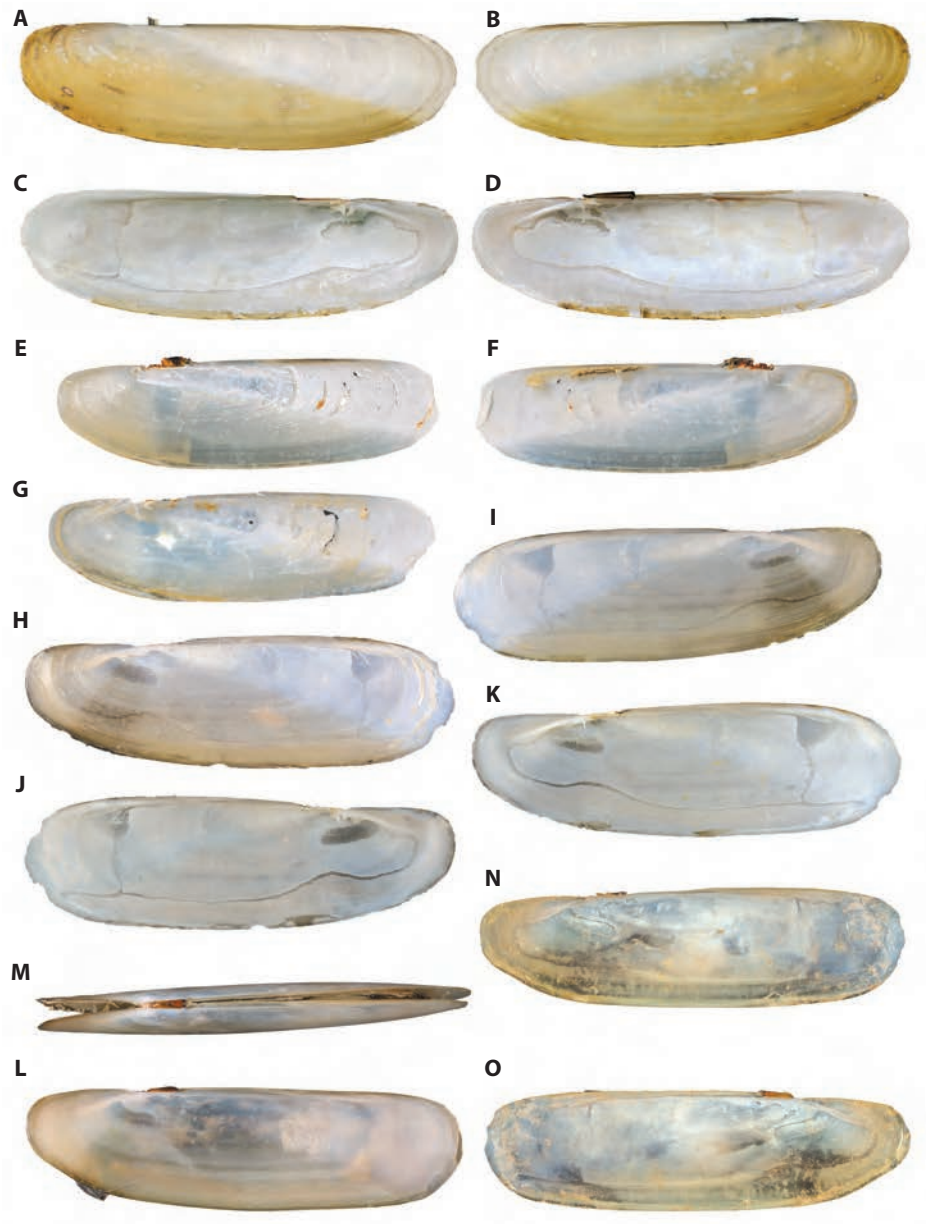
Shell up to 31 mm long, elongate, quite variable in outline and size, 3 to 4 times longer than high, very thin and fragile, nearly transparent. Anterior part rounded, its dorsal margin horizontal or more or less convex, anterior margin narrowly rounded. Posterior part broad, posterior margin rounded, in some specimens weakly rounded-angulate in the middle. Ventral margin very slightly to markedly convex. Surface glossy, with faint, irregular growth lines. Periostracum thin, olive and translucent. Valves translucent whitish brown.

Distribution. Mauritania (20°N) to northern Angola (Luanda).



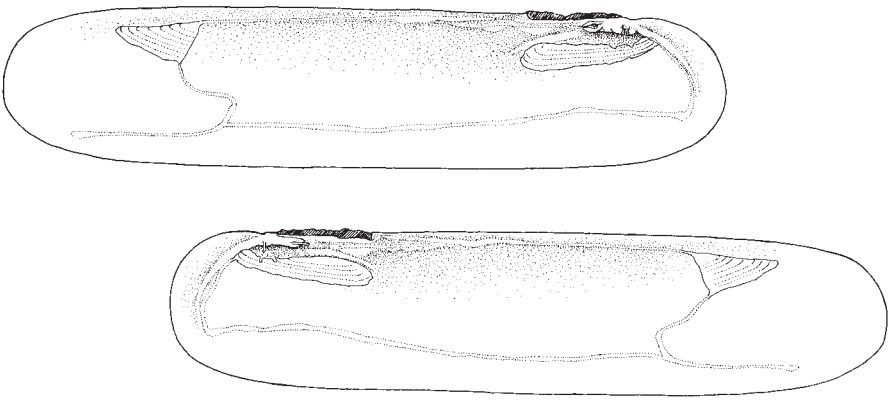
Biotope. In fine muddy sand and fine sand, offshore from about 5 to 30 m, but also from low tide mark downward in regions with changing, slightly reduced or raised salinity such as sheltered bays, estuaries, inlets and the long "rias" such as Casamance River and Saloum River, where they have been found quite far upstream. Common, locally abundant.

Remarks. This is the most common and widespread West African pharid. It is close to *N. nasutus*, from which it is distinguished by its smaller size, the shorter and broader shell, the shorter anterior part and the different angle of the anterior reinforcement inside the valves. Valves and shells are only very rarely found on beaches, occasionally in agglomerations of very light particles, *e.g.* of peat, wood or lignite on less exposed beach sections, mostly near low tide mark, occasionally together with the shells of small tellinids or other small pharids.



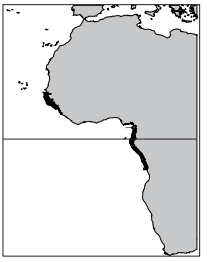
14.10. ***Nasopharus elegans*** **Cosel, 1993. A-D**, Ile Kiaoné, Mauritania, 20°02'N, 16°22'W, 6 m (31.2 mm). **E-G**, Sine-Saloum, Petite Côte, Senegal, near mangroves (13.3 mm). **H-K**, Abidjan region, Côte d'Ivoire (28.5 mm). **L-M**, same locality (28.0 mm). **N-O**, Pointe-Noire, Congo Brazzaville, off Plage Orstom, 5-6 m (holotype, 23.0 mm, photo Manuel Caballer/Recolnat).

Sinupharus africanus (Chenu, 1843)



14.11. Joal, Petite Côte, Senegal (38.0 mm).

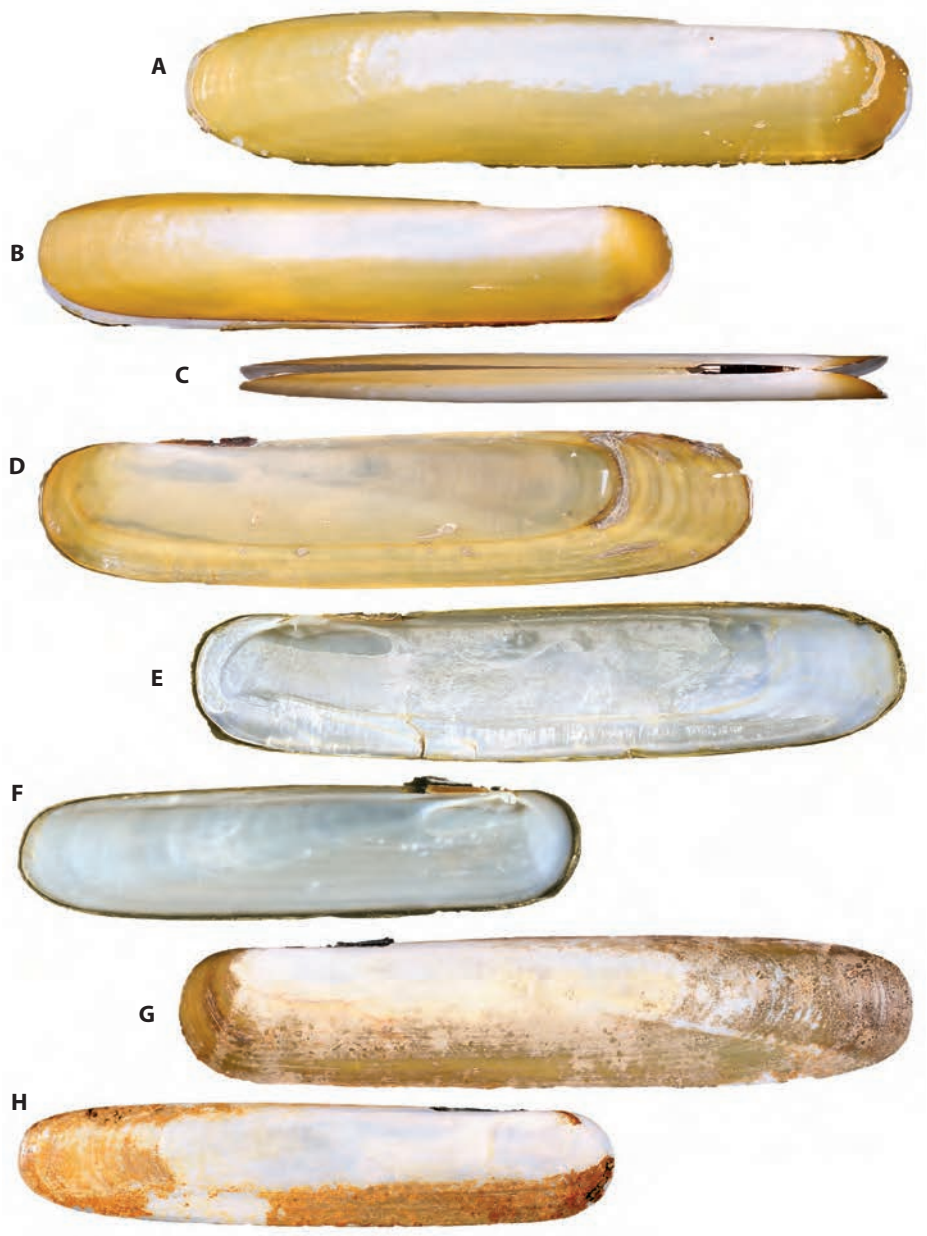
Shell up to 75 mm long, variable in outline, elongate, 4.2 to 5.2 times longer than high, straight, thin and fragile, compressed. Anterior margin well semicircular, posterior margin semicircular to very slightly tapering. Hinge and ligamental region not or very faintly bent upwards. Dorsal margin straight to slightly convex, ventral margin very slightly convex, in the middle portion nearly straight. Beaks subterminal. Surface glossy, with faint, irregular growth lines. Periostracum quite thin and light green to brownish. Outside and inside white to ivory.



Distribution. Senegal (South of the Cap Vert Peninsula) to Guinea (Conakry); Cameroon (Victoria/Limbe) to northern Angola (Luanda). No records known from Sierra Leone to Nigeria.

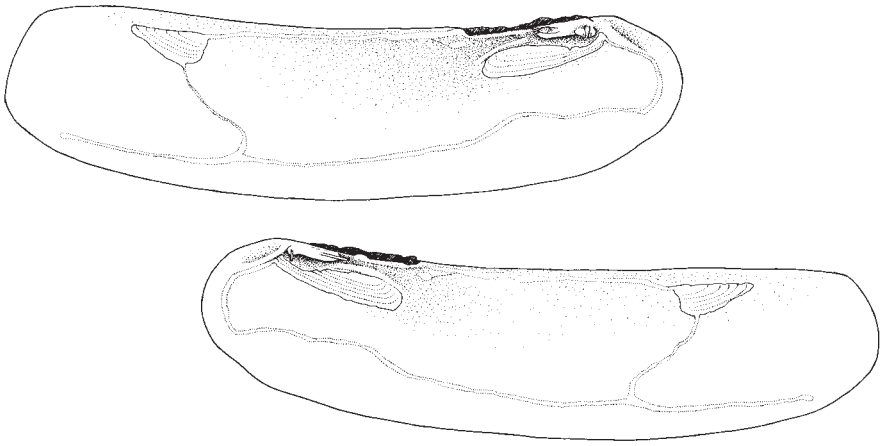
Biotope. In more or less fine, clean sand, in shallow water from low tide mark to a few metres, mostly in more or less sheltered bays. Not common.

Remarks. This is the largest known living *Sinupharus* and is most convergent in shell form and mode of life to *Solen* and *Ensis*. Empty shells are occasionally found on certain beaches. The species was hitherto commonly known as *Cultellus tenuis* (Gray, 1834). However, *Solen tenuis* Gray, 1834 (*non* W. Wood, 1828) is a primary homonym and therefore invalid. A synonym is *Cultellus politus* Dunker, 1862. Apparently subfossil valves of a very close undescribed species which is larger (up to 90 mm long) and broader, have been collected off "SW Africa" (Namibia) but further data are not known.



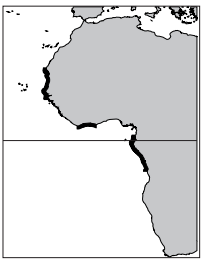
14.12. *Sinupharus africanus* (Chenu, 1843). **A**, Guinea (68.7 mm). **B-C**, same locality (59.7 mm). **D-E**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, sandbank N of the lighthouse, in sand at peak low tide (67.1 mm). **F**, same locality (47.3 mm). **G**, Barra do Cuanza, Luanda prov., N-Angola (68.8 mm). **H**, same locality (56.2 mm).

Sinupharus bernardi Cosel, 1993



14.13. Libreville, Gabon (holotype, 38.8 mm).

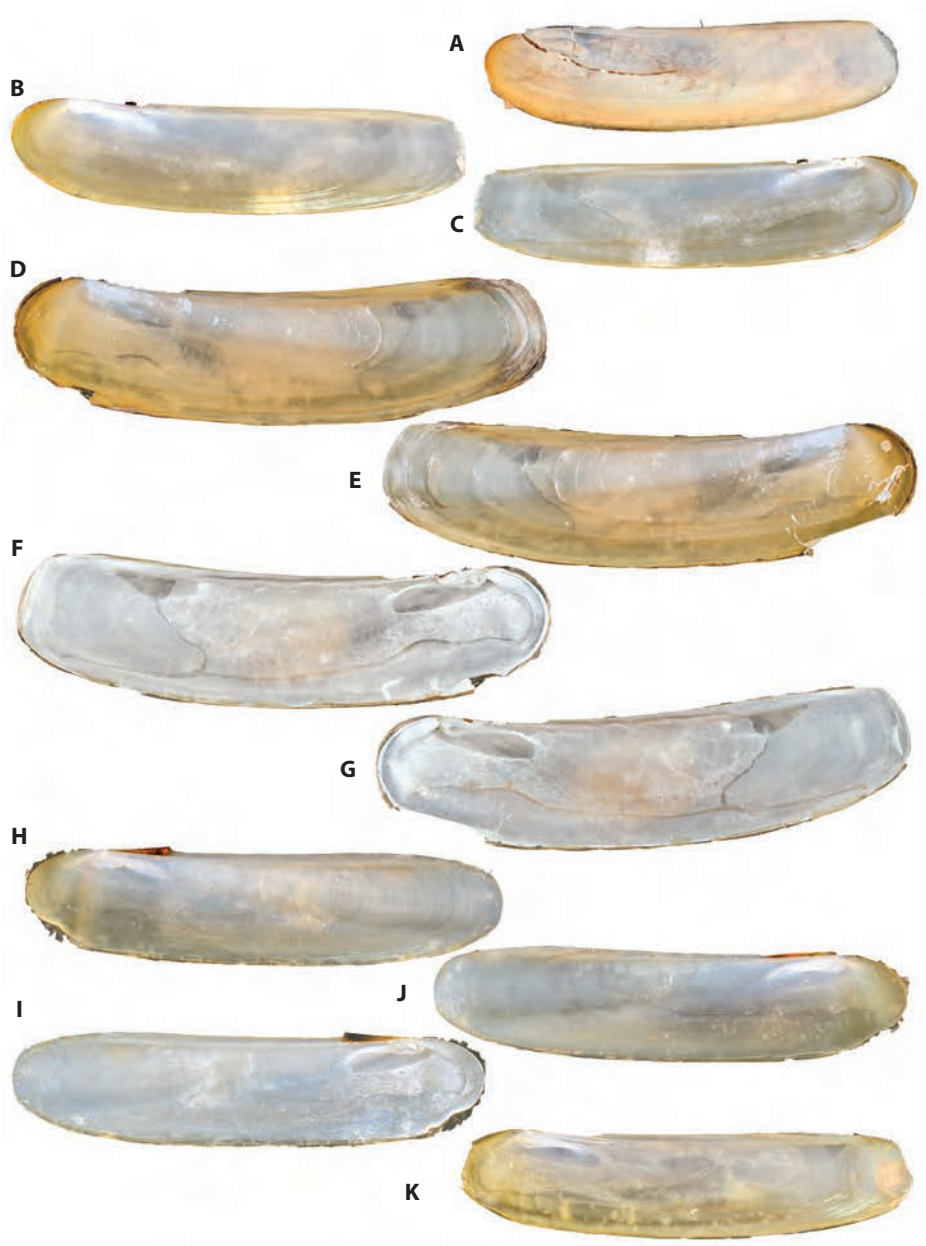
Shell up to 40 mm long, somewhat variable in outline, elongate, 3.6 to 4.4 times longer than high, slightly to markedly curved, thin and fragile, compressed. Anterior margin rounded, dorsally more or less sloping, ventrally with a shallow, but always visible sinuosity. Posterior margin rounded and slightly tapering. Hinge and ligamental region weakly to well bent upwards. Dorsal margin more or less concave, ventral margin markedly convex. Beaks subterminal. Exterior glossy, with faint, irregular growth lines. Periostracum quite thin, greenish, glossy. Valves whitish to very light brownish, translucent.



Distribution. Mauritania (Cap Blanc) to Senegal (Casamance); Côte d'Ivoire; Gabon (Libreville) to northern Angola (Luanda).

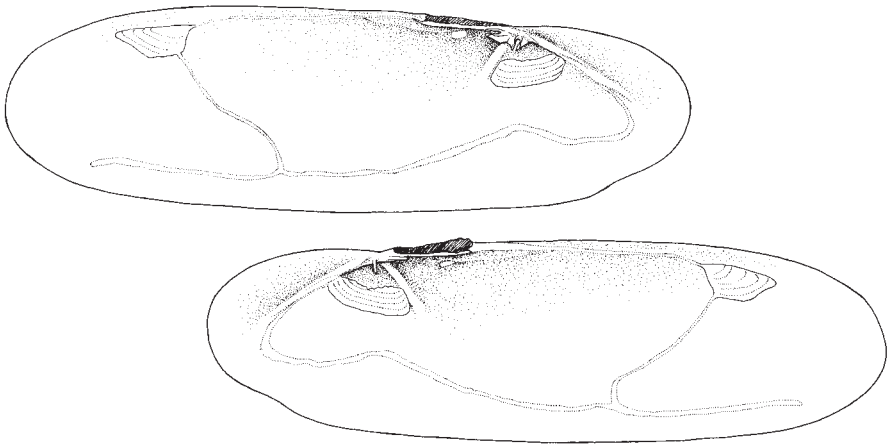
Biotope. In fine sand, from low tide (Gabon only) to about 30 m, mostly offshore, not common.

Remarks. This species is most close to *S. africanus*, but it has a more or less curved and generally shorter shell, a more tapering anterior part with an antero-ventral sinuosity and the anterior pallial line closer to the margin. It is the only West African small pharid with a curved shell. The absence of records in the two typical tropical regions is most probably due to distribution gaps.



14.14. ***Sinupharus bernardi*** **Cosel, 1993. A**, Mauritania, 17°42'N, 16°07'W, 17 m (17.1 mm). **B**-**C**, Abidjan region, Côte d'Ivoire (25.7 mm). **D**-**G**, Libreville, Gabon (holotype, 38.8 mm, photo Manuel Caballer/Recolnat). **H**-**J**, Owendo, near Libreville, Gabon, fine sand at peak low tide (33.0 mm). **K**, Palmeirinhas, Angola, 20-30 m (25.5 mm).

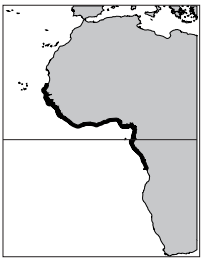
Sinupharus curtus Cosel, 1993



14.15. Casamance, 12°20.4'N, 16°53.1'W, 15 m (holotype, 31.2 mm).

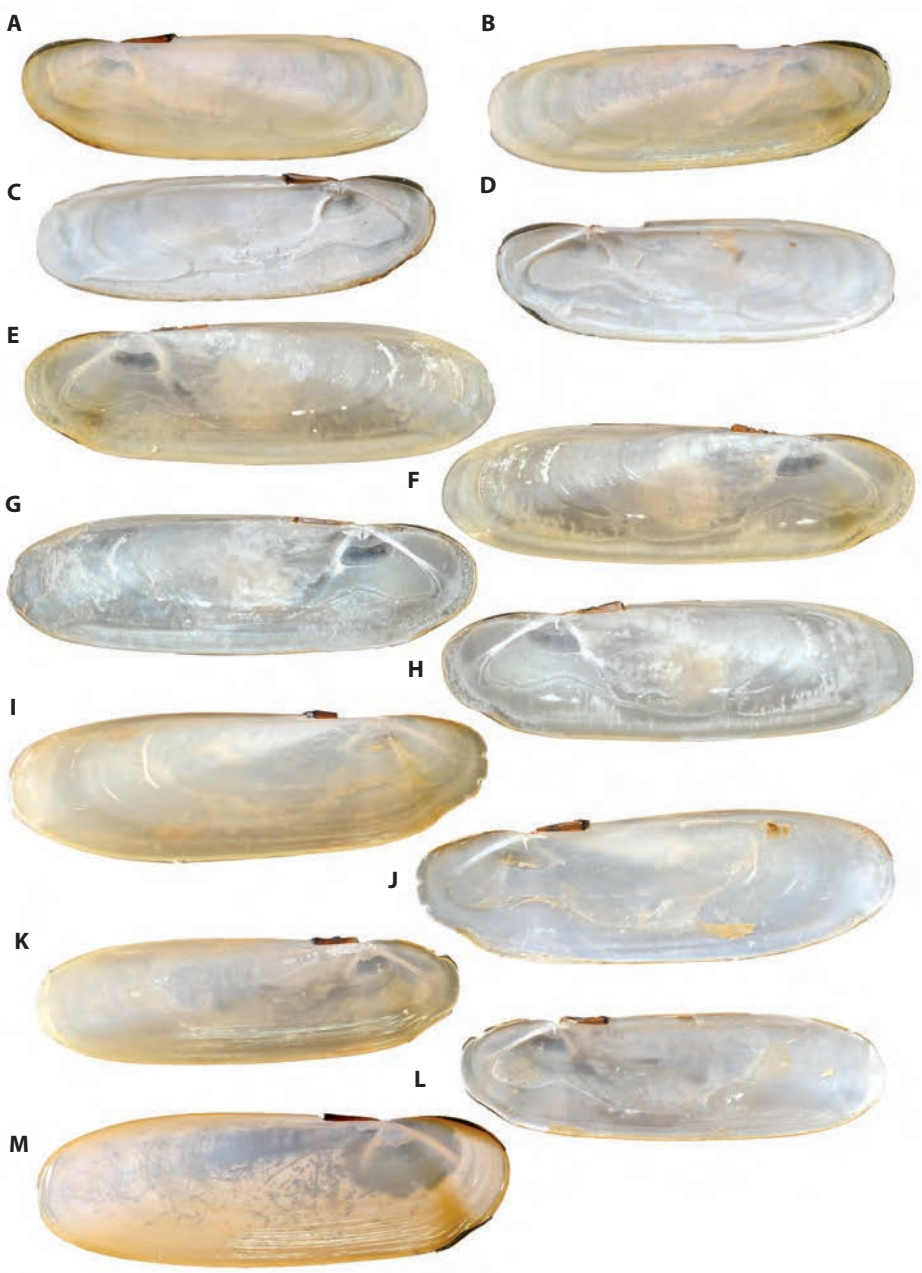
Shell up to 30 mm long, slightly variable in outline, elongate, 3 to 3.6 times longer than high, straight, thin and fragile, compressed. Anterior part often slightly tapering, anterior margin more or less narrowly rounded, with a shallow to pronounced ventral sinuosity. Posterior margin rounded and slightly tapering. Hinge and ligamental region not or only very slightly bent upwards. Dorsal margin weakly convex, occasionally straight in the middle, ventral margin convex. Beaks subterminal. Surface glossy, with faint, irregular growth lines. Periostracum thin and light greenish-olive. Valves whitish to very light brownish, translucent.

Distribution. Mauritania (17°30'N) to northern Angola (Luanda).



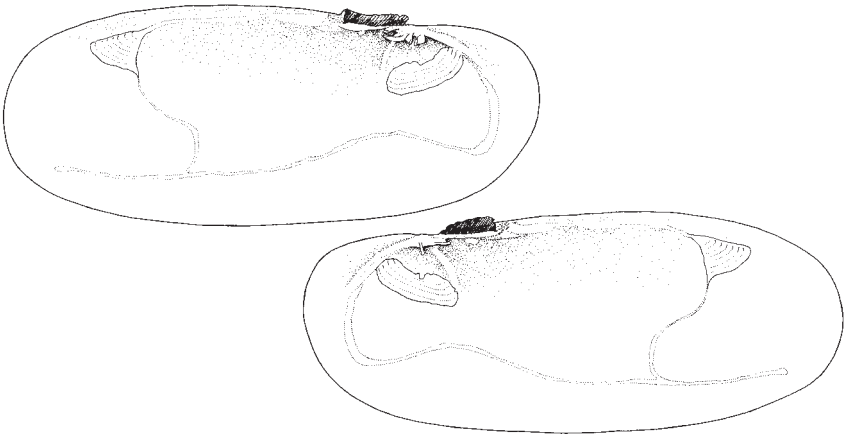
Biotope. In fine muddy sand and fine sand, offshore as well as in more or less protected bays, from shallow water (3-5 m, in bays only) to about 30 m, common. It may be found together with *Scissodesma micronitida* and *Pitar longior.*

Remarks. This species is the most common *Sinupharus*, it is distinguished from *S. africanus* and *S. bernardi* in being smaller, shorter and broader. In the first view, specimens may appear quite similar to *Nasopharus elegans*, which it is found often on the same place. It is, however, easily distinguished by its much deeper pallial sinus, the presence of both anterior and posterior reinforcement on the interior and the well marked antero-ventral sinuosity. Although the biotopes of both species overlap considerably, *N. elegans* seems to prefer more muddy sand, whereas *S. curtus* tends more towards clean sand. Beached shells are very uncommon.



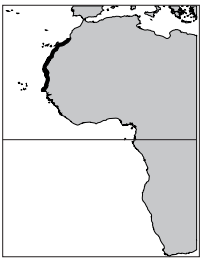
14.16. *Sinupharus curtus* Cosel, 1993. **A-D**, Mauritania, 17°24'N, 16°09'W, 14 m (21.1 mm). **E-H**, Cap Skirring, Casamance, Senegal, 12°20.7'N, 16°53.1'W, 15 m (holotype, 31.2 mm, photo Manuel Caballer/Recolnat). **I-J**, Sierra Leone River, S of Bullom Wreck, Sierra Leone (28.1 mm). **K-L**, same locality (24.7 mm). **M**, SW of Abidjan, Côte d'Ivoire, 5°09'N, 4°39'W, 20 m (27.0 mm).

Sinupharus combieri (Fischer-Piette & Nicklès, 1946)



14.17. Baie de Gorée, 14°41'N, 17°23.2'W, 17 m, fine muddy sand (32.0 mm).

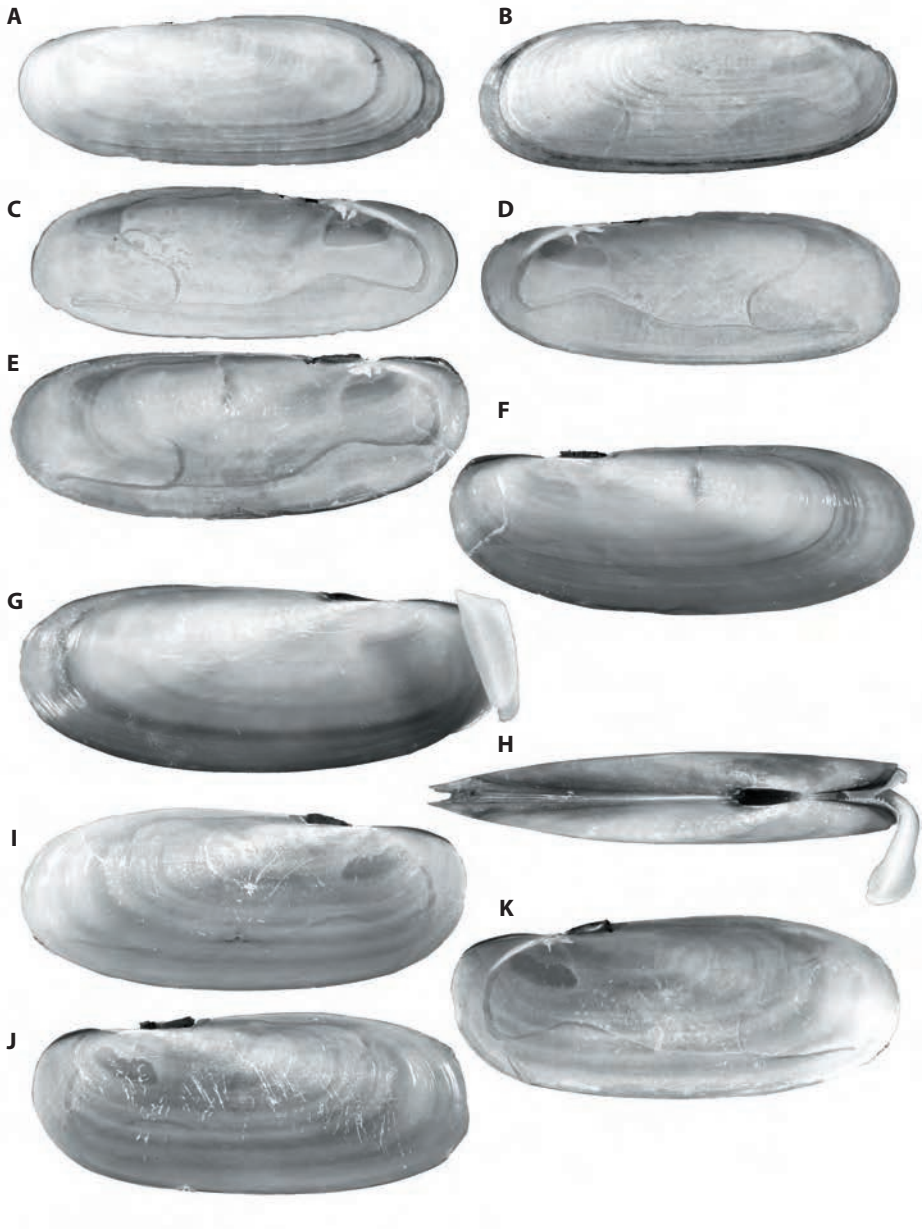
Shell up to 34 mm long, oval-oblong and extremely short for the genus, 2.4 to 2.9 times longer than high, straight, thin and fragile, very compressed. Anterior margin rounded to nearly semicircular, ventrally more gently curved than dorsally, no antero-ventral sinuosity. Posterior part very broad, posterior margin semicircular and more or less tapering. Hinge and ligamental region not bent upward. Dorsal and ventral margin gently convex. Beaks at the end of the first fourth of the valves. Surface glossy, with faint, irregular growth lines. Valves whitish, with light brownish hue, translucent.



Distribution. Southern part of Atlantic Morocco (Agadir) to Senegal (Dakar, Baie de Gorée).

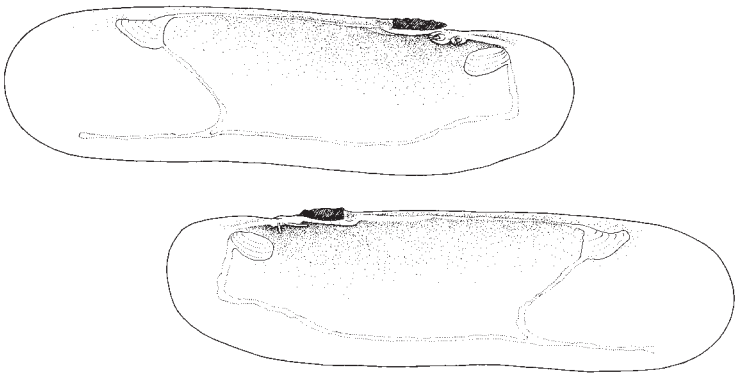
Biotope. In fine, slightly muddy sand, from about 17 to 30 m, not common.

Remarks. This is the northernmost species of *Sinupharus*, it is mostly restricted to the zone with permanent or predominant upwelling. Like its southern counterpart, *S. galatheae*, it is characterized by its extremely short and broad shell. The animal has two typical, conspicuous reddish brown spots on the posterior end above and below the siphons, which are a major distinguishing feature to *S. galatheae*, where they are absent. The distribution range coincides more or less with that of *Pharus chenui*, however, the southern limit seems to be the Dakar region, it has not yet been found southward to Casamance. A senior synonym is *Solen minutissimus* Chenu, 1843 (*non* Anton, 1839).



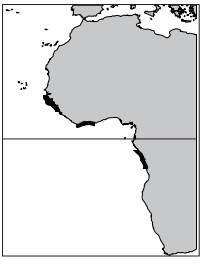
14.18. ***Sinupharus combieri*** **(Fischer-Piette & Nicklès, 1946). A-B**, SE of Agadir, Atlantic Morocco, 29°14'N, 10°23'W, 20 m (29.9 mm). **C-D**, same locality (33.5 mm). **E-F**, Mauritania, 20°49'N, 17°01'W, 15 m (31.2 mm, RMNH). **G-H**, same locality (30.9 mm). **I-K**, SE of Gorée, Senegal, 14°41'N, 17°23.2'W, 17 m (32.0 mm).

Sinucultellus atlanticus Cosel, 1993



14.19. Guinée Bissau, Geba plateau, 11°58'N, 16°58'W, 13 m (paratype SMF, 39.5 mm).

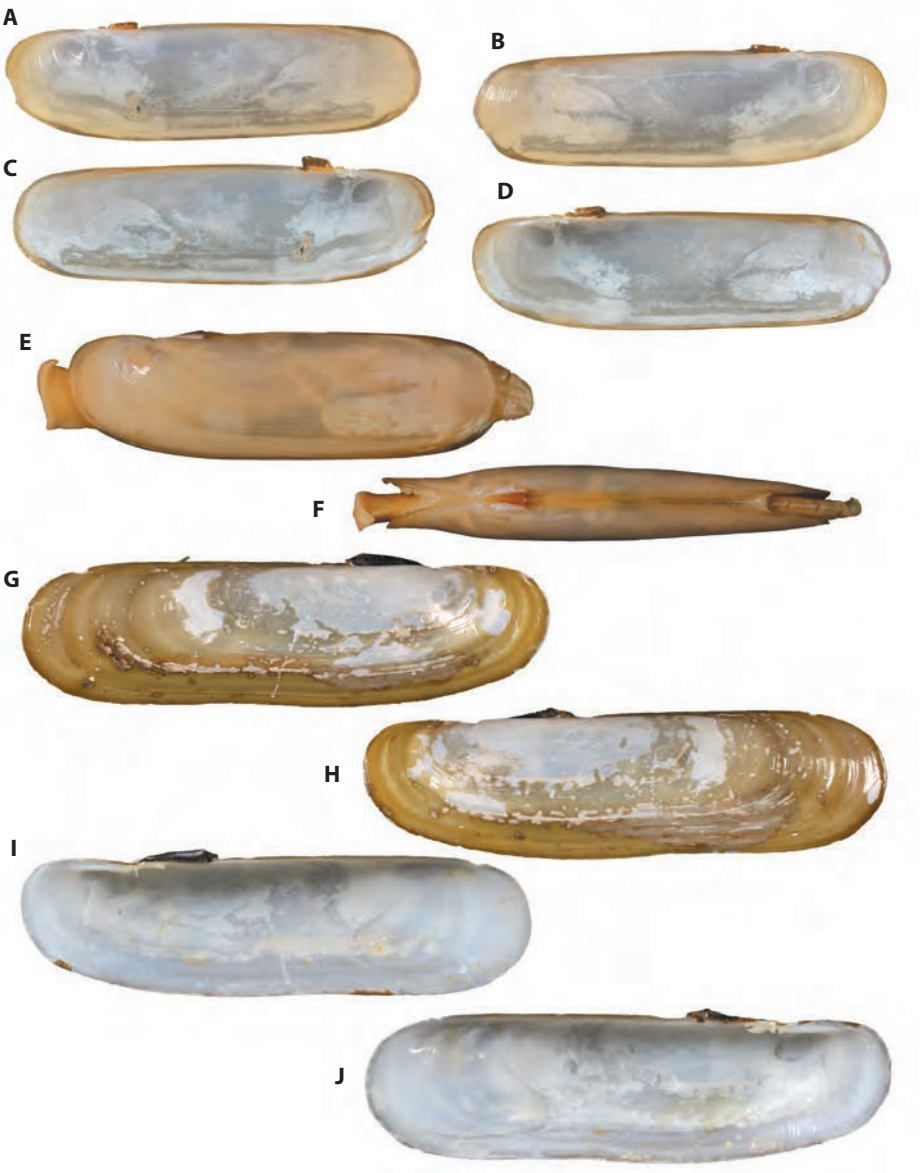
Shell up to 50 mm long, somewhat variable in outline, 3.3 to 3.8 times longer than high, compressed, rather thin and brittle, fully grown sprcimens somewhat thicker. Anterior margin slightly tapering ventrally and flaring laterally, thus underlining the gaping. Hinge and ligamental area not bent upwards. Dorsal margin straight to weakly convex, ventral margin slightly convex, straight or even faintly concave. Surface with rather strong, irregular growth lines. Periostracum thin, pale greenish to olive green, on very old specimens peeling off on the umbonal area. Valves whitish and translucent, older specimens becoming more milky.



Distribution. Senegal (Casamance) to Guinea-Bissau and Guinea (9°18'N); Côte d'Ivoire; Congo Brazzaville (Conkouati and Pointe-Noire Bay) to northern Angola (Luanda). The species seems to need at least slight upwelling influence, and the absence of records from the typical tropical zones indicate most probably distribution gaps. Moreover, the patchy distribution may also be due to the special biotope in very soft mud.

Biotope. Restricted to clean and soft muddy bottoms with less than about 10 % sand, from shallow water (3-5 m) to about 20 m, offshore as well as in more sheltered regions; locally common to abundant.

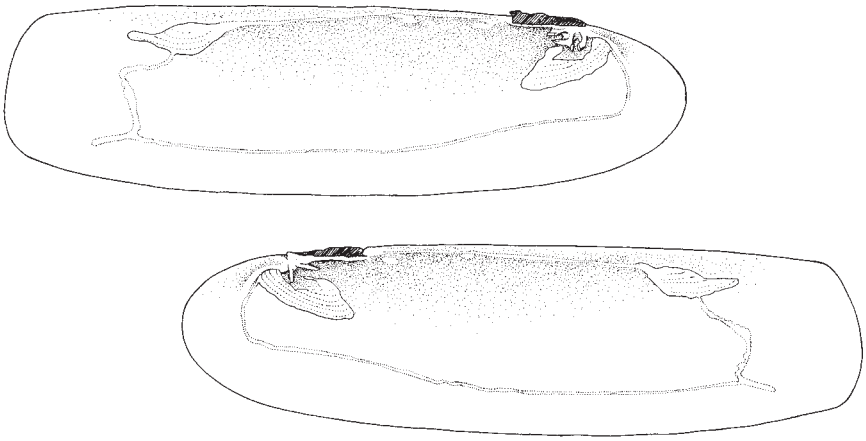
Remarks. The few hitherto known valves or shells of this species must obviously have been mistaken for *Cultellus tenuis* (Gray, 1834) (now *Sinupharus africanus*) because of the superficial similarity of the shells. Only during recent extensive field work on the vast muddy regions of the upper shelf off Guinea-Bissau (in sea charts: "Grand Plateau de Geba") it had been discovered that this species is in fact the only member of a hitherto unknown genus of pharids with similarities to the Indo-Pacific *Cultellus* and to *Siliqua*, both not present in the Eastern Atlantic (for details, also on anatomy and behaviour, see Cosel 1993). *Sinucultellus atlanticus* is, together with few other small mud-dwelling bivalves (*e.g. Scissodesma micronitida, Huberimactra inconstans*), most probably one of the main food sources for young bottom fishes in the Bissau region, where



14.20. *Sinucultellus atlanticus* Cosel, 1993. **A**-**D**, off mouth of Rio Geba, Guinea-Bissau, 11°53'N, 16°55'W, 12 m, very soft grey mud (holotype, 41.0 mm, photo Manuel Caballer/Recolnat). **E**-**F**, SW of Ile Tristão, Guinea, 10°45'N, 15°12'W, 13 m (32.5 mm). **G**-**J**, Abidjan region, Côte d'Ivoire (50.2 mm).

it occurs in quite dense populations. This part of the shelf is now well known as a fish nursery from which a large part of the stocks of the coast strip from Senegal to Guinea are recruited. Because of their fragility, dead shells are extremely rare on beaches and mostly broken.

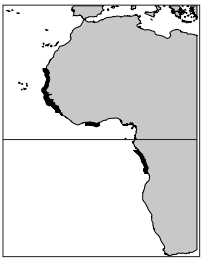
Phaxas tenellus Cosel, 1993



14.21. Angola, off Mussulo, Luanda, 50-70 m (12.0 mm).

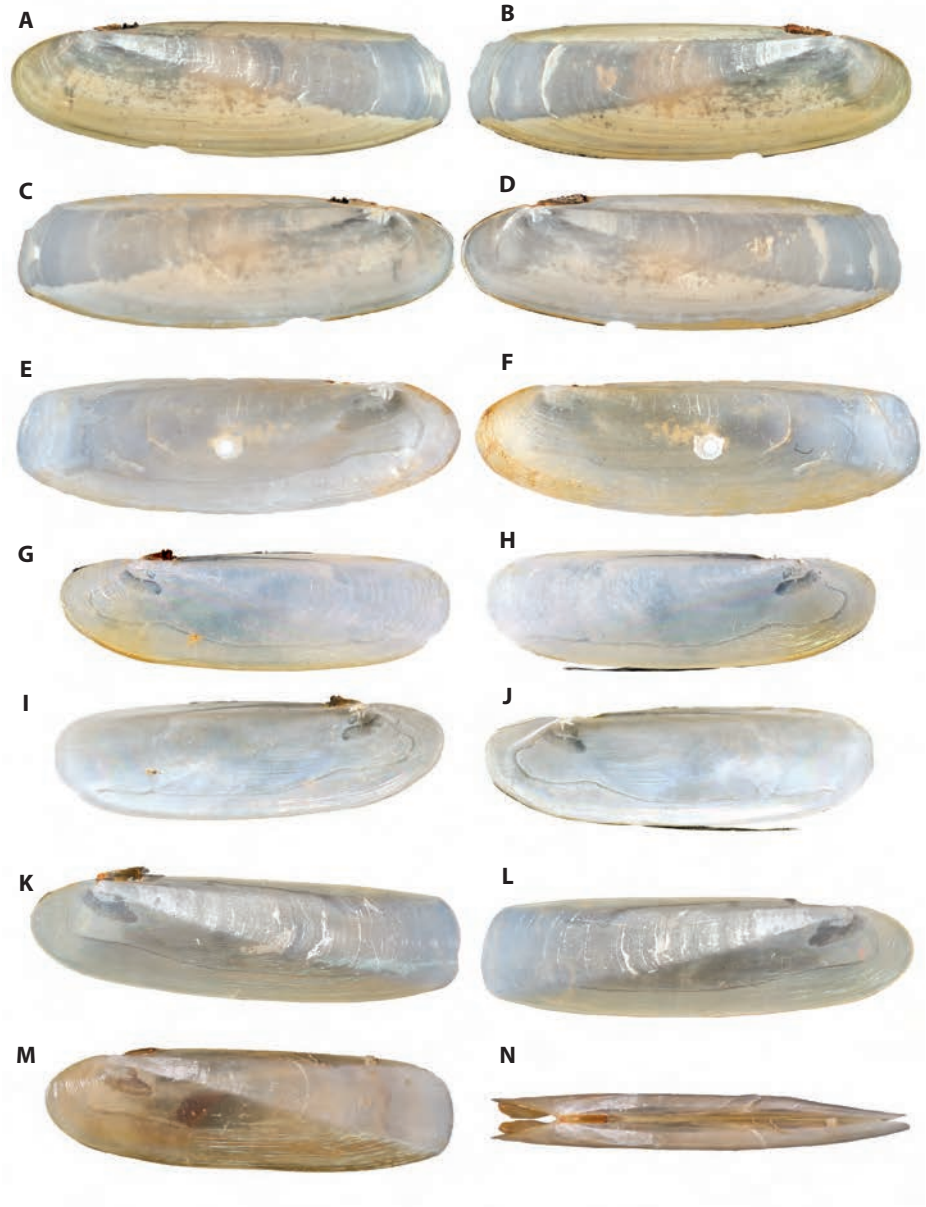
Shell very small, up to 16 mm long, elongate, 3.3 to 3.8 times longer than high, straight, thin and fragile, compressed. Anterior margin rounded and slightly tapering, posterior margin obliquely truncated, with rounded corners. Hinge and ligamental region not bent upwards. Dorsal margin more or less convex, ventral margin strongly convex. Beaks subterminal. Surface glossy, with fine, irregular growth lines. Periostracum thin, pale greenish yellow.Valves whitish to very faintly pale brownish, translucent.

Distribution. Mauritania (Cap Blanc) to Guinea (9°06'N); Côte d'Ivoire (Grand Bassam); Congo Brazzaville to northern Angola (Mussulo, Luanda). No record from south of Guinea to Liberia and from Ghana to Gabon, which may indicate distribution gaps.



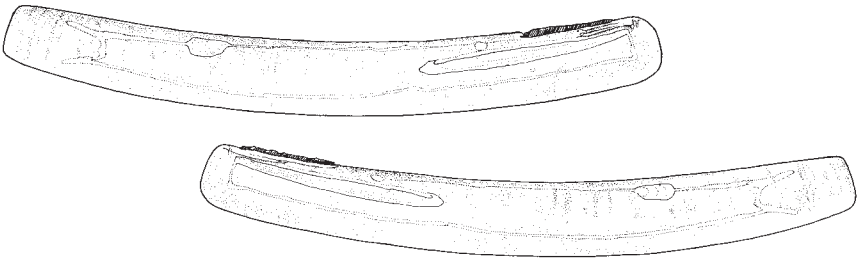
Biotope. In fine, clean sand, well offshore, from about 30 to 65 m, occasionally shallower, up to 20 m. Not common. Not found in more muddy or silty substrate.

Remarks. This species is much smaller than the European *Phaxas pellucidus* (Pennant, 1777), it is broader and always straight and has a more curved anterior adductor scar. The Mediterranean *P. adriaticus* Coen, 1933 is more slender and has the posterior adductor scar placed more forward. *Phaxas tenellus* can only be obtained by dredging or with a bottom grab.



14.22. ***Phaxas tenellus*** **Cosel, 1993.** **A**-**D**, Tiaouilît, Mauritania, 19°50'N, 16°36'W, 62 m (holotype, 14.3 mm, photo Manuel Caballer/Recolnat). **E**-**F**, Mauritania, 18°48'N, 16°20'W, 18 m (16.1 mm). **G**-**J**, Sine-Saloum, Petite Côte, Senegal, near mangroves (13.9 mm). **K**-**L**, off Mussulo (Macôco), Luanda prov., N-Angola, dredged, 50-70 m (12.0 mm). **M**-**N**, same locality (11.7 mm).

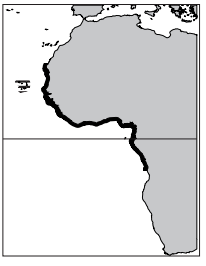
Ensis goreensis (Clessin, 1888)



14.23. Ile Banié, Gabon, 2-6 m (68.3 mm).

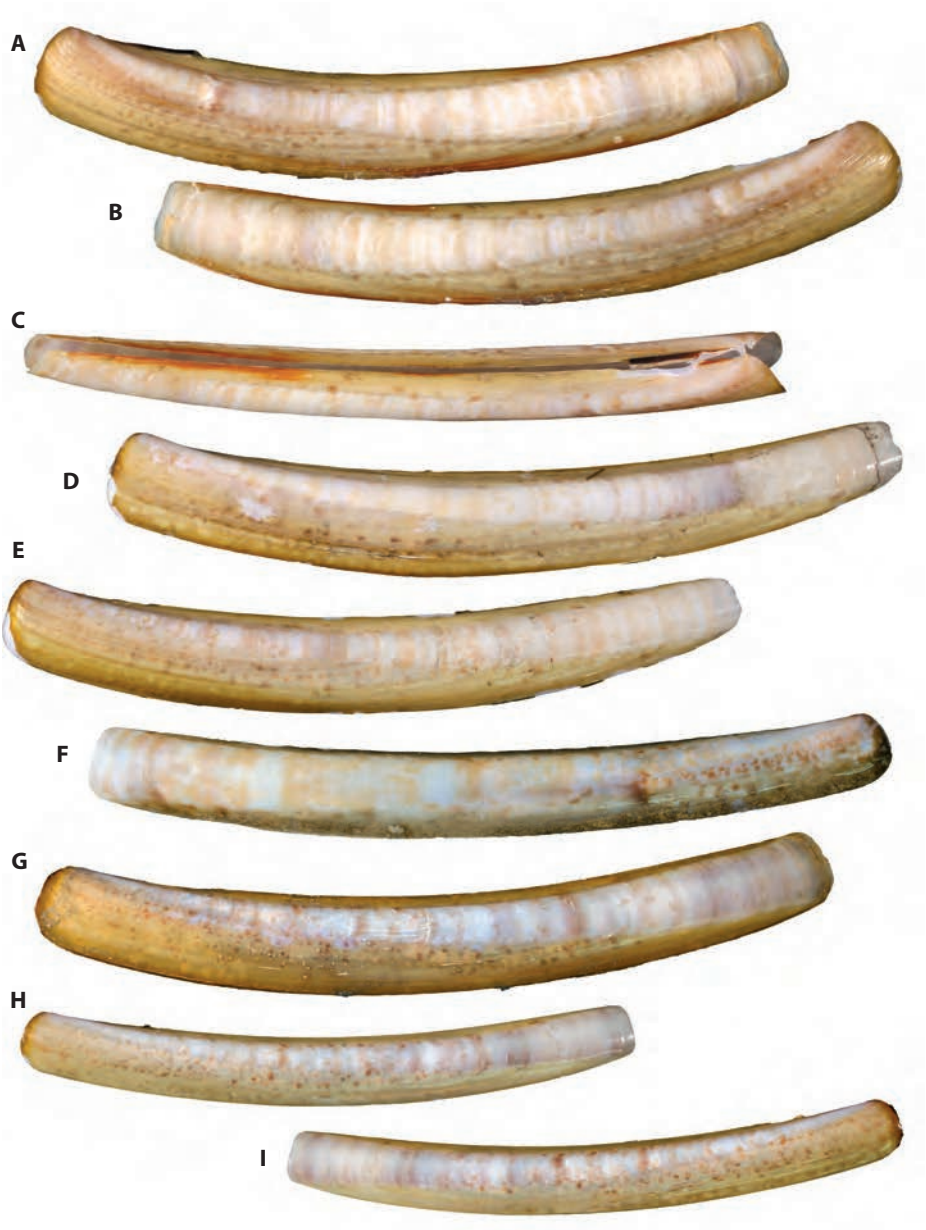
Shell up to 90 mm long, extremely long and narrow, 7 to 9 times longer than high, markedly curved, rather thin and fragile, moderately compressed. Anterior margin rounded-truncated, with well rounded corners, posterior margin truncated and slightly convex. Dorsal and ventral margin parallel and concave resp. convex. Hinge and ligamental area bent upwards only as corresponding to the line of concaveness of the dorsal margin. Beaks at the anterior end of the valve. Surface with fine, irregular growth lines. Periostracum thin and yellowish green. Outside whitish to pale pinkish violet, with few weakly marked to numerous well marked brownish red to violet vertical growth zones on the postero-dorsal part and numerous small points and spots on the antero-ventral and very dorsal part of the valves, on the inside showing through.

Distribution. Southern part of West Sahara (Rio de Oro) to northern Angola (Luanda); single, perhaps subrecent valves found at Cape Verde Islands.



Biotope. In fine sand, mixed sand and moderately coarse sand, also with calcareous algae and shell debris, mostly offshore between 20 and 50 m, but occasionally also shallower, from about 3 m downwards. Not uncommon in the adequate environment.

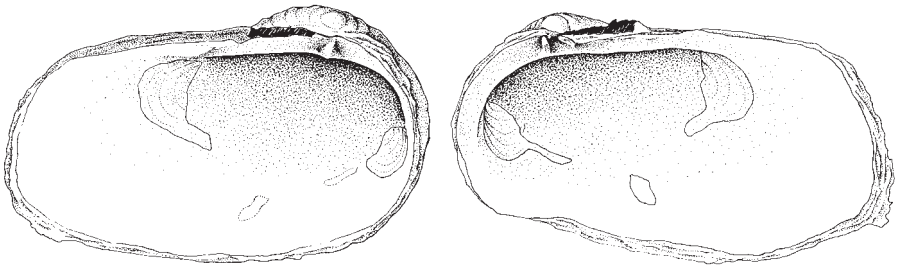
Remarks. From the closest European species, *E. ensis* (Linnaeus, 1758), *E. goreensis* is distinguished by its more slender shell and the less rounded anterior margin. *E. goreensis* is more vividly coloured with its typical small dark violet spots, points and blotches. Specimens from the Dakar region and Casamance are somewhat broader and shorter and often more curved than specimens form the tropical zone proper, the posterior adductor scar is closer to the pallial sinus. Specimens from Guinea southward are more slender and tend to be less curved, the posterior adductor scar is placed more forward (see Cosel 2009). In their distribution pattern, the two morphs apparently do not overlap: the southernmost known record from Casamance is from 12°30'N. In spite of the first author's fieldwork off Guinea-Bissau, there is so far no record from there: the vast extensions of bottom with very soft mud along that coast may function as a biological barrier. The northernmost record of the more southern, tropical morph is from 10°36'N (Compony Banks, Guinea). It cannot completely



14.24. *Ensis goreensis* (Clessin, 1888). **A**-**C**, SW of Madeleines Is., Dakar, Senegal, 48 m (62.1 mm). **D**, off Casamance, 10-20 m (91.7 mm). **E**, same locality (85.2 mm). **F**, Guinea, W of Ouendi, 9°54'N, 16°01.5'W, 39 m (71.1 mm). **G**, Ile Banié, off Cap Esterias, Gabon, fine sand 2-6 m (88.5 mm). **H**-**I**, same locality (68.8 mm).

be excluded that a separate undescribed species may be involved. However, more material, and DNA tests would be necessary. Due to the generally offshore biotope, beached shells are extremely rare.

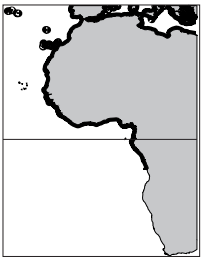
Hiatella arctica (Linnaeus, 1767)



14.25. Palmeirinhas, Luanda, N-Angola, 2-3 m (12.2 mm).

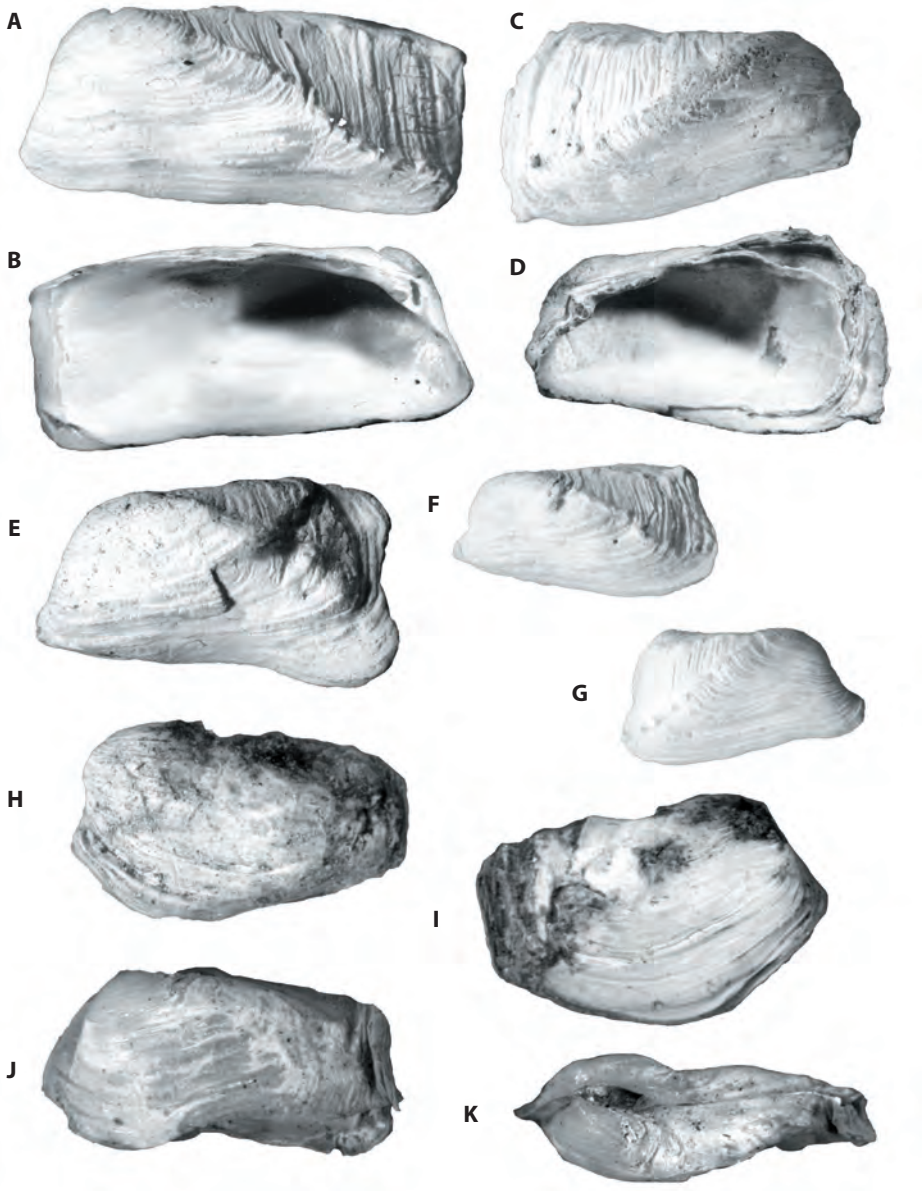
Shell up to 38 mm long (West African specimens only up to 14 mm), extremely variable in shape, slightly inequivalve, oblong, rectangular to trapezoidal, posteriorly narrowly gaping, occasionally also antero-ventrally. Beaks near the anterior margin, subterminal. Surface with irregular, commarginal undulations, ridges and growth lines. Posterior angle with a ridge which often bears short spines; there is a second similar ridge closer to the postero-dorsal margin. The spines are frequently eroded. Periostracum thin, light brownish, often worn away. Outside and inside white.

Distribution. Arctic circumpolar, Norway and British Isles southward to northern Angola (Luanda); Azores, Madeira, Canary Island; throughout the Mediterranean.



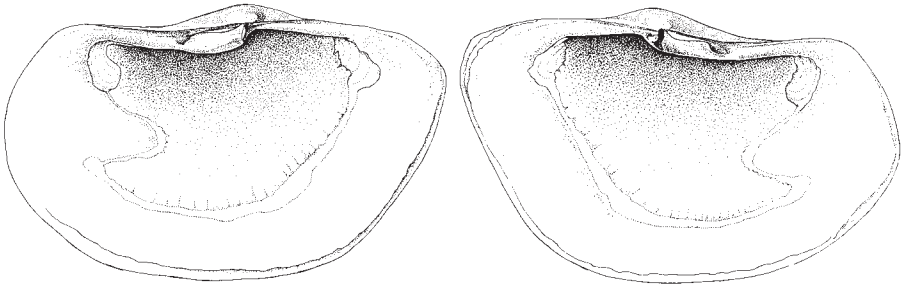
Biotope. On hard substrate byssally attached in crevices or empty bore holes, also boring itself in very soft rock, from shallow water (1-5 m) to 60 m and probably also deeper, common to very common in Europe, uncommon to rare in West Africa. Also reported from the Western Atlantic.

Remarks. The West African material is here assigned to *H. arctica*; the more northern *H. rugosa* (Linnaeus, 1767) is often considered conspecific. However, some characters (*e.g.* reproduction period, boring habit) indicate that the two species might be separate. Further molecular data (Laakkonen *et al.* 2016) clearly indicate that a species complex is involved, still in need of taxonomic clarification. The specimens from Ghana and Congo Brazzaville are smaller, but in lack of more specimens we cannot say if this is the rule.



14.26. *Hiatella arctica* (Linnaeus, 1767). **A**-**B**, off St. Louis, Senegal, 580 m (13.1 mm). **C**-**D**, same locality (11.0 mm). **E**, same locality (11.3 mm). **F**, same locality (8.1 mm). **G**, same locality (7.6 mm). **H**-**I**, off Cape Coast Ghana (6.0 mm). **J**-**K**, Pointe-Noire, Congo, Plage Mondaine (5.5 mm).

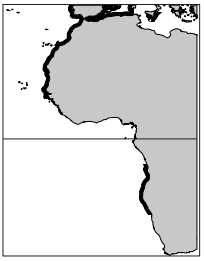
Panopea glycimeris (Born, 1778)



14.27. Futungo, Baia de Mussulo, Luanda, N-Angola (226 mm).

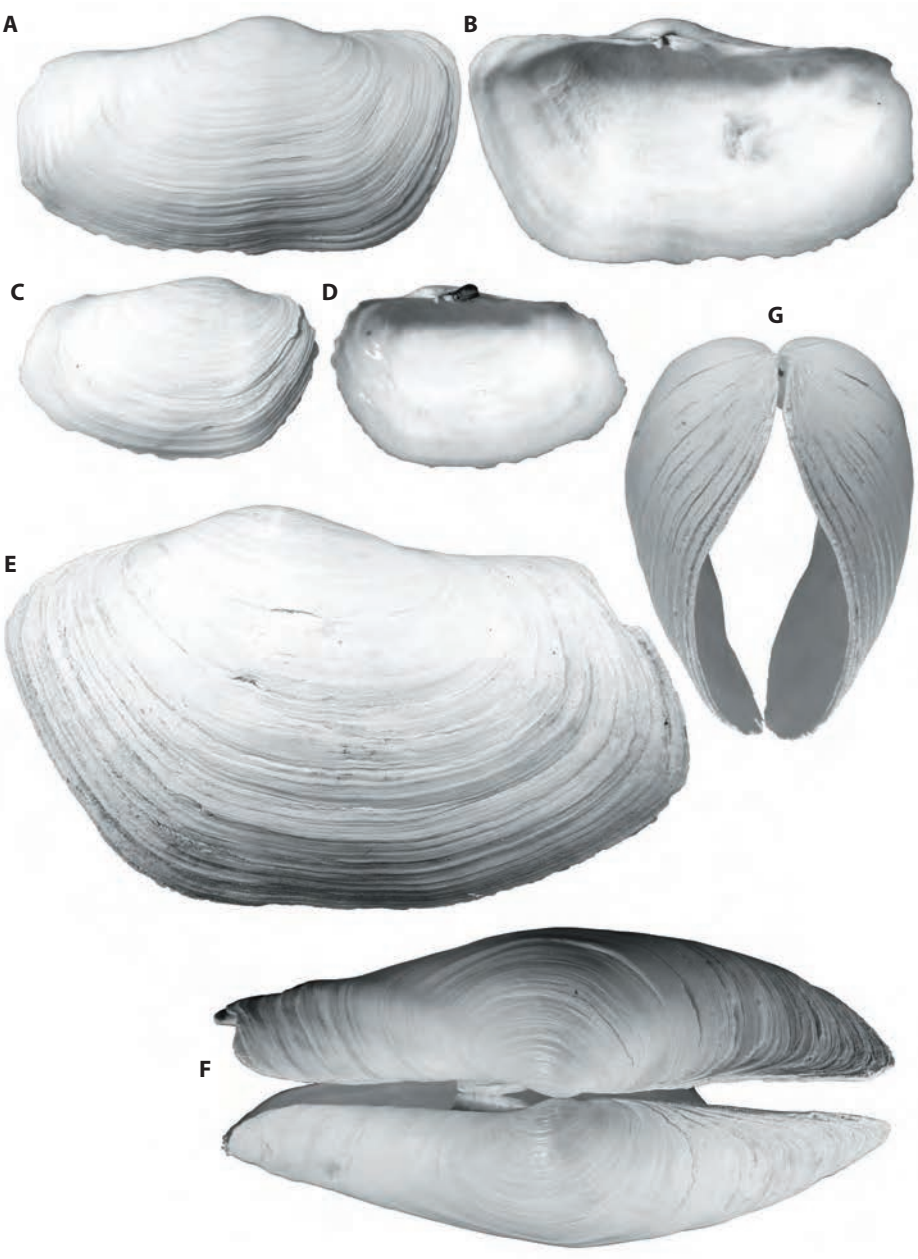
Shell very large to gigantic, 160-270 mm long (largest known West African specimen 230 mm long), somewhat variable in outline, suboval, trapezoidal, juveniles thin, adults very thick and solid, inflated, widely gaping anteriorly and posteriorly. Anterior margin oblique, in adult specimens often slightly sinuous, posterior margin rounded-truncated. Beaks well in front of the vertical midline. Surface dull, with strong, irregular growth lines and occasional coarser growth stages. On the first (umbonal) 20-30 mm faint, broad, commarginal waves, disappearing more ventrally. Periostracum thick and brown, on juveniles thin, persistent only near the margins. Ligament very strong, on a thick nymphal plate. Outside and inside dirty white. The soft parts cannot be completely withdrawn into the shell and largely surpass the shell length.

Distribution. Northwest Spain (Ria de Vigo) southward to Senegal (Casamance); northern and southern Angola (Mussulo to Baia dos Tigres) and perhaps further southward into Namibia; extreme south-western Mediterranean and isolated localities in the western Mediterranean (*e.g.* eastern Sicily). There are no records between southern Senegal and northern Angola.



Biotope. In fine sand and mixed sand, from shallow water (3-5 m) to about 80 m and perhaps deeper, burrowing deeper than 1 m; locally common in Europe, uncommon in West Africa.

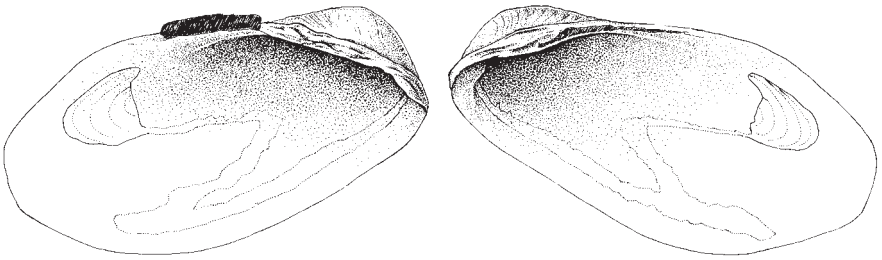
Remarks. This is the largest eastern Atlantic eulamellibranch bivalve, it exceeds even the close northeastern Pacific *P. generosa* Gould, 1850, the famous "geoduck", in length, and unconfirmed literature information indicate even 300 mm as maximum shell length for *P. glycimeris*; with the stretched foot siphonal tubes, the animal can reach a total length of 700 mm! In contrast to *P. generosa*, the eastern Atlantic species has a very patchy distribution pattern and is generally subtidal, collection of live specimens by hand is extremely difficult, not to say impossible (as the experience during the MNHN Expedition to Algarve Coast has shown); the species is hence not marketed. *Glycimeris rugosa* Bosc, 1801, *Panopea aldrovandi* Ménard de la Groye, 1807 and *Glycimeris cyclopana* Monterosato, 1889 are synonyms. The two other synonyms, *P. australis* Valenciennes, 1839 (*non* G.B. Sowerby I, 1833) and *P. natalensis* Woodward, 1855, are based on the same specimen which was live-collected at low tide in Baia dos Tigres,



14.28. *Panopea glycimeris* (Born, 1778). **A**-**B**, Port-Etienne (now Nouadhibou), Mauritania (150 mm). **C-D**, same locality (100 mm). **E-G**, Futungo, Baia do Mussulo, N- Angola, 0-2 m (237 mm. F, dorsal view. G, anterior view).

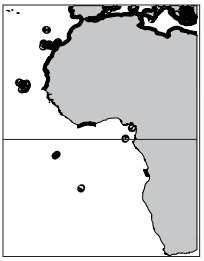
Angola. A close fossil species is *P. faujasi* Ménard de la Groye, 1807 from the Pliocene of Europe. For details, see Thomsen *et al.* (2009).

Rocellaria dubia (Pennant, 1777)



14.29. Cabo Ledo, Luanda, N-Angola, 40 m (9.1 mm).

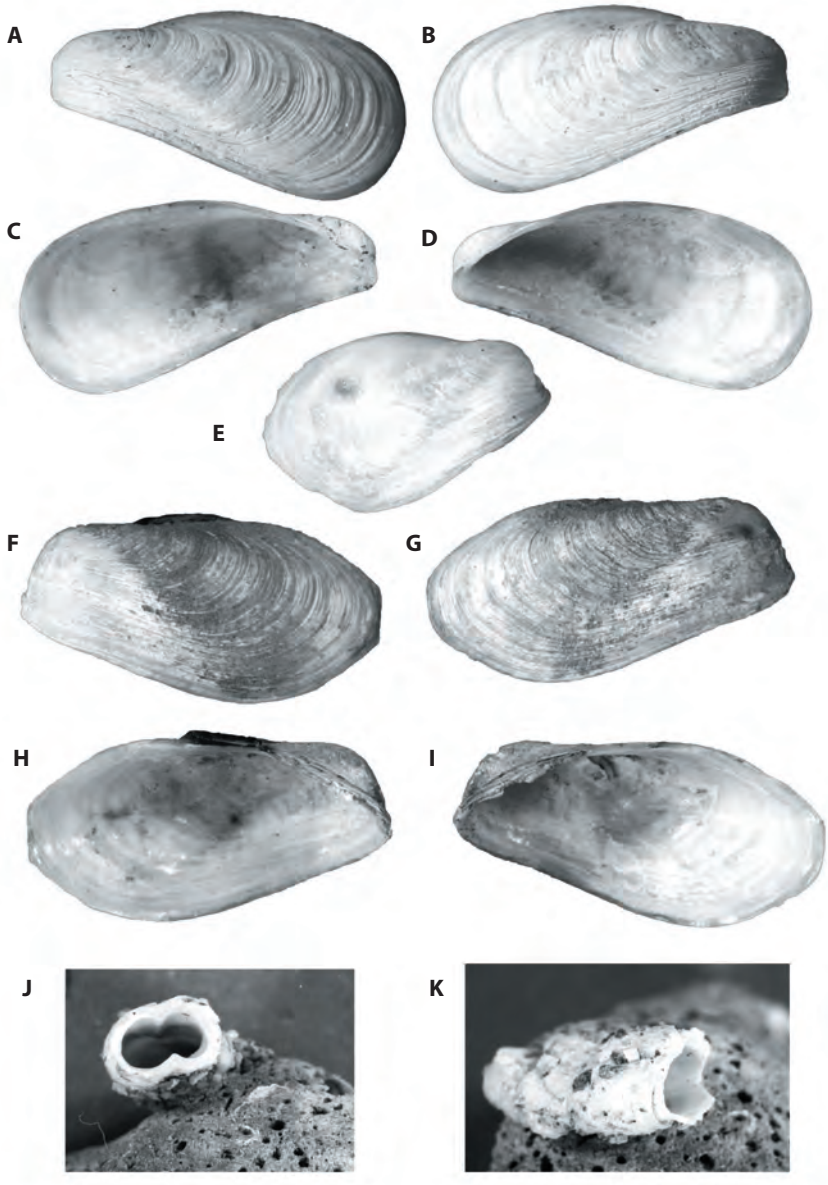
Shell up to 25 mm long (West African specimens only to 10 mm), variable in outline, elongate-triangular, gaping widely antero-ventrally, thin and fragile, inflated. Anterior margin narrowly rounded, posterior part broad, posterior margin somewhat tapering. Beaks subterminal, situated just behind the anterior margin. Surface dull with well developed, dense, irregular growth lines and often a few irregular undulations. Periostracum brownish, mostly eroded. Hinge line with a slight thickening under the beaks, no teeth. Outside and inside white.



Distribution. Western Ireland and south-western England, western part of the Channel southward to Senegal (Dakar region); Côte d'Ivoire; northern Angola (Cabo Ledo); Madeira, Canary Islands, Cape Verde Islands, St Helena; throughout the Mediterranean.

Biotope. Boring in shells (dead and live), rocks and limestone, from shallow water to about 50 m, quite common in Europe, uncommon in West Africa. The species builds a shelly, tubular prolongation of the siphonal end of its bore hole which has an 8-shaped cross-section and which attains a length of about 10 mm with a specimen of equal length in the hole.

Remarks. The few known West African specimens are here assigned to *R. dubia*. Although they are considerably smaller than specimens from Europe, we consider them remaining within the variability of this species. Synonyms are *G. hians* Fleming, 1828, *G. cuneiformis auct.* (*non* Spengler, 1783) and *G. polii* Philippi, 1844. The absence of records from the typical tropical zones may indicate distribution gaps.



14.30. ***Rocellaria dubia*** **(Pennant, 1777).** **A**-**D**, Dakar region, Senegal, 14°21'N, 17°20'W, 46-49 m (10.0 mm). **E**, Abidjan region, Côte d'Ivoire, 5.2 mm). **F**-**I**, 3206-3207 Cabo Ledo, Luanda prov., N-Angola, 40 m (8.5 mm). **J**-**K**, Part of the tube of *Gastrochaena dubia* outside of boring hole.

Family **MACTRIDAE**
- Genus ***Mactra*** Linnaeus, 1767 – 2 species
- Genus ***Mactrotoma*** Dall, 1894 – 1 species
- Genus ***Barymactra*** Cossmann & Peyrot, 1909 – 1 species
- Genus ***Leptospisula*** Dall, 1895 – 1 species
- Genus ***Huberimactra*** Cosel & Gofas, 2018 – 2 species
- Genus ***Spisula*** Gray, 1837 – 1 species
- Genus ***Oxyperas*** Mörch, 1853 – 2 species
- Genus ***Scissodesma*** Gray, 1837 – 4 species
- Genus ***Lutraria*** Lamarck, 1799 – 2 species
- Genus ***Eastonia*** Gray, 1853 – 1 species
- Genus ***Tumbeziconcha*** Pilsbry & Olsson, 1935 – 1 species

Family **CARDILIIDAE**
- Genus ***Cardilia*** Deshayes, 1835 – 1 species

Superfamily Mactroidea

This superfamily currently comprises the families Mactridae, Anatinellidae and Mesodesmatidae, of which only the first is represented in West Africa. The small, enigmatic family Cardiliidae is also placed there.

Family MACTRIDAE

Shells small to large, mostly thin and fragile but sometimes thick and solid, equivalve, equilateral or inequilateral with beaks in front of the vertical midline, triangular or subtriangular to oval or elongate-oval. Surface smooth or, more rarely, sculptured. Hinge with an inverted V-shaped cardinal in the left valve and two cardinals in the right valve, with laterals elongate or blade-shaped, sometimes reduced or absent. External ligament inconspicuous or absent; internal ligament strong, inserted in a characteristically triangular and slightly protruding resilifer. Margins smooth. Adductor muscle scars subequal. Pallial sinus shallow to deep. The worldwide species number is 184, from West Africa, 18 species are recorded. The genus-level systematics of the family has been tackled by Huber 2010, Signorelli & Pastorino 2011, 2012a, 2012b. However, a comprehensive supraspecific revision of the Mactroidea is still missing.

The genera of Mactridae are currently distributed in four subfamilies, two of which are present in West Africa: the subfamily Mactrinae, with shells mostly equilateral and well-developed lateral teeth, and subfamily Lutrariinae, with shells inequilateral, gaping posteriorly, and with lateral teeth inconspicuous. The family is easily diagnosed by two unique features: the inverted V-shaped paired cardinals in the left valve and the large internal part of the ligament (termed "resilium" by Dall 1895) set in a well developed and generally protruding chondrophore. The configuration of the ligament is of importance for the definition of genera among Mactridae, according to whether the internal resilium is separated from the external ligament by a shelly lamina (*e.g. Mactra*) or not (*e.g. Spisula*), whether the external part of the ligament is connected to the resilium (*Scissodesma*), or is absent.

Genus *Mactra* Linnaeus, 1767. Shells medium-sized to rather large (over 100 mm), generally quite thin and fragile, equilateral, oval-triangular, more or less inflated; no groove delimiting lunule and escutcheon. Surface smooth or with commarginal sculpture. External ligament very small and separated from internal ligament (resilium) by a shelly lamella. Lateral teeth well developed, smooth, elongate and well separated from cardinals, extending over nearly half the shell length, forming raised lamellae, 1 anterior and 1 posterior on lv, 2 anterior and 2 posterior on rv. Pallial sinus rather short and broad, well rounded; siphons fused and retractible within the shell. Pallial line very thick ventrally.

Genus *Mactrotoma* Dall, 1894. Shells small to rather large (over 60 mm), moderately thin to thick and solid, slightly inequilateral. oval-oblong to elongate-oval. Posterior angle sharp, well-marked as a ridge. Hinge plate broad, with large, shallow resilifer. Hinge teeth close set, small cardinals, lateral teeth very short and not very strong; lower anterior lateral of rv prolonging anterior cardinal (Lamy 1917-1918; Signorelli & Pastorino 2012a). External ligament large for a mactrid separated from internal ligament (resilium) by a shelly lamella. Periostracum thin, with wrinkles along the posterior angle. Pallial line thin, bordered internally by a row of minute scars.

Genus *Barymactra* Cossmann & Peyrot, 1909. Shells large (to 90 mm), thick and solid, high-triangular, tumid. Hinge with strong and short hinge teeth. Pallial sinus small, narrow-triangular, slightly pointing downward. Pallial line thin, bordered internally by a row of minute scars.

Genus *Leptospisula* Dall, 1895. Shells large to very large (to 160 mm), rather thin, inflated, with commarginal waves on the beak, slightly gaping posteriorly. Hinge plate short and broad, pallial sinus rather deep, narrow-triangular with narrowly rounded extremity. Pallial line thin, bordered internally by a row of minute scars.

Genus *Huberimactra* Cosel & Gofas, 2018. Shells small to medium-sized (to 60 mm), very thin and fragile, oval. Surface smooth or with fine commarginal waves on the early umbonal part. Lunular area broad, weakly to well delimited. Posterior angle formed by ridge or keel. Inside with short and very broad, well rounded pallial sinus and a row of small secondary scars dorsal to the pallial line. Cardinal platform with inconspicuous cardinal teeth appressed on the anterior edge of the chondrophore, and lamellar anterior and posterior lateral teeth. Internal ligament strong, inserted in a characteristically triangular and slightly protruding resilifer. A unique feature of *Huberimactra* is the configuration of the ventral edge of the cardinal platform, drawn as a fine lamella spanning between the tip of the anterior and of the posterior laterals.

Genus *Spisula* Gray, 1837. Shells small to very large (over 200 mm), rather thin to quite thick and solid, triangular-suboval to narrowly suboval, more or less inflated, not gaping, with beaks more or less median or in front of the vertical midline. Hinge with well-developed laterals, which are finely crenulate. Surface

smooth or with commarginal sculpture. External ligament and resilium not separated by a lamina. Pallial sinus more or less deep and rounded.

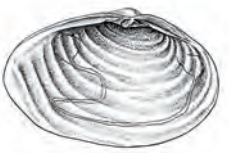
Genus *Oxyperas* Mörch, 1853. Shells medium sized to large (to over 100 mm), moderately solid, elongate-triangular to more or less long and slender, with rather narrow anterior and posterior margins. Surface with commarginal cords or nearly smooth with growth lines. Periostracum nearly colourless to yellowish, mostly with outstanding irregular dark brown spots. Pallial sinus very deep, rounded, partly confluent with the pallial line. Two species in West Africa and a few in the Indo-Pacific. *Pseudoxyperas* Sacco, 1901 was defined as being more gracile and slender than typical *Oxyperas*, and is not distinguished here.

Genus *Scissodesma* Gray, 1837. Shells small to large (to over 120 mm), rather strong, equilateral, triangular to elongate-triangular, moderately inflated. A characteristically deep ligament slit running from the dorsal side of the hinge plate to the tip of the umbos; the external part of the ligament is therefore not separated by a lamina from the internal resilium. Lateral teeth well-developed, short to moderately elongate but clearly separate from cardinals, not crenulated like in *Spisula*. Surface almost smooth or with fine commarginal ridges which may be stronger on the lunular area and postero-dorsal slope. Posterior angle, delimiting the postero-dorsal slope from the rest of the valve, narrowly rounded to very sharp. Pallial sinus variable, triangular, with acute or more or less rounded extremity, rather small to comparatively large, about horizontal to slightly pointing upwards. In the type species *S. spengleri* (Linnaeus, 1767) from South Africa, the ligamental slit is long and spectacular, whereas in the four West African species here classified in subgenus *Crepispisula* Eames, 1957, it is small, narrow and more oblique, occasionally indistinct.

Genus *Lutraria* Lamarck, 1799. Shells quite large (to over 150 mm), rather thin and fragile to moderately thick, compressed, gaping at both ends, with rounded anterior and posterior margin and subparallel dorsal and ventral margin. Beaks well in front of the vertical midline. Surface smooth with well-marked commarginal growth lines. Hinge with lateral teeth reduced or absent. Ligament horizontal, deep, broad and rounded at the end. Pallial sinus very large, reaching the vertical midline- The siphons cannot be retracted into the shell.

Genus *Eastonia* Gray, 1853. Shells medium-sized (to over 80 mm), oval, inflated, quite thin to thick and solid, gaping at both ends, with beaks slightly anterior to the vertical midline. Surface with strong radial sculpture except on the posterior area. Pallial sinus large, rounded. This is the only mactrid genus with a strong radial sculpture.

Genus *Tumbeziconcha* Pilsbry & Olsson, 1935. Shells quite small to medium-sized, very thin and fragile, oval with posterior end tapering to rostrate, anteriorly inflated, posteriorly compressed, with well marked subcommarginal waves, reflected on the interior. Beaks in front of to behind the vertical midline. Posterior angle a more or less shallow ridge.

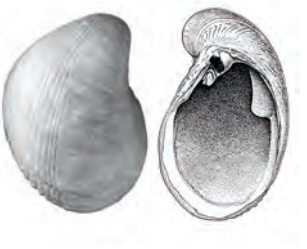


Species treated (18)
Mactra glabrata Linnaeus, 1767; *Mactra sauliana* Gray, 1838; *Mactrotoma compressa* (Spengler, 1802); *Barymactra rostrata* (Spengler, 1802); *Leptospisula nivea* (Gmelin, 1791); *Huberimactra inconstans* (Cosel, 1995); *Huberimactra grayi* (Huber, 2015); *Spisula subtruncata* (da Costa, 1778); *Oxyperas egenum* (Reeve, 1854); *Oxyperas proaspersum* (Sacco, 1901); *Scissodesma (Crepispisula) nitida* (Gmelin, 1791); *Scissodesma (Crepispisula) angolensis* (Cosel, 1995); *Scissodesma (Crepispisula) micronitida* (Cosel, 1995); *Scissodesma (Crepispisula) acutissima* (Cosel, 1995); *Lutraria senegalensis* Gray, 1837; *Lutraria budkeri* Nicklès, 1955; *Eastonia rugosa* (Helbling, 1779); *Tumbeziconcha senegalica* (Cosel, 1995).

Family CARDILIIDAE

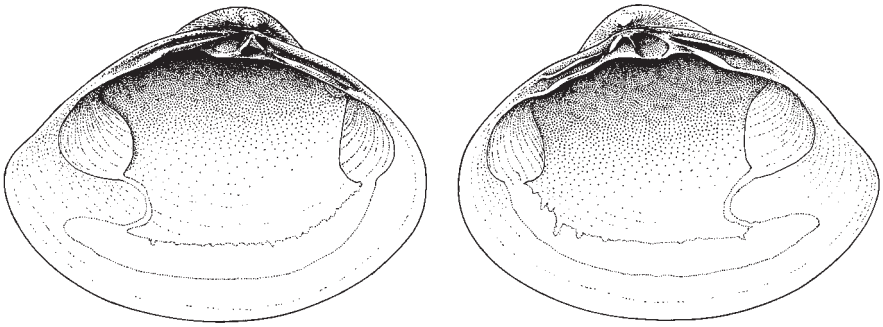
Shells higher than long, equivalve, with large and oblique resilifer and an external ligament. Left valve with inverted V-shaped cardinal, right valve with a weaker, triangular, lamellar cardinal. Only one genus is known with four Recent species, three of them Indo-Pacific and one West African (Signorelli & Raven 2018). There are no data on anatomy or life history of this enigmatic family, and the placement in superfamily Mactroidea, supported by the configuration of the cardinal teeth, remains tentative.

Genus *Cardilia* Deshayes, 1835. Shells small, higher than long, very inflated, with radial ribs on at least the posterior part of the shell. Posterior adductor scar on an internal leaf-like projection on the inner dorsal margin of the shell. No pallial sinus. Cardinal teeth on a sort of buttress situated under the resilifer; right valve with one lateral tooth.



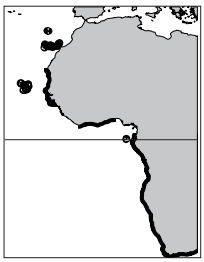
Species treated (1)
Cardilia atlantica Nicklès, 1955.

Mactra glabrata Linnaeus, 1767



15.1. Praia Etambar, Corimba, Angola (73.6 mm).

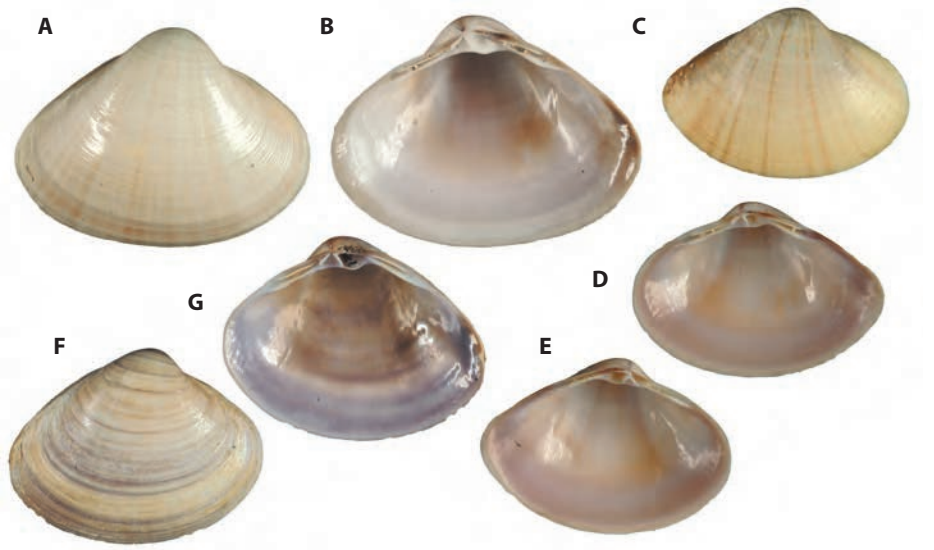
Shell up to 89 mm long, somewhat variable in shape, more so in size and colouration, suboval, rather thin to quite thick and solid, more or less inflated, especially large specimens. Anterior margin well rounded, frequently more or less truncated at the extremity, especially in very large specimens; posterior margin more pointed, beaks very slightly in front of the vertical midline. Postero-dorsal margin almost straight, only just behind the beaks convex, or slightly convex on its whole length. Surface quite smooth, except for antero-ventral area, lunule and escutcheon, on which regular, fine commarginal ridges are often developed, especially in large specimens. Periostracum thin and translucent to often thicker and brown in fully grown specimens. Pallial sinus rather small, short and round. Outside either uniform white, cream with light grey or violet, whitish to pale brownish (mostly the larger specimens from the extremities of the distribution area) or pale grey-lilac, with irregular, more or less darker brown radial rays and often with irregular, brownish-violet to violet commarginal bands (*e.g.* specimens from Cape Verde Islands). Inside whitish or pale brownish violet to deep violet.



Distribution. Mauritania (Cap Blanc) to Guinea (just S of Cap Verga, 10° N); Côte d'Ivoire to Bénin (Icheppé, Mission Gruvel); Equatorial Guinea (Bata) to southern Angola; Canary Islands, Cape Verde Islands, São Tomé, Ilha do Principe, Annobon.

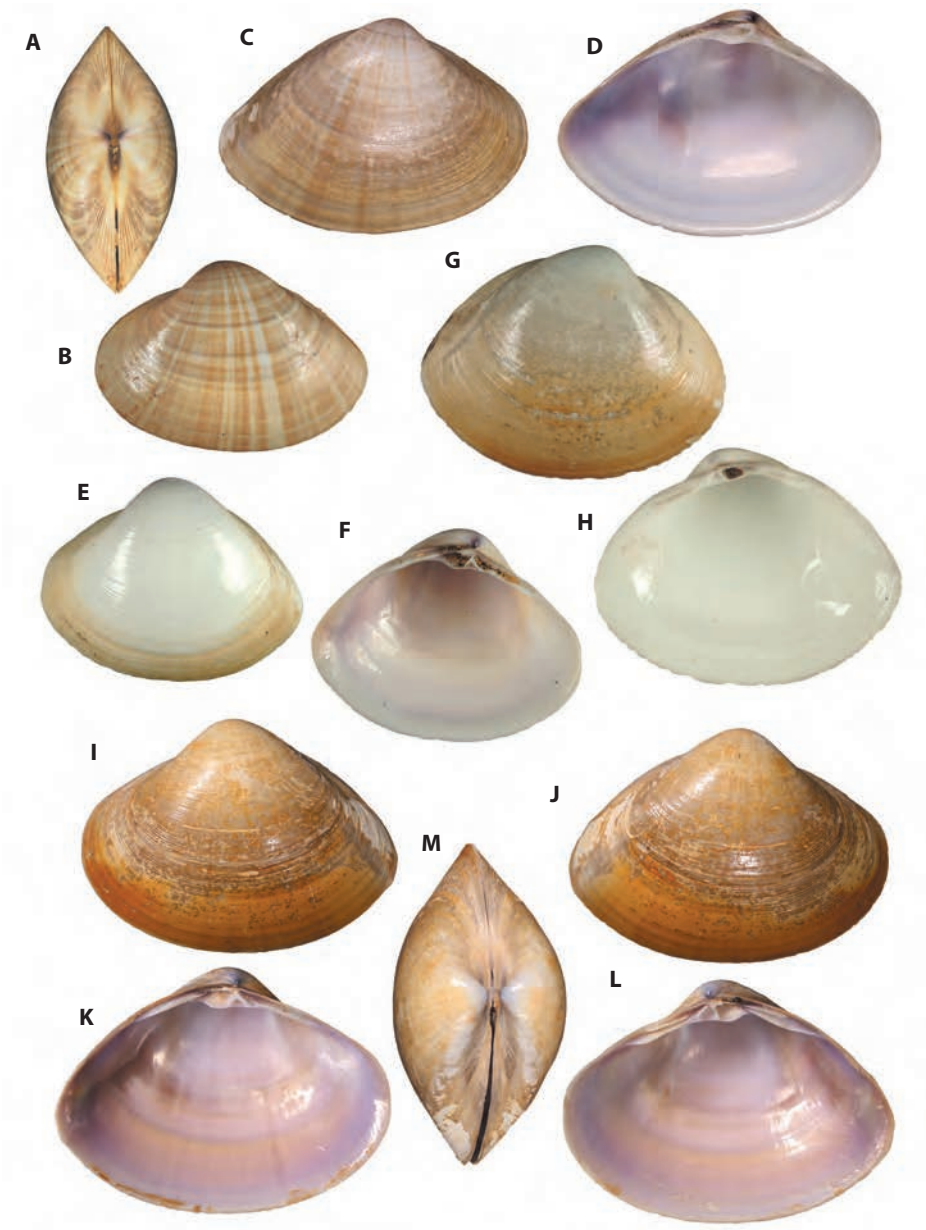
Biotope. In clean fine or mixed sand, also with shell debris, from extreme low tide (in calm, sheltered bays) or shallow water to about 25 m, occasionally deeper. Common to abundant in the North and the South, uncommon in the atypical tropical region (Côte d'Ivoire, Ghana, Togo).

Remarks. This species has apparently two distribution gaps corresponding to the typical tropical zones. It is not recorded from Sierra Leone and Liberia, and it was also not found in Cameroon during field work there. The specimens from Senegal to Guinea and also from Côte d'Ivoire to Bénin are rather small, whereas the populations from the Canary Islands and Cape Verde Islands



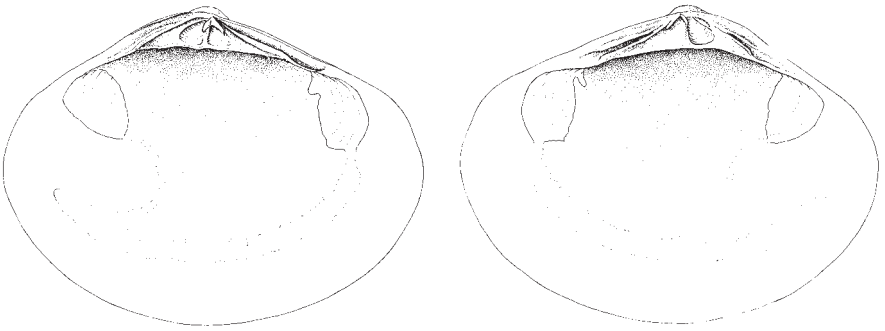
15.2. *Mactra glabrata* Linnaeus, 1767. **A-B**, Playa Las Canteras, Las Palmas, Gran Canaria, beach drift (51.3 mm). **C-E**, Pointe des Maures (20°55'N), Mauritania, intertidally (31.7 mm). **F-G**, Praia, São Tiago, Cape Verde Islands, beach drift (37.1 mm).

and from Gabon and Angola southward comprises often larger, heavier and somewhat more tumid specimens without radial rays, occasionally a more or less truncated anterior margin and a less pointed posterior margin. On these grounds, the species has often been divided into two species, the smaller *M. glabrata* from the tropical part and *M. largillierti* Philippi, 1848, for the larger (to almost 70 mm, Cape Verde Islands, and 89 mm, Angola) specimens from the North and from the South. Also Huber (2010) firmly distinguishes the two species: "the comparatively small, trigonal, glossy" true *M. glabrata* from the Canary Islands and West Sahara to Cape Verde Islands and "certainly Senegal", and the "larger, more inflated, rounder" *M. largillierti* from Ghana "through Gabon, Port-Gentil" to Angola. However, after having examined numerous lots from the whole distribution area, among them several juveniles, a sharp division into two species cannot be supported from morphology: all kinds of intergrades in outline and colouration exist. Only the radial rays are more frequent in specimens from the tropical regions, and are not present in the very large specimens. In contast to Huber's statement, more tumid specimens exist also in the northern part of the distribution area. The largest examined specimen from Senegal (Petite Côte) measures almost 65 mm, from Northern Angola almost 89 mm. The presence of two species or not in the area finally can only be resolved by DNA analysis. This is "Le Lisor" of Adanson. Two close species exist in South and East Africa: *M. ochracea* Martens, 1880 from South Africa and Moçambique and *M. lilacea* Lamarck, 1818, on the East African coast northward to the Arabian Gulf, this latter had often been considered a subspecies of *M. glabrata*. Empty valves and shells are commonly washed ashore on many beaches. *M. glabrata* is locally consumed, *e.g.* in the Bay of Pointe-Noire (Congo) it is taken at low tide from the sand at 0.5-1 m and sold on the local market.



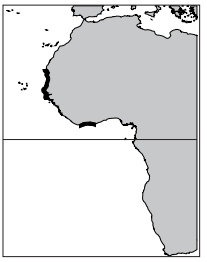
15.3. ***Mactra glabrata*** **Linnaeus, 1767. A-B**, Diembéring, N-Casamance, 12°30.4'N, 17°16'W, 21 m (27.2 mm). **C-D**, off Cap Verga, Guinea, 10°13'N, 14°45.5'W, 17 m (48.4 mm). **E-F**, Baia de Ana Chaves, São Tomé, beach drift (43.8 mm). **G-H**, Pointe-Noire, plage Palais du Peuple - Phare (46.5 mm). **I-M**, Ponta do Mussulo, Luanda prov., N-Angola (59.2 mm).

Mactra sauliana Gray, 1838



15.4. Senegal old coll. MNHN (60.5 mm).

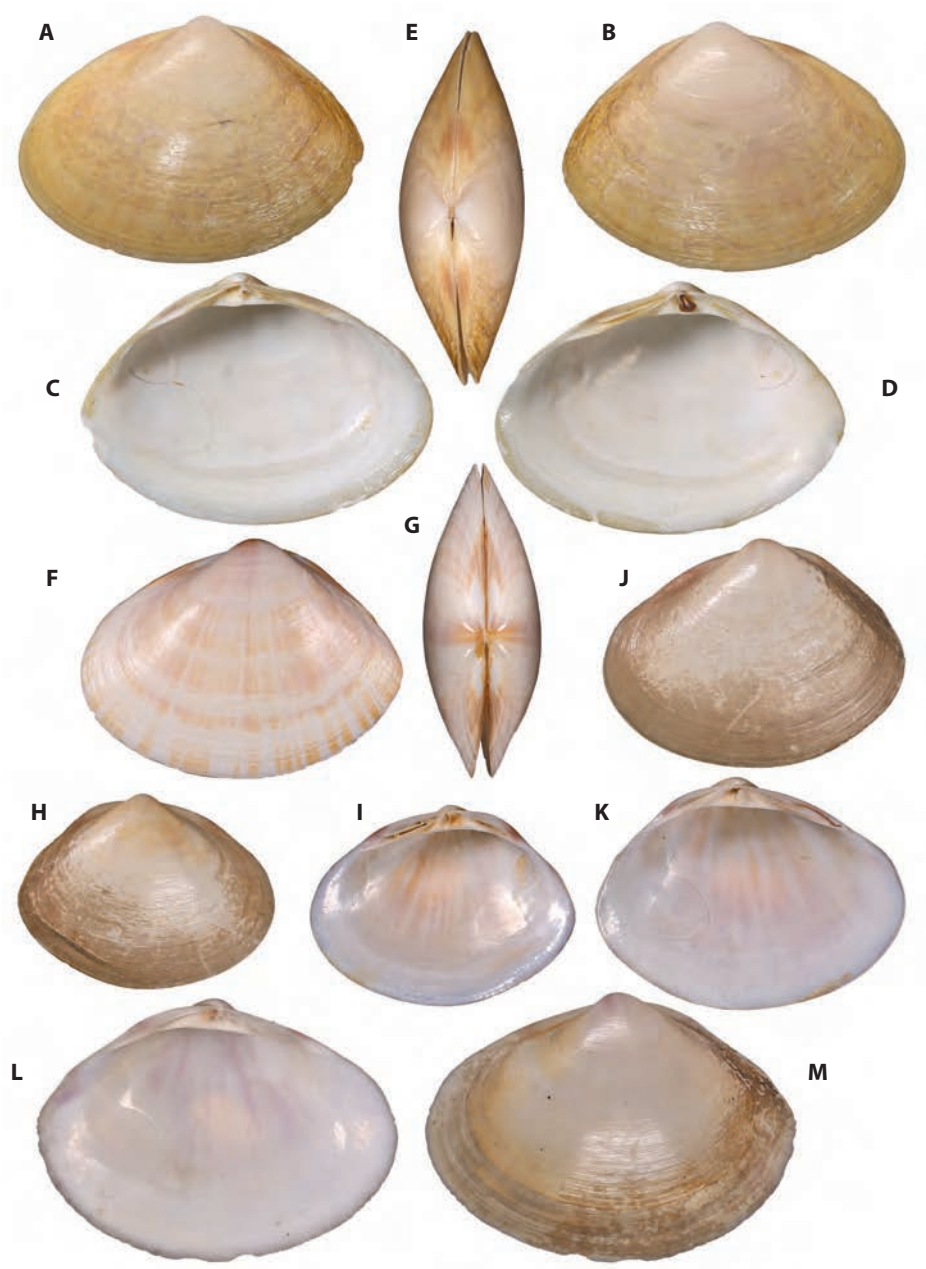
Shell up to 60 mm long, suboval, somewhat variable in outline and tumidity, thin and fragile, rather compressed. Anterior margin rounded, posterior margin more narrowly rounded, ventral margin evenly convex, beaks nearly in the middle or just behind the vertical midline. Lunular and escutcheon margin protruding. Surface smooth, only with fine, irregular growth lines. Periostracum light yellowish to yellowish grey, occasionally nearly colourless, thin and translucent. Pallial sinus short and broad. Outside uniform cream or whitish with irregular, light brownish, often interrupted radial rays and beaks slightly tinged with brownish or pink. Inside whitish to pale yellowish, outside colouration showing through. Occasionally very faint coloured rays only visible on the inside.



Distribution. Mauritania (20° 30'N) to Senegal (Casamance); Côte d'Ivoire. Not found on the continental shelf of Guinea and not reported from Sierra Leone and Liberia.

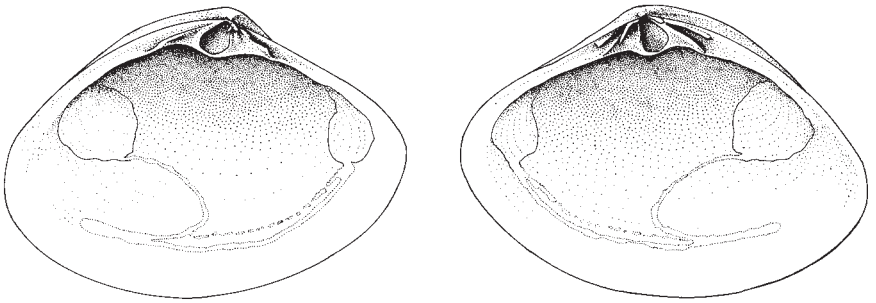
Biotope. In clean fine sand from about 10 to 20 m, not common.

Remarks. This species has its distribution centre in Casamance which is the transition zone between full influence of upwelling and the tropical zone proper. The two isolated records from Côte d'Ivoire indicate disjunct distribution, linked to the intermittent seasonal upwelling occurring there. Authors subsequent to Gray except Conrad (1868) have cited the species as *M. sauliae*, which is an incorrect subsequent spelling.



15.5. ***Mactra sauliana*** **Gray, 1838. A-E**, Mauritania, 20°00'N, 17°10'W, 15 m (47.0 mm). **F-G**, Casamance, Senegal, 10-20 m (46.5 mm). **H-I**, Kafountine, N-Casamance, Senegal, 12°53.4'N, 17°01.5'W, 17 m (30.4 mm). **J-K**, same locality (35.2 mm). **L-M**, Abidjan region, Côte d'Ivoire (48.0 mm).

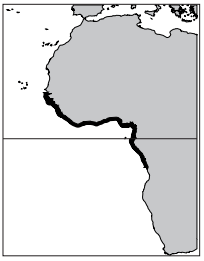
Mactrotoma compressa (Spengler, 1802)



15.6. Cacuaco, N-Angola, 0-1 m (59.8 mm).

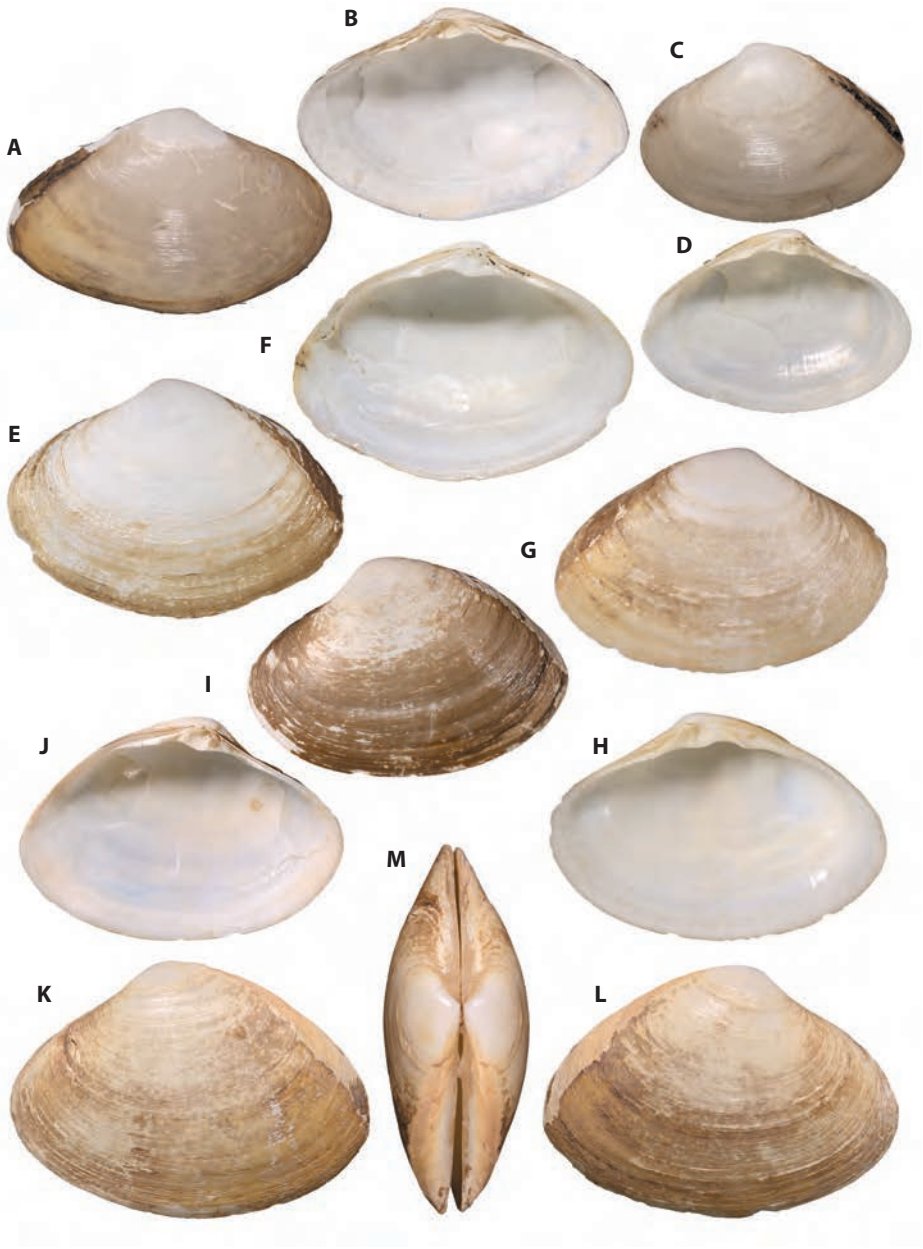
Shell up to 65 mm long, very variable in shape and size, narrowly suboval, rather thin to moderately thick and solid, compressed. Anterior margin broadly rounded, posterior margin only slightly more narrowly rounded, beaks slightly in front of the vertical midline. Surface smooth with irregular growth lines and stages. Postero-dorsal area separated by a not very prominent but well marked angular ridge from the rest of the shell. Pallial sinus large. Periostracum greyish olive, rather thin, wrinkled on the postero-dorsal slope, bristly on the posterior angle and mostly eroded on the earlier parts of adult specimens. Outside and inside whitish to cream.

Distribution. Senegal (Petite Côte: M'Bour) to northern Angola (Luanda); Ilha do Principe.



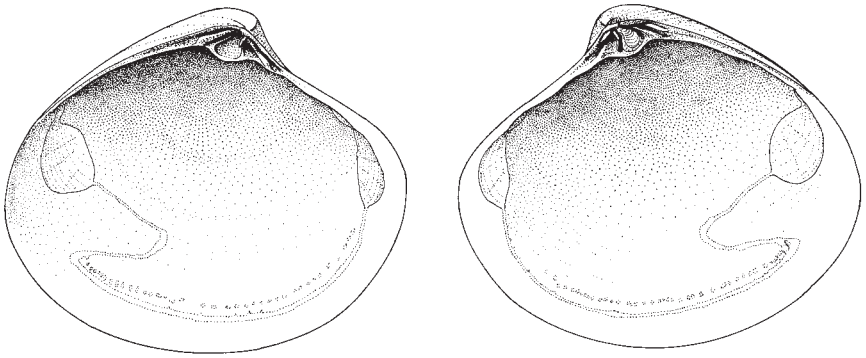
Biotope. In muddy sand, fine, mixed and coarse sand, also gravel and shell debris or patches of sand and gravel on rocky coasts, in mangrove areas as well as in the open sea, from extreme low tide to about 10 m, not common. The species occurs regularly in lagoons, creeks, estuaries (*e.g.* the "bôlons" of Sine-Saloum and Casamance), even with drastic salinity changes from low salinity to hypersalinity.

Remarks. Due to its biotope, *M. compressa* is quite variable in outline and tumidity. The species was known for a long time under its synonyms *Mactra silicula* Reeve, 1854, *M. ambigua* Weinkauff, 1884 and *M. diolensis* Bouchet & Nicklès, 1976. The genus *Mactrotoma* also occurs in the Indo-Pacific, Caribbean and Panamic-Pacific Province. A very close species, *Mactrotoma ovalina* (Lamarck, 1818) is found from the Gulf of Oman southward along the East African coast to Durban and a similar Caribbean species is *Mactrotoma fragilis* (Gmelin, 1791). *Mactrotoma compressa* is rare in the beach drift.



15.7. *Mactrotoma compressa* (Spengler, 1802). **A**-**B**, Ziguinchor, Casamance River, dredged, 5-6 m (23.3 mm). **C**-**D**, same locality (18.9 mm). **E**-**F**, Morton Bay, Victoria (now Limbe), Cameroon, beach drift (33.6 mm). **G**-**H**, Santo Antonio, Ilha do Principe, beach drift (36.3 mm). **I**-**J**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 3-4 m (33.9 mm). **K**-**M**, Cacuaco, Bengo prov., N-Angola, rubble, low tide (42.0 mm).

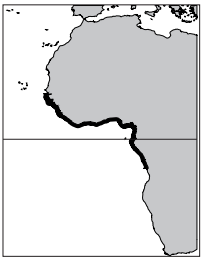
Barymactra rostrata (Spengler, 1802)



15.8. Mouth of Kouilou River, Congo Brazzaville, 4°30'S, 11°37'E, 12 m (86.8 mm).

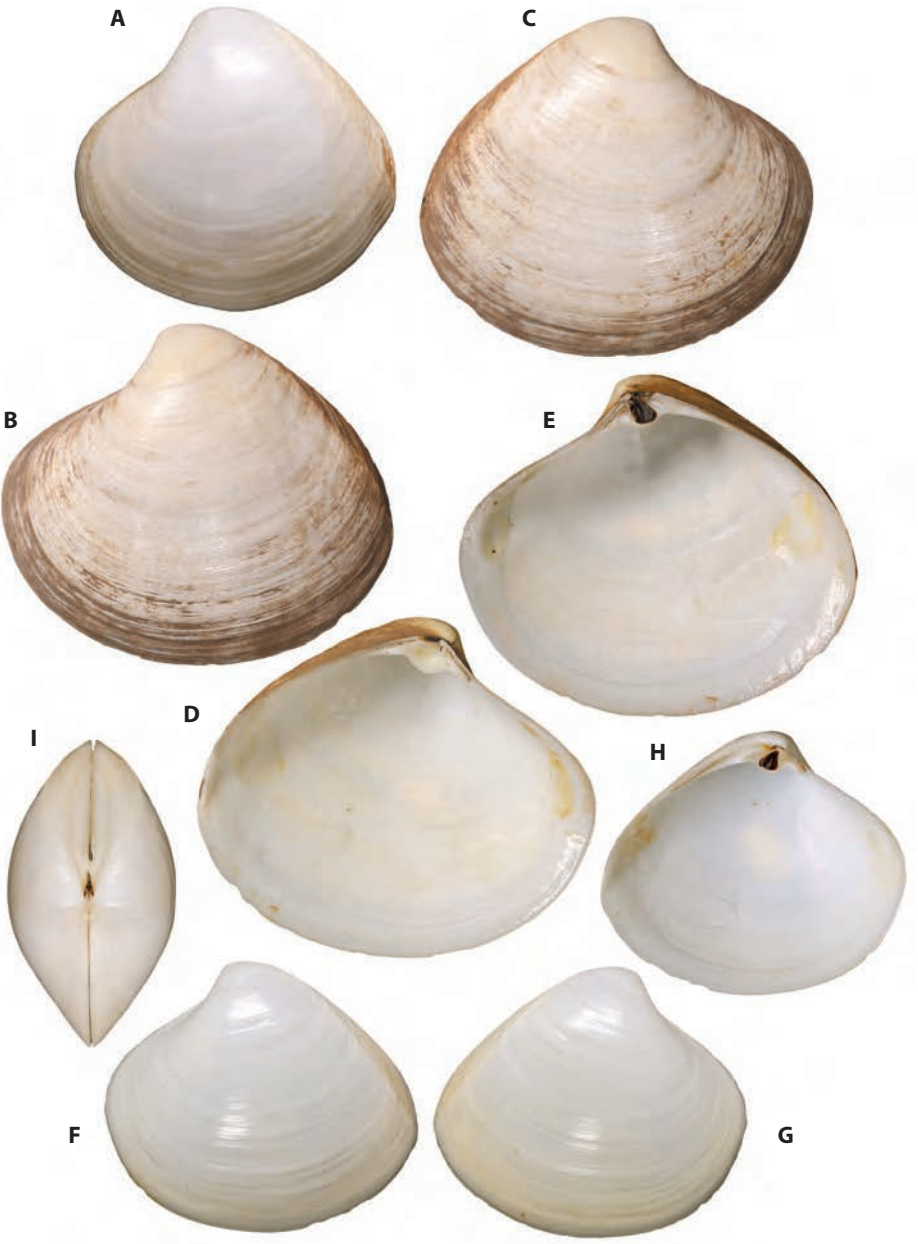
Shell large, up to 87 mm long, slightly variable in shape, quite high and rounded-triangular, thin but robust, inflated. Anterior margin broadly rounded, posterior margin also broad but with a very slight angle, beaks prominent, on the vertical midline or slightly in front of it. Surface smooth, with fine, irregular growth lines and occasional hardly visible irregular radial striae and an indistinct keel delimiting the postero-dorsal area. Periostracum nearly colourless to pale yellowish or greyish olive, slightly wrinkly, especially on the postero-dorsal slope, generally present only on the marginal part of the valves. Outside and inside white or cream.

Distribution. Gambia to northern Angola (Luanda).



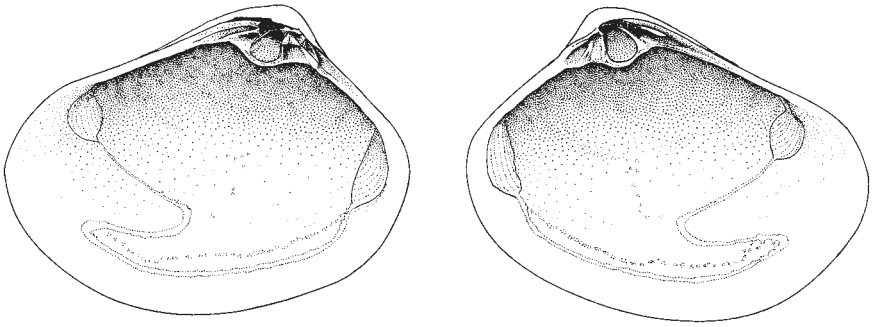
Biotope. In sandy mud and fine muddy sand, from about 3 to 20 m, not common everywhere.

Remarks. This species is sometimes taken as by-catch by trawlers going for shrimp or bottom fish. Empty valves, often older and already postmortal grey, are regularly found on some beaches. A synonym is *Mactra cumingiana* Petit de la Saussaye, 1853.



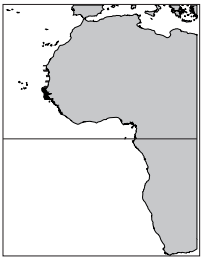
15.9. *Barymactra rostrata* (Spengler, 1802). **A**, Boffa Nalou, Guinea (65.2 mm). **B-E**, off Mouth of Kouilou River, Congo Brazzaville (87.0 mm). **F-I**, Praia Buraco, Palmeirinhas, Luanda prov., N-Angola (53.1 mm).

Leptospisula nivea (Gmelin, 1791)



15.10. Dakar-Thiaroye, beach facing CRODT (84.1 mm).

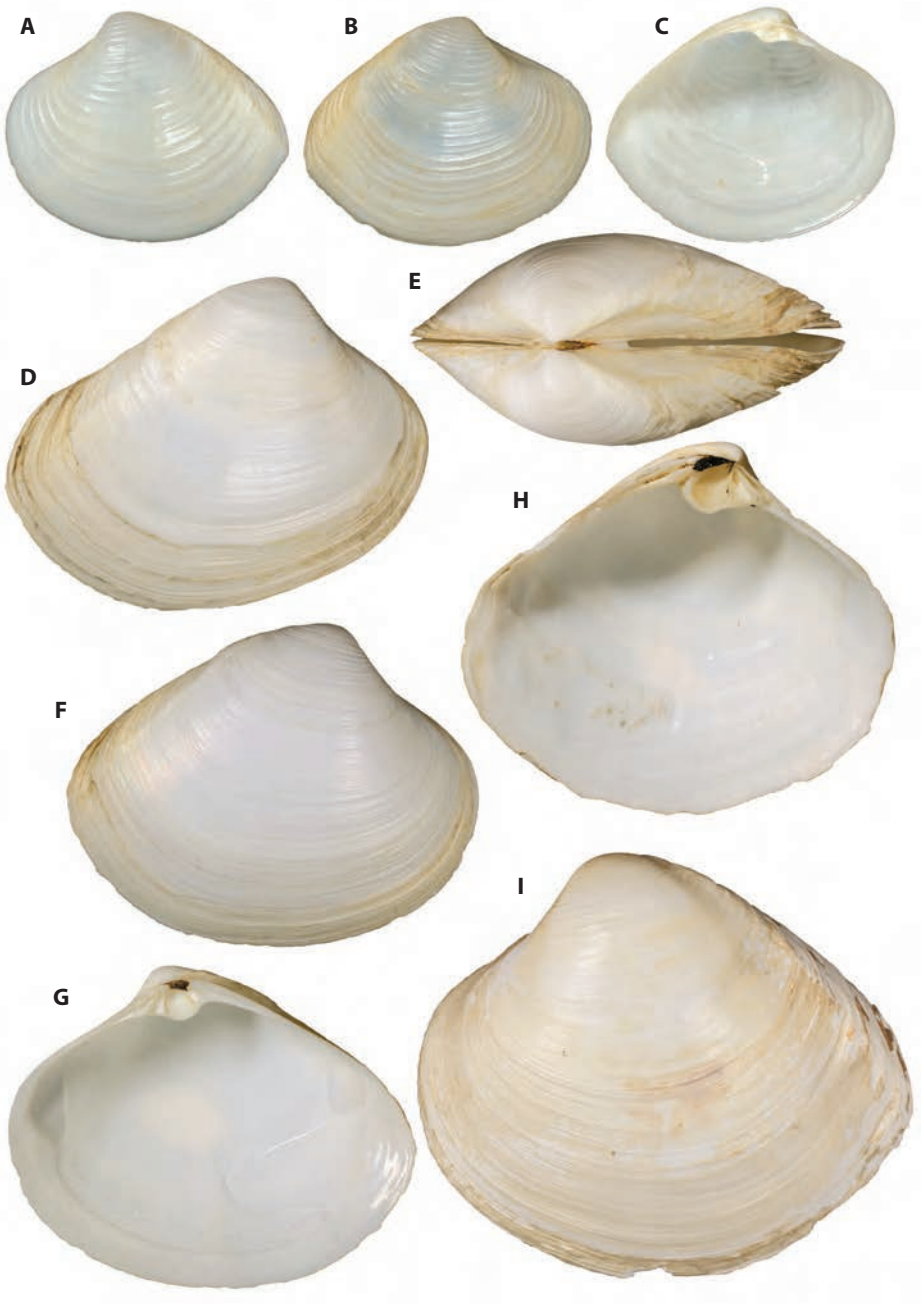
Shell very large, 90-140 mm long, variable in shape, broadly suboval, thin and fragile (younger specimens) to quite thick and solid (very old specimens), inflated. Anterior margin broadly rounded, posterior end broad and slightly angulate, beaks prominent and well in front of the vertical midline. Surface with numerous, irregular, coarse growth lines and growth stages and fine, irregular commarginal waves on the first (umbonal) 15 to 25 millimetres of the valves. Postero-dorsal slope separated from the rest of the valve by the posterior angle, formed by an obtuse keel. Periostracum thin and cream-yellowish to nearly colourless. Outside and inside white.



Distribution. Restricted to Senegal, from St. Louis to Casamance, records of recent specimens from Mauritania need confirmation; however the species is there recorded from the Quaternary (Coulombel 1980) and also from kitchen middens at Mahariat near Cap Barbas, West Sahara (Rosso & Petit-Maire 1978).

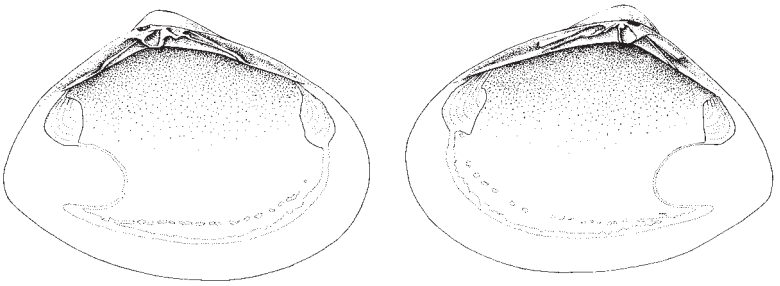
Biotope. In clean sand in shallow water (presumably 2-10 m), uncommon.

Remarks. Although known since the times of Adanson, this species, which is "Le Fatan" of Adanson and to which Gmelin's description refers, is not very often seen in "modern" collections, possibly due to its rarity and its restricted range. It is superficially similar to *Barymactra rostrata* but is larger, more elongate and has the well visible commarginal waves on the umbonal part of the valves. *Mactra striatella* Lamarck, 1818 is a synonym. The species was also erroneously placed in the genus *Standella* Gray, 1853, however, that is an entirely different Indo-Pacific Mactridae (for details, see Huber 2010: 760). Occasionally valves are cast ashore on beaches at Dakar-Thiaroye and southward along the "Petite Côte". The subrecent shells and valves found in kitchen middens near the delta of the Senegal River are about. 4000 years old. This is one of the largest known living Mactridae and the type species of the subgenus *Leptospisula*.



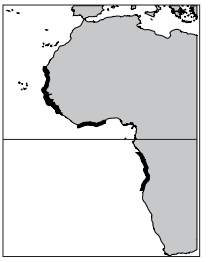
15.11. ***Leptospisula nivea*** **(Gmelin, 1791).** **A**-**C**, Senegal, juvenile v (35.3 + 36.2 mm), old coll. MNHN. **D**-**E**, M'Bour Plage, Petite Côte, Senegal (86.6 mm). **F**-**G**, same locality (84.8 mm). **H**, same locality (102 mm). **I**, Senegal (116 mm), old coll. MNHN.

Huberimactra inconstans (Cosel, 1995)



15.12. Casamance, 12º47.2'N, 17º12.4', 24 m (20.5 mm).

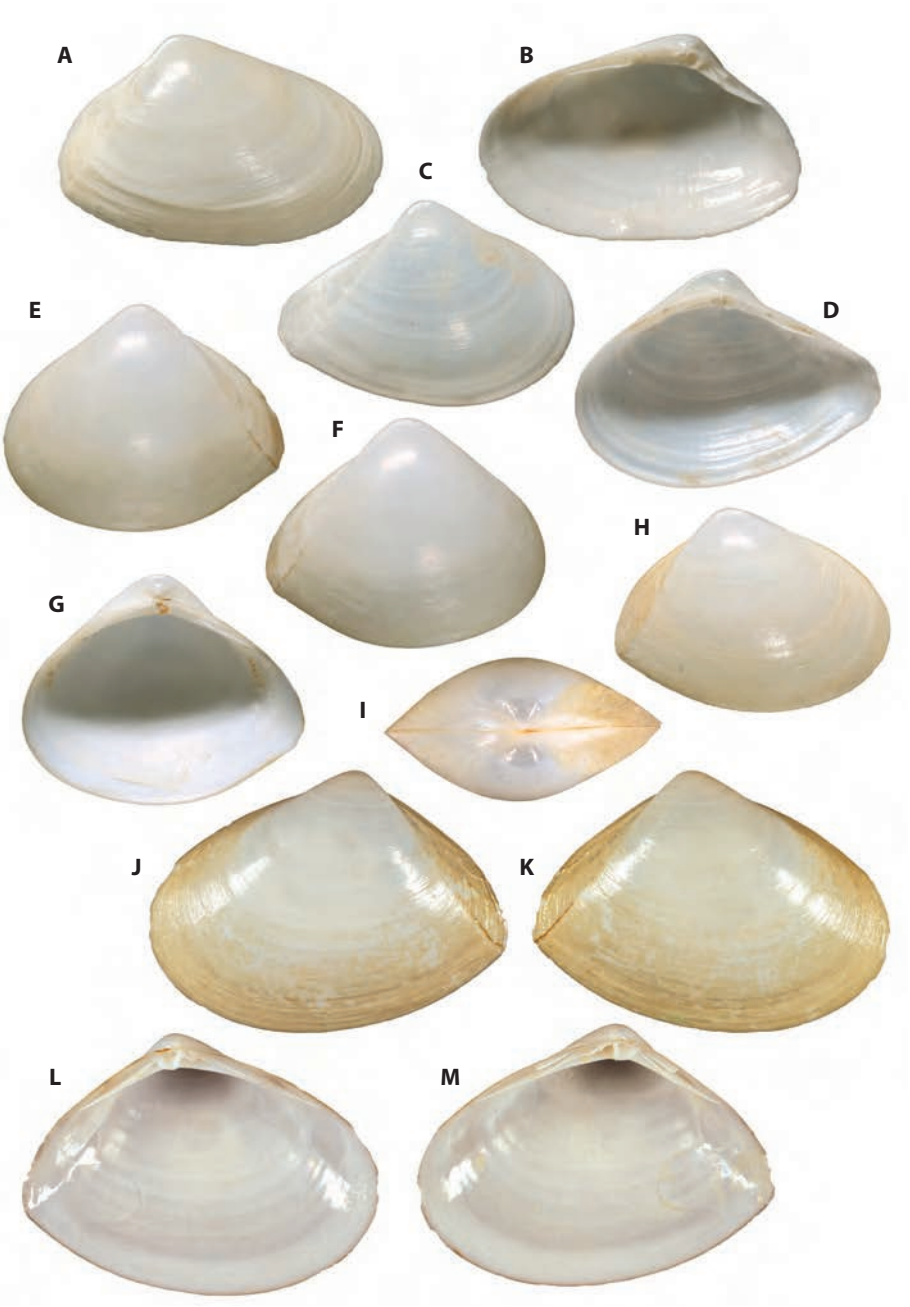
Shell up to 22 mm long, extremely variable in outline, shape and situation of the umbos, suboval to subtriangular, very thin and fragile, inflated to very inflated. Anterior margin broadly rounded, posterior margin pointed and more or less angulate, ventral margin often with a very weak sinuosity just anterior to the posterior end. Beaks slightly to well behind the vertical midline, occasionally in the middle. Surface smooth, with fine irregular growth lines, no particular sculpture. Antero-dorsal area with a faintly delimited lunule, posterior angle forming a more or less sharp keel. Periostracum pale yellowish to nearly colourless, thin and translucent, bristly on the posterior keel. Hinge line with a thin submarginal lamina reaching from the anterior to the posterior lateral, which are thin and blade-shaped. There is a small and hardly developed ligament slit. Valves entirely white.



Distribution. Mauritania (Cap Blanc) to Guinea (Iles de Los); Côte d'Ivoire and Ghana; southern Gabon to southern Angola (Moçâmedes, Namibe province).

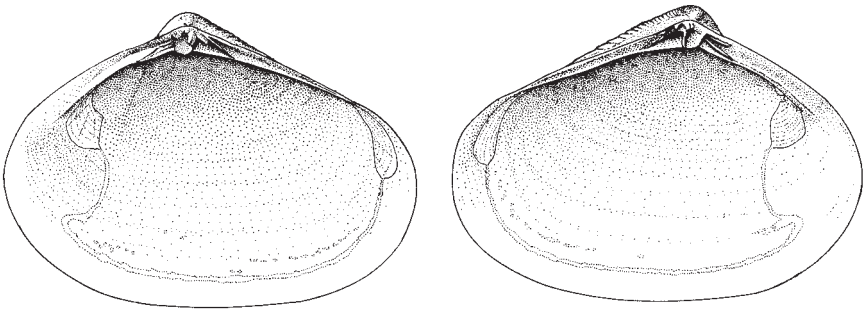
Biotope. In fine, slightly muddy sand or clean fine sand, also with shells and shell debris, from shallow water (1.5-5 m, sheltered areas) to 50 m, moderately common to uncommon.

Remarks. This species is characterized by its extreme variability. Within populations from clean sandy bottom in 20-40 m it seems to be quite stable. However, in shallower water (1.5-20 m) the different forms seem to occur together with intergrades in the same population. Generally, a higher form with posterior-situated beaks, broad posterior part, convex postero-dorsal margin and sharp posterior keel from the deeper water and a somewhat smaller, slightly more elongate form with more median beaks, more pointed posterior part, more or less straight postero-dorsal margin, and a less developed posterior keel can be distinguished. However, the presence of all kinds of intermediate forms do not allow the separation into two or more species. The hinge is very close to that of *H. grayi* (see following entry) with long, thin and blade-like laterals. There are no records known from Sierra Leone and Liberia, as well as from Nigeria to Gabon which indicate distribution gaps in the typical tropical regions. Beached shells are extremely rare.



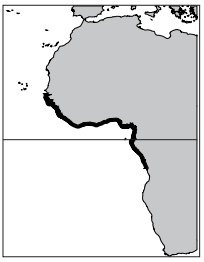
15.13. ***Huberimactra inconstans*** **(Cosel, 1995). A-B**, Kafountine, N-Casamance, Senegal, 12°50.4'N, 16°58.8'W, 13-14 m (19.2 mm). **C-D**, W of Baie de Sangarea, Guinea, 9°41.5'N, 14°11'W, 17 m (16.5 mm). **E-G**, SW of Abidjan, Côte d'Ivoire, 5°09'N, 4°39'W, 20 m (16.2 mm). **H-I**, SW of Abidjan, Côte d'Ivoire, 5°07'N, 3°22'W, 20 m (15.8 mm). **J-M**, Praia de Buraco, Palmeirinhas, Luanda prov., N-Angola, low water of spring tide (holotype, 22.3 mm, photo Manuel Caballer/Recolnat).

Huberimactra grayi (Huber, 2015)



15.14. Palmeirinhas, N-Angola (45.0 mm).

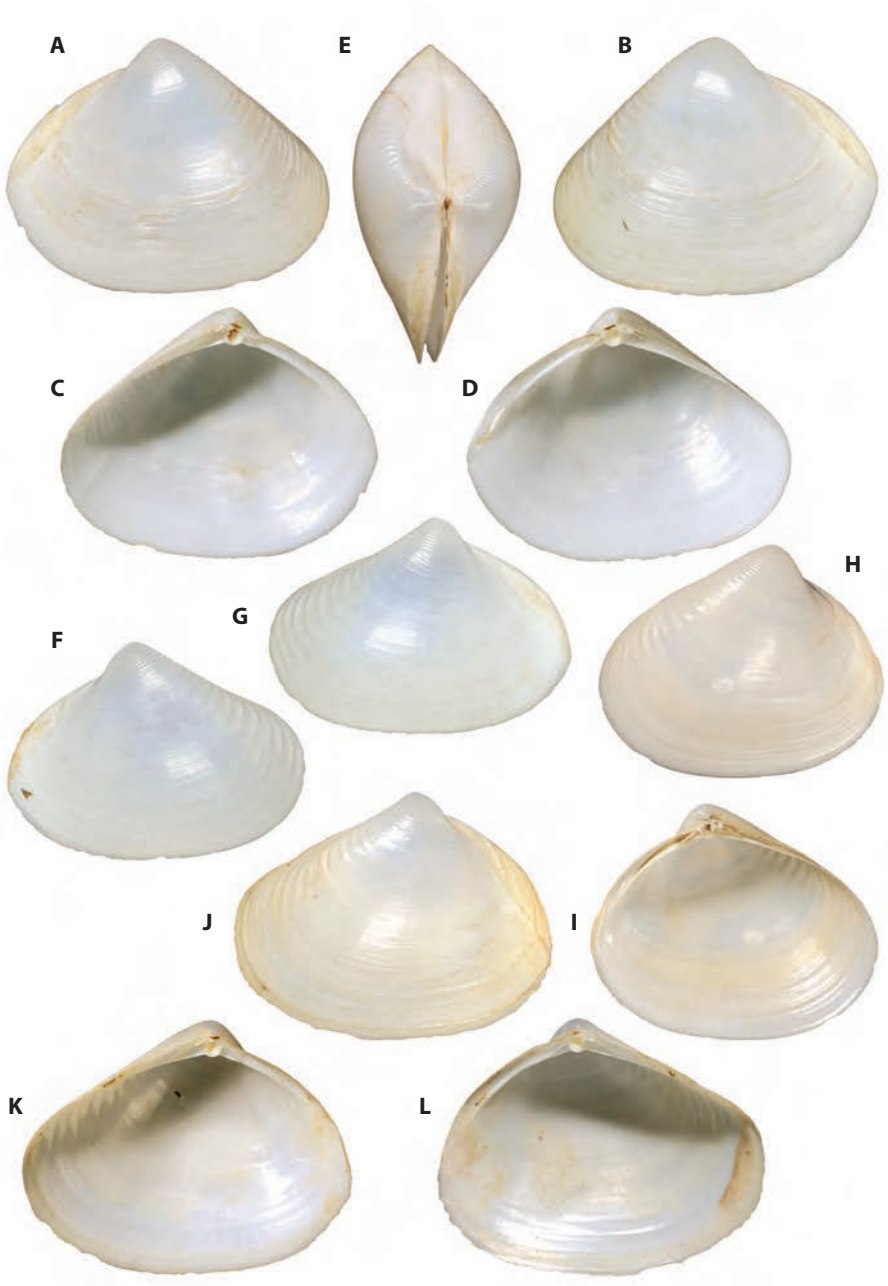
Shell up to 60 mm long, somewhat variable in shape, suboval, generally extremely thin and fragile, more inflated towards anterior, and more compressed towards the posterior end. Anterior margin more or less narrowly rounded, posterior margin broadly rounded, occasionally with a slight angle, beaks somewhat behind the vertical midline. Surface smooth with fine irregular growth lines, on the early umbonal part fine commarginal waves which gradually disappear towards the ventral part of the shell except on the rounded anterior angle. Antero-dorsal area with a well delimited large lunule, postero-dorsal area delimited by a faint ridge. Periostracum very thin, translucent and colourless, eroded on the earlier part of the valves. Hinge with a submarginal lamina reaching from the anterior to the posterior lateral; laterals thin and laminar. Valves entirely white.



Distribution. Senegal (Casamance) to northern Angola (Luanda).

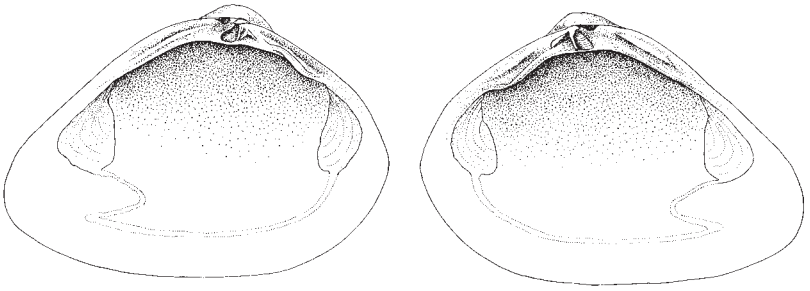
Biotope. In slightly sandy mud to fine muddy sand, from about 3 to 20 m, not common.

Remarks. This species has undergone some nomenclatural changes (see Huber 2010) and is here placed in the recently described genus *Huberimactra* Cosel & Gofas, 2018, together with *H. inconstans* (see previous entry). Because of its fragility, this species is very difficult to be obtained intact, although it may occasionally be encountered in the by-catch of shrimpboats; beached valves are rare and normally broken. *Mactra vitrea* Gray, 1837 is a junior homonym of *Mactra vitrea* Spengler, 1802; *Anatina grayi* Huber, 2015 is a replacement name.



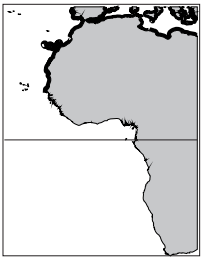
15.15. *Huberimactra grayi* (Huber, 2015). A-E, Kafountine, Casamance, Senegal, 3-6 m (49.7 mm). F-G, Gabon (46.2 mm). H-I, Conkouati, Congo Brazzaville, about 10 m (37.5 mm). J-L, Cacuaco, Bengo prov., N-Angola, low tide (39.5 mm).

Spisula subtruncata (da Costa, 1778)



15.16. Mauritania, 19°54'N, 17°21'W, 55 m (19 mm).

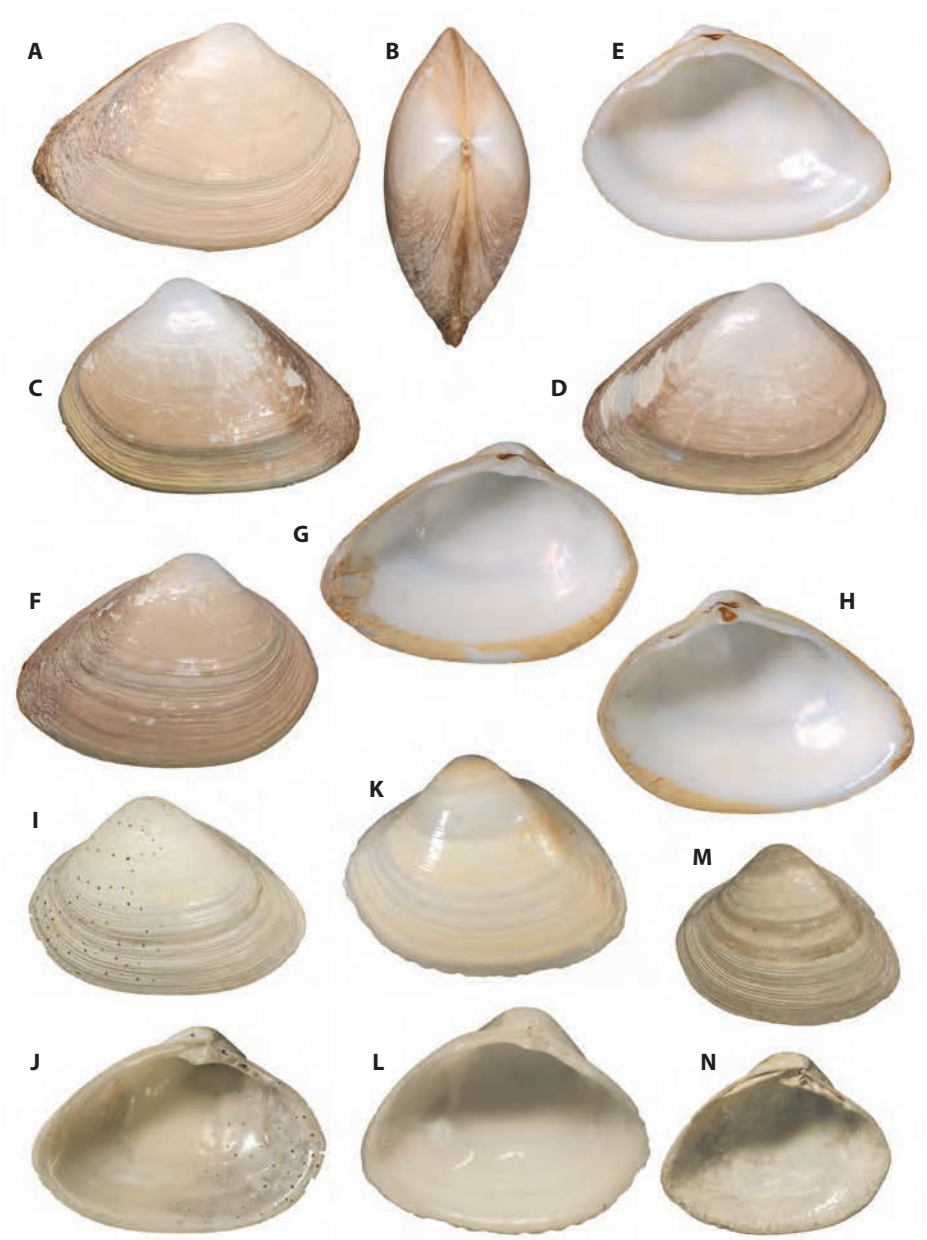
Shell up to 31 mm long (West African specimens only up to 20 mm), variable in shape, elongate-triangular, thick and solid, inflated. Anterior margin rounded and in the middle very slightly angulate, posterior margin more or less pointed, with rounded end; beaks in front of the vertical midline. Surface smooth, with fine growth lines and coarser growth stages. There are also fine, irregular commarginal ribs on the antero-ventral or the whole marginal part and regular commarginal ridges on the lunular area and the postero-dorsal slope. Limit of the very large lunule as a not very sharp keel; posterior angle rounded. Periostracum light greyish olive, moderately thin, wrinkly on the postero-dorsal angle, often eroded on the earlier parts of the valves. Outside white, with irregular cream to light greyish commarginal growth bands, inside white with external colour showing through.



Distribution. Norway (67.5° N), Faeroes, Great Britain, North Sea and western Baltic Sea, Atlantic coast southward to Senegal (Dakar); Mediterranean and Black Sea.

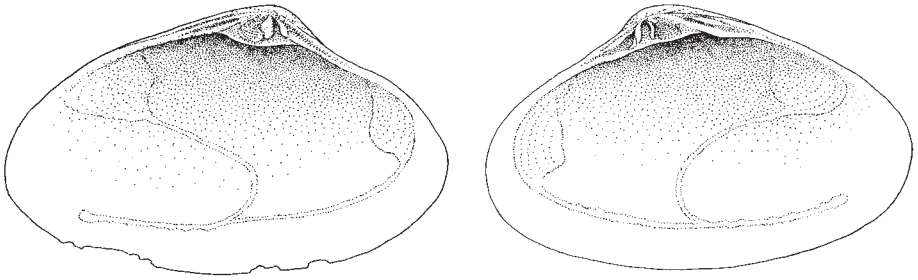
Biotope. In fine, mostly more or less muddy or silty sand, from the lower intertidal zone to about 200 m, the upper bathymetric limit deepening towards the south, off Morocco (30°N) it is at about 25-30 m, off Cap Blanc (19°54'N) at 50-60 m and off Dakar at 100-130 m. Common to abundant in Europe, becoming rarer in the south.

Remarks. This is a northern, prevailingly cold-temperate species which survives in the subtropical and tropical regions only in deeper water with lower temperature. Extremely common on European beaches.



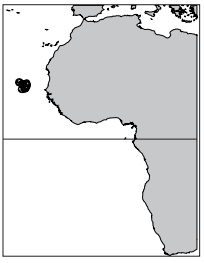
15.17. *Spisula subtruncata* (da Costa, 1778). **A-B**, Mauritania, 19°54'N, 17°21'W, 55 m (21.7 mm). **C-E**, same locality (19.2 mm). **F-H**, same locality (19.3 mm). **I-J**, Senegal (23.2 mm). **K-L**, Dakar region, Senegal (13.2 mm). **M-N**, Senegal, 14°50'N, 17°29'W (18.2 mm).

Oxyperas egenum (Reeve, 1854)



15.18. Baia Matiota, São Vicente, Cape Verde Islands, 2-3 m (lv, 53.8 mm; rv, 51.4 mm).

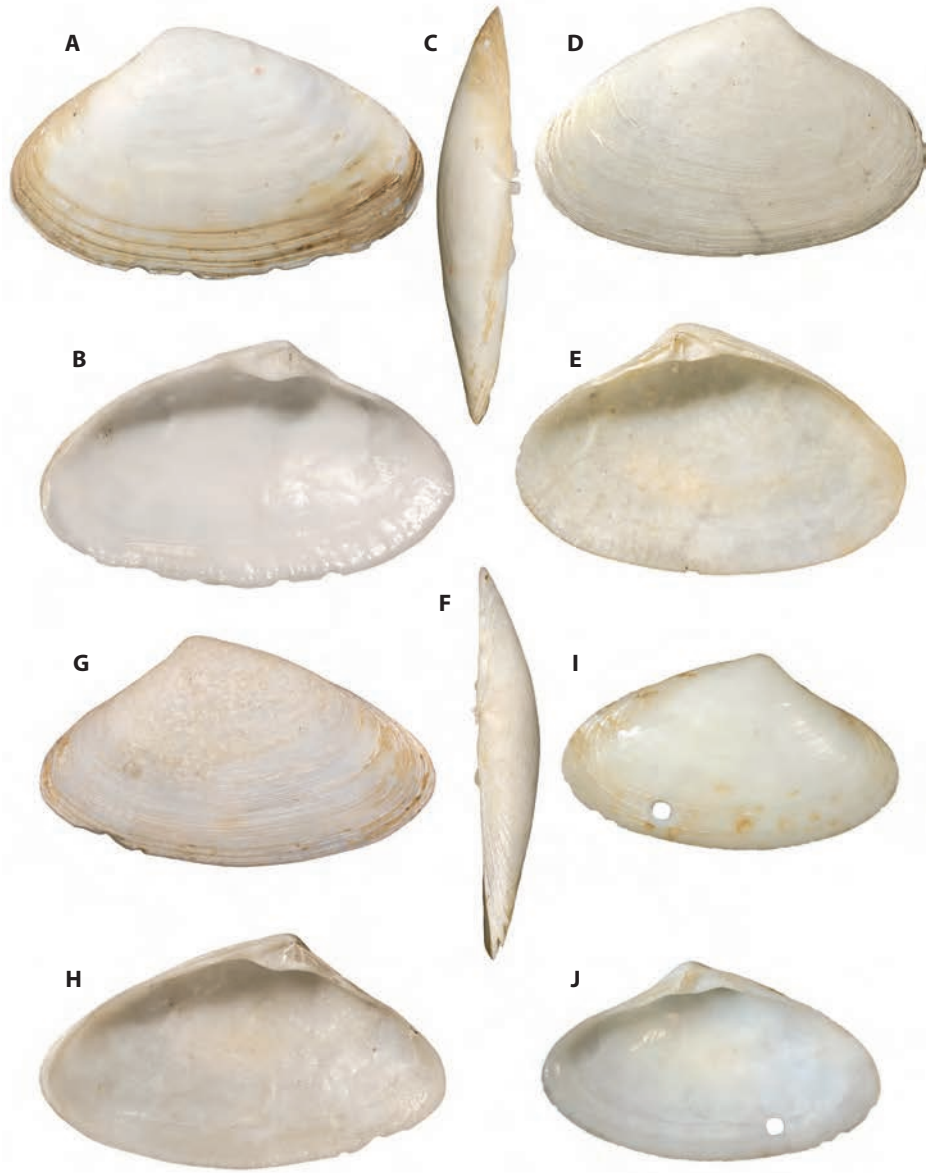
Shell to 54 mm long, somewhat variable in outline, oblong-oval-elongate, rather thick, compressed. Anterior and posterior margin more or less narrowly rounded, ventral margin gently convex, beaks well in front of the vertical midline. Surface with irregular growth lines, few coarser growth stages and slightly irregular commarginal ridges on the lunular area and the postero-dorsal slope, occasionally finer commarginal ridges on the postero-marginal part. There are also very fine, irregular folds or wrinkles in all directions on the rounded posterior angle, which are only visible under a lens (x 10-20). Pallial sinus reaching to under the beaks. Periostracum dull and thin, pale yellowish to nearly colourless, often eroded on the earlier parts of the valves, with very few scattered irregular brownish spots. Outside and inside of valves white.



Distribution. Known only from the Cape Verde Islands.

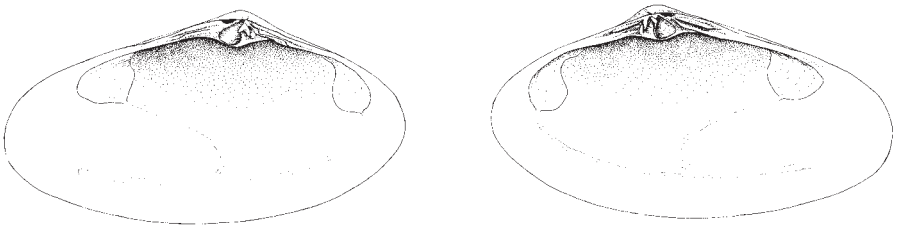
Biotope. The known material was collected in mixed and coarse sand, from shallow water (about 2-4 m) to about 15 m and may perhaps occur deeper, rare.

Remarks. This is a hitherto neglected species which was figured by Reeve (1854, vol. 8, *Mactra* sp. 71) without locality. However, it looks very similar to the Cape Verde Islands specimens from shallow water. Also Huber (2010: 449) figured the species under this name, and his figured specimen also coincides with the capeverdian shallow water species. The record of *Mactra aspersa* G.B. Sowerby I, 1825 (by Cosel 1982) refers to the present species. *Oxyperas egenum* is distinguished from *O. proaspersum* (Sacco, 1901) (see following entry) by its somewhat shorter, higher, more robust and less fragile, more inflated valves, with very few speckles in the persisting periostracum. The commarginal ridges on the posterior slope are much more pronounced.



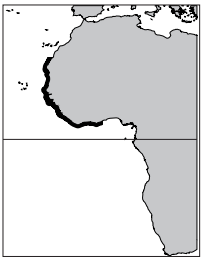
15.19. ***Oxyperas egenum*** **(Reeve, 1854).** **A**-**C**, Baia Matiota, São Vicente, Cape Verde Islands, 2-3 m, sand with calcareous algae (53.8 mm). **D**-**F**, same locality (51.4 mm). **G**-**H**, Baia Matiota, São Vicente, Cape Verde Islands (42.3 mm). **I**-**J**, Praia, São Tiago, Cape Verde Islands, 14°53.9', 23°30.5'W, 15 m (17.9 mm).

Oxyperas proaspersum (Sacco, 1901)



15.20. Dakar region, Senegal, Seminole Bank, 43-45 m (36.3 mm).

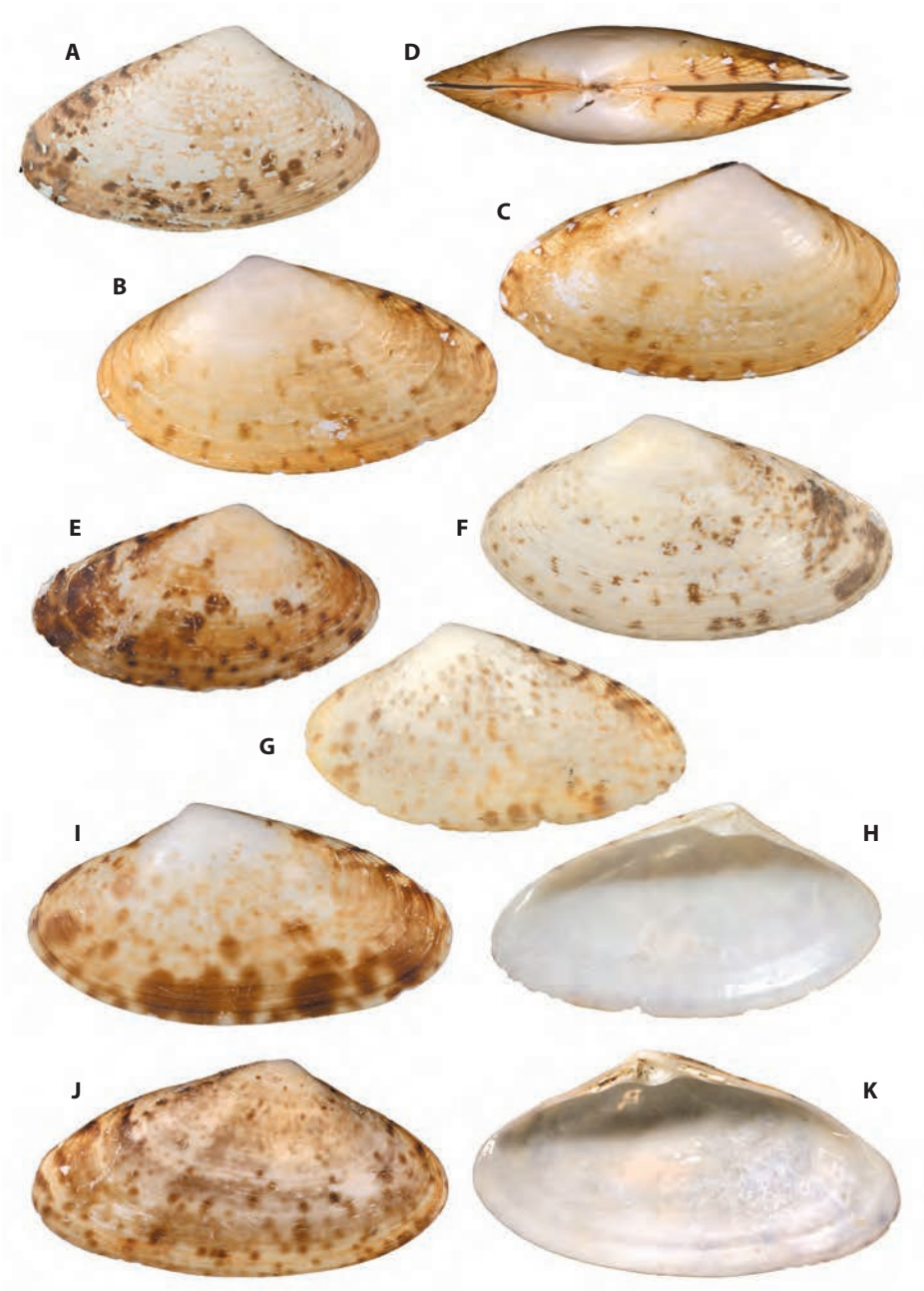
Shell up to 54 mm long, little variable in outline, very elongate, moderately thin and rather fragile, compressed. Anterior and posterior margin narrowly rounded, ventral margin gently convex, beaks well in front of the vertical midline. Surface with fine growth lines, few growth stages especially near the ventral margin, and slightly irregular commarginal ridges on the lunular area and the postero-dorsal slope, occasionally finer commarginal ridges on the postero-marginal part. There are also very fine, irregular folds or wrinkles in all directions on the rounded posterior angle, which are only visible under a lens (x 10-20). Pallial sinus reaching to just behind the beaks. Periostracum dull and thin, pale yellowish to nearly colourless, with irregular dark brown spots, streaks and patches, often also with darker commarginal zones. Outside and inside of valves white.



Distribution. West Sahara (Rio de Oro, 25°13'N) to Guinea; in the Cape Verde Islands, mostly replaced by *O. egenum*.

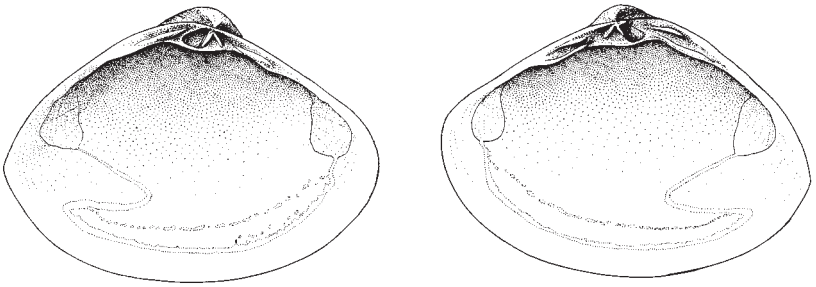
Biotope. In mixed and coarse sand, mostly with calcareous algae or with shells and shell debris, mostly well offshore, from about 40 to 70 m, not common.

Remarks. This species is distinguished from *O. egenum* by its more elongate, thinner and brittle shell; the densely spaced brownish spots on the periostracum and the habitat in deeper water. The subgenus *Pseudoxyperas* Sacco, 1901, of which *O. proaspersum* is the type species, is characterized by the peculiar spotted periostracum which it has in common only with some Indo-Pacific species. *Oxyperas proaspersum* had originally been described from the Pliocene of Northern Italy. However, the Recent material falls well into the variability of Sacco's species and there is no reason for creating another name for it. The West African species had frequently been confounded with the Indo-Pacific *O. aspersum* (G.B. Sowerby I, 1825) from East Africa to New Caledonia, which is larger and somewhat higher and has fine, regular commarginal striae on the greater part of the surface. Another close species is the still larger and heavier *O. elongatum* (Quoy & Gaimard, 1835) from New Zealand for which the genus *Longimactra* Finlay, 1928 had been erected.



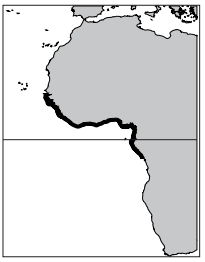
15.21. *Oxyperas proaspersum* (Sacco, 1901). **A**, off Port-Etienne (now Nouadhibou), Mauritania (44.6 mm). **B**-**D**, Cap de Naze–Pobenguine, Senegal (37.2 mm). **E**, Abéné, N-Casamance, Senegal, 13°01.8'N, 17°25.5'W, 53 m (33.2 mm). **F**, Gambia, 13°01'N, 17°24'W, 51-55 m (48.5 mm). **G**-**H**, São Tiago, Cape Verde Islands, 15°26.5'N, 23°4.5'W, 50-65 m (37.8 mm). **I**, W of Iles de Los, Guinea, 9°30'N, 15°09,6'W, 45 m (36.4 mm). **J**-**K**, W of Kaporo, Guinea, 9°35.9'N, 15°40.2'W, 48 m (44.7 mm).

Scissodesma (*Crepispisula*) *nitida* (Gmelin, 1791)



15.22. Victoria/Limbe, Cameroun, beach drift (44.5 mm).

Shell up to 58 mm long, somewhat variable in outline, triangular-suboval, quite thick and solid, moderately inflated. Anterior margin narrowly rounded, posterior margin broadly angulate, beaks on the vertical midline or very slightly in front of it. Surface smooth, with fine irregular growth lines and with very fine, regular commarginal ridges on the lunular area and a part of the postero-dorsal slope; the latter is separated from the rest of the valve by a sharp keel. Pallial sinus triangular, rather narrow. Periostracum pale yellowish grey to greyish olive, thin and translucent, but thicker on the marginal part of the valves in fully grown specimens. Outside whitish, inside occasionally with a pale yellowish hue and exceptionally glossy.



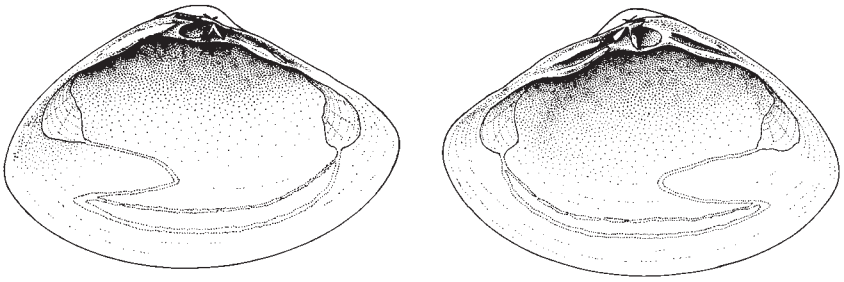
Distribution. Senegal (Petite Côte: M'Bour) to Congo (Brazzaville) and Cabinda.

Biotope. In clean fine sand, on open coasts with not too much inclined shore and in half-closed bays, from shallow water (ca. 3-5 m) to 10 m; common in certain regions such as Casamance, Guinea and Cameroon, rarer in the south.

Remarks. This species is mainly tropical and does not penetrate far into the regions with stronger upwelling influence. It is easily recognized by its porcelain-like, glossy inside. Beached shells are common to abundant in some areas. Under the name "*Mactra nitida*" Gmelin, 1791, several other more or less similar but mostly smaller West African species of Mactridae had hitherto been mixed up. They are treated in the following entries.

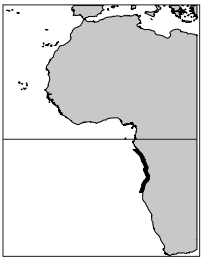
15.23. *Scissodesma (Crepispisula) nitida* (Gmelin, 1791). **A**-**B**, Cap Skirring, Casamance, Senegal, beach drift (48.8 mm). **C**-**D**, same locality (48.0 mm). **E**-**F**, same locality (51.2 mm and enlarged view of the hinge showing the characteristic ligament slit of *Scissodesma*). **G**, Accra, Ghana old coll. MNHN (48.7 mm). **H**-**I**, Morton Bay, Victoria (now Limbe), Cameroon, beach drift (48.1 mm). **J**-**K**, same locality (38.0 mm). **L**, same locality (41.6 mm).

Scissodesma (*Crepispisula*) *angolensis* (Cosel, 1995)



15.24. Barra do Cuanza, N-Angola (49.1 mm).

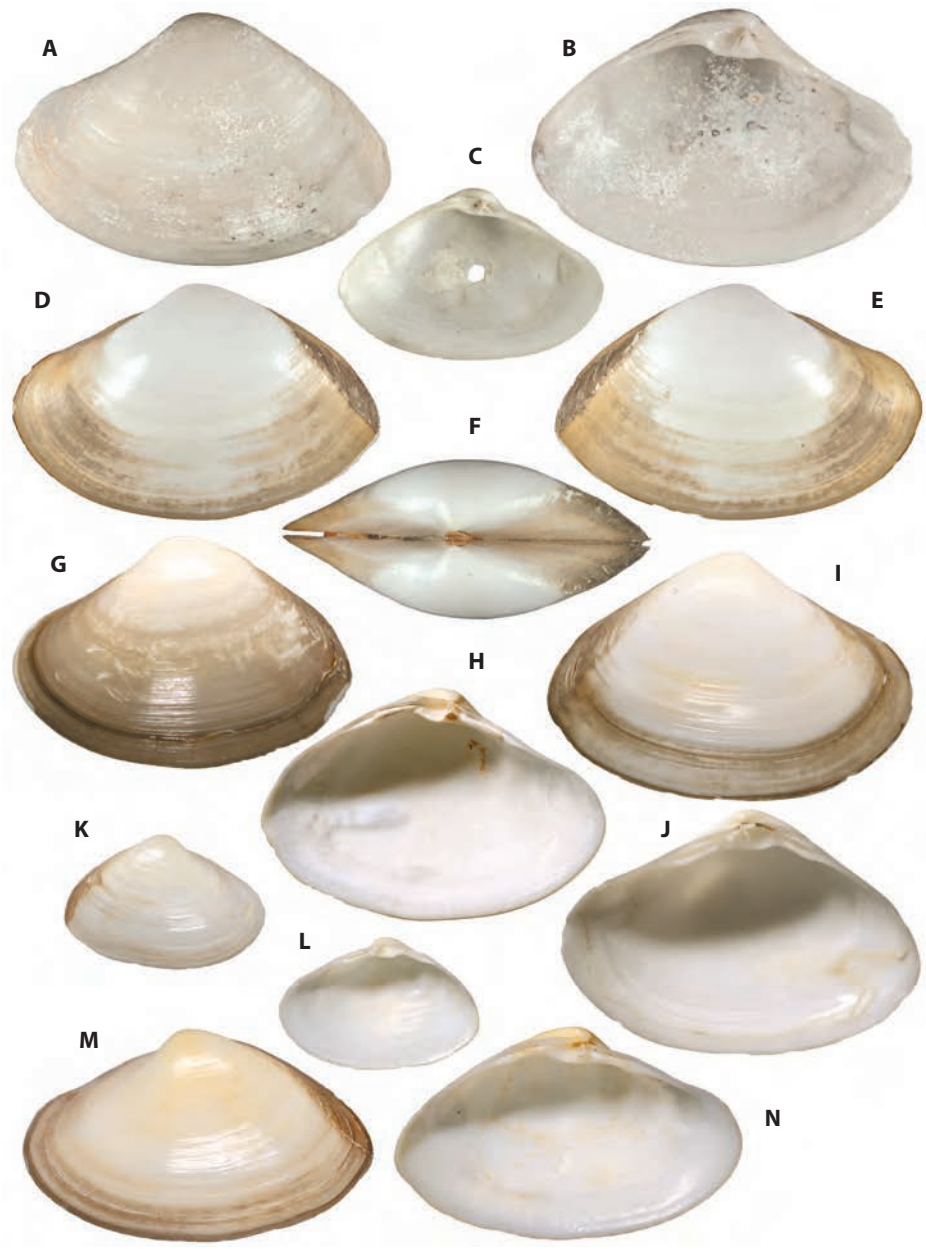
Shell up to 70 mm long, slightly variable in outline, narrowly suboval, thick and solid, large specimens very thick and heavy, moderately inflated. Anterior margin narrowly rounded, posterior margin pointed and somewhat angulate, beaks in or very slightly in front of the vertical midline. Surface with fine irregular growth lines, otherwise smooth, also on lunular and escutcheon area with the exception of a few striae on the very early part of the valves. Postero-dorsal slope separated from the rest of the valve by a weak keel. Pallial sinus rather long and narrow, triangular. Periostracum pale to dark greyish olive, in fully grown specimens mostly present only on the marginal and dorsal part of the valves. Outside white, occasionally with pale yellowish towards the umbos, inside dull, white.



Distribution. Congo (Pointe-Noire, valves only) to northern Angola (Barra do Cuanza) and southern Angola (Moçâmedes, Namibe province).

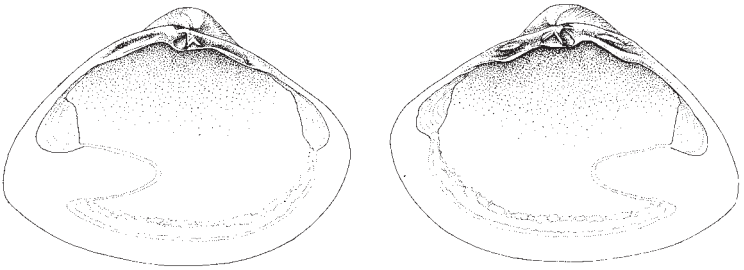
Biotope. In clean fine and mixed sand, in shallow water (1-5 m), locally common.

Remarks. This species has frequently been mistaken for *S. nitida*, and all Angolan records for *S. nitida* in fact refer to *S. angolensis*. Its different habitus had already been recognized by Dunker (1853), however he did not name it. *Scissodesma angolensis* is more slender than *S. nitida*, has a narrower and deeper pallial sinus and lacks the commarginal ridges on the antero- and postero-dorsal area. *Scissodesma micronitida* (Cosel, 1995) is constantly smaller and shorter; *S. acutissima* (Cosel, 1995) is equally small but has the typical more upwards pointing pallial sinus and cannot be taken as juvenile of *S. angolensis* (see next entries). Empty shells are commonly cast ashore.



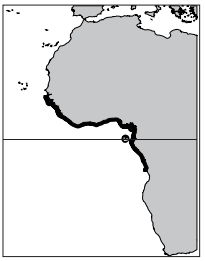
15.25. ***Scissodesma (Crepispisula) angolensis*** **(Cosel, 1995).** **A**-**B**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, N of lighthouse (68.5 mm). **C**, same locality (31.4 mm). **D**-**F**, Barra do Cuanza, Luanda prov., N-Angola, sand at low tide (holotype, 56.1 mm, photo Manuel Caballer/Recolnat). **G**-**H**, same locality (paratype, 51.7 mm). **I**-**J**, same locality (paratype, 54.1 mm). **K**-**L**, Moçâmedes, Namibe prov., S-Angola , beach (29.6 mm). **M**-**N**, same locality (51.8 mm).

Scissodesma (*Crepispisula*) *micronitida* (Cosel, 1995)



15.26. Cap Skirring, S.-Casamance, Senegal, 12°22.5'N, 17°03'W, 20 m (26.6 mm).

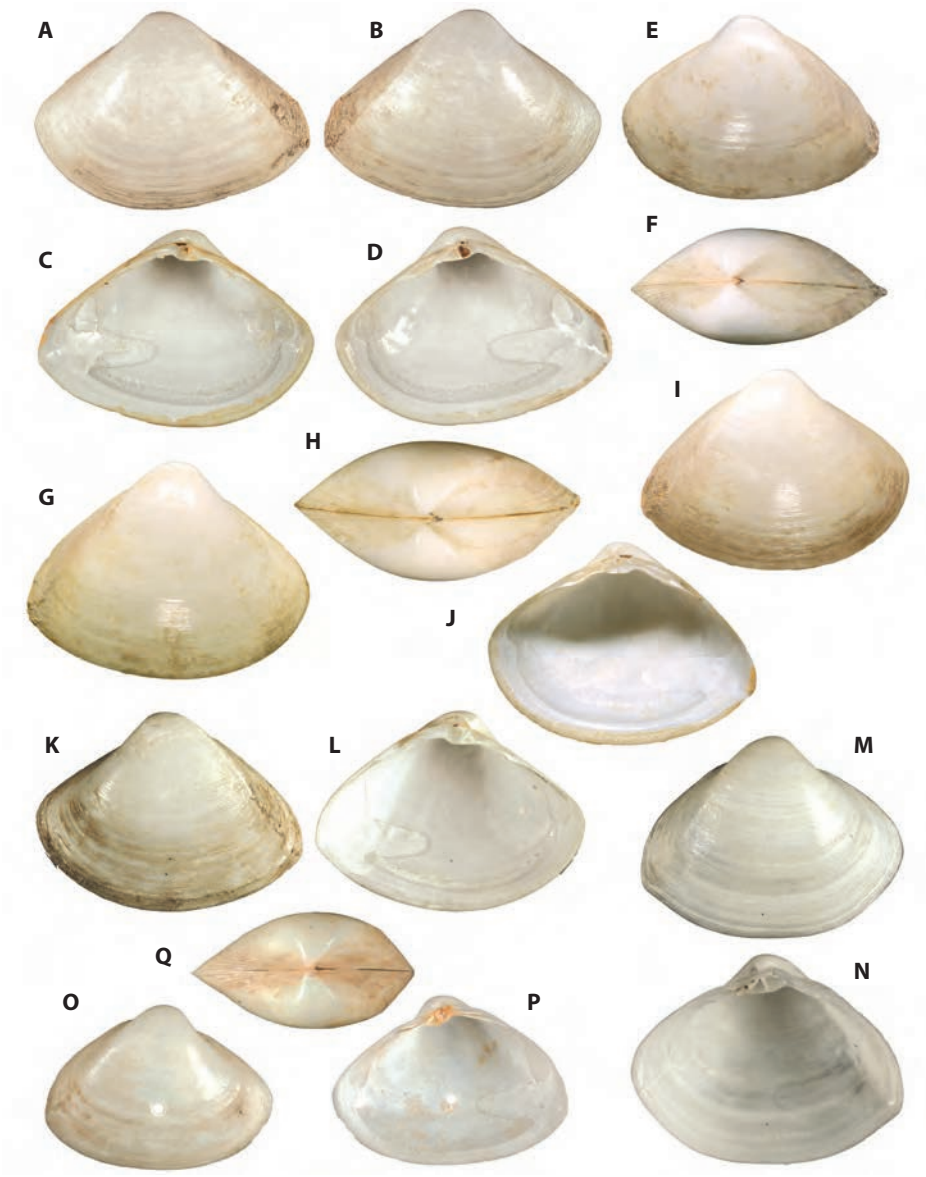
Shell up to 31 mm long, somewhat variable in outline, suboval-subtriangular, moderately thick and solid, rather inflated. Anterior margin narrowly rounded to slightly pointed, posterior margin more or less pointed and slightly angulate, beaks slightly in front of the vertical midline. Surface smooth, with numerous, very fine, regular, commarginal ridges on the marginal half or one third of the valves, sometimes nearly completely missing. Lunular area and postero-dorsal slope with broader commarginal ribs. A keeled posterior angle separates the postero-dorsal slope from the rest of the shell. Pallial sinus triangular, rather large, horizontal with slightly rounded extremity. Periostracum very light brownish grey to nearly colourless, thin and translucent, slightly bristly on the postero-dorsal keel. Inside and outside uniform dirty white, inside dull.



Distribution. Senegal (Casamance) to northern Angola (Cabo Ledo, S of Luanda); São Tomé, Ilha do Principe.

Biotope. In slightly sandy mud to fine muddy sand, on open coasts and in sheltered bays, from shallow water (3-4 m) to about 18-20 m, rare in northern Casamance and Angola, more common to abundant under more tropical conditions, *e.g.* in southern Casamance, in the vast muddy areas off Guinea-Bissau and Guinea, as well as in Cameroon. It seems to tolerate salinity changes in a certain amount.

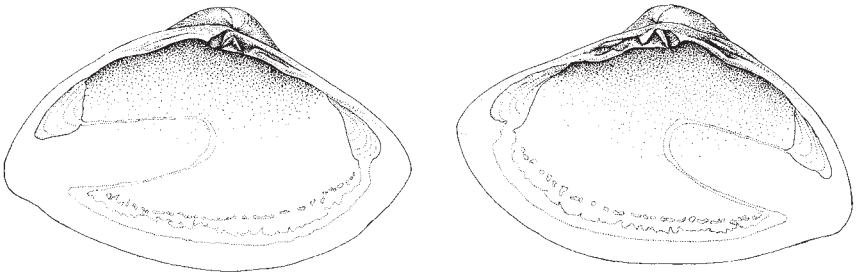
Remarks. This species was hitherto always mistaken for young *S. nitida*, as seen in the literature and on museum labels but Nicklès noted its difference in labelling it "juv.". However, in spite of its variability, *S. micronitida* is always distinguished from *S. nitida* by its much smaller size, the longer pallial sinus, the more pointed anterior and posterior end, the duller inside and the external sculpture. Also the biotope is entirely different. *Scissodesma micronitida* is an important indicator of shallow water fine sandy mud bottom communities. Empty valves are frequently washed up on flat beaches, *e.g.* in Casamance, and often form the main component of the drift-line. Specimens in shell concentrates off Côte d'Ivoire were recently found deeper than usually (25-35 m), and the valves are slightly different: thinner, somewhat more tumid, with a more convex postero-dorsal margin and a still longer pallial sinus (Fig. 15.27M-N). It could not be excluded that this is a cryptic, still undescribed species which replaces *S. micronitida* in slightly



15.27. ***Scissodesma (Crepispisula) micronitida*** **(Cosel, 1995).** **A**-**D**, Cap Skirring, S-Casamance, Senegal, 12°20.7'N, 16°53.1'W, 15 m (holotype, 28.1 mm, photo Manuel Caballer/Recolnat). **E**-**F**, same locality (paratype, 20.6 mm). **G**-**H**, same locality (paratype, 23.3 mm). **I**-**J**, same locality (paratype, 25.0 mm). **K**-**L**, Rio Geba, Guinea-Bissau, 11°45'N, 16°42.5'W, 12 m (27.1 mm). **M**-**N**, ***Scissodesma cf. micronitida***, Grand Bassam, Côte d'Ivoire, 5°09.2'N, 3°47.2'W, 30 m (19.2 mm). **O**-**Q**, Kipundji, Congo Brazzaville, 5°56'S, 12°07'E, 22-25 m, sandy mud (19.5 mm).

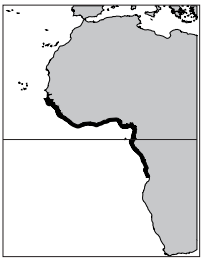
deeper water in the northern (and southern) alternant zone with intermittent upwelling. Besides Côte d'Ivoire, this form was also dredged off Congo (Brazzaville) in 22-25 m. DNA analysis and ecological studies are necessary to prove this separation.

Scissodesma (*Crepispisula*) *acutissima* (Cosel, 1995)



15.28. Conakry region, Guinea, 9°25'N, 13°48.5'W (19.6 mm).

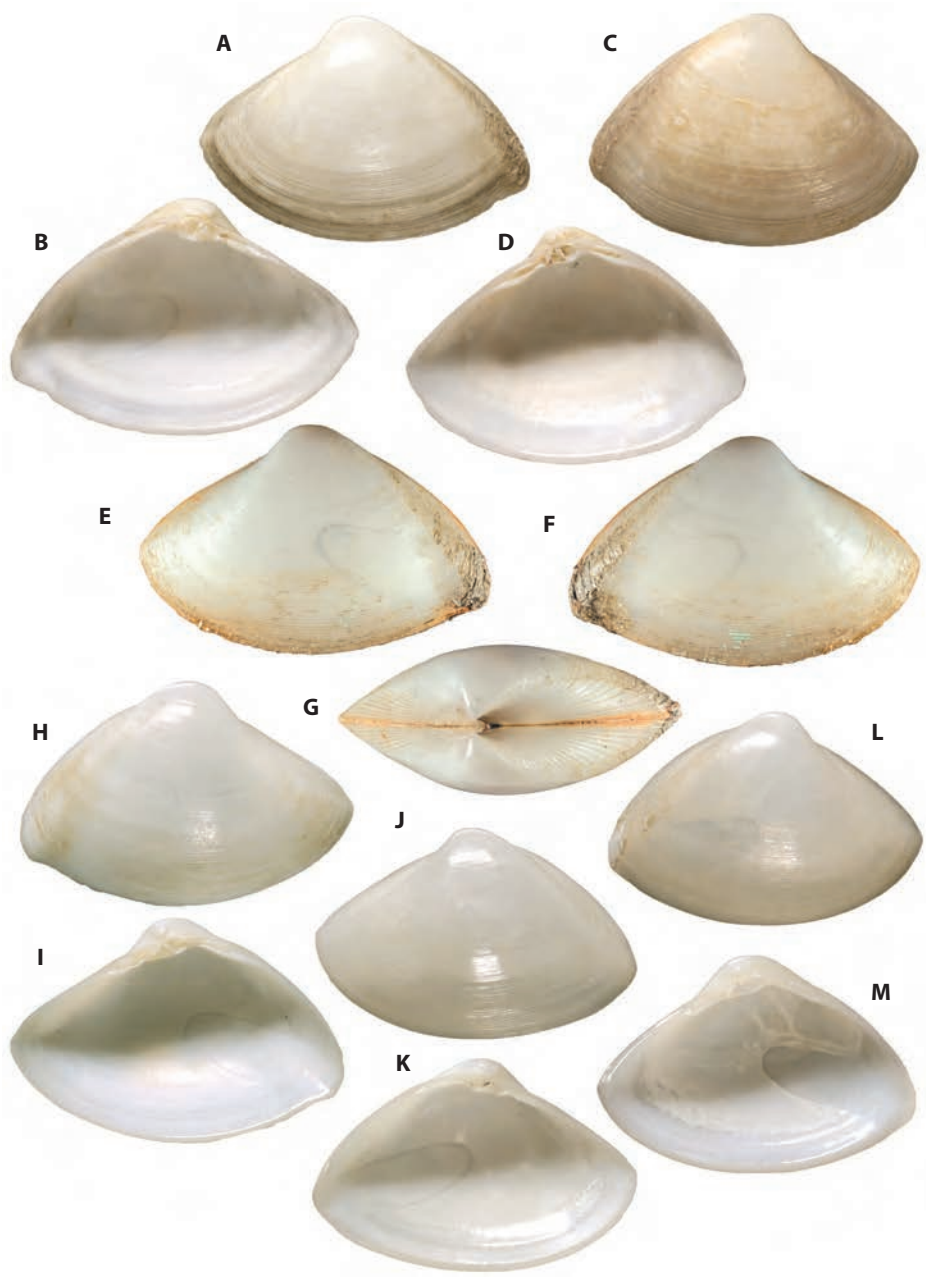
Shell up to 27 mm long, slightly variable in outline, suboval-triangular, moderately thick and solid, rather inflated. Anterior margin pointed and angulate, posterior margin pointed, with a rounded corner. Ventral margin with a weak sinuosity just anterior to the posterior end. Beaks just in front of the vertical midline. Surface smooth, with numerous regular commarginal ribs on the marginal half, occasionally also on earlier parts but sometimes restricted to the immediate marginal zone. Lunular area and postero-dorsal slope with broad commarginal ribs which terminate on the keels delimiting the antero-dorsal area and the rounded postero-dorsal angle respectively. Pallial sinus very large and pointing slightly upwards, with rounded extremity. Periostracum light olive grey, thin and translucent, slightly bristly on the postero-dorsal angle. Inside and outside dirty white, inside more or less dull.



Distribution. Senegal (Casamance, Diembéring) to southern Angola (Lobito).

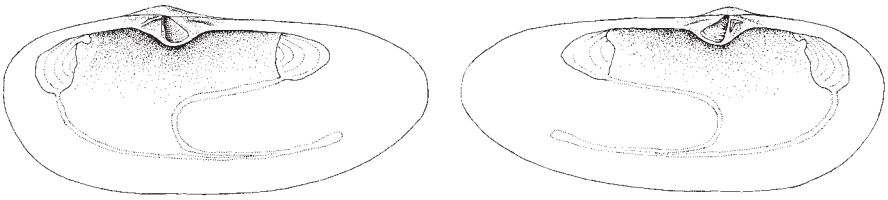
Biotope. In fine, slightly muddy sand on open coasts and in sheltered areas, from shallow water (1.5 m in calm water) to about 15 m, not common everywhere.

Remarks. *Scissodesma acutissima* is superficially very close to *S. micronitida*, it is distinguished by the more elongate shell with the sharply pointed anterior end, also pointed posterior end and the long pallial sinus which is not horizontal but which characteristically points upward to just behind the beaks (see drawings). *S. acutissima* is less common than the preceding species, it inhabits cleaner sandy sediment, but occasionally the two species co-occur in the same habitat as their sediment preferences overlap. *Scissodesma acutissima* seems to have less tolerance for salinity changes than *S. micronitida*. Empty valves are often found on beaches together with the preceding species, but are less common.



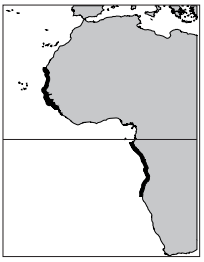
15.29. ***Scissodesma (Crepispisula) acutissima*** **(Cosel, 1995). A-B**, S-Casamance, Senegal, Diembéring, 12°30.4'N, 17°16'W, 21 m (24.1 mm). **C-D**, Casamance, Senegal, 12°50.4'N, 16°58.8'W, 13-14 m (24.6 mm). **E-G**, N-side of Roume, Iles de Los, Guinea, 1.5-2 m, fine sand (holotype, 16.6 mm, photo Manuel Caballer/Recolnat). **H-I**, same locality (paratype, 18.7 mm). **J-K**, same locality (paratype, 15.8 mm). **L-M**, same locality (paratype, 15.5 mm).

Lutraria senegalensis Gray, 1837



15.30. Casamance, Senegal, 10-20 m (78.8 mm).

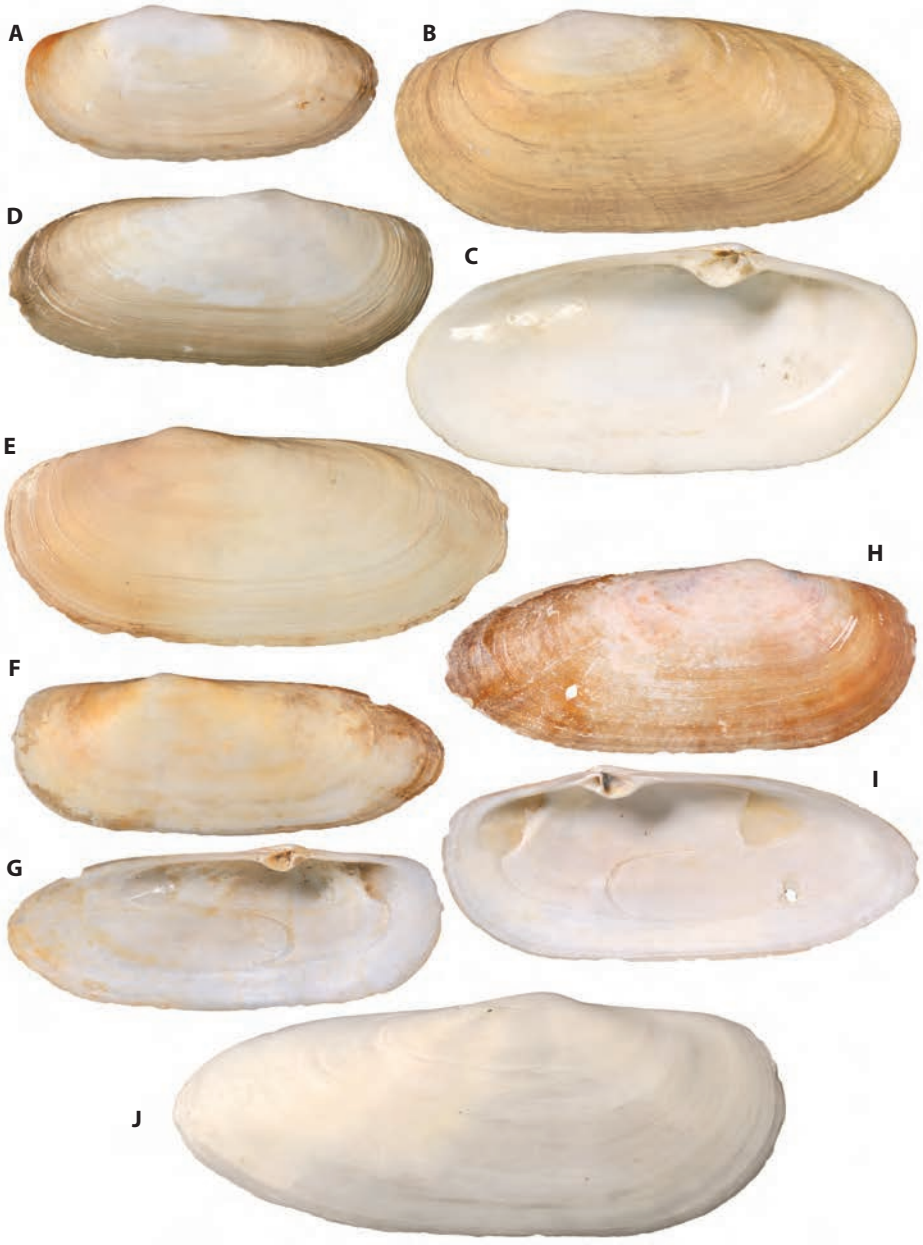
Shell up to 110 mm long, quite variable in outline, elongate, more than two times longer than high, thin but solid, moderately compressed. Anterior margin broadly rounded, posterior margin more or less pointed, at the end narrowly rounded. Dorsal and ventral margin nearly parallel, beaks very small and well in front of the vertical midline. Surface with irregular, more or less marked growth lines and occasional coarser growth stages. Pallial sinus deep, horizontal and partly confluent with the pallial line. Periostracum rather thin, dull and light to dark greyish olive. Inside and outside of valves white.



Distribution. Mauritania (Cap Blanc) to Guinea (Sierra Leone border); Gabon to southern Angola (Baia dos Tigres).

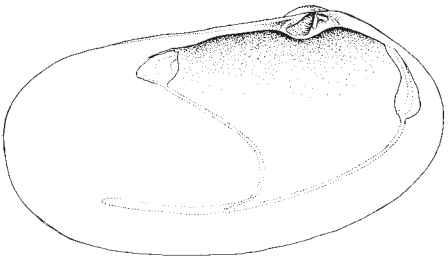
Biotope. In fine sand and mixed sand, also with shells and shell debris, from shallow water to about 35 m, uncommon.

Remarks. This species is commonly known as *L. elongata* Gray, 1837, however, the holotype of this species is slightly different from the West African species and the type locality is Prince-of-Wales Island, N-Australia. Specimens of *L. senegalensis* from Angola and the Congo have a still more pointed posterior end than specimens from the northern part of the range, but they fall well within the variability. Within the studied material, there are no specimens from Sierra Leone to northern Gabon, which is also confirmed by the literature records; this indicates a distribution discontinuity. The European *L. lutraria* (Linnaeus, 1758) is larger, thinner and higher, but young specimens might be very close to *L. senegalensis*.



15.31. *Lutraria senegalensis* Gray, 1837. **A**, Cap Roxo, S-Casamance, Senegal (52.5 mm). **B**-**C**, same locality (77.5 mm). **D**, Senegal (61.3 mm). **E**, Port-Gentil, Gabon (87.0 mm). **F**-**G**, Pointe-Noire, Congo Brazzaville, Plage Mondaine (69.9 mm). **H**-**I**, same locality (76.7 mm). **J**, Baia dos Tigres, S-Angola (101.6 mm).

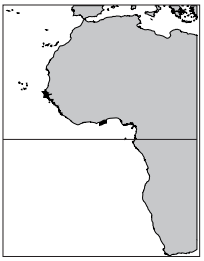
Lutraria budkeri Nicklès, 1955



15.32. Winneba, Ghana, 5°36'N, 0°38'E, 50 m, redrawn from Nicklès 1955 (holotype, 114 mm).

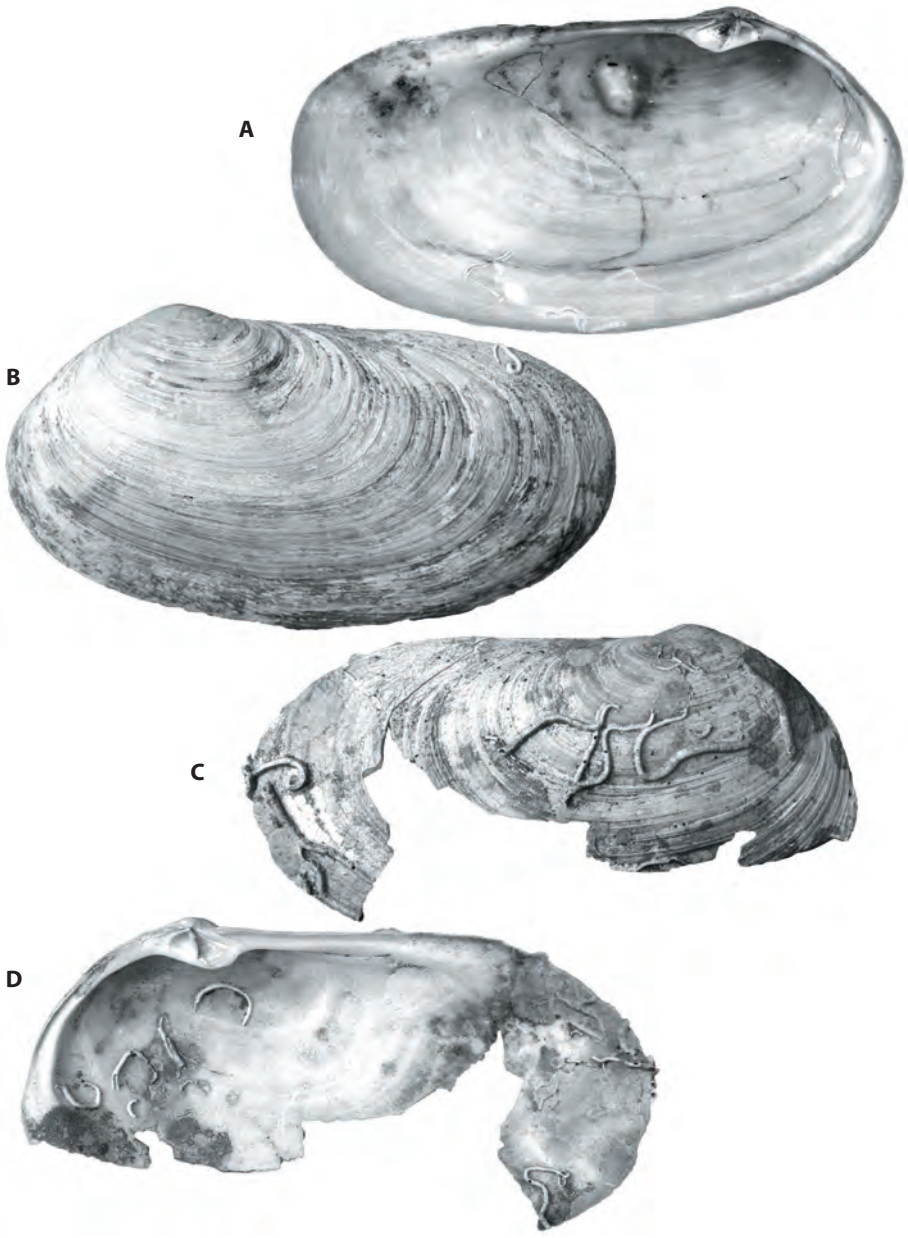
Shell large, up to 119 mm long, oblong, slightly less than two times longer than high, thin and fragile. Anterior and posterior margin broadly rounded, dorsal margin almost straight, ventral margin well and evenly convex. Beaks small and nearly a fourth of the shell length in front of the vertical midline. Surface with strong and irregular commarginal waves and growth lines, reflected on the interior. Pallial sinus broad and deep, partly confluent with the pallial line. Periostracum very slightly straw-coloured, nearly whitish and slightly wrinkly, especially near the margins. Outside and inside of valves white.

Distribution. Senegal (Rufisque, Nicklès 1955); Ghana (5°37'N, 0°38'E).



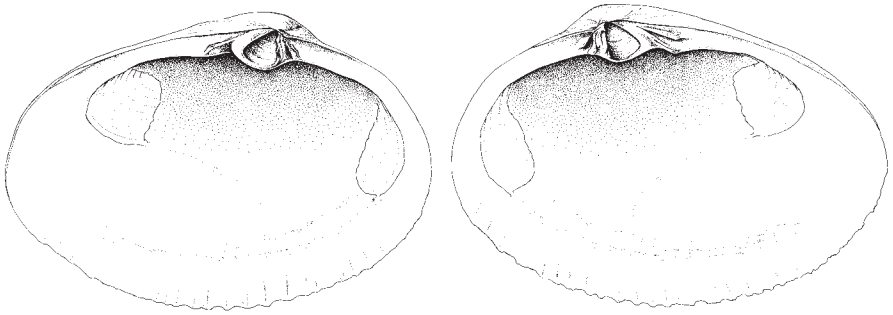
Biotope. Not known, obviously in sandy bottom, offshore (50 m), very rare.

Remarks. This large and impressive but still enigmatic *Lutraria* is only known by the type lot from Ghana (in ZMC) and one chipped left valve from Rufisque Bay, Senegal, which had been dredged by Th. Monod and P. Budker on 22. of January 1941 (Nicklès 1955). However, that specimen is not present in the MNHN and was not available for study. *Lutraria budkeri* differs from *L. senegalensis* and the European *L. lutraria* by its much broader and thinner shell with the beaks in a more forward position, the broad posterior part and the smaller hinge.



15.33. ***Lutraria budkeri*** **Nicklès, 1955. A-D**, Winneba, Ghana, 5°36′N, 0°38′E, 50 m (holotype ZMC, 114 mm), R/V *Atlantide* sta. 85, 1945.

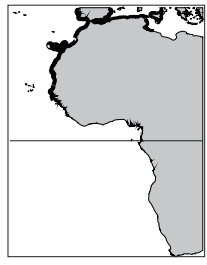
Eastonia rugosa (Helbling, 1779)



15.34. Nouadhibou region, Mauritania (62.2 mm).

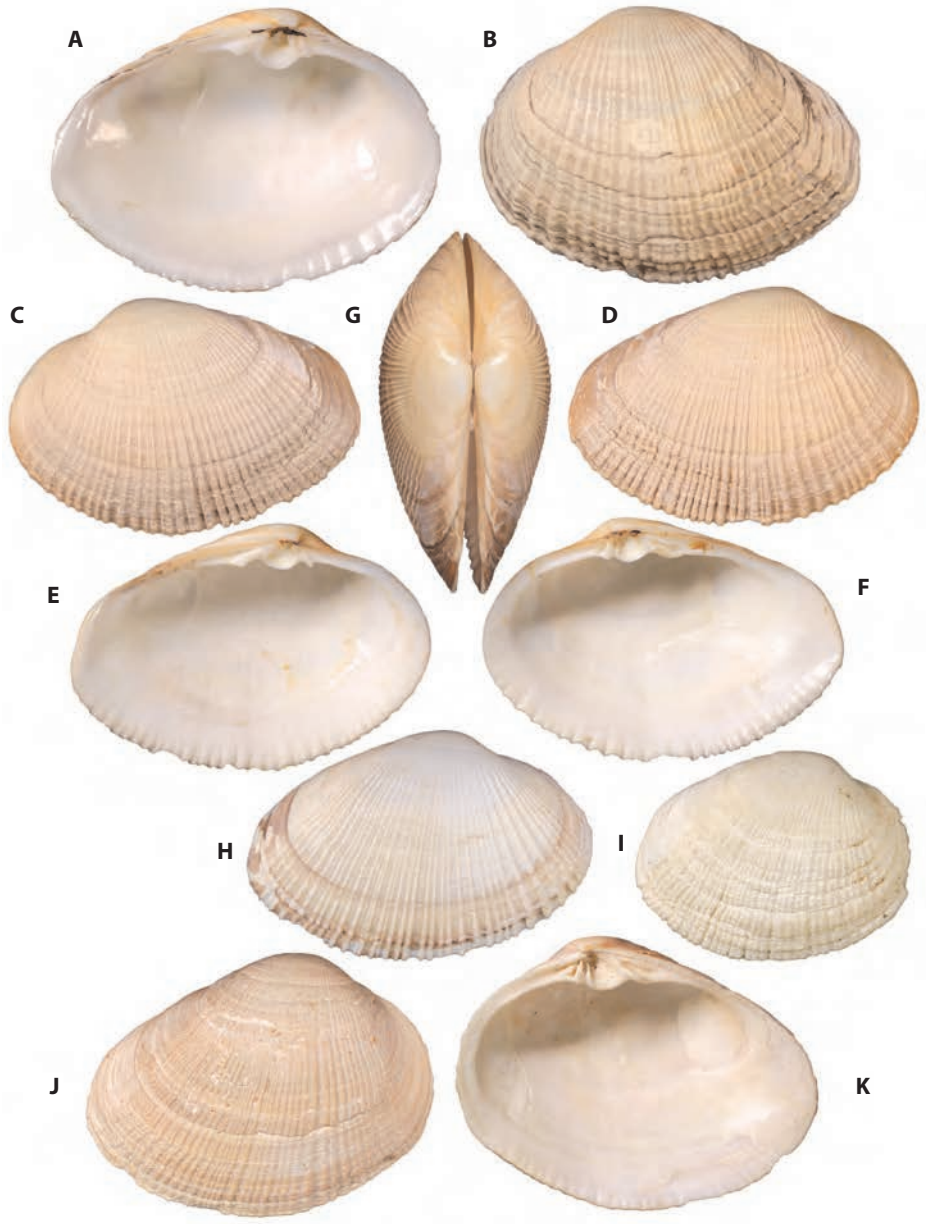
Shell up to 81 mm long, variable in shape and sculpture, oblong, thick and solid, inflated to very inflated. Anterior margin well rounded, posterior margin rounded and often obtusely angulate in the middle. Beaks flat, broad and well in front of the vertical midline. Surface with numerous irregular, thin, sharp and prominent radial ribs, with interspaces of different width, these ribs are absent on the antero- and postero-dorsal slope. There are also fine irregular growth lines. Periostracum thin and nearly colourless to light brownish grey and slightly wrinkly in the interspaces of the ribs, often present only on the marginal parts of the valves. Outside dirty whitish to cream, inside white.

Distribution. Northern Portugal (Aveiro) to Senegal (Dakar); Canary Islands; south-western Mediterranean from Algeria to the Alboran Sea (Gofas *et al.* 2011) and Gibraltar, Sicily (Orlando 1979), Tunisia. Recently also found near in the central Tyrrhenian Sea near Rome (Ostia, Tor Caldara, see La Valle *et al.* 2007).



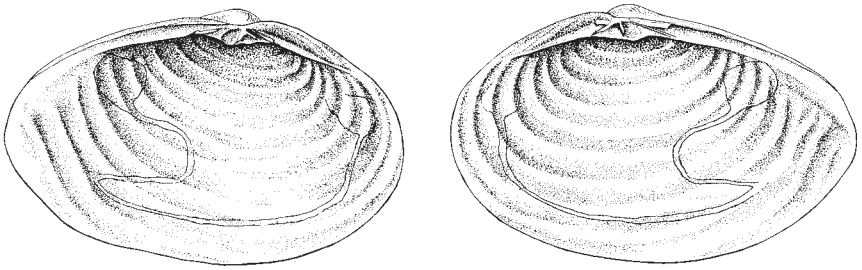
Biotope. In muddy and muddy-sandy bottom from shallow water to about 30 m, seems to like proximity of some freshwater influx (Orlando 1979); not common, rare south of Mauritania.

Remarks. This species is very seldom found alive, most beached shells are worn and without periostracum. A synonym is *E. locardi* Paulino de Oliveira, 1895. A similar but much smaller species, *E. solanderi* (Gray, 1837) occurs in the Indian Ocean from Jeffreys Bay (South Africa) northward.



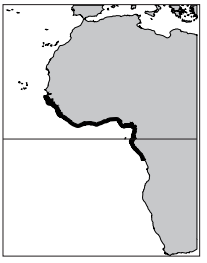
15.35. ***Eastonia rugosa*** **(Helbling, 1779). A-B**, Agadir, Morocco (61 mm). **C-G**, Port Etienne (now Nouadhibou), Mauritania (53.1 mm). **H**, Pointe des Maures, Mauritania (41.2 mm). **I**, same locality (33.0 mm). **J-K**, Banc de la Sentinelle, Mauritania, 20°41'N, 17°07'W, 12-13 m (80.0 mm).

Tumbeziconcha senegalica (Cosel, 1995)



15.36. Nemlao, Cabinda, MNHN old coll. (23.0 mm).

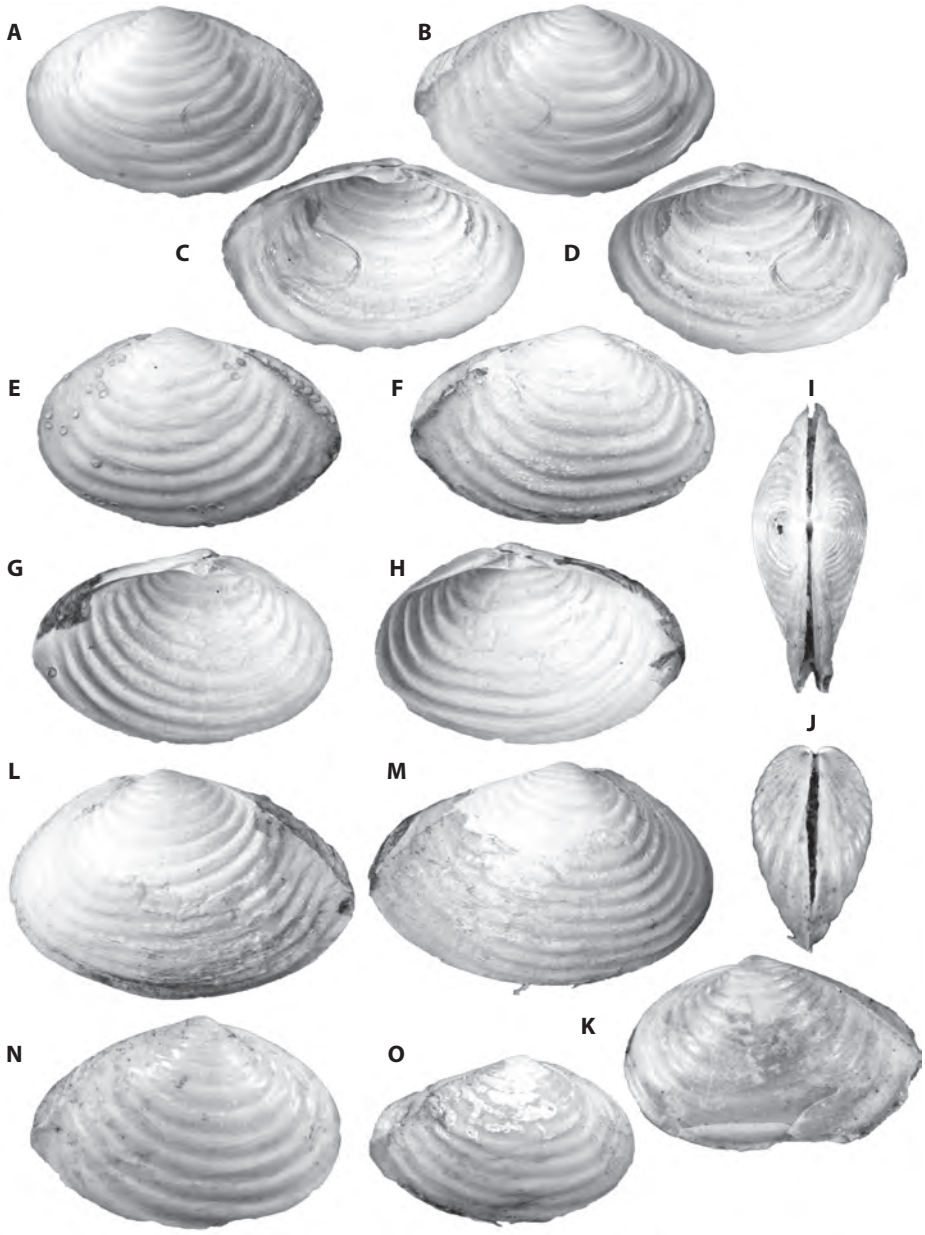
Shell up to 25 mm long, rather narrowly suboval, extremely thin and fragile, moderately inflated, posterior end compressed and slightly flaring, gaping. Anterior margin well rounded, posterior end somewhat pointed, with a weak angle. Beaks slightly in front of the vertical midline. Surface with strong, broad subcommarginal waves which are reproduced on the inside and which are slightly diverging from the very fine, regular, commarginal growth lines. Posterodorsal area separated by a sharp angular ridge from the rest of the valve. Periostracum very thin and nearly colourless to straw coloured or light brownish, regularly wrinkled in the sense of the growth lines, visible only under a lens (x 20-30). Muscle impressions and pallial line often hardly visible. Hinge plate with a short submarginal lamina reaching from the anterior to the posterior lateral. Shell white and somewhat translucent.



Distribution. Because of the special biotope, the range is still very imperfectly known, globally Senegal (Casamance), Guinea, Côte d'Ivoire, Cameroon to northern Angola (Cabinda).

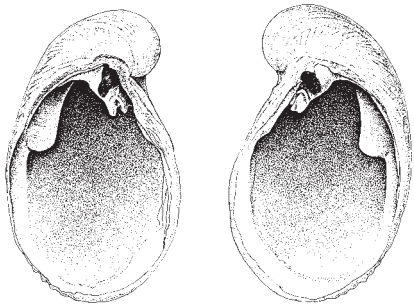
Biotope. Unknown but most probably mud or slightly sandy mud, in calm, shallow water, mostly in mangrove areas. The species is rare, and due to its special habitat and the fragility of the shell, complete specimens are extremely difficult to obtain. It seems to tolerate reduced as well as also higher salinity, as a fragment was found in the Casamance River at Ziguinchor.

Remarks. This species was for a long time known as "*Mactra senegalensis* Philippi, 1849", but Philippi's original description does not coincide with this species but with a juvenile *Mactra glabrata*. However, *Mactra senegalensis* as described and figured in Reeve (1854: species 120), to which obviously all subsequent authors refer, is this species. Finally Cosel (1995: 51-52) placed it provisionally in *Raeta* Gray, 1853 pending a more thorough revision of Mactridae. A very similar species, *Tumbeziconcha thracioides* (Adams & Reeve, 1850), is the type of the genus and occurs in the Panamic-Pacific province from El Salvador to Peru.



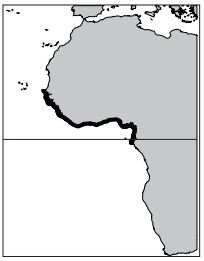
15.37. ***Tumbeziconcha senegalica*** **(Cosel, 1995).** **A**-**D**, Banana, Congo Kinshasa (holotype ANSP 277094, 18.2 mm). **E**-**H**, same locality (paratype ANSP, 22.2 mm). **I**-**K**, same locality (paratype ANSP, 13.3 mm). **L**-**M**, same locality (paratype ANSP, 25.1 mm). **N**, same locality (paratype 3 ANSP, 17.7 mm). **O**, same locality (paratype ANSP, 16.8 mm).

Cardilia atlantica Nicklès, 1955



15.38. Abidjan region, Côte d'Ivoire, 40 m (13.4 mm ht).

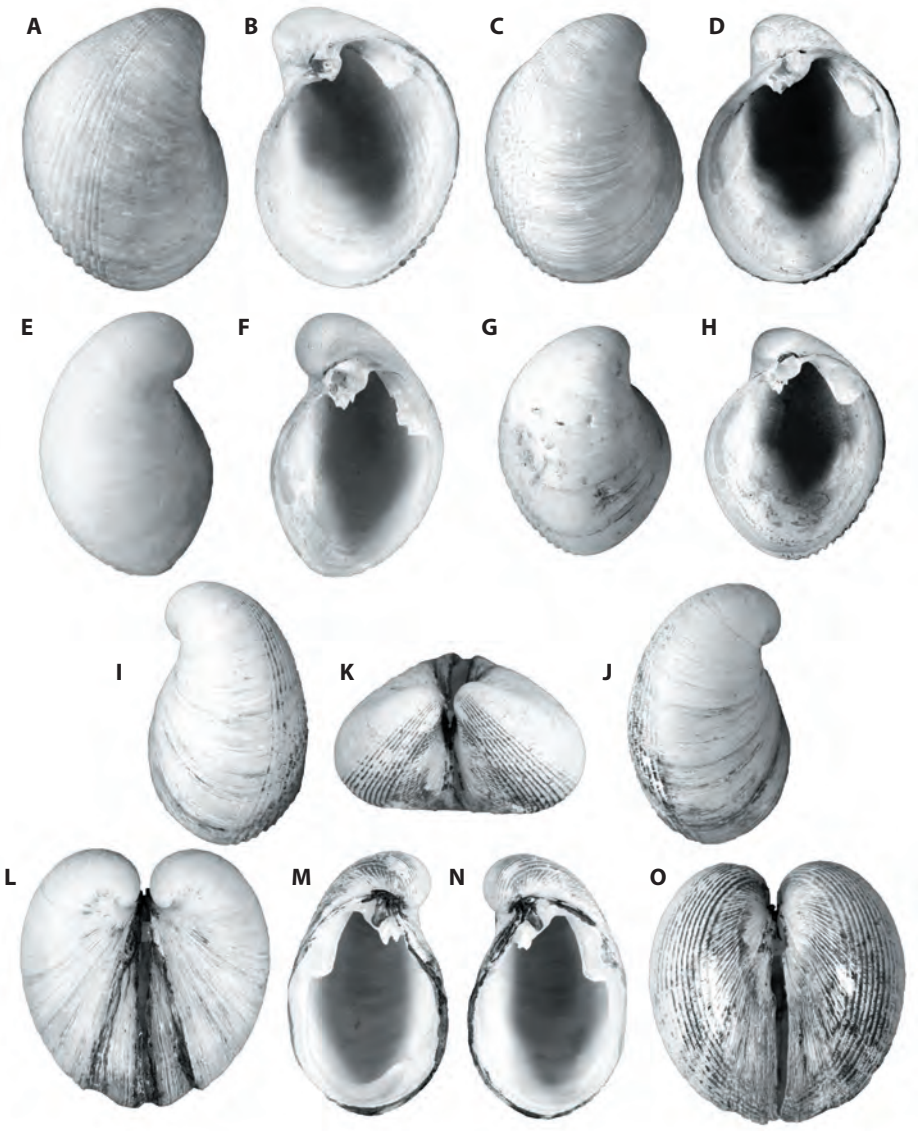
Shell small, up to 14 mm high and 10 mm long, thin but solid, extremely inflated, the two valves heart-shaped, with inrolled beaks, situated in front of the vertical midline. Surface with irregular commarginal growth lines and coarser growth stages and 8-12 more or less regular, prominent radial ribs on the posterior part, except on the postero-dorsal slope near the margin where very fine commarginal lamellae are present. Periostracum very thin, pale greyish and hardly visible, remaining only on the marginal part of the valves. Outside dirty white, inside white.



Distribution. Senegal (Dakar) to Cameroon (Victoria/Limbe area) and Gabon (Cap Lopez). No records from Sierra Leone.

Biotope. In clean fine sand, offshore from about 30 to 65 m, rare.

Remarks. The genus *Cardilia* was known from the Indo-Pacific, and only in 1945, the Atlantic species was dredged by the R/V *Atlantide*. It is also known from the Quaternary of Port-Gentil (Gabon). Not found on beaches. A close fossil species is *C. michelottii* Deshayes, 1844 from the Northern Italian Pliocene. Quite similar Indo-Pacific species are *C. inermis* Deshayes, 1844 from the Western Pacific and *C. semisulcata* (Lamarck, 1819) from the Gulf of Oman.



15.39. ***Cardilia atlantica*** **Nicklès, 1955. A-B**, Baie de Gorée, Senegal, 30 m (rv, 15.7 mm ht). **C-D**, Dakar region, Senegal, 14°33'N, 17°24'W, 52 m (14.3 mm ht). **E-F**, Kafountine, N-Casamance, 12°46.9'N, 17°29.9'W, 45 m (11.2 mm ht). **G-H**, Liberia, NW of Monrovia, 6°40'N, 11°23'W, 51 m (12.8 mm ht). **I-O**, Grand Bassam, Côte d'Ivoire, 40 m (13.5 mm ht).

Superfamily **CHAMOIDEA**

Family **CHAMIDAE**
- Genus ***Chama*** Linnaeus, 1758 – 2 species
- Genus ***Pseudochama*** Odhner, 1917 – 2 species

Superfamily **UNGULINOIDEA**

Family **UNGULINIDAE**
- Genus ***Ungulina*** Bosc, 1801 – 2 species
- Genus ***Diplodonta*** Bronn, 1831 – 9 species
- Genus ***Lamysia*** Huber, 2015 – 1 species

Superfamily **CYRENOIDEA**

Family **CYRENOIDIDAE**
- Genus ***Cyrenoida*** de Joannis, 1835 – 2 species

Superfamily **ARCTICOIDEA**

Family **TRAPEZIDAE**
- Genus ***Coralliophaga*** Blainville, 1824 – 1 species

Superfamily **GLOSSOIDEA**

Family **VESICOMYIDAE**
- Genus *Vesicomya* Dall, 1886 – 2 species (not treated)
- Genus *Callogonia* Dall, 1889 – 1 species (not treated)
- Genus *Calyptogena* Dall, 1891 – 1 species (not treated)
- Genus *Christineconcha* Krylova & Cosel, 2011 – 1 species (not treated)
- Genus *Isorropodon* Sturany, 1896 – 6 species (1 treated)
- Genus *Elenaconcha* Cosel & Olu, 2009 – 1 species (not treated)
- Genus *Laubiericoncha* Cosel & Olu, 2008 – 1 species (not treated)
- Genus *Waisiuconcha* Beets, 1942 – 1 species (not treated)
- Genus *Wareniconcha* Cosel & Olu, 2009 – 1 species (not treated)

Miscellaneous heterodont families

This section deals with several heterodont families whose phylogenetic position has been uncertain, which are distantly related to the veneroids and somewhat resemble them, but differ among other characters in lacking the conspicuous siphons and pallial sinus which are characteristic of the latter. The Chamoidea are very modified bivalves which are all cemented to the substrate in adult stage and whose systematic position is still unsettled. Ungulinidae and Cyrenoididae have long been considered as members of the superfamily Lucinoidea due to superficial similarity but are now consistently classified closer to venerids. Finally, the Vesicomyidae belong to the superfamily Glossoidea which is long known to be close to venerids albeit having a long separate evolutionary history.

Superfamily CHAMOIDEA

The members of this superfamily are profoundly modified due to the habit of cementing to the substrate by one of the valves, and their phylogenetic relationships remain unresolved (Bieler *et al.* 2014). The superfamily includes the sole family Chamidae.

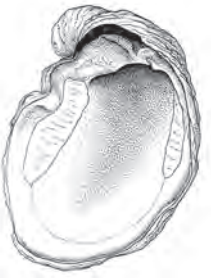
Family CHAMIDAE

Shells small to rather large, equivalve to very inequivalve, irregularly subcircular to irregularly quadrangular, very variable in shape, thick to very thick and heavy, with one valve cemented to hard substrate. Surface with strong commarginal or radial sculpture or a combination of both, mostly with irregular, commarginal lamellae which are often frondose with more or less long, leaf-like spines, or radial ribs with spines on them. Beaks mostly in front of the vertical midline, bent forward. Hinge with one or two cardinals in each valve, one of them strong, and occasionally one or two weak laterals. No pallial sinus. Adductor scars large. Inner margin crenulate or smooth. Shell often vividly coloured. For a brief general introduction and soft part morphology, see Matsukuma (1996). The family includes 6 genera and 65 species worldwide. Two genera and four species occur in tropical West Africa.

Genus *Chama* Linnaeus, 1758. Shells small to rather large, inequivalve, very irregular, often with somewhat subcircular inner margin, solid to very thick and heavy. Species attached to the substrate with the left valve, which is deeper than the right valve; the beak of the attached valve is bent to the right. Surface

predominantly with commarginal, foliaceous sculpture and often with vivid colouration. Left valve with two cardinals and one small, knob-like posterior lateral, the anterior cardinal being large and rough. Right valve with two long cardinals, not always well-defined, and a small posterior lateral tooth. Thick, external ligament. Two West African species are treated herein, but it is possible, that due to the extreme variability of the group and the difficulty of collecting good series, more species present in the area have still to be recognized.

Genus *Pseudochama* Odhner, 1917. Shells medium-sized to quite large, inequivalve, very variable in shape, irregular, often with somewhat subcircular inner margin, thick to very thick and heavy. Species normally attached with the right valve, the beak of the attached valve being bent to the left. Surface with sculpture as in *Chama*, but colours often less vivid. As also "right-handed" specimens of certain species of *Pseudochama* are found, it is questionable whether *Pseudochama* should really be maintained as a separate genus.



Species treated (4)
Chama crenulata Lamarck, 1819; *Chama gryphoides* Linnaeus, 1758; *Pseudochama gryphina* (Lamarck, 1819); *Pseudochama cristella* (Lamarck, 1819).

Superfamily UNGULINOIDEA

This group has for a long time been placed in the vicinity of the Lucinoidea because of superficially similar shells, likewise usually white and lacking a pallial sinus. Nevertheless the phylogenetic reconstructions based on molecular characters consistently point to a relationship with Cyrenoidea and Veneroidea, far away from lucinids in the bivalve tree (Taylor *et al.* 2007b). There is only one family.

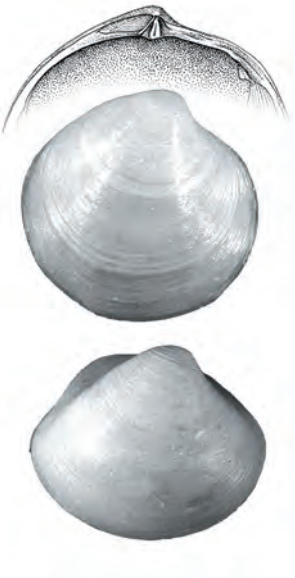
Family UNGULINIDAE

Shells small to rather large, equivalve, circular, subcircular, oval or irregular, thin and fragile to thick, with a deeply sunken posterior ligament. Surface smooth or with fine commarginal sculpture, sometimes punctate; margins smooth. Beaks mostly in or near the middle. No lunule nor escutcheon. Hinge with two cardinals in each valve, the anterior tooth in the left valve and the posterior tooth in the right valve bifid, laterals indistinct or absent. No pallial sinus. Adductor scars short to long, without a ventral extension diverging from the pallial line. There are 91 known species, 12 from tropical West Africa. Only three genera, *Ungulina*, *Diplodonta* and *Lamysia* are recognized here. *Felania* is held on subgeneric rank because of the rather subtle differences.

A modern revision of this difficult group is long overdue. The South African species were revised by Kilburn (1996).

Genus *Ungulina* Bosc, 1801. Shells medium-sized, circular to high-oval, more or less irregular, solid, rather inflated, no lunule or escutcheon. Surface with coarse commarginal sculpture. Ligament compound, with a broad and short internal part in a resilifer very close behind the posterior cardinal, and a strong external ligament in a very deep groove just next to it. No lateral teeth present. Two species in West Africa.

Genus *Diplodonta* Bronn, 1831. Shells small to quite large, subcircular to circular or slightly irregular, thin to rather solid, more or less inflated to nearly globose. Lunule and escutcheon indistinct or absent. Surface occasionally with weak commarginal sculpture, mostly with growth lines only. Beaks median or more or less in front of the vertical midline. Hinge with two cardinals in each valve, the anterior cardinal of lv and the posterior one of rv distinctly bifid (hence the name); no laterals. Ligament on a more or less deeply sunken nymph, which may be reaching onto the hinge plate. Pallial line entire and rather close to the ventral margin; anterior adductor scar usually narrower than posterior scar. The West African *Diplodonta* still pose thorny identification problems, and their treatment herein cannot solve them all. As also remarked by Oliver (1992), juveniles might be quite different in outline and tumidity from fully grown specimens, and growth series would often be needed for the proper identification of juvenile specimens. The nominal subgenus *Diplodonta* has shells mostly subcircular, inflated to nearly globose; the ligament is moderately sunken and largely visible from the dorsal view; anterior adductor scar is moderately elongate and the posterior one, less so or nearly ovate.



Subgenus *Felania* Récluz, 1851. Shells medium-sized to quite large, circular or subcircular to somewhat irregular, with the ligament deeply sunken in a dorsal groove and barely visible when the valves are closed; the anterior portion of the hinge plate bears a distinct groove; adductor scars are very elongate but parallel to the shell margin. *Felania* is often treated as a full genus; however, the differences between *Felania* and *Diplodonta* are small and there appears to be gradations.

Genus *Lamysia* Huber, 2015. Shell up to 20 mm long, subcircular, very thin-shelled when juvenile but more solid when adult, quite tumid, with a spectacular constriction along the posterior slope

between the posterior margin and the rest of the valve. Ligament short; hinge teeth as in *Diplodonta*, anterior part of hinge plate with a deep groove. Pallial line entire but ragged, posterior muscle scar narrow, anterior ill-defined and rounded.

Species treated (12)
Ungulina rubra de Roissy, 1804; *Ungulina alba* Dunker, 1853; *Diplodonta* (*Diplodonta*) *rotundata* (Montagu, 1803); *Diplodonta* (*Diplodonta*) *undata* Cosel, 1995; *Diplodonta* (*Diplodonta*) *enigmatica* Cosel, 1995; *Diplodonta* (*Diplodonta*) *brocchii* (Deshayes, 1850); *Diplodonta* (*Diplodonta*) *dautzenbergi* Thiele, 1931; *Diplodonta* (*Felania*) *diaphana* (Gmelin, 1791); *Diplodonta* (*Felania*) *circularis* Dunker, 1846; *Diplodonta* (*Felania*) *nizeryi* Cosel & Gofas, 2018; *Diplodonta* (*Felania*) *knudseni* Nicklès, 1955; *Lamysia jousseaumei* (Lamy, 1921).

Superfamily CYRENOIDEA
Family CYRENOIDIDAE

Shells medium-sized, equivalve, subcircular, rather thin, with marginal ligament and narrow resilium which is visible from the interior of the valve. Surface smooth, with irregular growth lines, margins smooth. Beaks in front of the vertical midline. Hinge in the left valve with one long anterior cardinal and a short posterior cardinal, the two teeth linked under the beak and arranged in V-shape. Right valve with two long and parallel anterior cardinals and two short and parallel posterior cardinals, both pairs of anterior and correspondent posterior linked under the beak and so forming a "V". The inner (lower) pair may be merged into a single bicuspidate tooth. No pallial sinus. Adductor scars rather large, pallial line often hardly visible or not at all. There are 6 species known worldwide, at most three from West Africa.

Genus *Cyrenoida* de Joannis, 1835. The only genus, with characters of the family. Five West African taxa are listed by Pilsbry & Bequaert (1927), two by Daget (1998). The genus lives in rivers, lagoons, creeks and estuaries with considerably reduced salinity, also close to mangroves, in mud and probably also in sandy mud. As our knowledge of this group is very limited, and as material is rare in collections, and mostly old and not well localized material was available for study, the true number of valid species cannot be established at the moment. Synonyms are *Cyrenella* Deshayes, 1835 and *Cyrenodonta* A & H. Adams, 1857; *Cyrenoides* (*in* G.B. Sowerby II 1839) and *Cyrenoidea* (*in* Hanley 1842-1846) are misspellings.

Species treated (2)
Cyrenoida dupontia de Joannis, 1835; *Cyrenoida rhodopyga* Martens, 1891.

Superfamily ARCTICOIDEA
Family TRAPEZIDAE

Shells mostly rather small, elongate, more or less solid, with the beaks placed near the anterior end. Surface sculptured or smooth. Hinge with two cardinals in each valve, often also one posterior and one small anterior lateral. Pallial sinus very shallow or absent. Three Recent and three fossil genera are recognized; the worldwide species number is estimated at no more than 12, among them one West African species. For a generic overview, see Maestrati & Lozouet 1995.

Genus *Coralliophaga* Blainville, 1824. Shells small, quite thin and often translucent, more or less oblong to irregular, inflated, with or without external sculpture. Hinge plate narrow, with two cardinals and generally one lateral in each valve. Pallial sinus very weak.

Species treated (1)
Coralliophaga lithophagella (Lamarck, 1819).

Superfamily GLOSSOIDEA

This group includes the three families Glossidae, Kelliellidae and Vesicomyidae, which resemble the Veneridae in having rounded to oval shells with enrolled, definitely prosogyrous umbos and a posterior external ligament. A major difference is that there is no pallial sinus, and also the hinge teeth tend to become more or less parallel to the dorsal margin instead of radiating from the umbo. Some authors would unite Vesicomyidae and Kelliellidae but recent molecular and anatomical work (Krylova *et al.* 2018) indicates that they are related, but distinct.

Family VESICOMYIDAE

Shells small to very large, more or less oval or oblong to rather short and circular or very elongate, thin to very thick and heavy, in part with escutcheon. Hinge with variable dentition, cardinals more or less parallel o the dorsal margin (*e.g.* in *Vesicomya s. l.*, *Isorropodon*) or more like in Veneridae (*Calyptogena*); laterals absent. The vesicomyids inhabit soft bottoms, they are

predominantly found in fine muddy sand or mud, many species live in pure mud, they inhabit hot vents, cold seeps or reducing sediments and are symbiotic with thiotrophic or methanotrophic bacteria. There are 103 species worldwide; among them are 15 West African. Most of them live in deep water, from 600 to 4000 m. For the deep-water West African species, the reader is referred to Cosel & Salas (2001), Cosel & Olu (2009), Krylova & Cosel (2011). For a general overview of distribution patterns and current taxonomy of the family, see Krylova & Sahling (2010). The genus *Vesicomya s. str.* includes very small species, and all medium-sized (more than 10 mm) to large Vesicomyidae belong to the subfamily Pliocardiinae (Krylova *et al.* 2018).

Genus *Isorropodon* Sturany, 1896. Shells oblong-oval, with rounded anterior and posterior margin, a slightly convex postero-dorsal margin and strongly convex ventral margin. Surface with growth lines and often irregular commarginal striae. Hinge with cardinals more or less parallel to the margin, partly fused; laterals absent. No subumbonal pit. Pallial sinus very shallow to obsolete. Ctenidia with one demibranch only. Six species are known from west African waters, two others from the Mediterranean and the Ibero-Moroccan Gulf.

Species treated (1)

Isorropodon bigoti Cosel & Salas, 2001.

Other species reported in the area (14)

Vesicomya atlantica (E.A. Smith, 1885). Off Mauritania, 3118-3139 m (Cosel & Salas 2001); Canaries Basin, 1564-2588 m; off Guinea-Bissau, 1944-2131 m; off Angola, 527-4566 m; off Namibia, 439-2864 m (all Allen 2001); also Azores and off W. Europe.

Vesicomya adamsii (E.A. Smith, 1885). Off Sierra Leone, 4410 m (Smith 1885); off Namibia, 5124 m (Cosel & Salas 2001).

Waisiuconcha haeckeli Cosel & Salas, 2001. Off Mauritania, 606-1200 m (Cosel & Salas 2001).

Isorropodon striatum (Jaeckel & Thiele, 1931). Off Cameroon 2492 m (Thiele & Jaeckel, 1931).

Isorropodon curtum Cosel & Salas, 2001. Off Mauritania, 900-1200 m (Cosel & Salas 2001).

Isorropodon atalantae Cosel & Olu, 2009. Congo Canyon, 3159–3113m (Cosel & Olu 2009).

Isorropodon elongatum (Allen, 2001). Off Guinea-Bissau, 1976 m; off Namibia, 481-1014 m (Allen 2001, as *Kelliella elongata*).

Isorropodon tenina (Allen, 2001). Off Namibia, 1014 m (Allen 2001, as *Kelliella tenina*).

Callogonia mauritanica Cosel & Salas, 2001. Off Mauritania 900-1200 m.

Laubiericoncha chuni (Jaeckel & Thiele, 1931). Off Cameroon, 2492 m (Thiele & Jaeckel 1931, as *Vesicomya chuni*); Ghana (4°58'N, 3°48'E), 2268-2332 m, Congo Canyon, 3113-3159 m (Cosel & Olu 2009).

Elenaconcha guiness Cosel & Olu, 2009. Off Mauritania, 900-1200 m; off Gabon, 439-670 m (Cosel & Olu 2009).

Wareniconcha guineensis (Jaeckel & Thiele, 1931). Off Cameroon, 2492 m (Thiele & Jaeckel 1931, as *Vesicomya guineensis*); Congo Canyon, 3159-4017 m (Cosel & Olu 2009).

Christineconcha regab (Cosel & Olu, 2009). Congo Canyon, 3113-3170 m (Cosel & Olu 2009).

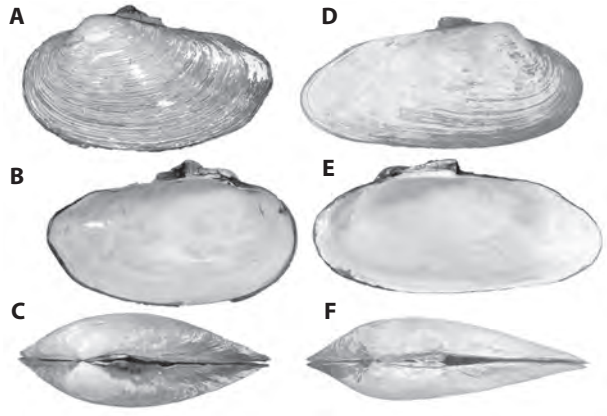
Calyptogena valdiviae (Jaeckel & Thiele, 1931). Off W. Sahara, 2500 m; off Cameroon, 2492 m (Thiele & Jaeckel 1931, as *Vesicomya valdiviae* and *Vesicomya longa*); off Gabon, 579-670 m (Cosel & Olu 2009).

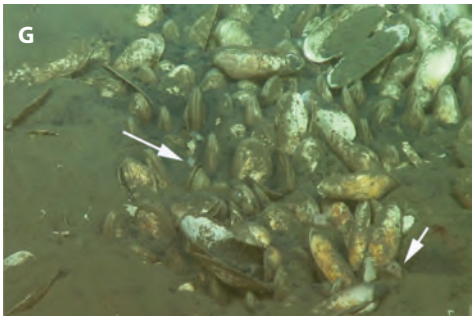
The Vesicomyidae: giant chemosymbiotic clams of the deep

The first five species of large vesicomyids from the eastern Atlantic were taken in 1898 by the German R/V *Valdivia* off West Africa, three species in the Gulf of Guinea and two from off Rio de Oro (NW-Africa). They were published by Thiele and Jaeckel (1931) at a time when the significance of those findings was not understood, and they were just large, strange deep-water clams.

The late 20th century staged the discovery of deep-sea features such as hydrothermal vents and cold seeps. Vents are volcanic activity, unlikely to occur on the West African margin. Conversely, cold seeps are places of the ocean floor where hydrogen sulphide, methane and other hydrocarbons escape naturally from the sediments of the sea-floor. Both vents and seeps are characterized by the occurrence of spectacular communities of invertebrates which depend on bacteria for primary production of organic matter, through chemical processes which (unlike photosynthesis) do not require light. The microbial communities act as the base of the food chain and are found either on the seafloor, or as symbionts within the body of larger invertebrate such as bivalves and tube worms.

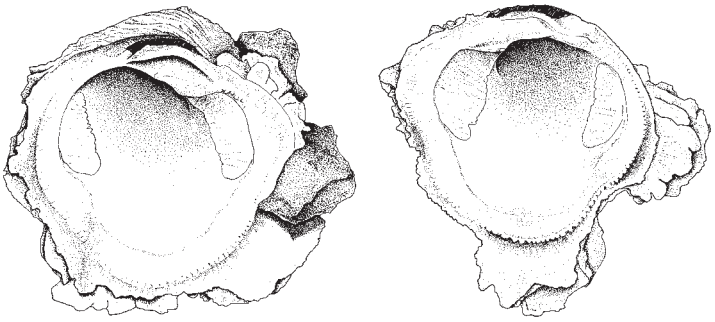
The continental margins of West Africa, like that of eastern South America, have been covered with thick layers of sediments since the continents have rifted apart to become separated by an ocean, and this setting has favoured the formation of major hydrocarbon reserves. The offshore oil exploration revealed the occurrence of important seep areas off the coasts of Congo and Gabon, and their exploration through collaborative projects by the Ifremer and Total (Zaiango and Biozaire expeditions) yielded plenty of specimens of the species that were so far known from a few dead valves (Cosel & Olu 2009).





16.1. **A-C**, *Laubiericoncha chuni* (Thiele & Jaeckel, 1931) from Regab site, 5°47.38'S, 9°44.21'E, 3159-3113 m (83.2 mm, trawled R/V *l'Atalante*, cruise Biozaire 3). **D-F**, *Christineconcha regab* (Cosel & Olu, 2009) from Regab site, 5°57°85'S, 9°42.70'E, 3140-3170 m (holotype, 95.6 mm, collected by Rov "Victor 6000" cruise Zairov 2). **G**, Vesicomyid bed with *C. regab* and *L. chuni* photographed by Rov Victor 6000 on the Regab pockmark off the mouth of the Congo. Arrows show *L. chuni* siphons (reproduced from Ifremer Wacs cruise report 2011, courtesy of K. Olu-Le Roy).

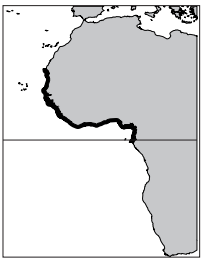
Chama crenulata Lamarck, 1819



16.2. W Rio Morébaya, Guinea, 9°24'N, 14°21'W, 40 m (lv, 46 m; rv, 45 mm).

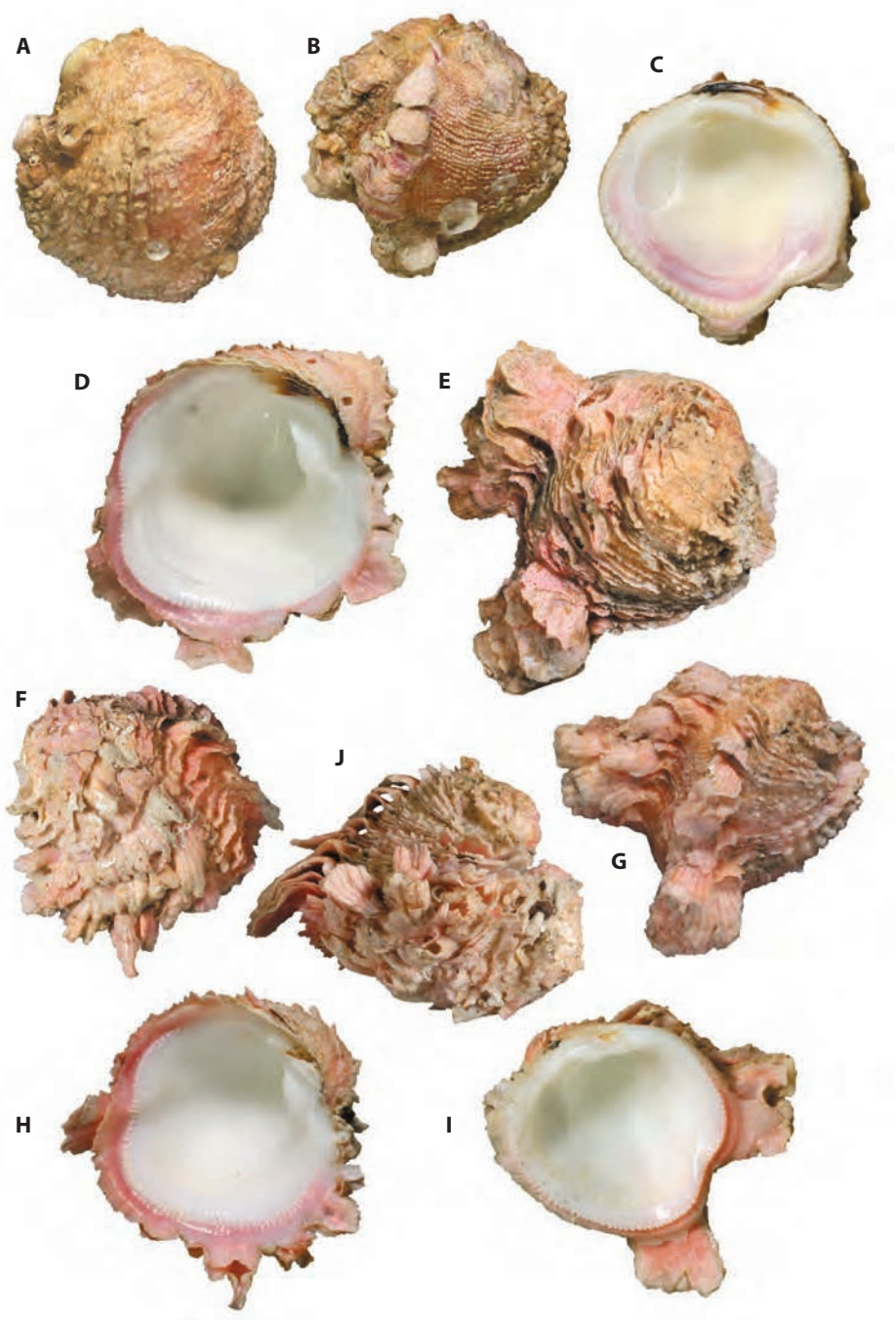
Shell up to 50 mm long and up to 55 mm high, variable in shape and size, with irregular or more or less subcircular inner margin, very inflated, thick and heavy. Surface with numerous, very close-set commarginal lamellae, on the posterior part and sometimes also on the anterior margin mostly more or less foliate. Lamellae overlain by dense, irregular radial ribs with scales where crossing the ribs. Right (upper) valve with a shallow, broad, radial depression on the postero-dorsal slope, delimited by two radial rows of broad, prominent, leaf-like scales. Inner margin crenulate. Outside pink to vivid bright red, occasionally also pinkish yellow with brownish radial rays. Inside white, often with purplish hue, with a bright red rim in the left valve.

Distribution. Mauritania (Cap Blanc) to Gabon (Port Gentil); doubtful occurrence in Angola and in the Cape Verde Islands (Nicklès 1955).



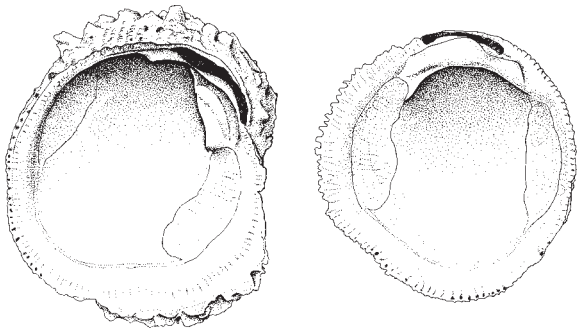
Biotope. On primary hard substrate such as rocks, stones and gravel, as well as on artificial hard substrate like wharfs, buoys, ship hulls and oil drilling platforms, also on shells of live molluscs (*e.g. Cymbium* or even *Conus pulcher* Lightfoot, 1786) and on dead shells on soft bottoms, mostly on open coasts, from low tide level to about 50-60 m; common to abundant. Needs clear water of full salinity.

Remarks. *Chama crenulata* is the commonest West African *Chama*; in Mauritania and Senegal it is more frequently found in shallow water (0-5 m) but also offshore, whereas most samples from the more southern part of its range with fully tropical conditions (Guinea to Gabon) were collected in deeper water (15-45 m). Specimens from these depths have a more leafy sculpture than specimens from near low tidemark, which show a sculpture with more predominant radial ribs. Two juvenile valves from Angola (Luanda and Benguela) might belong to *C. crenulata*. This is "Le Jataron" of Adanson. *Chama placentina* (Defrance, 1817) from the Pliocene of Northern Italy (Sacco 1899), the upper Pliocene of Calabria and Sicily (Malatesta 1963) and from the Pleistocene of Grammichele (Sicily) (Malatesta 1963) is very close or even may be this species (see Dollfus & Dautzenberg 1920).



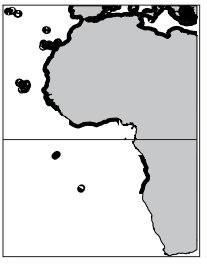
16.3. *Chama crenulata* Lamarck, 1819. **A**-**C**, Dakar region, Senegal, 14°26.5'N, 17°05.5'W, 10-11 m (36.2 mm). **D**-**E**, Senegal, old coll. MNHN (45.0 mm). **F**-**J**, W Kaporo, Guinea, 9°35.8' N, 14°51'W, 33 m (49 mm attached, 45 mm free).

Chama gryphoides Linnaeus, 1758



16.4. Caotinha, Benguela, S-Angola, on rocks, 1-3 m (lv, 20.4 mm; rv, 18.5 mm).

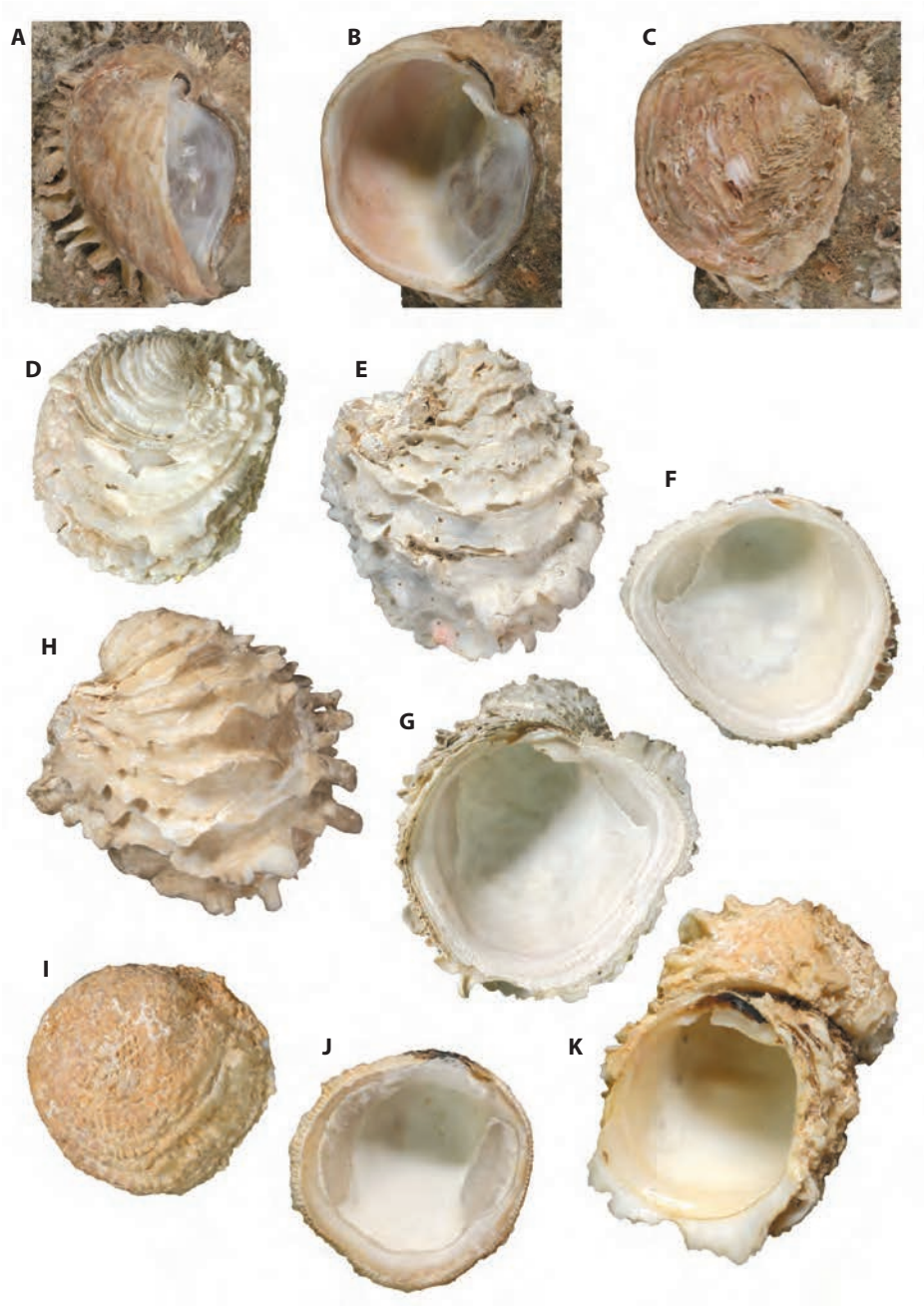
Shell up to 30 mm long, up to 33 mm high, very variable in shape, size, and sculpture, with subcircular or irregular inner margin, more or less inflated, rather thin to thick and solid. Surface with numerous commarginal lamellae with many small leafy or spiny-tubular scales which are very short to rather long. The lamellae can also be broader, more or less continuous and wavy. Inner margin finely crenulate, occasionally partly or entirely smooth. Outside whitish, pale pinkish, irregularly reddish or light brownish, inside white, pale yellowish, brownish or pink.



Distribution. Southern Portugal to Morocco, Senegal (Dakar) and Guinea (9°12′ N and 9°29′ N); eastern Liberia (8°3′W) to Nigeria; northern and southern Angola (Ambrizete to Moçâmedes), no records between these localities; Azores, Madeira, Canary Islands, Cape Verde Islands; Islands in the Gulf of Guinea; throughout the Mediterranean.

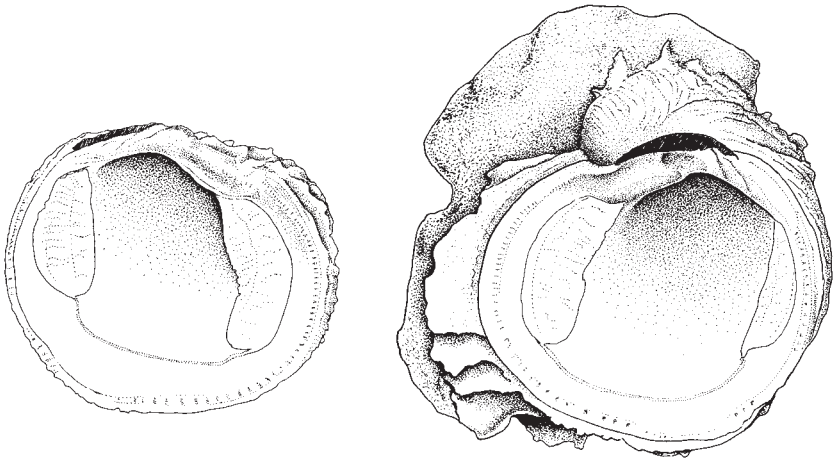
Biotope. On all kinds of hard substrate: rocks, stones, gravel, shells and coral pieces, in the Mediterranean also on the so-called "coralligenous" (bioclastic gravel), from shallow water (1-5 m) to offshore (150-200 m) and occasionally deeper; common in the Mediterranean and on the islands, uncommon to rare on the West African shelf.

Remarks. Specimens of this very variable species collected in deeper water (>100 m) have broader and more continuous commarginal lamellae; this form was described as *C. circinata* Monterosato, 1878 (= *C. nicolloni* Dautzenberg, 1892), which are here considered synonyms of *C. gryphoides*. Specimens from Angola show very slight differences in sculpture but remain within the variability of *C. gryphoides*. Two lots labelled as *C. sarda* Reeve, 1847 (a Caribbean species), from Ilha do Principe, were encountered in the old collection of MNHN. As modern records are missing, this cannot be confirmed; these specimens more likely fall also into the variability of *C. gryphoides*.



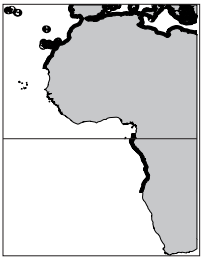
16.5. *Chama gryphoides* Linnaeus, 1758. **A**-**C**, SW of Ponta Garbeiro, Fogo, Cape Verde Islands, 70-120 m (18.7 mm). **D**-**G**, off Abidjan, Côte d'Ivoire, 200 m (29.0 mm). **H**, Abidjan region, Côte d'Ivoire (29.0 mm). **I**-**K**, Caotinha, Benguela prov., S-Angola, 12°36'S, 13°15'E, low tide (21.5 mm attached, 14.8 mm free valve).

Pseudochama gryphina (Lamarck, 1819)



16.6. Pointe-Noire region, Congo (lv, 25 mm; rv, 28 mm without substrate).

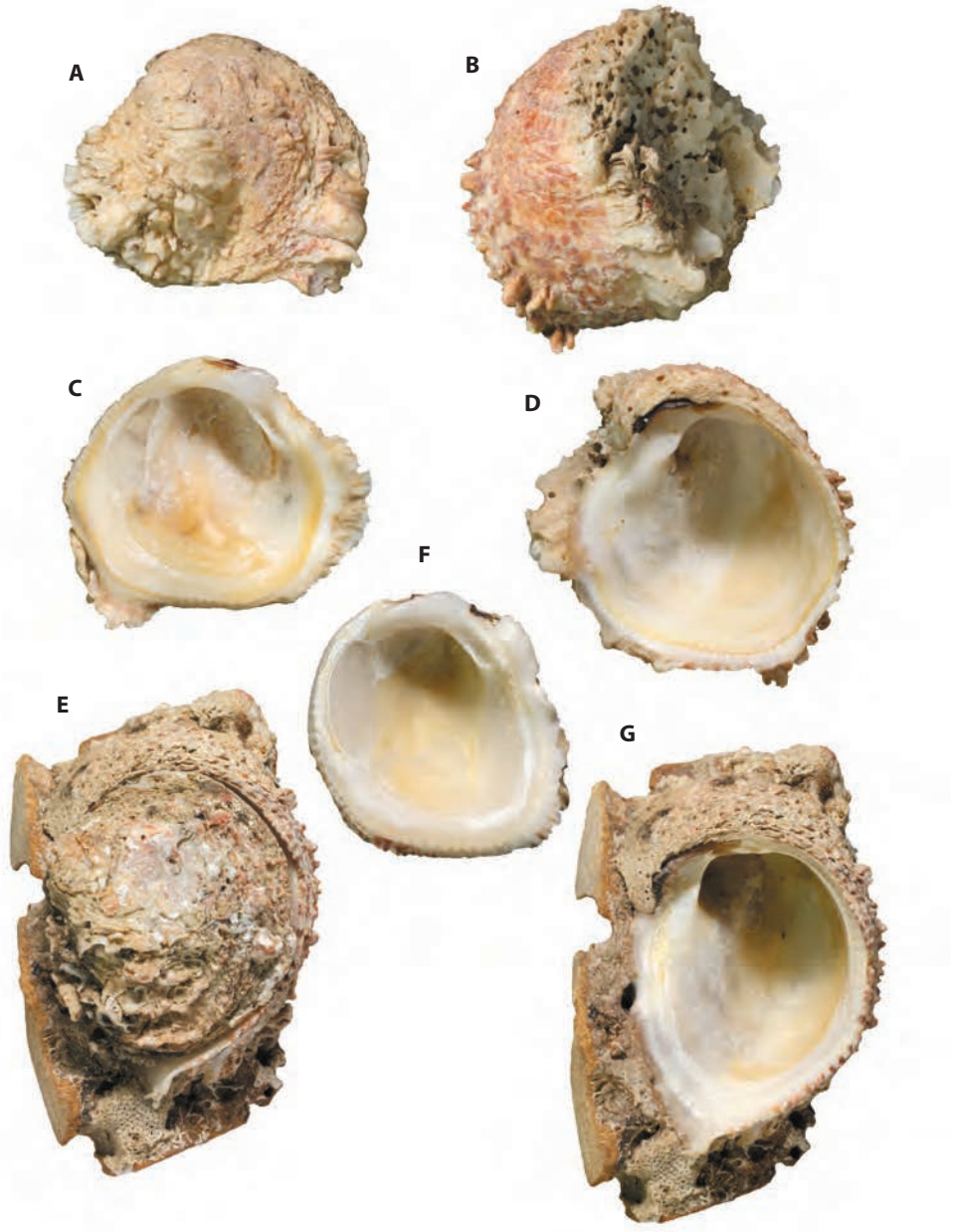
Shell up to 40 mm long and up to 43 mm high (right valve), very variable in shape, sculpture and size, thick and heavy, with irregular inner margin, often showing a somewhat broadly trigonal outline. Lower (right) valve very inflated, left valve more compressed. Surface with very irregular, narrow to broad and leaf-like, commarginal lamellae, often eroded or encrusted by calcareous algae, worm tubes or vermetid snails. Inner margin distinctly crenulate. Outside whitish, often with light brownish to somewhat reddish brown or brownish speckles on the white background. Inside white, pale yellowish, occasionally with a brownish, or light greenish hue.



Distribution. Southern Portugal to Mauritania; Gabon to southern Angola (Benguela); Azores, Madeira, Canary Islands; throughout the Mediterranean.

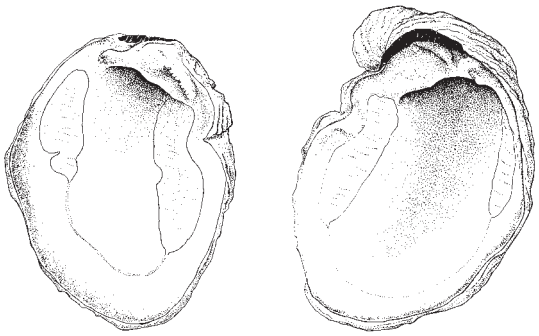
Biotope. On hard bottom such as rocks and stones, in clear water offshore from about 10 to 60 m, not uncommon.

Remarks. This species has a large distribution gap in the tropical part of West Africa. There is no material present from Cape Verde Islands or from the continental coast between Mauritania and Gabon. Angolan specimens do not show any substantial difference to specimens from the Mediterranean, except for habitat which in the Mediterranean is usually within the first meter depth.



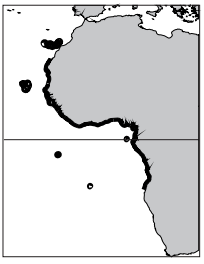
16.7. *Pseudochama gryphina* (Lamarck, 1819). A-D, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (23.0 mm). E-G, Cabo Ledo, Bengo prov., N-Angola, 10-40 m (18.0 mm).

Pseudochama cristella (Lamarck, 1819)



16.8. Baia Porto Grande, São Vicente, Cape Verde Islands, on beach W of Mindelo (lv, 37.3 mm; rv, 41.6 mm).

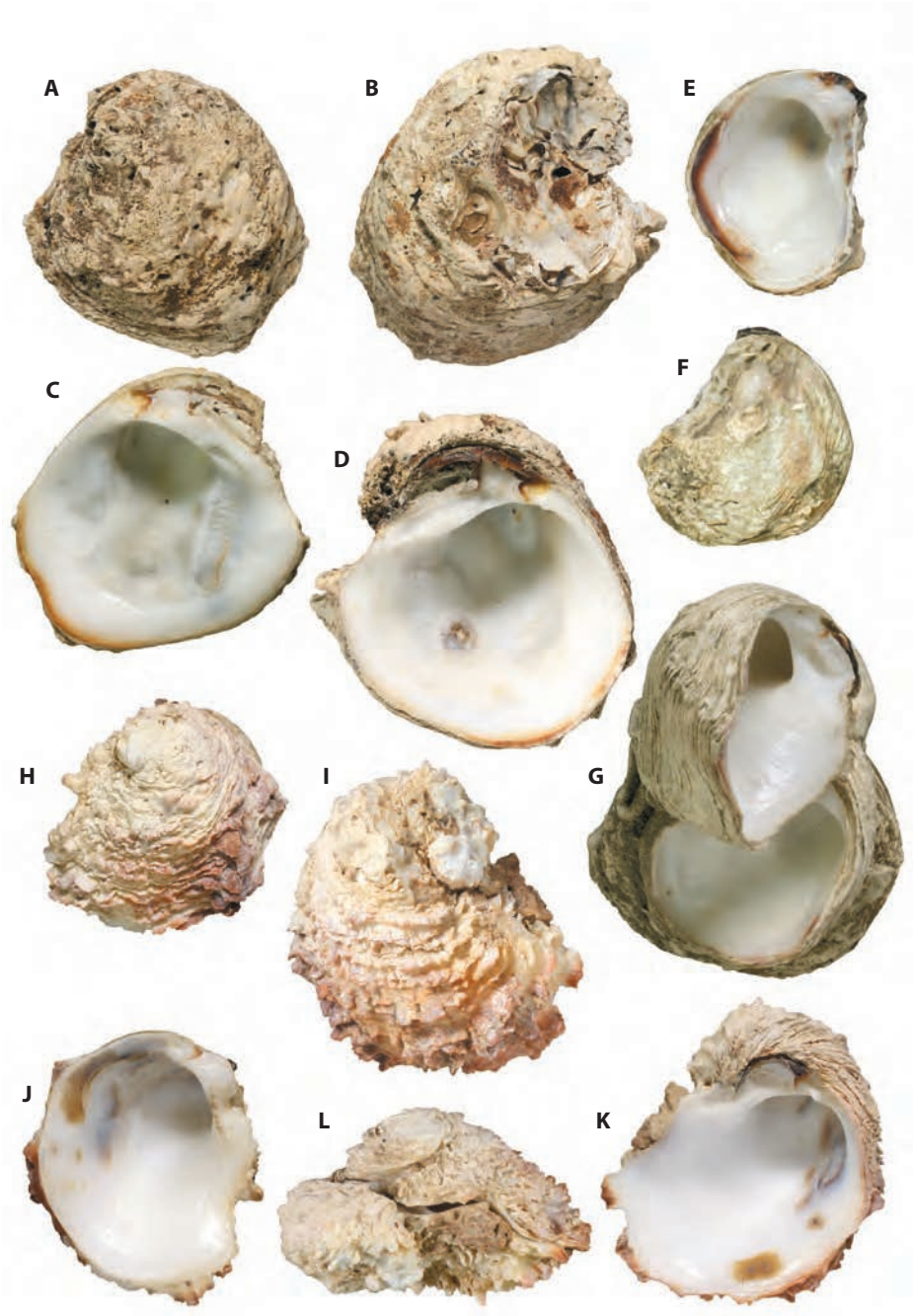
Shell rather large, up to 65 mm long and up to 90 mm high (right valve), extremely variable in shape, with irregular, subcircular or somewhat subtrigonal inner margin, with very inflated right valve and inflated left valve, thick and heavy. Surface with irregular, close-set commarginal lamellae, mostly narrow, eroded and often heavily encrusted by calcareous algae and remains of sessile organisms. Inner margin mostly smooth, very rarely showing crenulations. Outside whitish, often with brown on the posterior part, occasionally also with yellow. Inside white to pale bluish grey, often brownish in the umbonal area or with dark brownish spots and flecks on the margins, other specimens have a light to dark brown rim along the margin or a part of it.



Distribution. S of Rio de Oro (Lemsid, N of Nouakchott) to southern Angola (Santo Antonio, Benguela); Canary Islands (Hernández *et al.* 2011), Cape Verde Islands, Ascension, St. Helena; Also throughout the Caribbean.

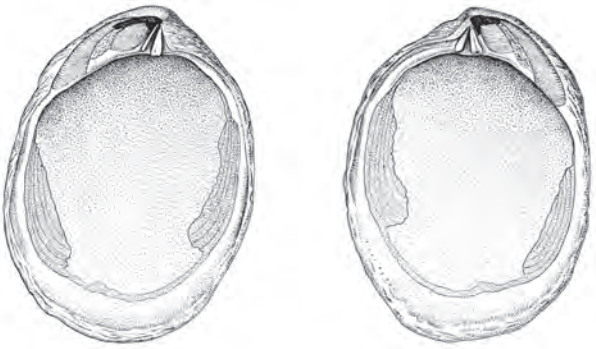
Biotope. On rocks and stones, on rocky shores or rocky zones within sandy coasts, from the low water mark to about 3 m, occasionally deeper, to 10 m. The species is mostly found in murky and sediment-laden water, except in the Cape Verde Islands where it lives in clearer water. It tolerates salinity reductions within certain limits and was found for example on the Conakry Peninsula together with *Diplodonta circularis*, *Pitar virgo*, *Crassostrea tulipa*, *Anomia* sp. and the snail *Turritella gemmata* Reeve, 1849. Common to abundant in its proper habitat.

Remarks. Huber (2010) discussed at length the name of this species, concluded that *Chama radians* Lamarck, 1819 and *C. cristella* Lamarck, 1819 are the same that both were described with a wrong Indo-Pacific locality. As first reviser he selected *Chama cristella*, which is also the type species of *Pseudochama*, as the valid name. This species also occurs in the Caribbean where it is found in the same type of habitat. Occasionally "right handed" specimens are encountered; among the reference material, a lot from Gabon (Cap Esterias) has this particularity.



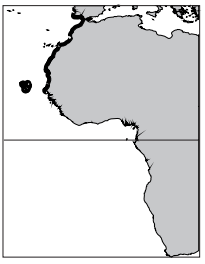
16.9. *Pseudochama cristella* (Lamarck, 1819). A-D, Gorée, Senegal (60.0 mm). E-G, Cap Esterias, Libreville, Gabon (free valve 34.0 mm, attached 39.4 mm). H-L, Praia Etambar, Corimba, Luanda prov., N-Angola (rv, 45.1 mm).

Ungulina rubra de Roissy, 1804



16.10. Baie de l'Etoile, Mauritania, low tide (22.3 mm ht).

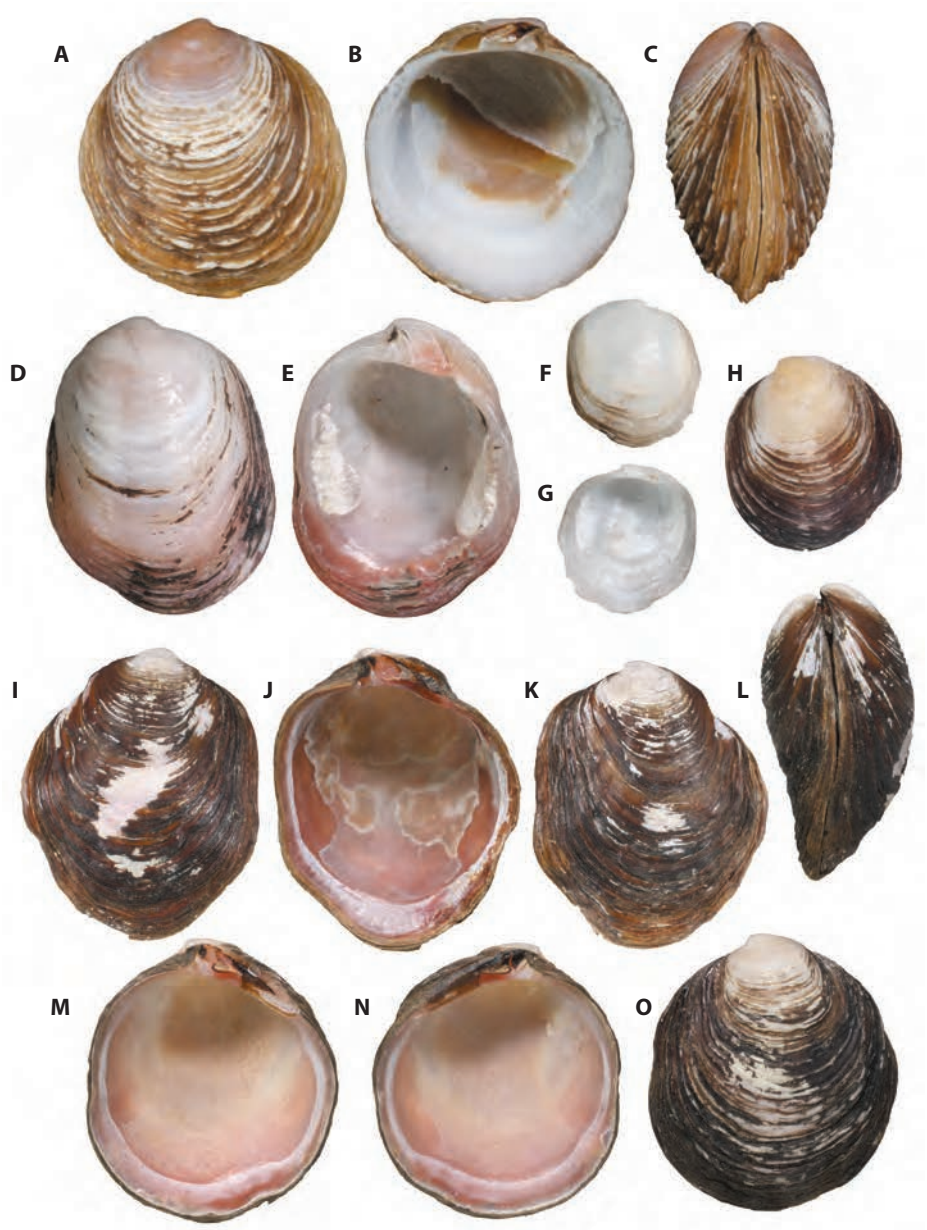
Shell up to 32 mm long, extremely variable in outline, shape and tumidity, circular, subcircular or irregular-oval, most frequently slightly higher than long but occasionally longer than high, solid, quite inflated. Beaks generally more or less anterior to the vertical midline. Surface with very irregular, coarse, commarginal ridges, growth lines and growth stages. Inner margin smooth. Periostracum strong, thick and brown to dark brown or nearly black, on the umbos often more or less eroded. Outside dirty whitish pink to reddish, inside light to dark reddish, often with a brownish layer extending from the umbonal cavity to the pallial line.



Distribution. Portugal (Milfontes to Algarve Coast) and Alboran Sea (Fuengirola) to Senegal (Dakar); Cape Verde Islands. Dunker (1853) recorded it from Luanda, Angola, but there are no recent findings.

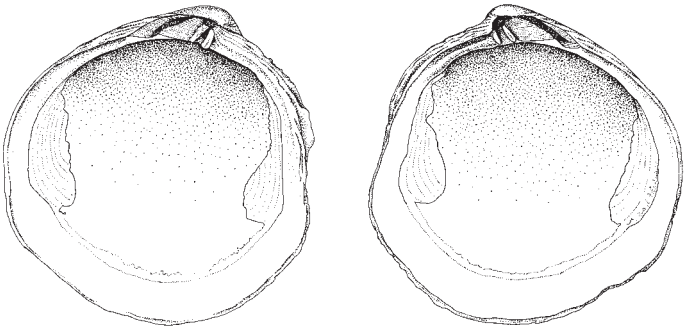
Biotope. On rocky coasts in patches with coarse sand or in crevices between rocks as well as in empty bore holes, from low tide to about 5 m, not uncommon.

Remarks. This species was commonly known as *Ungulina cuneata* (Spengler, 1798). However, examination of the type material in ZMC Copenhagen revealed that *Tellina cuneata* Spengler, 1798 is an Indian Ocean ungulinid (Huber 2015); de Roissy's name is hence the first available name for this West African species. This is a typical warm-temperate species with distribution centre in the northern upwelling zone. More tropical conditions are encountered only in the Cape Verde Archipelago. This is the type species of the genus *Ungulina*. Synonyms are *U. oblonga* Lamarck, 1818 and *U. transversa* Lamarck, 1818.



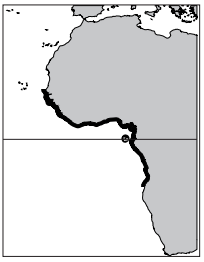
16.11. *Ungulina rubra* de Roissy, 1804. **A**-**C**, Tan Tan Plage, Atlantic Morocco (15.6 mm ht). **D**-**E**, Baia Algodoeiro, Ilha do Sal, Cape Verde Islands, on beach (20.5 mm ht). **F**-**G**, same locality (7.5 mm ht). **H**, Baia Mordeira, Ilha do Sal, Cape Verde Is., on beach (12.6 mm ht). **I**-**L**, Senegal (23.7 mm ht), old coll. MNHN ex-Daudin. **M**-**O**, same locality (23.0 mm).

Ungulina alba Dunker, 1853



16.12. Dixinn Port, Conakry, Guinea, on sand between rocks at low tide (16.6 mm).

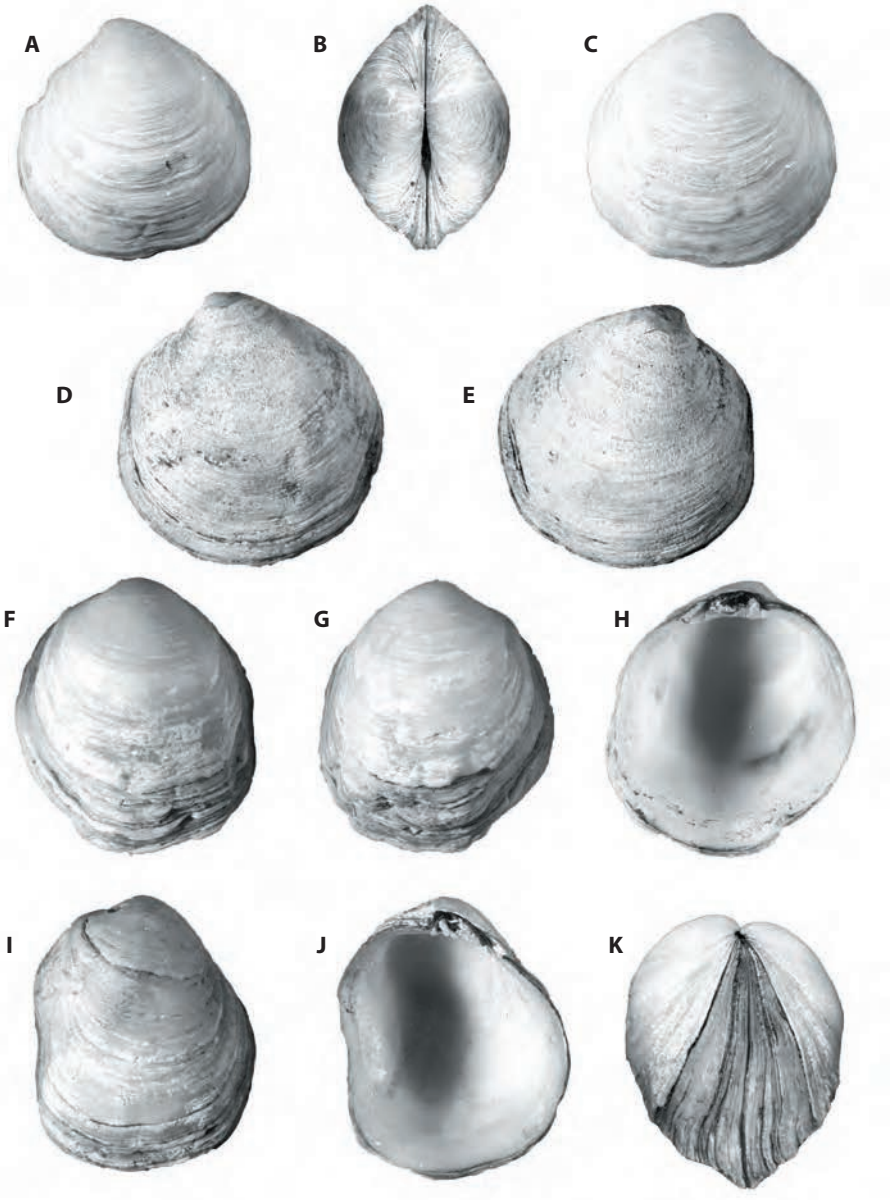
Shell up to 25 mm long, very variable in shape and tumidity, irregularly circular to subcircular, longer than high to slightly higher than long, thick and solid, inflated. Beaks median or slightly anterior to the vertical midline. Surface with very irregular, coarse growth lines and stronger growth stages. There are also occasional indents or depressions. Inner margin smooth. Periostracum thin, nearly colourless, persistent only in the marginal growth stages. Outside and inside entirely white.



Distribution. Senegal (Dakar) to southern Angola (Santo Antonio, Benguela); São Tomé, Ilha do Principe.

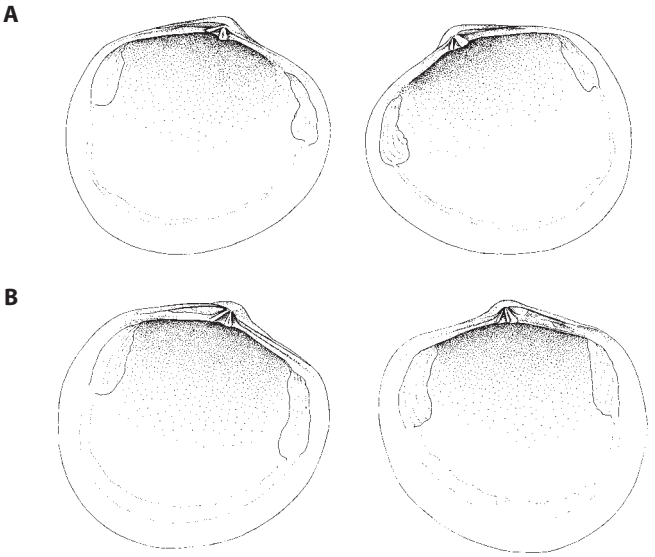
Biotope. On rocky shores in coarse sand, gravel and between stones, also in crevices and empty boreholes of rocks, from low tide to shallow water (3-5 m), not uncommon.

Remarks. This species replaces *U. rubra* in the tropical part of the West African coast; the two species seem to co-occur only at Dakar. Empty valves are found on beaches near rocky coasts. *U. alba* resembles *Diplodonta* (*Felania*) *circularis* (see below), but is distinguished by the irregular and thicker shell and the still shorter and broader ligament in a very deep groove, which are also the principal differences between the two genera.



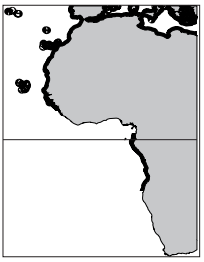
16.13. *Ungulina alba* Dunker, 1853. A-C, Presqu'île du Cap-Vert, Senegal (23.1 mm). D-E, Morton Bay, Victoria (now Limbe), Cameroon, intertidally (19.1 mm). F-H, Barra do Dande, Bengo prov., N-Angola (15.1 mm). I-K, same locality (14.2 mm).

Diplodonta (*Diplodonta*) *rotundata* (Montagu, 1803)



16.14. **A**, Baia Santo Pedro, São Vicente, Cape Verde Islands (19.8 mm). **B**, lv, W Baie de Sangarea, Guinea, 9°42'N, 15°31.7'W, 35 m (22.4 mm); rv, SW Ouendi, Guinea, 9°54.3'N, 14°25'W, 25 m (16.2 mm).

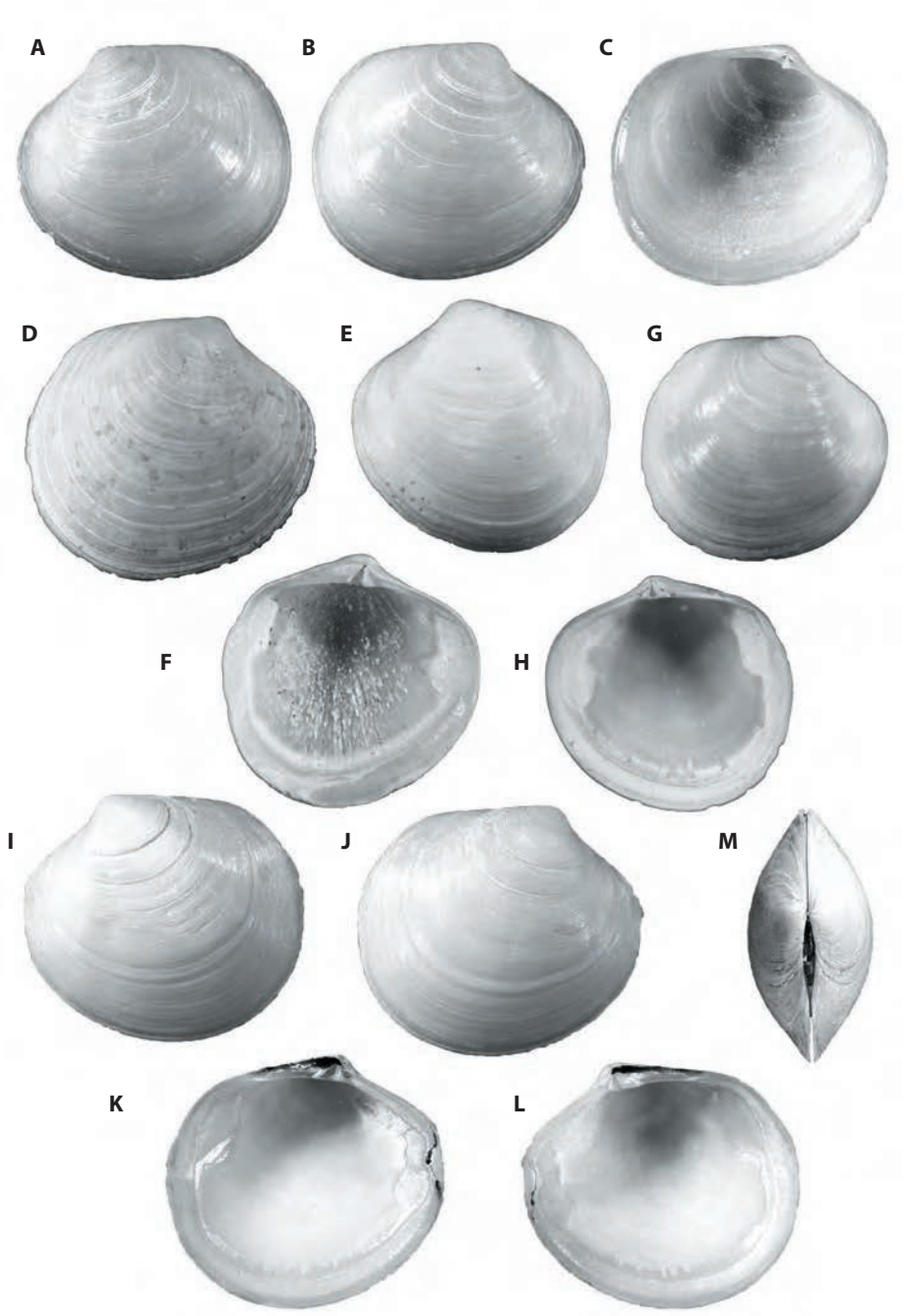
Shell up to 30 mm long, variable in shape, subcircular, longer than high, with posterior part markedly broader than anterior part, moderately thin, rather solid, somewhat inflated. Beaks well in front of the vertical midline. Surface smooth, with irregular, commarginal growth lines and several coarser growth stages. There are occasionally a few very faint radiating waves on the anterior and posterior part, only visible under a lens (x 10). Periostracum thin, light brownish to nearly colourless, persistent mostly on the marginal part of the valves. Outside and inside uniform white.



Distribution. West coast of Ireland, Channel and Wales southward to Guinea-Sierra Leone border; Gabon (Ile Banié) to southern Angola (Lucira); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

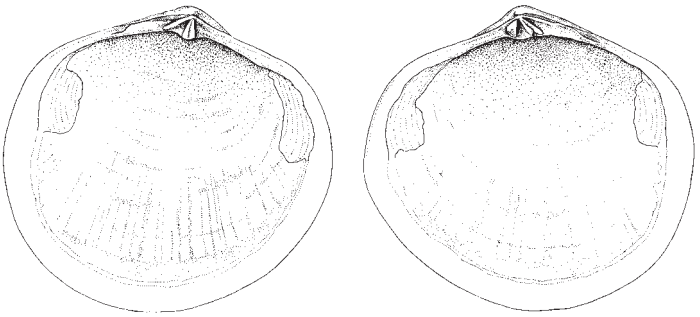
Biotope. In fine, mixed and coarse sand, also with gravel, from shallow water (5-10 m, Europe and Angola only) to offshore (20-70 m, all regions) common in Europe, rarer in West Africa.

Remarks. This species seems to prefer areas with seasonal or permanent upwelling; there are no records yet known from Liberia to Cameroon. Specimens from Guinea and Angola show a markedly less pronounced nymph, with the ligament visible from the interior as in *Felania* (see drawing); this character is here considered to fall within the variability of the species. Outside Europe, shells and valves are regularly cast ashore only in Gabon (Port-Gentil) and Angola. This is the type species of the genus *Diplodonta*.



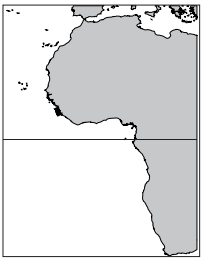
16.15. *Diplodonta (Diplodonta) rotundata* (Montagu, 1803). **A**-**C**, Baia S. Pedro, São Vicente, Cape Verde Islands (19.4 mm). **D**, W of Baie de Sangarea, Guinea, 9°42'N, 15°33'W, 35 m (20.3 mm). **E**-**F**, Ile Banié, N-Gabon, shallow water (27.5 mm). **G**-**H**, same locality (26.3 mm). **I**-**M**, Futungo, Baia do Mussulo, Luanda prov., N-Angola (22.0 mm).

Diplodonta (*Diplodonta*) *undata* Cosel, 1995



16.16. Iv, W of Ile Kouffin, Guinea, 10°33'N, 15°43'W, 23 m, rv, W of Rio Nunez, Guinea, 10°36'N, 15°30'W, 25 m (both 22.8 mm).

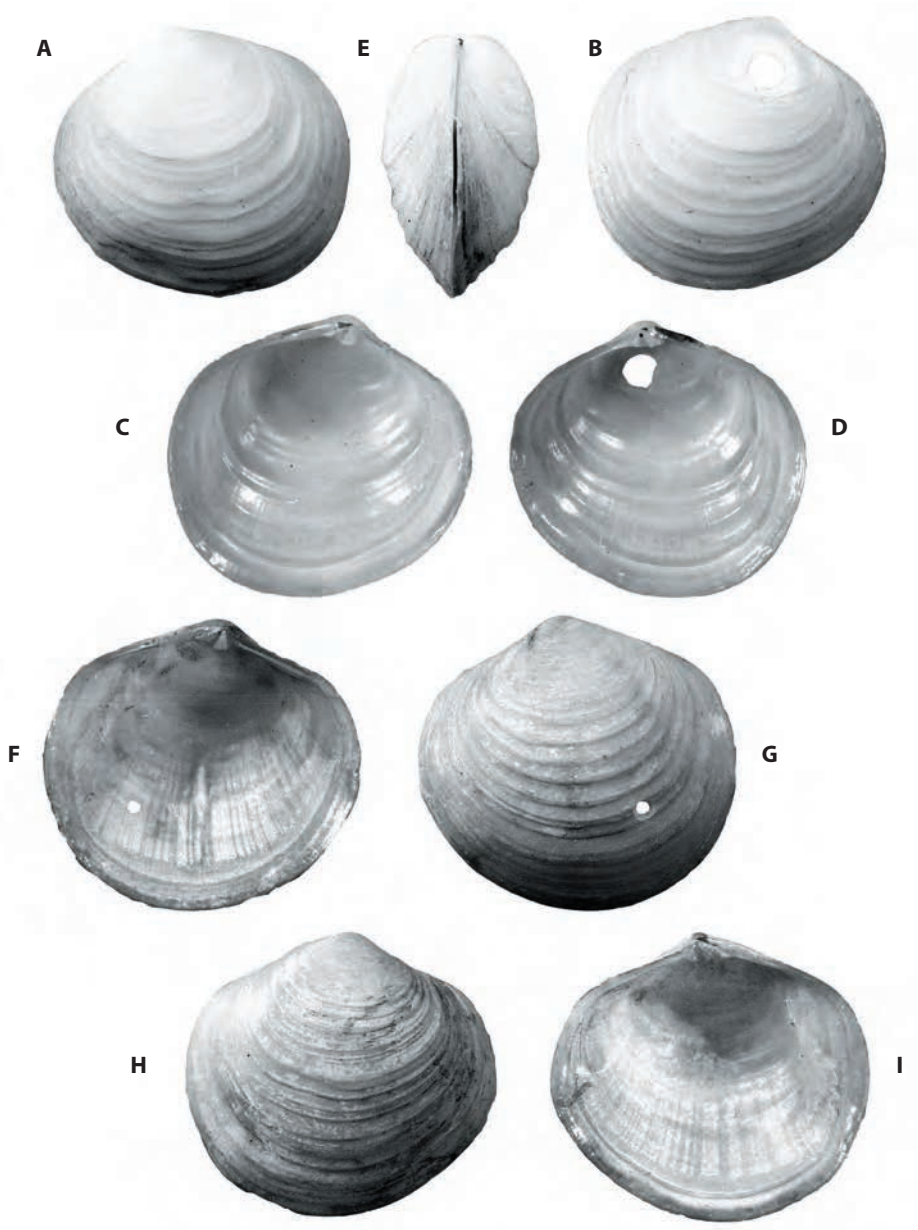
Shell up to 24 mm long, somewhat variable in shape, subcircular, slightly longer than high, with posterior part broader than anterior part, thin but solid, inflated. Beaks in front of the vertical midline. Surface with very coarse and rather broad, irregular, commarginal waves, with which the growth stages are integrated. No microsculpture. The waves are reflected on the interior, especially in juvenile specimens. Periostracum very pale yellowish, nearly colourless, usually eroded on the umbonal part of the valves. Outside and inside dirty whitish.



Distribution. Only known from the continental shelf of Guinea (9°12'N - 10°36'N) where the species was discovered in 1988, but most probably also distributed southward and perhaps northward.

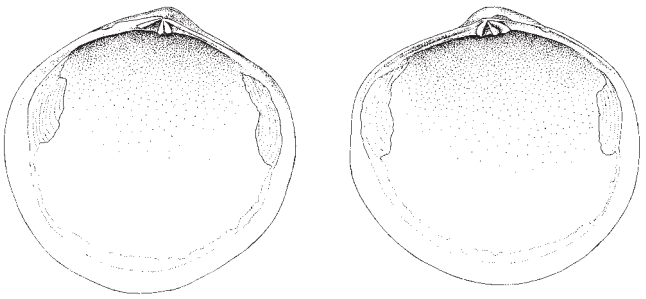
Biotope. In coarse sand, often with gravel, stones or shell concentrates, from 20 to about 50 m, rare.

Remarks. This species is distinguished from *D. rotundata* principally by its sculpture of conspicuous commarginal waves. The shell is also slightly higher; in contrast to the Guinean specimens of *D. rotundata*, the ligament is always on a well-developed nymph and not visible from an interior view of the valve.



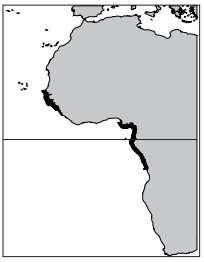
16.17. *Diplodonta (Diplodonta) undata* Cosel, 1995. **A**-**E**, W of Kaporo, Guinea, 9°35.5'N, 15°48'W, 32 m (holotype, 15.2 mm). **F**-**G**, W of Rio Nunez, Guinea, 10°36'N, 15°30'W, 25 m (paratype, 22.4 mm). **H**-**I**, W of Ile Kouffin, Guinea, 10°33'N, 15°43'W, 23 m (paratype, 23.1 mm).

Diplodonta (*Diplodonta*) *enigmatica* Cosel, 1995



16.18. lv, W Ouendi, Guinea, 9°54.3'N, 15°25'W, 25 m; rv, W of Rio Yomboya, Guinea, 10°27'N, 15°53.5'W, 20 m (both 16.9 mm).

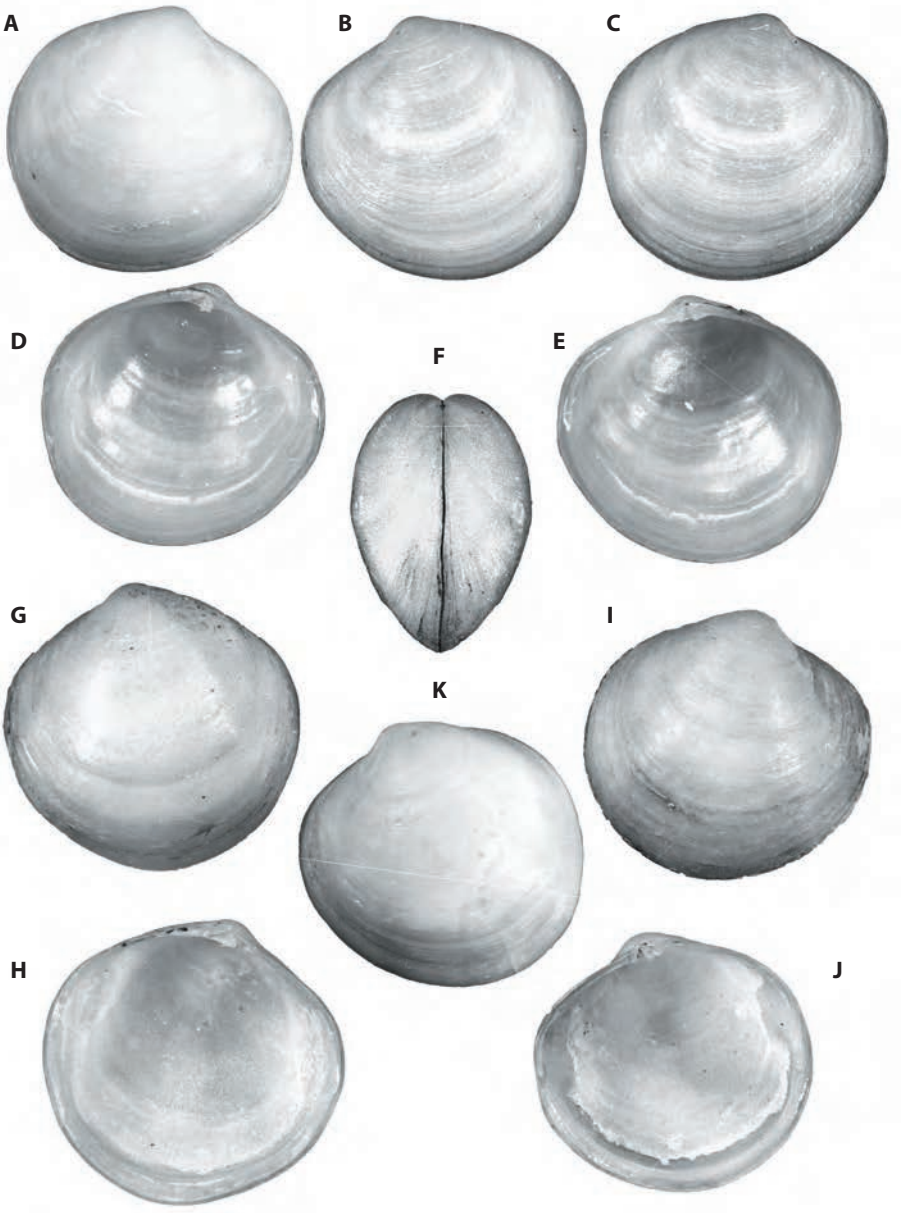
Shell up to 18 mm long, quite variable in outline and tumidity, circular to subcircular, as long as high or only slightly longer than high, with posterior part broader than anterior part, thin but solid, inflated to very inflated. Beaks in front of the vertical midline. Surface with commarginal growth lines and very fine, dense, commarginal striae, often obsolete. There are also very fine and close-set pits which become feebler or obsolete on the marginal area of adult valves They are only visible under a lens (x 20-40) and give the surface a punctate aspect. Periostracum thin and very pale yellowish, persistent only on the marginal part of the valves. Outside and inside dirty white.



Distribution. Senegal (Dakar) to Guinea (9°N); Nigeria (Niger delta) to northern Angola (Luanda). No records from Sierra Leone and Liberia and from the atypical tropical zone (Côte d'Ivoire-Bénin).

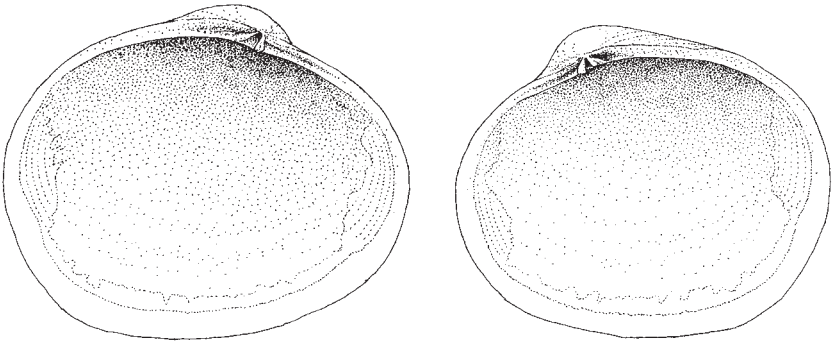
Biotope. In muddy sand and fine sand, offshore from 30 to 70 m and occasionally deeper, not uncommon.

Remarks. This species is distinguished from *D.* (*D.*) *rotundata* by its smaller and slightly higher shell and the fine, punctate sculpture. The nymph is always quite well developed, and the ligament is hardly visible from an inside view. *Diplodonta enigmatica* differs from *D. brocchii* (following entry) by its higher and less obese shell and the more close-set commarginal striae.



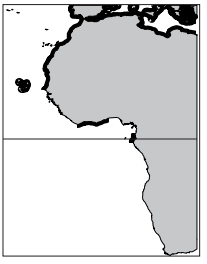
16.19. *Diplodonta (Diplodonta) enigmatica* Cosel, 1995. **A**, Dakar region (rv, 16.8 mm). **B-F**, W of Cap Verga, Guinea, 10°12'N, 15°15'W, 34 m (holotype, 12.8 mm). **G-H**, W of Rio Yomboya, Guinea, 10°27'N, 15°53.5'W, 20 m (paratype, 16.8 mm). **I-J**, same locality (paratype, 16.6 mm). **K**, W of Conakry, Guinea, 8°30'N, 14°02'W, 25 m (paratype, 17.3 mm).

Diplodonta (*Diplodonta*) *brocchii* (Deshayes, 1850)



16.20. Off Cadiz, SW Spain, 106 m (syntypes of *Diplodonta labelliformis*, lv, 22.7 mm; rv, 20.5 mm).

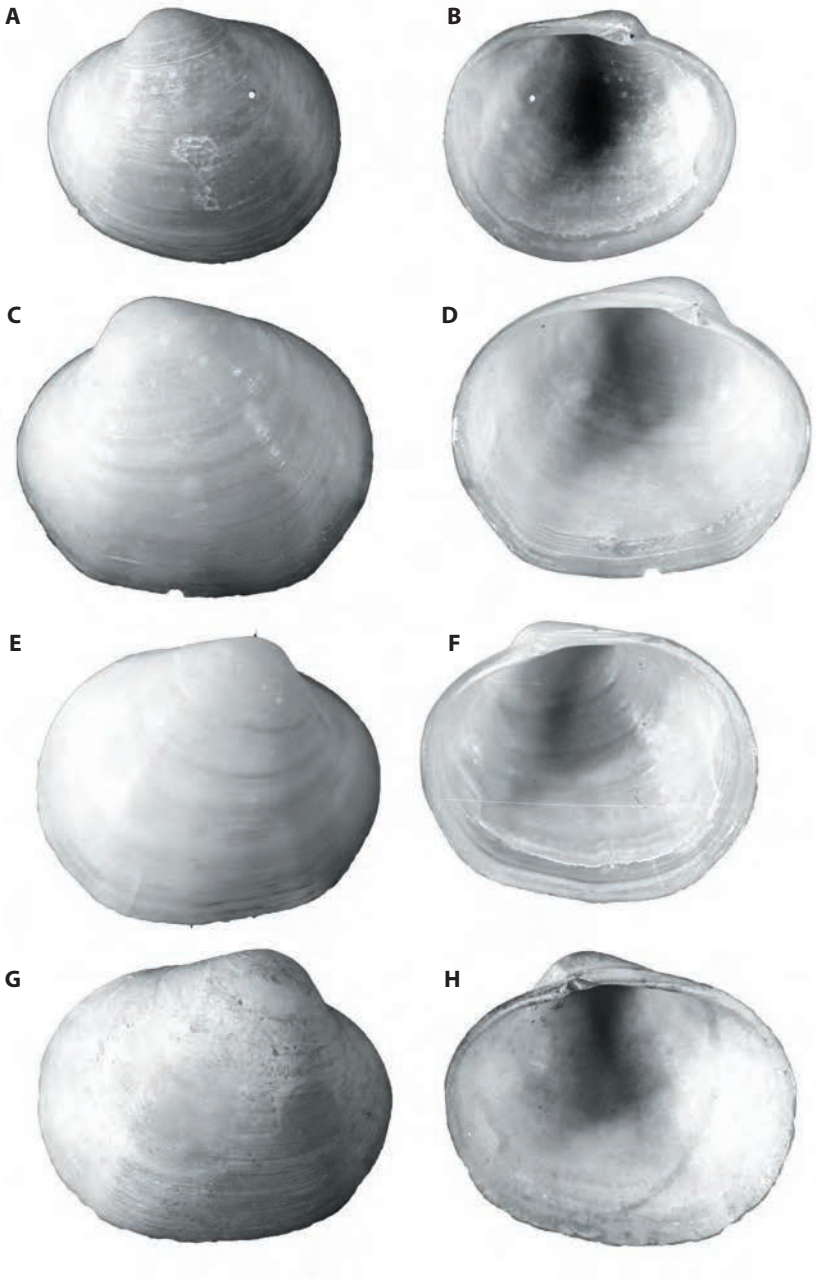
Shell up to 22 mm long, variable in outline, subcircular, somewhat longer than high, usually with posterior part broader than anterior part, rather thin but strong, very inflated to globose. Beaks in front of the vertical midline. Surface smooth, with dense irregular growth lines and coarser growth stages and occasionally with some small irregular depressions or dents. No lunule. Nymph narrow and ligament always visible on an inside view. Periostracum thin. Outside and inside white.



Distribution. Mediterranean (Panetta 1972); Bay of Biscay, Strait of Gibraltar. In West Africa recorded from the Cape Verde Islands, Senegal (Dakar area), Côte d'Ivoire, Ghana and Gabon, there reaching southward to 0°25'N.

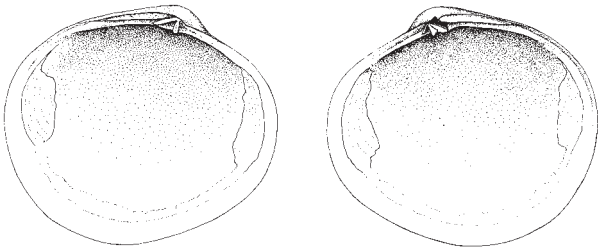
Biotope. Most probably sandy bottom, offshore from about 10 m downward, rare in West Africa.

Remarks. This species differs from *D.* (*D.*) *dautzenbergi* (see next entry) by its somewhat larger shell with always non-punctate surface. *D. brocchii* was described from the Italian Pliocene but there are no appreciable differences between this and Recent specimens. For ecological and taxonomic details, see Panetta (1972) and Carrozza (1983). Synonyms are *D. labelliformis* Locard, 1898 and *D. orbiculata* Locard, 1898.



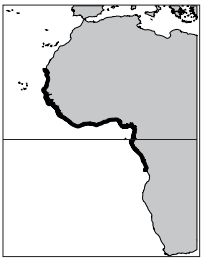
16.21. *Diplodonta (Diplodonta) brocchii* (Deshayes, 1850). **A-B,** SW of Ponta Tantão, Brava, Cape Verde Islands, 56-70 m (17.1 mm). **C-D**, Liberia, 5°21.5'N, 9°54.5'W, 73-80 m (20.6 mm). **E-F**, W of Libreville, Gabon, 0°25'N, 9°00'E, 73 m (18.3 mm). **G-H**, same locality (22.8 mm).

Diplodonta (*Diplodonta*) *dautzenbergi* Thiele, 1931



16.22. W Kaporo, Guinea, 9°36'N, 15°03'W, 39 m (13.2 mm).

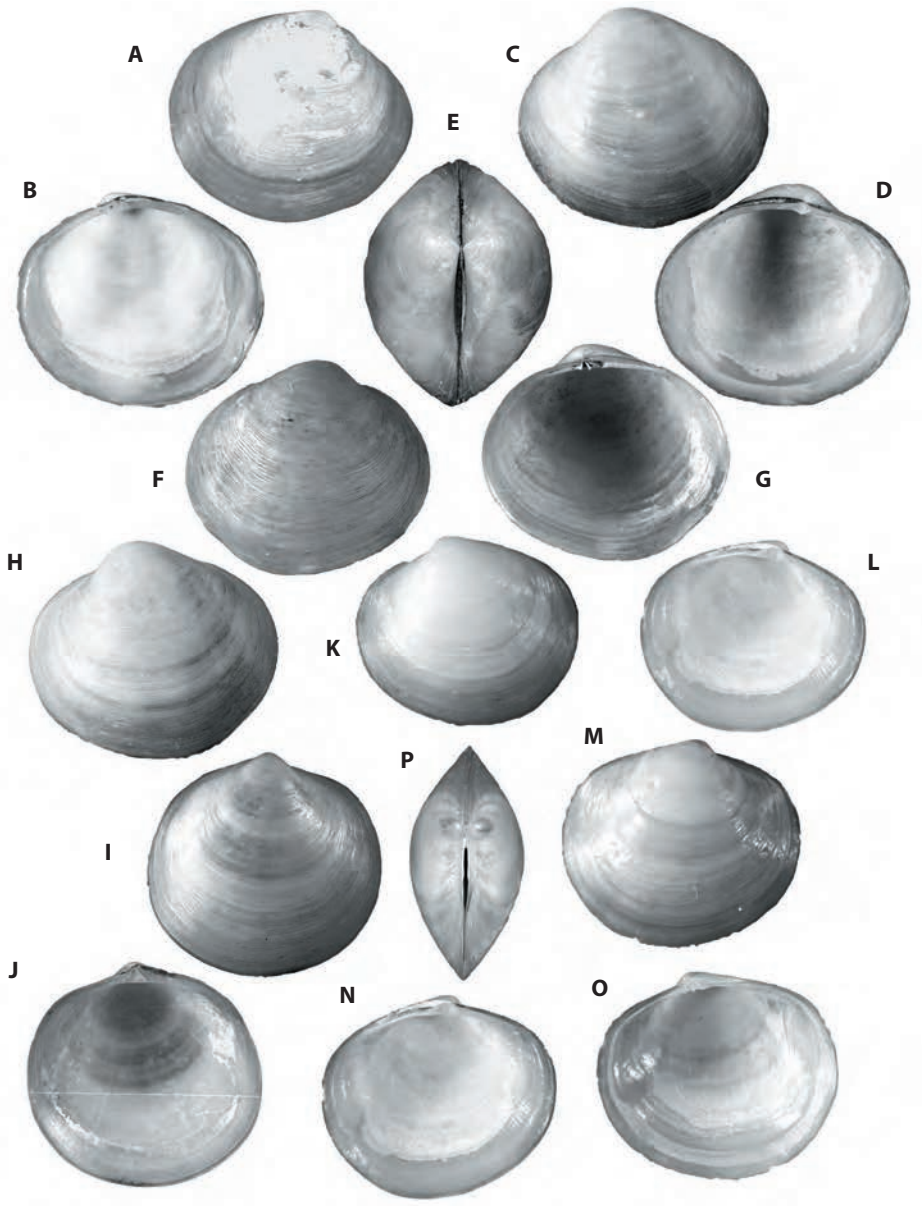
Shell up to 18 mm long, variable in shape and tumidity, subcircular, somewhat longer than high, thin, generally very inflated to globose. Beaks slightly in front of the vertical midline. Surface with fine, densely spaced and more or less, often only slightly irregular commarginal striae, occasionally in form of tiny lamellae, towards the earlier part of the valves and the beaks becoming obsolete. There are also irregular growth lines and coarser growth stages. Very fine and close-set pits over the whole valve or on the umbonal region give the surface a punctate aspect. These pits are only visible under a lens (x 20-40) and are not always present; they are absent on most specimens from the brackish water areas. Nymph narrow and ligament always more or less visible on an inside view. No lunule. Periostracum thin, brownish to reddish brown, thicker in the growth stages. Outside and inside white.



Distribution. Mauritania (Cap Blanc) to northern Angola (Luanda); one old valve from southern Angola (São Nicolau, Namibe province).

Biotope. In fine, mixed and coarse sand, often with gravel or mud or both, offshore as well as in sheltered bays and also in rias and creeks (*e.g.* the Casamance River and "bôlons"), from shallow water (2-5 m) to about 150 m, common. The species seems to tolerate salinity changes in certain limits. Usually not found on the beach.

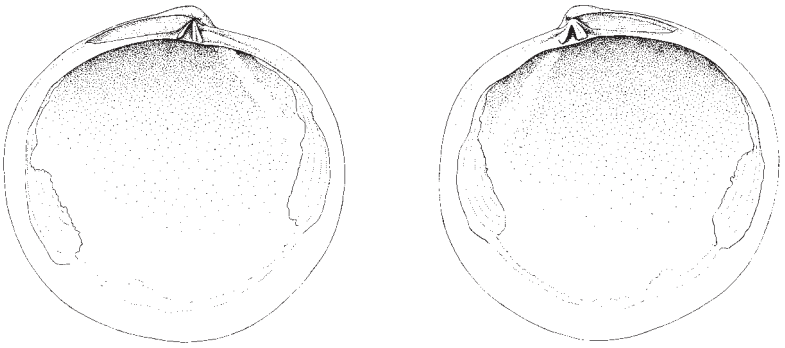
Remarks. This variable species somewhat resembles *Diplodonta enigmatica* but is distinguished by its smaller, somewhat longer and more globose shell and the brownish periostracum. It is also similar to *D. brocchii*, but differs by the smaller size, the dense commarginal striae and the punctate surface. Specimens from the areas with brackish water or drastically changing salinity (*e.g.* along the Casamance River, the Sine-Saloum area on the Petite Côte, Senegal) have wider spaced commarginal lamellae, and the punctate surface sculpture is obsolete; intergrades between smooth and punctate specimens are possible. This species was cited by Nicklès (1955: 155) as "*Diplodonta globosa* (Forsskål, 1775)" which is a similar species from the Red Sea and Indian Ocean. A non-punctate form with a rather glossy periostracum which is not uncommonly found on the beach of Ponta do Mussulo, northern Angola, may perhaps prove to be a separate species. Another *Diplodonta* (Fig. 16.23I-J) recorded from Novo Redondo, Angola, in ZMB is labelled as "holotype of *Diplodonta semisculpta* Martens", however without year of publication.



16.23. *Diplodonta (Diplodonta) dautzenbergi* Thiele, 1931. A-B, Katakalous Bôlon, S-Casamance, 3-4 m (9.7 mm). C-E, W of Ile Kabak, Guinea, 9°18N, 13°45'W, 21 m (13.1 mm). F-G, Mouth of the Congo River (holotype MZB, 11.1 mm). H, W of Libreville, Gabon, 0°25'N, 9°00'E, 73 m (12.3 mm). I-J, Novo Redondo, Angola, 11.6 mm, (with manuscript name "*Diplodonta semisculpta* Martens", ZMB). K-L, Ponta do Mussulo, Luanda prov., N-Angola (17.1 mm). M-P, Baia da Corimba, Luanda prov., N-Angola (10.5 mm).

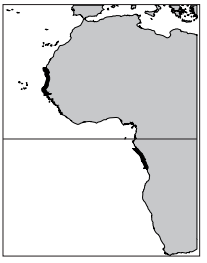
This name could not be traced in the literature, and is presumably unpublished. The specimen is small, rather thick and compressed with fine commarginal striae besides the growth lines.

Diplodonta (*Felania*) *diaphana* (Gmelin, 1791)



16.24. Baie de Gorée, Senegal, 5-20 m (27 mm).

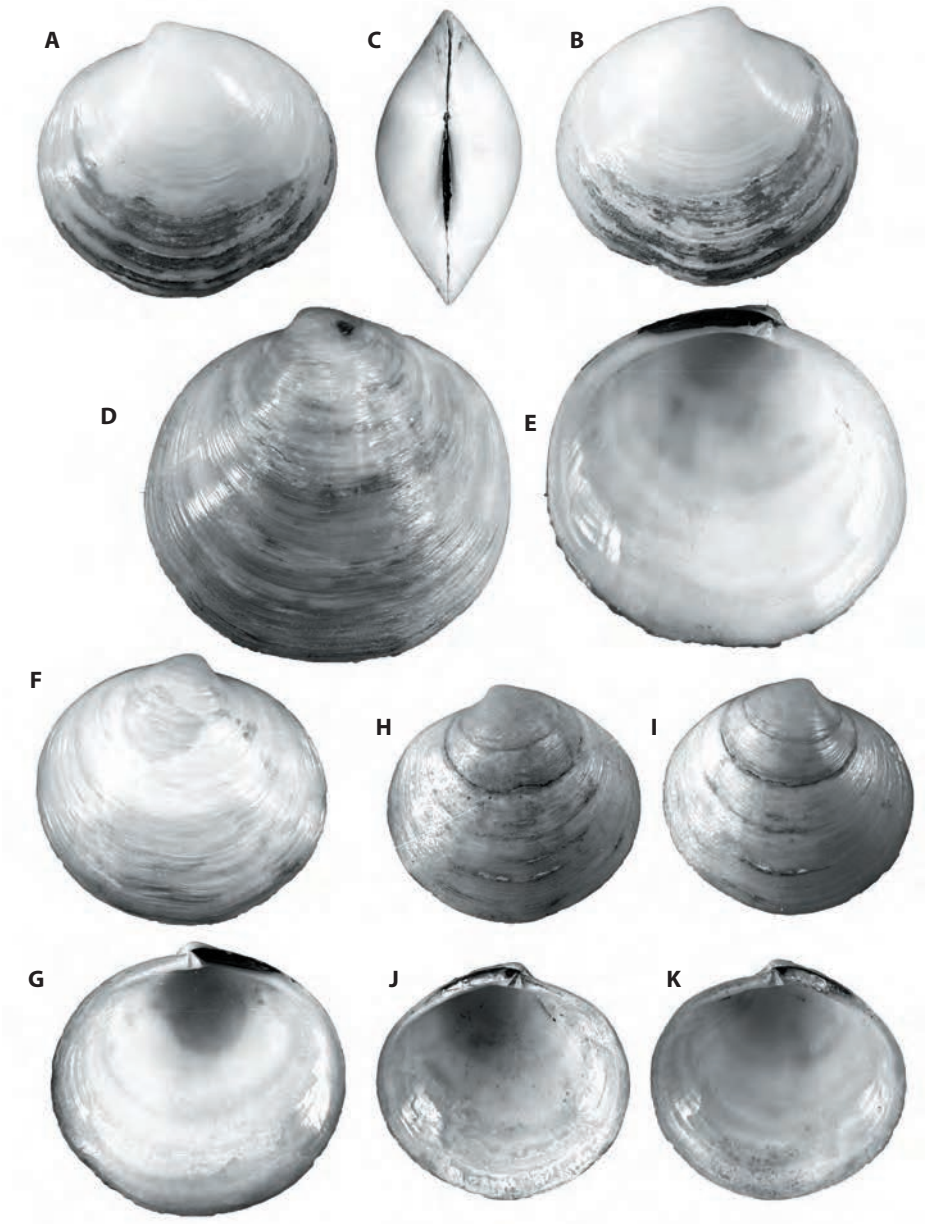
Shell up to 61 mm long, variable in size and also a little in outline, circular to subcircular, generally very slightly longer than high, thin but generally rather solid, quite inflated. Beaks somewhat anterior to the vertical midline. Surface with coarse, dense growth lines and often with some slight, irregular swells or waves but no true sculpture. Lunule extremely small and short. Ligament long and narrow, on a deeply sunken nymphal plate. Periostracum very thin, glossy, colourless to light greyish. Outside and inside entirely white.



Distribution. Mauritania (Cap Blanc) to Senegal (Casamance); Congo Brazzaville to northern Angola (Luanda).

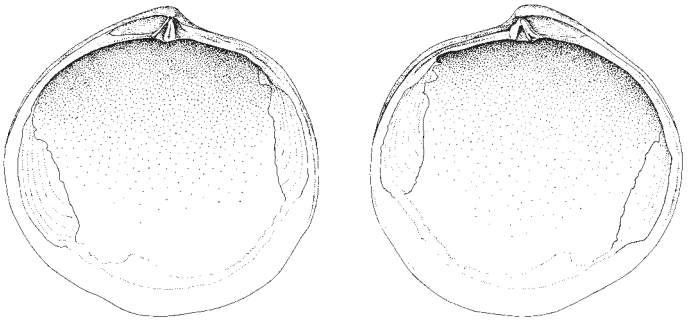
Biotope. In clean mixed and coarse sand, also with gravel, from low tide to about 5 m, only locally common.

Remarks. This species occurs in the northern and southern upwelling zones and has a disjunct distribution. Under the name "*Diplodonta diaphana*", two other species (see next entries) had hitherto been confused with *D.* (*F.*) *diaphana*, which is characterized by its rather large size, long and narrow ligament, entirely white colour and, in comparison with the other species, slightly less inflated shell. Valves and shells are regularly found on beaches, and occasionally live specimens are cast ashore. This is *D.* (*F.*) *gruneri* Dunker, 1846, "Le Félan" of Adanson and the type species of the subgenus *Felania*.



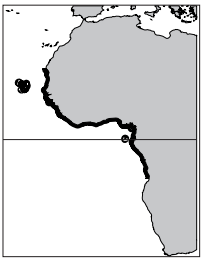
16.25. *Diplodonta (Felania) diaphana* (Gmelin, 1791). **A**-**C**, M'Bour Senegal, beach drift (35.1 mm). **D**-**E**, Pointe-Noire, Congo Brazzaville (61.6 mm). **F**-**G**, Cacuaco, Bengo prov., N-Angola, on beach (50.5 mm). **H**-**K**, unknown locality (holotype ZMB of *Diplodonta gruneri* Dunker, 1846, 29.4 mm).

Diplodonta (*Felania*) *circularis* Dunker, 1846



16.26. Dixinn Port, Conakry, Guinea, on sand with gravel at low tide (23.5 mm).

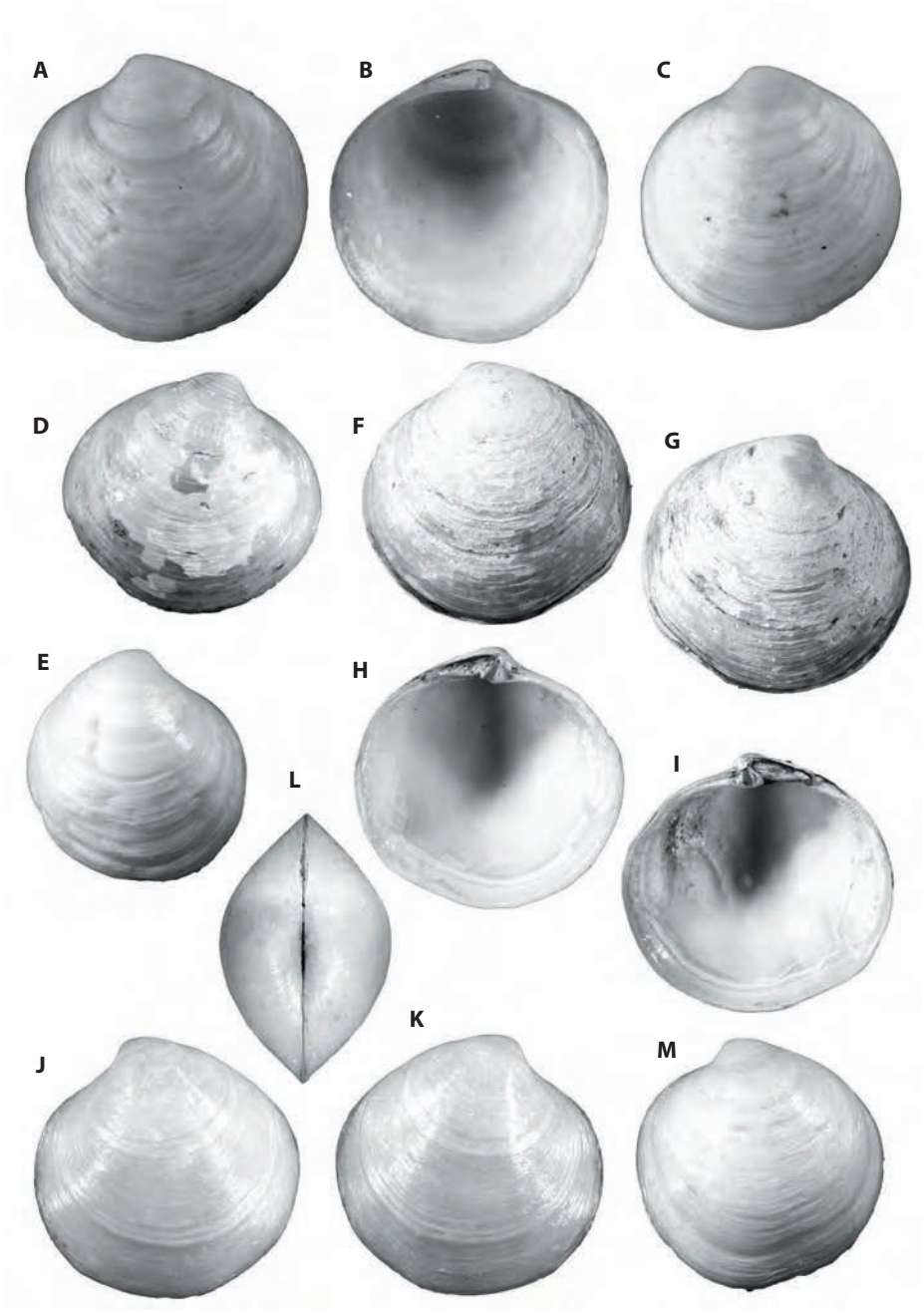
Shell up to 35 mm long, very variable in shape, tumidity and colour, circular to subcircular, as high as long or somewhat higher, rarely longer than high, thin but strong, very inflated. Beaks more or less median or very slightly anterior to the vertical midline. Surface with coarse, irregular growth lines and very irregular, commarginal ridges or striae which may be very fine and narrow or coarser or occasionally obsolete or totally absent. There are also some slight, irregular dents and coarser growth stages. Lunule extremely small and hardly visible. Ligament short and broad, slightly variable in length, on a deeply sunken nymphal plate. Periostracum very thin and nearly colourless. Outside white, cream or with a very light salmon reddish hue, occasionally more intense on the beaks. Inside white, yellowish cream or light salmon red with a narrow white marginal rim.



Distribution. Mauritania (Cap Blanc) to southern Angola (Santo Antonio, Benguela); São Tomé, Ilha do Principe; Cape Verde Islands.

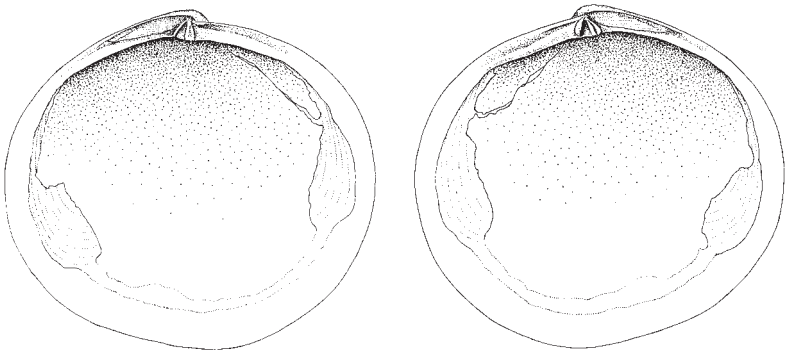
Biotope. In fine, mixed and coarse sand and gravel, also on small sand patches on rocky shores and on tidal flats, often with muddy gravel, shell debris and loose stones, where it is frequently found together with *Pitar virgo* and *Turritella gemmata* Reeve, 1849. *Diplodonta circularis* lives in more or less sheltered areas, also in also rias like the Casamance River and the adjacent creeks ("bôlons"), from the lower intertidal zone to about 5 m. It is often found in very murky water and tolerates rather drastic salinity changes. Common, locally abundant.

Remarks. This rather variable species has often been mistaken for *D.* (*F.*) *diaphana* and Huber (2010) treats it as a synonym. However, it is smaller, more inflated and higher with more sloping antero- and postero-dorsal margins. The best distinguishing character is the much shorter and broader ligament. The adductor scars are situated on the horizontal midline, whereas those of *D.* (*F.*) *diaphana* are slightly closer to the ventral margin. The salmon reddish variety has been described as *Felania rosea* Récluz, 1851, which is a synonym. Beached shells and valves are common in many places.



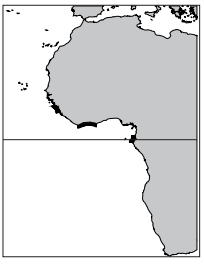
16.27. *Diplodonta (Felania) circularis* Dunker, 1846. A-B, unknown locality (syntype ZMB, 29.4 mm). C, unknown locality (syntype ZMB, 27.7 mm). D, Baie de l'Etoile, Mauritania, intertidally (26.6 mm). E, M'Bour, Petite Côte, Senegal, low water (24.1 mm). F-I, Dixinn Port, Conakry, Guinea, tidal flat (20.2 mm). J-L, Ilha do Principe, Cais de Santa Ana (23.4 mm). M, Praia Etambar, Corimba, Luanda prov., N-Angola (lv, 20.8 mm).

Diplodonta (*Felania*) *nizeryi* Cosel & Gofas, 2018



16.28. W Ouendi, Guinea, 9°54'N, 14°18.5'W, 15 m (21.1 mm).

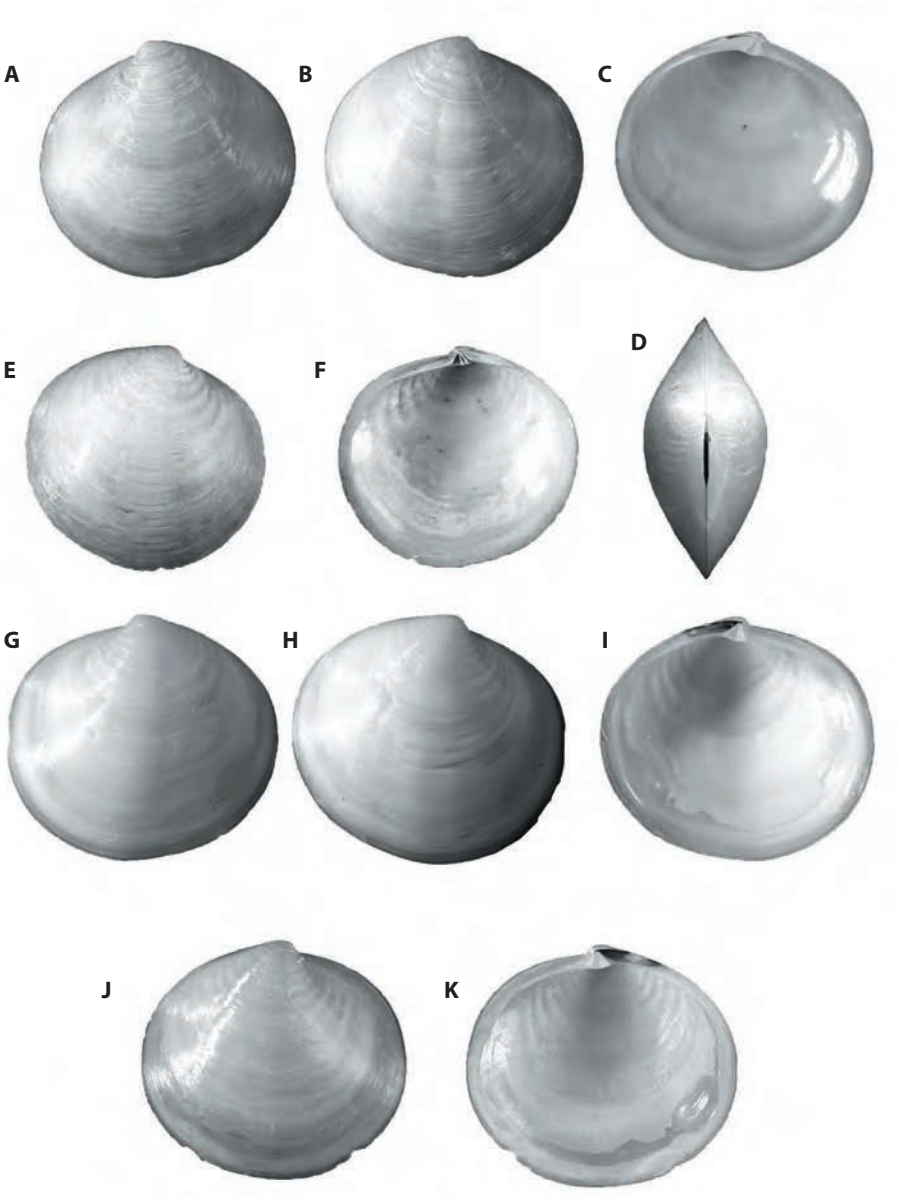
Shell up to 30 mm long, somewhat variable in shape, circular to subcircular, slightly longer than high, thin and rather fragile, not much inflated. Beaks more or less median. Surface with very fine, close, irregular growth lines and occasional small dents. Umbonal part of antero- and postero-dorsal slope with regular commarginal waves which disappear on the later, more marginal zone and which are not developed on the central part of the valves. Lunule not seen. Ligament moderately long and rather narrow. Periostracum very thin, translucent and colourless. Outside and inside entirely white.



Distribution. Guinea (Company Banks, 10°37'N, to Conakry); Côte d'Ivoire (Abidjan area); Gabon (Libreville area).

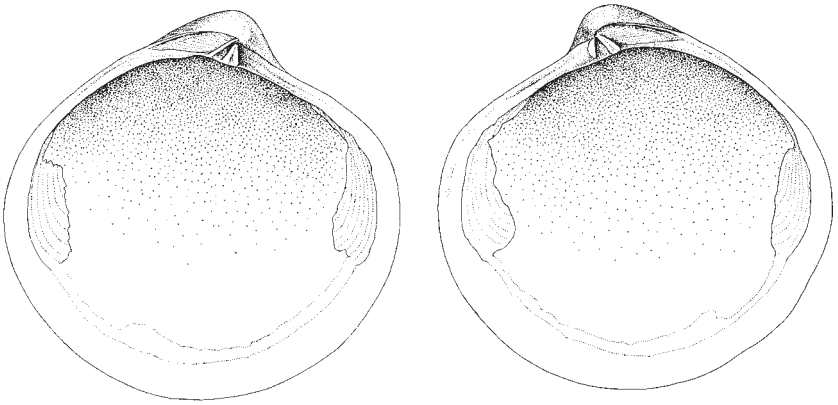
Biotope. In fine, muddy sand, and fine sand, also with shell debris, from 10 to 22 m, in Gabon probably also shallower, rare.

Remarks. This species has also been misidentified as *D. diaphana*. It is smaller, thinner and less tumid, has a slightly shorter ligament and is characterized by the peculiar waves on the earlier dorsal parts of the valves and the deep furrows on the hinge plate anterior to and behind the hinge teeth and ligament. *D. nizeryi* seems to avoid too much upwelling influence but has not yet been recorded from the typical tropical regions. The known distribution pattern is rather patchy but that may also be due to the rarity of the species. In Gabon, empty valves are occasionally found on sand flats at low tide.



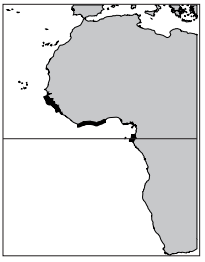
16.29. *Diplodonta (Felania) nizeryi* Cosel & Gofas, 2018. **A-D**, W of Ile Kabak, Guinea, 9°18'N, 13°45'W, 21 m (holotype, 21.8 mm). **E-F**, W of Rio Nuñez, Guinea, 10°37'N, 14°52.5'W, 20 m (paratype, 18.5 mm). **G-I**, Abidjan, Côte d'Ivoire, 20 m (21.4 mm). **J-K**, Komo Rive droite, Libreville, Gabon, on sand flat (16.8 mm).

Diplodonta (*Felania*) *knudseni* Nicklès, 1955



16.30. W Ile Kabak, Guinea, 9°18'N, 14°27'W, 47 m (20.3 mm).

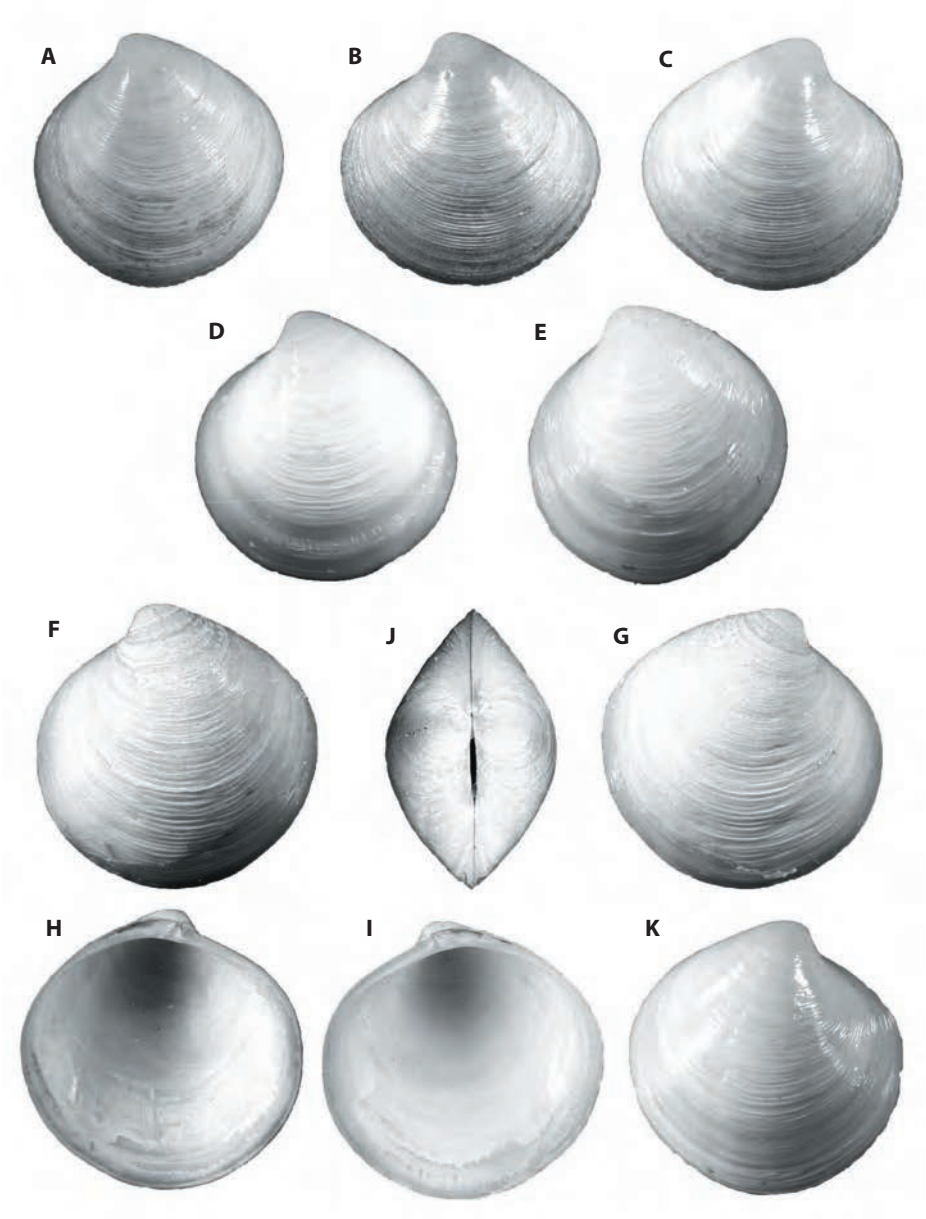
Shell up to 27 mm long, rather constant, circular, as long as high, thin but quite solid, inflated. Beaks rounded and very prominent, more or less median. Surface with somewhat irregular, dense, commarginal grooves, occasionally bifurcating, obsolete in the umbonal region and rarely also close to the margins, leaving only growth lines. No lunule present. Ligament rather short and broad. Periostracum very thin, somewhat glossy, translucent and nearly colourless, occasionally pale-straw-coloured, often eroded on the umbonal part of the valves. Outside white to ivory, inside white.



Distribution. Senegal (Casamance, 13°N) to Guinea (9°20'N); Côte d'Ivoire to Ghana; Gabon (Ile Banié-Port-Gentil).

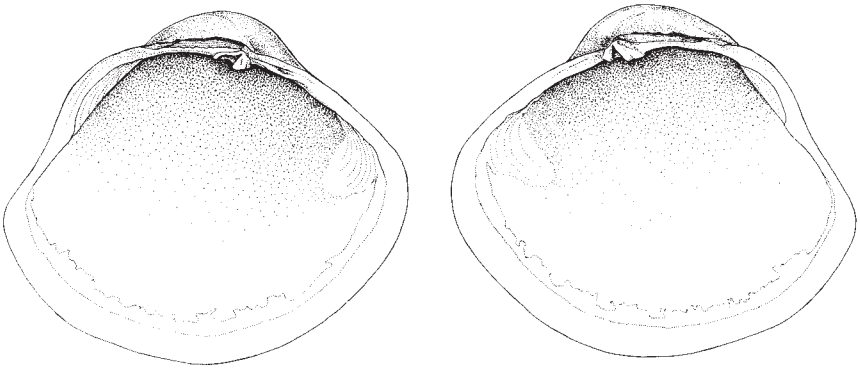
Biotope. In clean fine, mixed and coarse sand, also with gravel and shell debris, offshore from about 20 to 50 m, in Gabon apparently also shallower; uncommon.

Remarks. This species is easily separable from other *Felania* species by the distinctive *Dosinia*-like shape with prominent beaks, and by the commarginal sculpture which is also reminiscent of that found in certain venerids. Usually not washed up on the beach. *Diplodonta knudseni* has not yet been recorded from the typical tropical regions, and distribution gaps are probable.



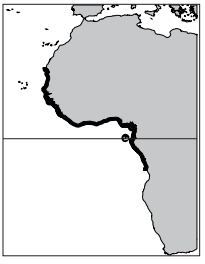
16.31. *Diplodonta (Felania) knudseni* Nicklès, 1955. **A**, Abéné, N-Casamance, Senegal, 13°05.6'N, 17°02.4'W, 19 m (24.3 mm). **B**-**C**, W of Ile Kabak, Guinea, 8°18'N, 14°27'W, 47 m (20.3 mm). **D**, Port-Gentil, Gabon, Plage de la Sogara, beach drift (27.1 mm). **E**, same locality (23.0 mm). **F**-**J**, same locality (22.6 mm). **K**, same locality (23.3 mm).

Lamysia jousseaumei (Lamy, 1921)



16.32. Ilha do Principe, 1°39.5'N, 7°26.9'W, 12 m (17.7 mm).

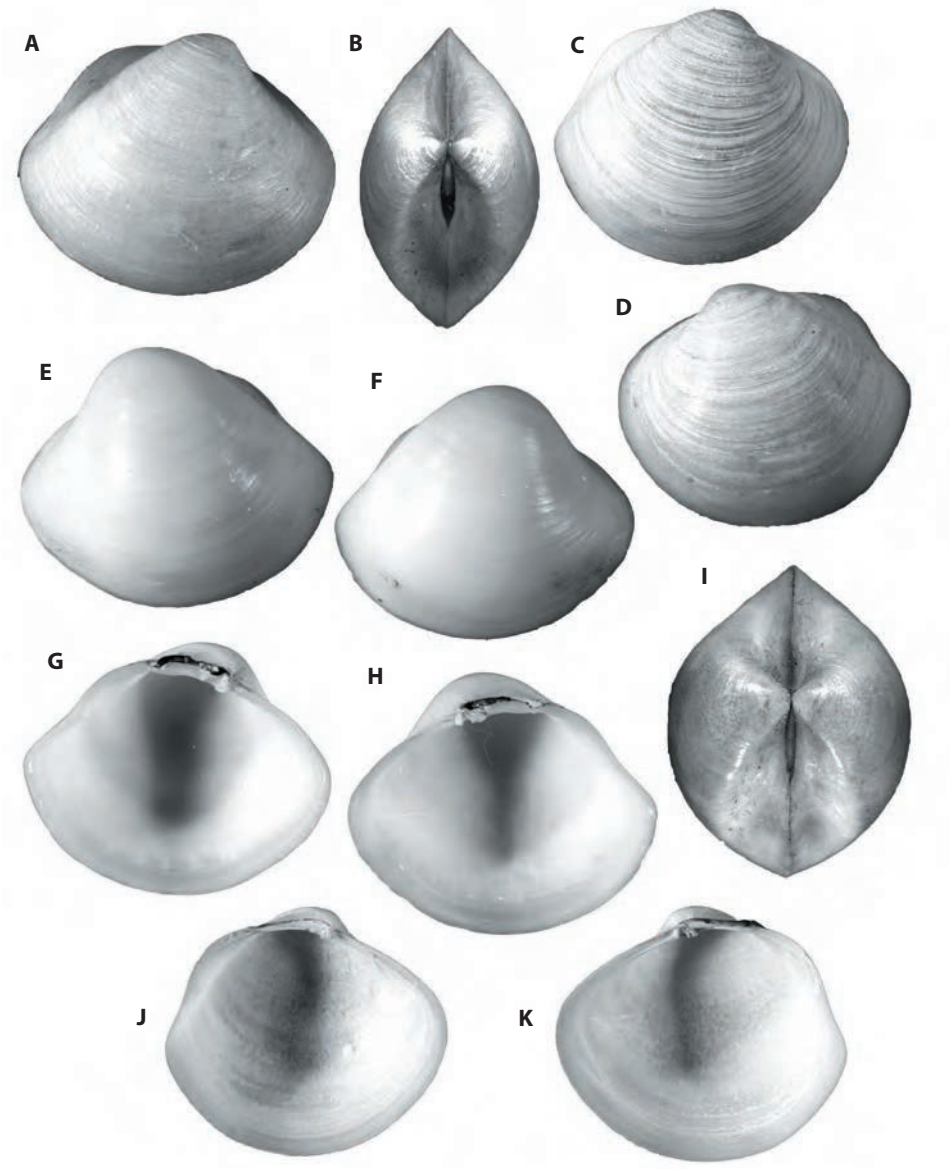
Shell up to 20 mm, triangular-subcircular, somewhat longer than high, thin, fully grown specimens rather solid, variable from moderately to extremely inflated. Beaks slightly anterior to the vertical midline. Surface smooth, with numerous irregular growth lines and a few coarser growth stages. A rounded but marked posterior angle separates a posterior area with a broad radial depression in its middle from the rest of the valve. Postero-dorsal margin rounded-angulate, giving it an auriculate aspect. Ligament external. Periostracum thin, dull, light brownish, frequently persistent only on the marginal part of the valves. Anterior adductor scar ill-defined. Outside and inside uniform white.



Distribution. Senegal (Saloum, Petite Côte) to northern Angola (Luanda); São Tomé, Ilha do Principe.

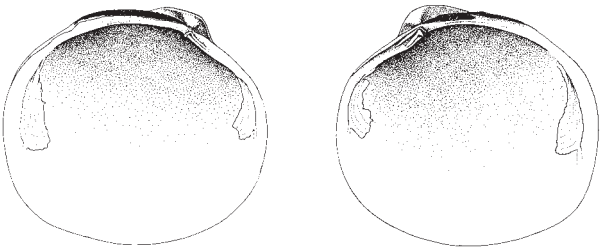
Biotope. In fine, muddy sand, also with shells and shell debris, in calm bays and other sheltered areas, from about 3 m to 20 m, locally not uncommon. It is often found together with *Scissodesma micronitida*, *Lissochlamys exotica* and *Pitar longior*.

Remarks. This species is distinguished from *Diplodonta* by its distinct posterior area with auriculate postero-dorsal margin and the form of the anterior adductor scar. It was misidentified by Fischer-Piette & Nicklès (1946) as *Diplodonta auriculata* G.B. Sowerby III, 1905 but the latter, described supposedly from Sierra Leone, is less inflated and has a differently formed postero-dorsal margin, and is considered by Huber (2015: 832) to be a valid Indian Ocean species. Empty valves are occasionally found on some beaches. A similar Indo-Pacific species is *L. lamyi* (Prashad, 1932) from Indonesia. Huber (2010: 831) erected the genus *Lamysia* for this species.



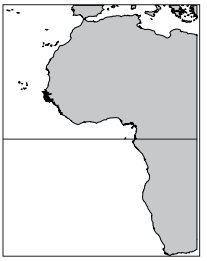
16.33. ***Lamysia jousseaumei*** **(Lamy, 1921).** **A**-**B**, Sine-Saloum area, Senegal, 10 m, dredged in soft mud near mangroves (12.3 mm). **C**, Katchek, Iles Tristão, Guinea (15.7 mm). **D**, same locality (15.5 mm). **E**-**H**, Ilha do Principe, 1°39.5'N, 7°26.8'E, 12 m (20.4 mm). **I**, same locality (17.5 mm). **J**-**K**, Cacuaco, Bengo prov., N-Angola, on beach (15.1 mm).

Cyrenoida dupontia de Joannis, 1835



16.34. Senegal, MNHN, old coll. (27.6 mm).

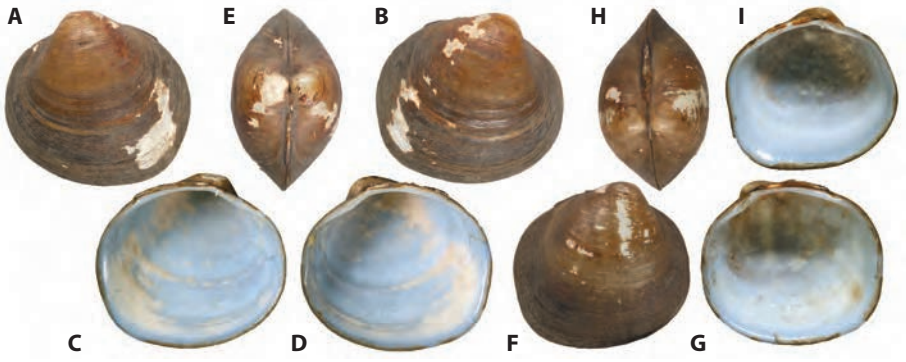
Shell up to 40 mm long, quite variable in shape, subcircular-subquadrangular, as long as high or slightly longer, thin but solid, inflated. Beaks well anterior to the vertical midline. No lunule or escutcheon. Surface smooth, with fine growth lines and coarser growth stages or growth waves. Periostracum rather thin, dark greenish brown to brown, dull, somewhat wrinkly, often eroded on the umbonal area and occasionally on the rounded posterior angle. Outside dirty whitish, inside bluish white.



Distribution. Senegal, in the Senegal River and perhaps more southward.

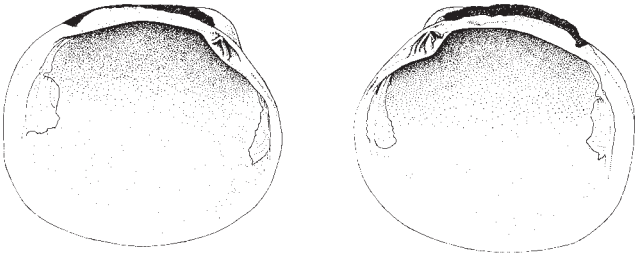
Biotope. In mud and perhaps also in sandy mud in estuarine habitats with low salinity, not common.

Remarks. This species is very poorly known, and only one "modern" lot was available for study. The inner cardinals in the right valve can either be clearly V-shaped and connected only under the beaks, or the teeth are closer together and merged, and the "V" is more or less filled with callus. This is the type species of the genus *Cyrenoida*. *Cyrenoides dupontii* (*in* Woodward 1854), and *Cyrenoida dupontiae* (*in* d'Ailly 1896), are misspellings.



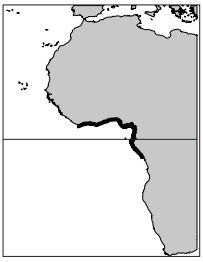
16.35. *Cyrenoida dupontia* de Joannis, 1835. **A**-**E**, Senegal (28.0 mm), old coll. MNHN. **F**-**H**, Gambia (30.7 mm), old coll. MNHN. **I**, same locality (29.3 mm).

Cyrenoida rhodopyga Martens, 1891



16.36. Abidjan, Côte d'Ivoire (21.6 mm).

Shell up to 20 mm long, variable in shape, subcircular, slightly longer than high to nearly elongate, with broader posterior part, thin but rather solid, inflated. Beaks well in front of the vertical midline. No lunule nor escutcheon. Surface with irregular, commarginal growth lines and coarser growth stages. Periostracum dark brown, rather thick, dull and somewhat wrinkly, often eroded in the umbonal area. Outside dirty whitish to light brownish, inside bluish white to pale salmon reddish.



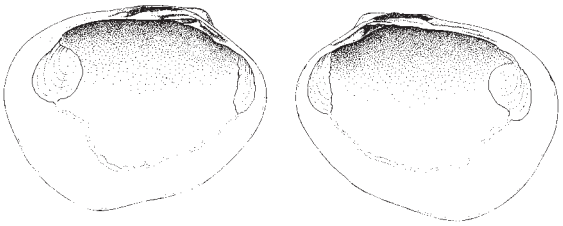
Distribution. Known from Côte d'Ivoire to the Congo.

Biotope. In mud in lagoons, creeks and other estuarine regions with much reduced salinity, locally perhaps not uncommon.

Remarks. This species is distinguished from *C. dupontia* by its smaller shell, the often salmon-reddish interior and the frequently more elongated outline with the beaks placed further forward. A synonym is *C. rosea* (d'Ailly, 1896). The subspecies *C. rosea brevidentata* Pilsbry & Bequaert, 1927, described from the Congo shows only minor differences to *C. rhodopyga* in the hinge teeth and is most probably a geographical form. Huber (2010) treated *C. rhodopyga* as a synonym of *C. dupontia* and used the name *C. rosea* for this species, but this is not consistent with the respective type localities and is not followed here. Good SEM micrographs of the hinge were provided by Taylor *et al.* 2009.

16.37. *Cyrenoida rhodopyga* Martens, 1891. A-E, Abidjan region, Côte d'Ivoire (19.5 mm). F-G, same locality (16.6 mm).

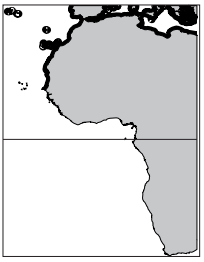
Coralliophaga lithophagella (Lamarck, 1819)



16.38. Baie de Gorée, Dakar, Senegal (5.5 mm).

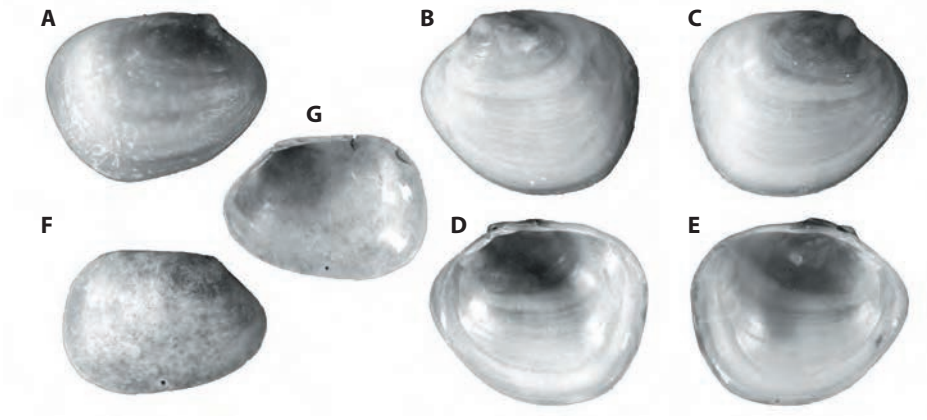
Shell up to 25 mm long (West African specimens known only to 5 mm), very variable in shape, suboval-subrectangular to nearly rounded-quadrate or irregular, thin, rather inflated. Anterior margin quite narrowly rounded, posterior margin broad, obliquely truncated, with rounded corners. Ventral margin mostly more or less straight. Beaks within the first fourth of the valves. Surface smooth with irregular growth lines and coarser growth stages. Periostracum thin, translucent and nearly colourless, on the growth stages occasionally thicker and light brown. Outside pale yellowish, cream or white, often with light brownish hue on the beaks. Inside whitish.

Distribution. Celtic Sea (48°40'N) southward to Senegal (Dakar); Azores, Madeira, Canary Islands; throughout the Mediterranean.



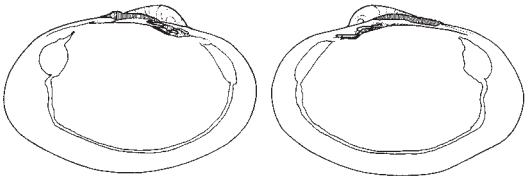
Biotope. On hard substrate, mostly coral, in crevices and empty burrows of rock-boring molluscs (but not boring itself), from about 30 to 350 m, not common.

Remarks. This is a temperate species which does not penetrate into the typical tropical zone. Synonyms are C. *guerinii* (Payraudeau, 1826), *Coralliophaga setosa* Dunker *in* Grube, 1864 and *C. johnsoni* Watson, 1897.



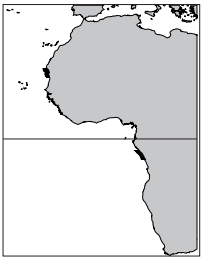
16.39. *Coralliophaga lithophagella* (Lamarck, 1819). **A**, Baie de Gorée (5.5 mm). **B-E**, same locality (4.8 mm). **F-G,** SW of Iles Madeleines, Dakar, 46 m (4.3 mm).

Isorropodon bigoti Cosel & Salas, 2001



16.40. "N'Kossa" oilfield, off Pointe Noire, Congo Brazzaville, 5º53.5'S, 11º38.84'E, 150 m (13.7 mm; reproduced from Cosel & Salas 2001, figs. 84-85).

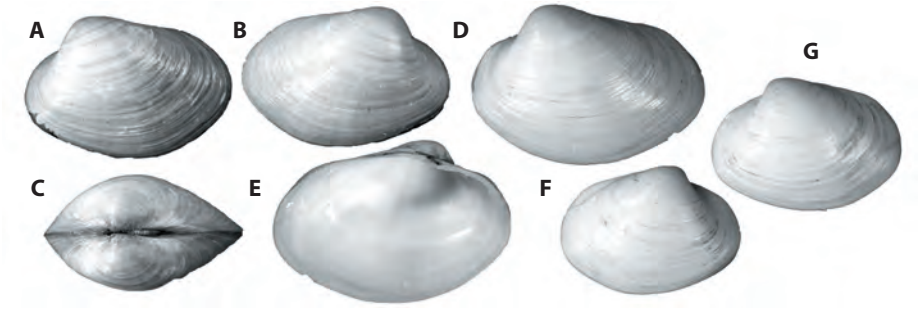
Shell up to 17 mm long, suboval, thin, very inflated, variable in outline and l/h ratio, juveniles being shorter than fully grown specimens. Anterior margin more or less evenly rounded, ventral margin strongly convex, in fully grown specimens less so on the anterior part, posterior margin broadly convex. Beaks well in front of the vertical midline. Surface with irregular commarginal growth lines and broad, faint and very irregular growth waves. No lunule, escutcheon long, very narrow, weak but well defined. Periostracum glossy, transparent and nearly colourless. Hinge line narrow, in each valve with two teeth beneath the umbos. By their situation parallel to the umbonal and dorsal margin, these teeth appear not clearly distinguishable into cardinal and laterals but functionally they are cardinals. Teeth may be partly resorbed in very large and old specimens. Real laterals absent. Ligament rather short, on a narrow nymphal ridge. No pallial sinus but posterior pallial line descending vertically with a very faint indentation. Valves entirely white.



Distribution. Known from 30 km SW of Pointe-Noire, Congo on the N'Kossa offshore oilfield and from a cold seep zone situated off Mauritania.

Biotope. In mud with very fine sand from 150 to about 250 m, in Mauritania 900-1200 m, associated to assumed hydrocarbon seeping and cold seeps in deeper water. The studied specimens from the Congo Republic were sampled directly under an oil drilling platform.

Remarks. This is the only West African vesicomyid occurring also in rather shallow water and one of the shallowest of all vesicomyids.



16.41. *Isorropodon bigoti* Cosel & Salas, 2001. **A-C**, "N'Kossa" oilfield, off Pointe-Noire, Congo Brazzaville, 5°53.5'S, 11°38.8'E, 150 m (holotype, 17.4 mm). **D-E**, same locality (paratype, 21.1 mm). **F-G**, same locality (paratype, 13.4 mm).

Family **VENERIDAE**
- Genus ***Venus*** Linnaeus, 1758 – 8 species (one with 2 subspecies)
- Genus ***Clausinella*** Gray, 1851 – 1 species
- Genus ***Circomphalus*** Mörch, 1853 – 1 species
- Genus ***Globivenus*** Coen, 1934 – 3 species
- Genus ***Gouldia*** C.B. Adams, 1847 – 1 species
- Genus ***Microcirce*** Habe, 1951 – 1 species
- Genus ***Timoclea*** Brown, 1827 – 2 species
- Genus ***Parvicirce*** Cosel, 1995 – 1 species
- Genus ***Tivela*** Link, 1807 – 2 species
- Genus ***Callista*** Poli, 1791 – 1 species
- Genus ***Pitar*** Römer, 1857
  - Subgenus ***Pitar*** Römer, 1857 – 7 species
  - Subgenus ***Costellipitar*** Habe, 1951 – 3 species
- Genus ***Dosinia*** Scopoli, 1777 – 6 species
- Genus ***Polititapes*** Chiamenti, 1900 – 1 species
- Genus ***Venerupis*** Lamarck, 1818 – 1 species
- Genus ***Ruditapes*** Chiamenti, 1900 – 1 species
- Genus ***Irus*** Schmidt, 1818 – 1 species

Subfamily **Petricolinae**
- Genus ***Petricola*** Lamarck, 1801 – 2 species
- Genus ***Petricolaria*** Stoliczka, 1870 – 1 species
- Genus ***Lajonkairia*** Deshayes, 1854 – 1 species
- Genus ***Mysia*** Lamarck, 1818 – 1 species

Family **NEOLEPTONIDAE**
- Genus ***Neolepton*** Monterosato, 1875 – 1 species

Superfamily Veneroidea

Venerids are among the best known clams and, together with the tellinids, one of the most species-rich groups of marine bivalves. Most are large and conspicuous, and many of them are commercial species. The superfamily Veneroidea comprises the large family Veneridae, and also a family of minute clams, the Neoleptonidae, which were held for a long time as distantly related. The family Glauconomidae, with the sole Indo-Pacific genus *Glauconome*, has long been considered as a member of the Veneroidea but is now placed in the superfamily Cyrenoidea.

Family VENERIDAE

Shells small (< 3 mm) to large (> 150 mm), inequilateral, equivalve, more or less suboval or oblong, triangular to circular, thin to very thick and heavy, with usually well developed lunule and escutcheon. Beaks mostly in front of the vertical midline, bent forward. Surface smooth or with commarginal or cancellate sculpture, occasionally with lamellae or with radial sculpture. Posterior angle with short to rather long spines in certain species. Hinge with three cardinals in each valve, posterior lateral weak or absent, anterior lateral present or absent, depending on the genera. Pallial line with usually a distinct sinus. Adductor scars subequal, rounded. Most venerids are soft bottom dwellers, they are predominantly found in fine to coarse sand with or without mud, some species live in pure mud, a few others inhabit hard bottom. This is possibly the most species-rich family worldwide, with 772 species, among which there are 46 West African species. Several supraspecific arrangements of this very large family (*e.g.* Fischer-Piette & Métivier (1971), Fischer-Piette (1975), Fischer-Piette & Vukadinovic (1977), Harte (1998) have been proposed. More recent insights using molecular characters (Mikkelsen *et al.* 2006; Kappner & Bieler 2006; Chen *et al*. 2011) are not always conclusive, and a comprehensive revision is still missing. The principal conchological difference between the subfamilies Venerinae and Chioninae — presence of a small anterior lateral in the Venerinae and its absence in the Chioninae — is not always sharply marked but somewhat labile, *e.g.* in *Circomphalus* and in the Caribbean group of *Lirophora paphia* (Linnaeus, 1767). These and other examples show that subfamilies are extremely close and available molecular data (Mikkelsen *et al.* 2006) suggest that the combined group Venerinae + Chioninae is monophyletic. Only the Petricolinae, hitherto always treated as a separate family, are now treated at subfamily rank.

In several genera and species of venerids the periostracum contains microscopic very short or long crystalline needles which consist of aragonite and which are visible as a dull whitish layer and give the surface a somewhat velvety aspect. An exhaustive paper on this periostracal calcification was recently published by Glover & Taylor (2010). Additionally, in other groups, notably Pitarinae, the surface is more or less coated with sediment, mostly on the ventral part or along the margin.

Genus *Venus* Linnaeus, 1758. Shells medium-sized, suboval to subcircular, thick and solid, with large, smooth escutcheon which is bevelled and larger in the left valve. Lunule well-marked, rather large and more or less sunken. Surface with prominent commarginal and less prominent radial sculpture. Hinge with three cardinals and a small, sometimes inconspicuous, lateral tooth next to anterior cardinal. Pallial sinus small, short and more or less triangular.

Genus *Clausinella* Gray, 1851. Shells medium-sized, suboval to subtriangular, thick and solid, with very conspicuous escutcheon and lunule. Sculpture, excepting lunule and escutcheon, of few, very strong commarginal ridges often raised as lamellae. Hinge with three cardinals in each valve, no laterals. Pallial sinus as in *Venus*. Molecular data (Kappner & Bieler 2006) suggest that the distinction from *Venus* may not be warranted.

Genus *Circomphalus* Mörch, 1853. Shells medium-sized to large, broadly suboval-subtriangular, compressed, with more or less widely spaced raised commarginal lamellae which are more or less folded towards dorsally and characteristically frilled on the well marked posterior angle and the delimitation of the escutcheon or on the whole posterior half. Interspaces smooth. Lunule well developed. Anterior margin rather narrowly rounded, posterior margin sharply and slightly obliquely truncated. Umbos placed more or less in front of the vertical midline. Hinge plate very broad to rather narrow, with three cardinals in either valve. Pallial sinus rather small and triangular. *Callanaitis* Iredale, 1917 is a synonym; species have also frequently been placed in the genus *Bassina* Jukes-Browne, 1914.

Genus *Globivenus* Coen, 1934. Shells medium-sized, extremely globose, lunule deep to extraordinarily deeply impressed, escutcheon narrow and not well set off from the rest of the surface. Sculpture mostly commarginal. Pallial sinus small and triangular.

Genus *Gouldia* C.B. Adams, 1847. Shells small, subcircular to broadly suboval, compressed, with long and narrow lunule, no escutcheon. Surface with commarginal or reticulate sculpture. Hinge with anterior laterals. Pallial sinus very shallow and indistinct.

Genus *Microcirce* Habe, 1951. Shells minute, solid for their size, subcircular, with indistinct escutcheon and lunule. Surface smooth or with weak commarginal sculpture. Hinge with three cardinals in each valve, one distinct anterior lateral on lv and two on

rv. Shell margin bevelled, with distinct commarginal grooves. Pallial sinus indistinct, hardly an inflection of the pallial line. The type species *M. dilecta* (Gould, 1861) was figured by Oliver & Zuschin (2001).

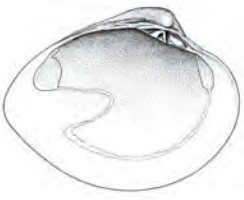
Genus *Timoclea* Brown, 1827. Shells mostly small, oval, more or less compressed to inflated, with lunule but no escutcheon. Surface with predominantly radial or with cancellate sculpture. Hinge with three cardinals in each valve, no laterals. Pallial sinus small and triangular. The genus *Timoclea* is now in subfamily Venerinae, close to *Periglypta* and *Antigona* (Kappner & Bieler 2006). About 25 species are known, most of them in the Indo-Pacific, two in the eastern Atlantic.

Genus *Parvicirce* Cosel, 1995. Shells minute, broadly suboval to subcircular, compressed, with beaks behind the vertical midline. Lunule very small and indistinct, escutcheon missing. Surface smooth with irregular growth lines only. Hinge in the right valve with three cardinals and two anterior laterals, in the left valve with three cardinals and one anterior lateral, no posterior laterals. Pallial sinus marked only by a few irregularities in the nearly integral pallial line.

Genus *Tivela* Link, 1807. Shells medium-sized to large, mostly markedly triangular, solid, more or less inflated, with large lunule and no escutcheon. Surface smooth. Hinge with three cardinal in each valve and smaller auxiliary teeth. Left valve with a strong anterior lateral, fitting into a socket on the right valve. Pallial sinus small to quite large, rounded.

Genus *Callista* Poli, 1791. Shells rather small to large, more or less broadly suboval, solid, porcellaneous, more or less inflated, with ill-defined lunule and no escutcheon, Surface glossy with or without light commarginal sculpture. Hinge with three cardinals and the anterior lateral in each valve. Pallial sinus deep, horizontal, broad, rounded, with an angle at the end.

Genus *Pitar* Römer, 1857. Shells quite small to medium-sized, oval to subtriangular, solid, inflated, with superficial lunule and no escutcheon. Surface smooth or with light commarginal sculpture. Periostracum calcified with microscopic aragonitic pins (Glover & Taylor 2010) giving it a velvety aspect, often also coated with a thin to more thick layer of sediment. Hinge with three cardinals in each valve, the two anterior cardinals in the left valve united at the top and forming a reversed "V". Anterior



laterals well developed. Pallial sinus quite large, rounded to somewhat triangular. A synonym is *Caryatis* Römer, 1862 (*non* Hübner, 1816). *Pitaria* Dall, 1902 is an unjustified emendation and hence synonym. The west African *Pitar* are amongst the most difficult groups within the Veneridae, and due to their plasticity, some species are often extremely problematic to separate. Their treatment herein is conservative and surely not the "last word". DNA studies will have to be employed for a proper species separation.

Subgenus *Costellipitar* Habe, 1951. Shells rather small, with more or less forward placed small umbos, broadly rounded anterior margin, tapering posterior part and rather acute posterior margin. Surface with fine regular to somewhat irregular commarginal ridges or threads. Pallial sinus medium-sized to rather deep. Huber (2010) uses *Costellipitar* as the genus level, but a knowledge of the phylogenetic relationships among the species treated here would be needed to support this.

Genus *Dosinia* Scopoli, 1777. Shells small to large, almost circular to circular and disk-shaped, more or less solid to very thick, rather compressed, with small and heart-shaped, deeply sunken lunule and with or without escutcheon. Surface with commarginal sculpture. Hinge broad and strong, with three cardinals in each valve and an anterior lateral in the left valve. Pallial sinus very deep, quite narrow and usually pointing upwards towards the antero-dorsal margin. This large and interesting, mainly subtropical and tropical genus (in the large sense) with numerous look-alike species is still very little understood, although an attempt of an overview had been made by Fischer-Piette & Delmas (1967). Several suggenera, based on shell characters, have been defined and some of them raised to genus level, mostly by Japanese authors. However, since their delimitation is difficult and some have been used inconsistently, the sole genus *Dosinia* will be used herein. Huber (2010) recognized *Pelecyora* Dall, 1902 as full genus, but this is not followed. Identification often poses problems, and the West African species make no exception. A comprehensive worldwide revision of the genus is long overdue.

Genus *Polititapes* Chiamenti, 1900 [February 1900]. Shells medium-sized to quite large, more or less elliptical-elongate, solid, porcellaneous, rather compressed, with lunule not impressed. Surface glossy, with close-set commarginal sculpture. Hinge plate narrow with three cardinals in each valve, no laterals. Pallial

sinus rather deep, rounded. *Callistotapes* Sacco, 1900 [April 19, 1900] is a synonym.

Genus *Venerupis* Lamarck, 1818. Shells medium-sized, oval-rhomboidal to trapezoidal, solid, rather inflated, with ill-defined lunule and no escutcheon. Surface with irregular commarginal sculpture, often stronger on the posterior part, and less prominent radial sculpture. Hinge plate narrow, three cardinals in each valve. Pallial sinus broad, deep, horizontal and rounded at the end.

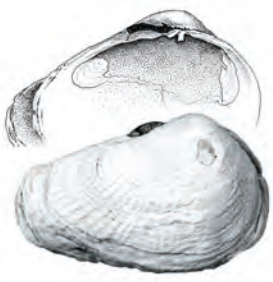
Genus *Ruditapes* Chiamenti, 1900. Shells medium-sized, oval-rhomboidal to trapezoidal, solid, rather inflated, with ill-defined lunule and no escutcheon. Surface with fine but prominent radial sculpture forming a decussate pattern with the commarginal sculpture and the growth lines. Hinge plate narrow, three cardinals in each valve. Pallial sinus like *Venerupis*. Some authors (*e.g.* Coan *et al.* 2000; Huber 2010) consider *Ruditapes* as a synonym of *Venerupis*, which is tenable, but the name is widely in use for commercial species and should be maintained unless compelling evidence proves the synonymy.

Genus *Irus* Schmidt, 1818. Shells small, irregularly rectangular, solid, inflated, with prominent commarginal lamellae and radial sculpture in the interspaces. Hinge with three cardinals in each valve, no laterals. Pallial sinus large, rounded.

Subfamily Petricolinae

Shells small to medium-sized, nearly circular or suboval to very elongate, often very irregular, inflated. No lunule nor escutcheon. Surface with predominantly radial but partly also with zigzag and commarginal sculpture. Hinge with three cardinals in the left valve and two cardinals in the right valve. Pallial sinus deep and rounded. About 30 species are known worldwide, among them 5 are West African species.

Genus *Petricola* Lamarck, 1801. Shells small to medium-sized, irregular and often very distorted according to the habitat, oval to elongate, more or less solid, inflated. Sculpture variable, radial or divaricate.



Genus *Petricolaria* Stoliczka, 1870. Shells small to medium-sized, variable more or less irregular but always elongate, rather thin, inflated. Sculpture with more or less developed radial ribs bearing scales on the anterior part; radial sculpture on

the posterior part much finer. This genus shows a remarkable convergence with the pholadid genus *Barnea* from the shell texture, ornamentation and external aspect, but is readily distinguished by the venerid hinge and ligament.

Genus *Lajonkairia* Deshayes, 1854. Shells small, subquadrangular, irregular, rather thin to more solid, more or less compressed. Surface with predominantly radial sculpture, but often somewhat cancellate. Hinge with three cardinals in the left valve and two in the right valve, no laterals. Pallial sinus large and rounded. Not boring, but living free. *Lajonkairea auct.* is a misspelling.

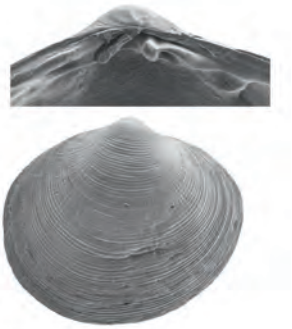
Genus *Mysia* Lamarck, 1818. Shells small, more or less rounded to circular, thin, rather inflated, with no lunule nor escutcheon. Surface smooth or with microscopic radial sculpture. Hinge with two cardinals in the right valve and three cardinals in the left valve, no laterals. Pallial sinus rather broad, long and pointing upwards to the lunular area.

Species treated (46, one with 2 subspecies)
Venus verrucosa verrucosa Linnaeus, 1758; *Venus verrucosa simulans* G.B. Sowerby I, 1844; *Venus casina* Linnaeus, 1758; *Venus verdensis* Dautzenberg & Fischer, 1906; *Venus declivis* G.B. Sowerby II, 1853; *Venus lyra* Hanley, 1845; *Venus crebrisulca* Lamarck, 1818; *Venus subrosalina* Tomlin, 1923; *Venus chevreuxi* Dautzenberg, 1891; *Clausinella punctigera* (Dautzenberg & Fischer, 1906); *Circomphalus foliaceolamellosus* (Dillwyn, 1817); *Globivenus effossa* (Bivona, 1836); *Globivenus pereffossa* (Dautzenberg & Fischer, 1906); *Globivenus libellus* (de Rayneval, Van den Hecke & Ponzi, 1854); *Gouldia minima* (Montagu, 1803); *Microcirce anteai* Cosel & Gofas, 2018; *Timoclea ovata* (Pennant, 1777); *Timoclea congoensis* (Thiele & Jaeckel, 1931); *Parvicirce donacina* Cosel, 1995; *Tivela bicolor* (Gray, 1838); *Tivela tripla* (Linnaeus, 1771); *Callista floridella* (Gray, 1838); *Pitar tumens* (Gmelin, 1791); *Pitar virgo* (Gray, 1838); *Pitar erubescens* (Dunker, 1853); *Pitar elatus* (G.B. Sowerby III, 1908); *Pitar nicklesi* Cosel & Gofas, 2018; *Pitar mediterraneus* (Aradas & Benoit, 1872); *Pitar rudis* (Poli, 1795); *Pitar (Costellipitar) peliferus* Cosel, 1995; *Pitar (Costellipitar) cor* (Hanley, 1844); *Pitar (Costellipitar) longior* Cosel & Gofas, 2018; *Dosinia exoleta* (Linnaeus, 1758); *Dosinia gabonensis* Cosel, 1989; *Dosinia adami* Nicklès, 1955; *Dosinia afra* (Gmelin, 1791); *Dosinia orbignyi* (Dunker, 1845); *Dosinia isocardia* (Dunker, 1845); *Polititapes durus* (Gmelin, 1791); *Ruditapes decussatus* (Linnaeus, 1758); *Venerupis corrugata* (Gmelin, 1791); *Irus irus* (Linnaeus, 1758); *Petricola angolensis* Cosel, 1995; *Petricola lithophaga* (Retzius, 1788); *Petricolaria gracilis* (Deshayes, 1853); *Lajonkairia substriata* (Montagu, 1808); *Mysia marchali* Cosel, 1995.

Family NEOLEPTONIDAE

Shells very small, subcircular to suboval, not very much inflated, equivalve, somewhat inequilateral, with fine commarginal ridges and occasionally additional fine radial sculpture. Hinge line more or less narrow but well developed, with two anterior cardinals dorsally fused in form of a hook and a posterior lateral in the left valve, and three anterior cardinals (the upper two dorsally fused as a hook and situated above the third one) and two posterior laterals in the left

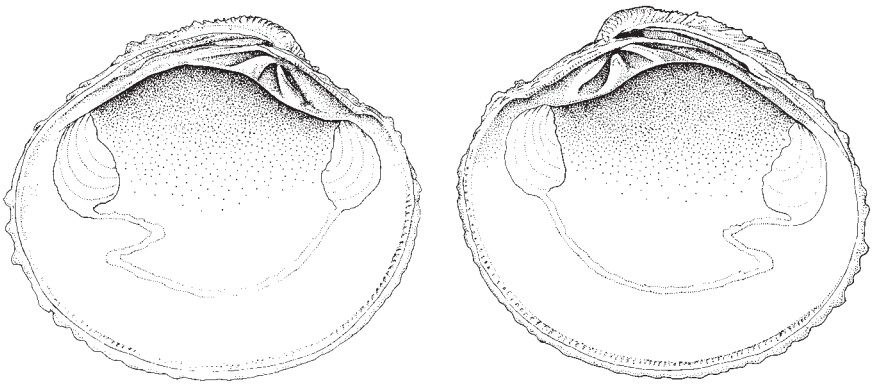
valve. Small internal and very small external ligament. Pallial line without sinus or small posterior deflection only. Inner margin of valves smooth. The family, with 54 species worldwide, used to be placed next to the Sportellidae in the superfamily Cyamioidea but Salas & Gofas (1998) discussed its proximity to the Veneroidea.



Genus *Neolepton* Monterosato, 1875. Characters of the family.

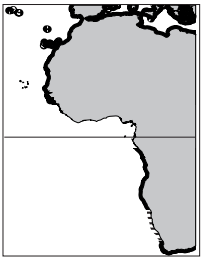
Species treated (1)
Neolepton benguelensis Salas & Gofas, 1998.

Venus verrucosa verrucosa Linnaeus, 1758



17.1. W Ile Kouffin, Guinea, 10°27'N, 15°43.5'W, 21 m (39 mm).

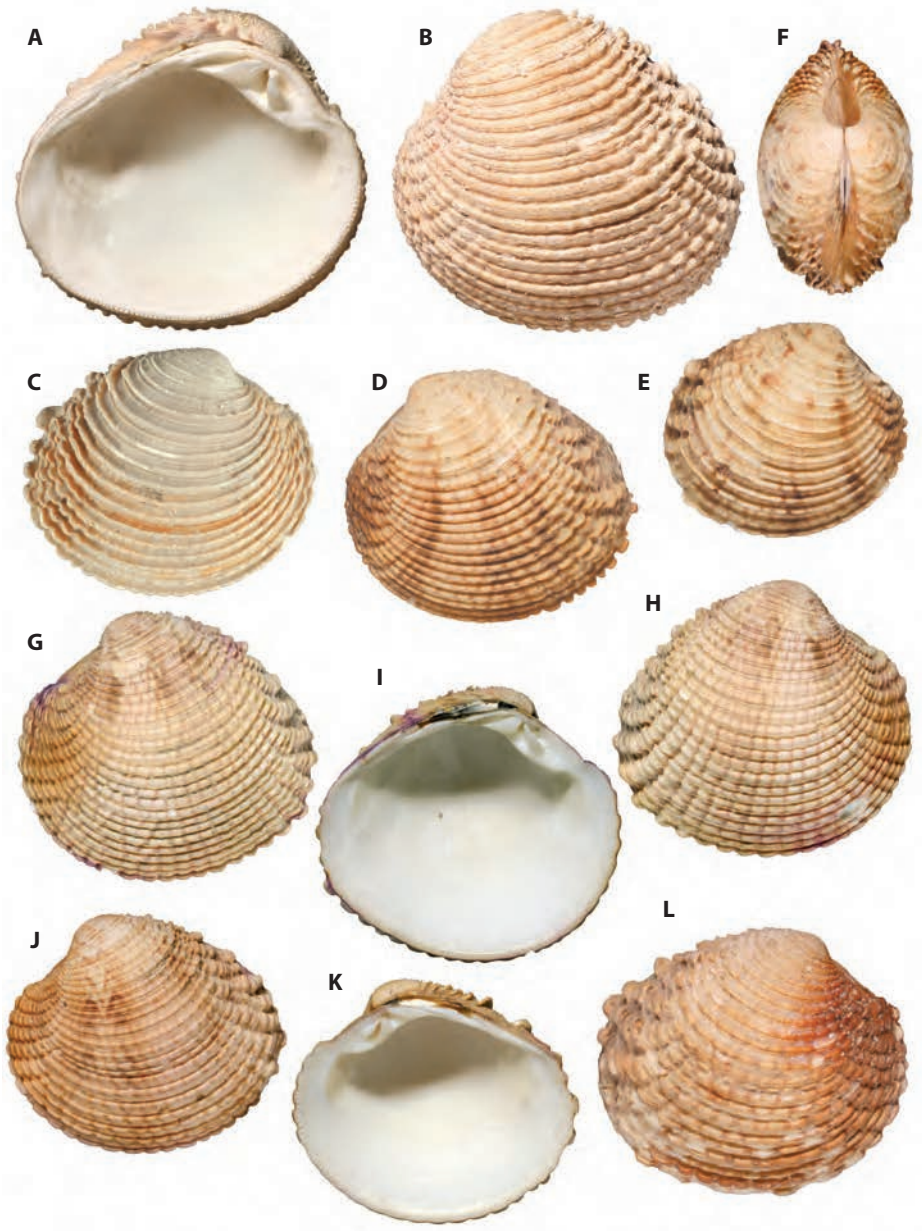
Shell up to 65 mm long, nearly subcircular, thick-shelled and solid, inflated, slightly longer than high, but occasionally as high as long. Beaks in front of the vertical midline. Surface with dense commarginal lamellae bearing warty spines on the anterior and posterior part. Between commarginal ridges fine radial ribs visible. Inner margin of the valves finely crenulate. Outside dirty white to pale yellow, often with brown blotches and spots. Inside white, often with brown or purple spot in the region of the posterior adductor scar.



Distribution. West coast of Scotland, SW-Ireland and English Channel southward to Guinea (Company Bancs); Congo Brazzaville (Pointe-Noire) to South Africa; Azores, Madeira, Canary Islands ; throughout the Mediterranean. Not recorded from Sierra Leone to Gabon.

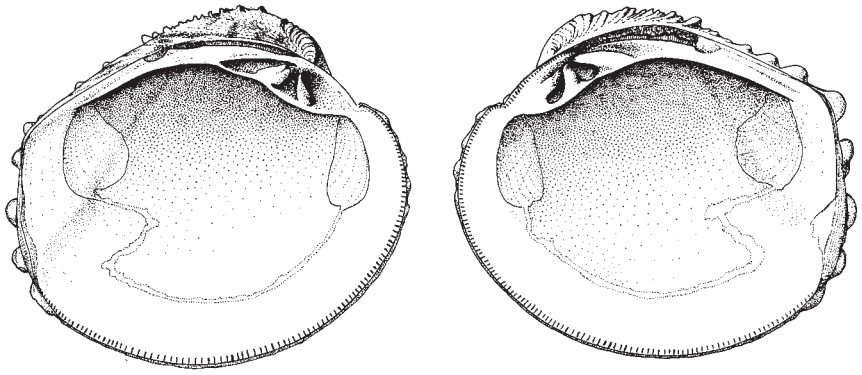
Biotope. In mixed sand, coarse sand or gravel, also between rocks, from the low water mark to about 100 m. Common in Europe and on the coast of Mauritania and northern Senegal, rare more in the south; becoming more common again from Angola southward.

Remarks. The species is fished and consumed in Western and Southern Europe as "praire". There are a few "stocks" in the Baie de Lévrier, Mauritania, which might be commercially exploited in the future. This is "La Clonisse" of Adanson and the type species of the genus *Venus*.



17.2. *Venus verrucosa verrucosa* Linnaeus, 1758. **A**-**B**, Port-Etienne (now Nouadhibou), Mauritania, 20°40'N, 16°44'W, 7-8 m (50.7 mm). **C**, Dakar region, Senegal, 14°26.5'N, 17°05.5'W, 10.5-11 m (40.0 mm). **D**, W of Ile Kouffin, Guinea, 10°30'N, 15°43.5'W, 21 m (38.6 mm). **E**-**F**, same locality (35.2 mm). **G**-**I**, Futungo, Luanda prov., N-Angola, intertidal (43.0 mm). **J**-**K**, same locality (38.4 mm). **L**, Praia Amelia, Namibe prov., S-Angola (42.5 mm).

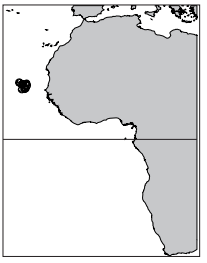
Venus verrucosa simulans G.B. Sowerby I, 1844



17.3. Baia Matiota, São Vicente, Cape Verde Islands, beach 2-3 m (35.0 mm).

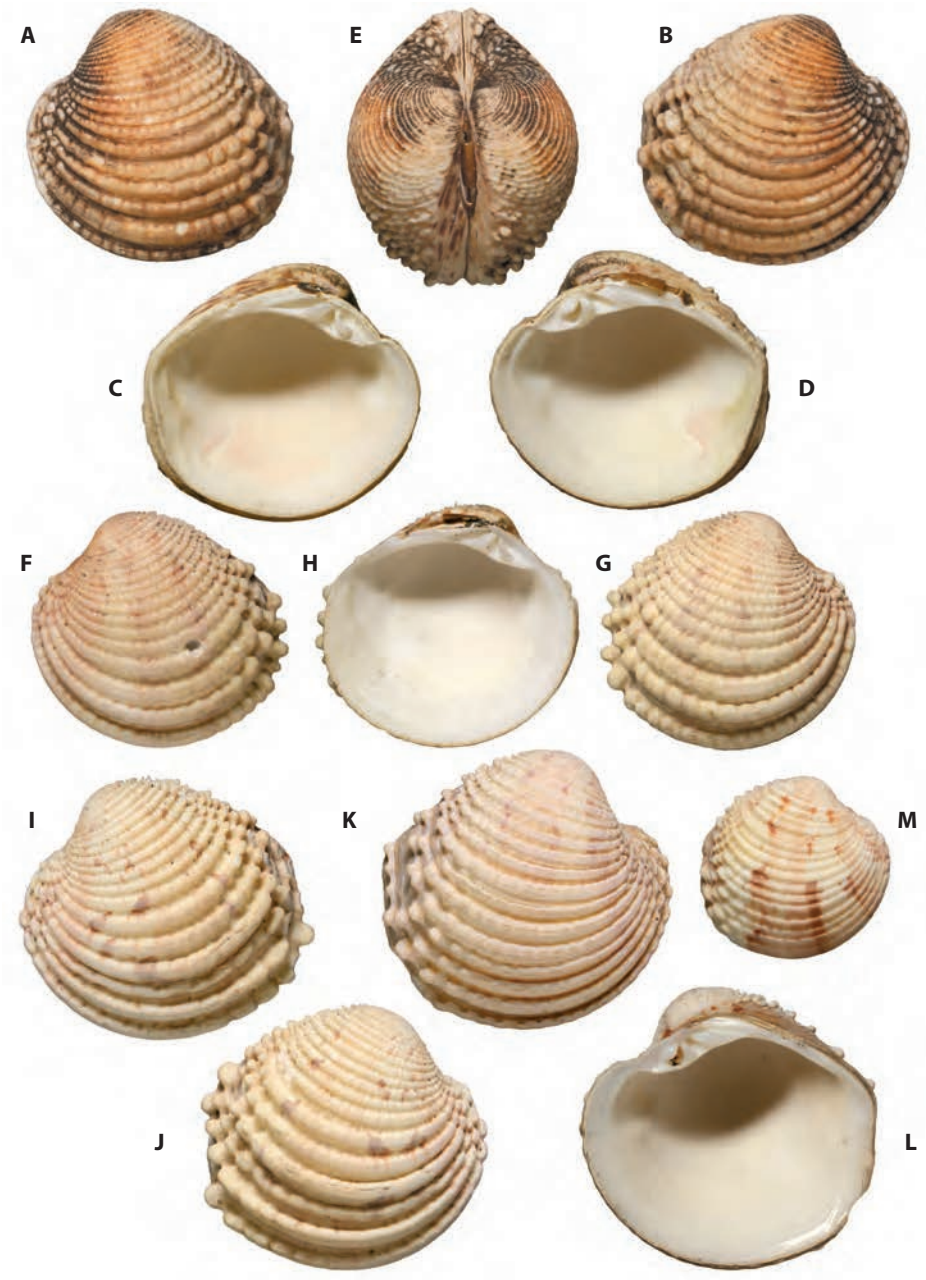
Shell up to 35 mm long, more or less subcircular, thick and solid, very inflated, slightly less high or as high as long. Posterior margin often somewhat truncated. Beaks well in front of the vertical midline. Surface with strong and more or less broad and bulbous commarginal ribs, on the anterior and posterior part with thick warts. Interspaces with low radial grooves, partly visible also on the ribs. Inner margin of the valves finely crenulate. Outside creamy whitish to pale yellowish, with irregular pale pink rays and a few reddish spots mostly on the side of the rays. Inside entirely white.

Distribution. Cape Verde Islands, endemic.



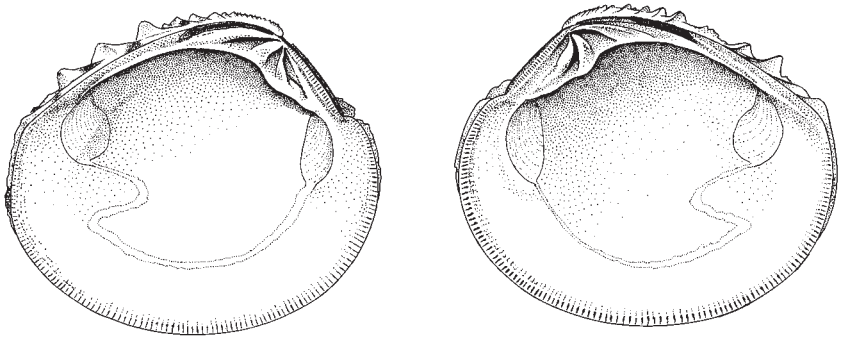
Biotope. In mixed sand, coarse sand, both mineral and carbonate, as well as between stones, from low water to about 15 m, locally common.

Remarks. This Capeverdian form is treated here as a geographic subspecies but after a more thorough study it might finally end up as a full species. It is smaller, shorter and more globose than *V. v. verrucosa* and has thicker curled commarginal ribs forming "rolls" rather than lamellae. It does not occur in sufficient quantities for being exploited commercially. Empty shells and valves are regularly found on the beaches around the islands. Synonyms are *V. tuberosa* Deshayes, 1853 and *V. nodosa* Dunker, 1853.



17.4. *Venus verrucosa simulans* G.B. Sowerby I, 1844. **A**-**E**, Baia Matiota, Porto Grande, São Vicente, Cape Verde Islands, 2-3 m (36.5 mm). **F**-**H**, Baia Porto Grande, São Vicente, Cape Verde Islands, beach drift (37.4 mm). **I**-**J**, same locality (38.6 mm). **K**-**L**, same locality (39.3 mm). **M**, same locality (25.1 mm).

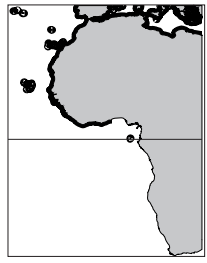
Venus casina Linnaeus, 1758



17.5. W of Iles de Los, Guinea, 9°30'N, 15°18'W, 41 m (27 mm).

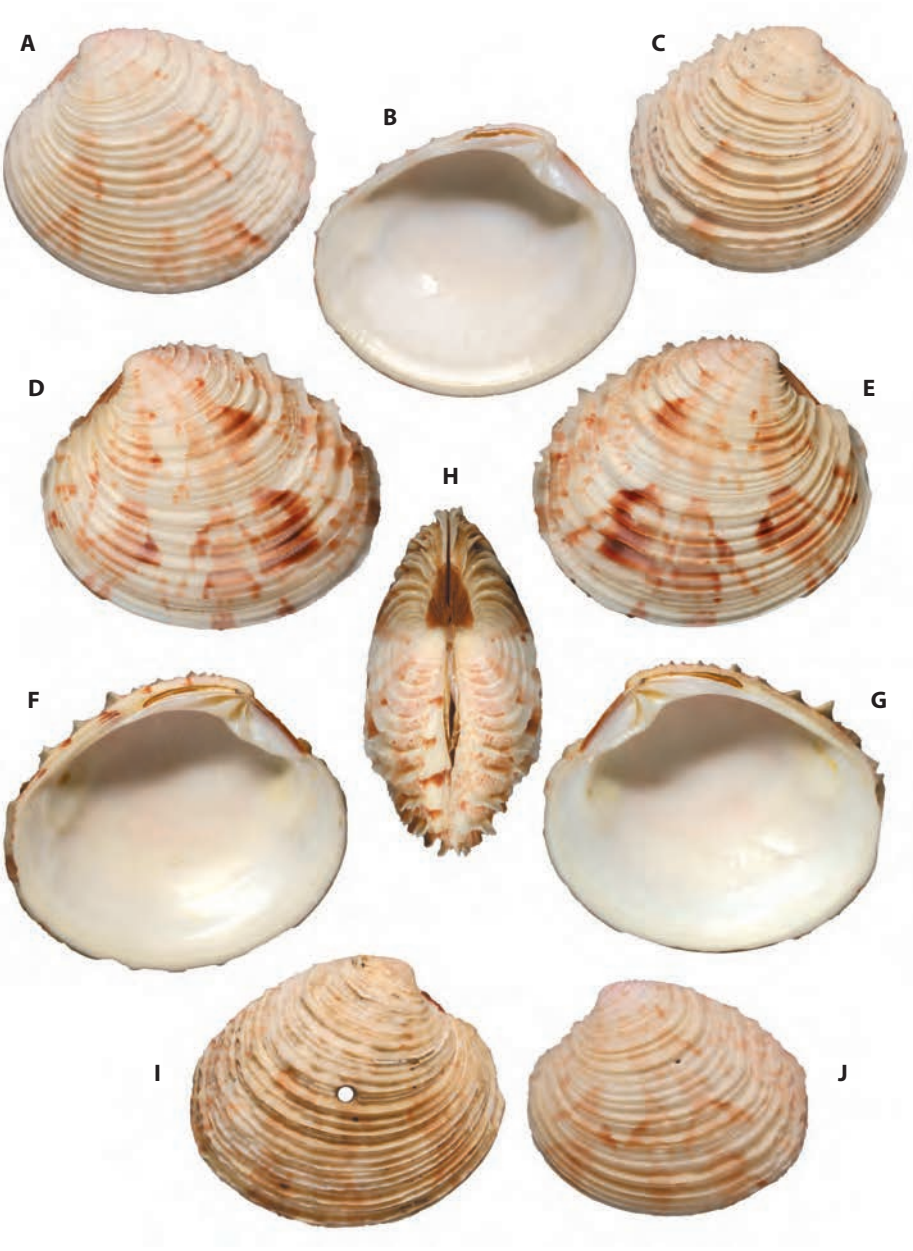
Shell up to 50 mm long (on the West African shelf rarely exceeding 30 mm), variable in shape, size and sculpture, broadly suboval to nearly circular, thick and solid, more or less inflated. Beaks well in front of the vertical midline. Surface with thin, irregular commarginal lamellae, some of them very prominent, the others between them smaller and often closer set, more frequently on the earlier parts of the valves. Prominent lamellae often slightly bent towards dorsally. Interspaces with very faint irregular radial striae. Inner margin of valves finely crenulate. Outside pale yellowish white to pale fawn, with brownish to purplish rays, dots and zigzag marks. European specimens from deeper water are frequently uniform dirty whitish and may represent a distinct species. Inside white, often with light pinkish hue, lacking in northern specimens.

Distribution. Norway (Trondheim fjord), British Isles and Western Europe southward to Côte d'Ivoire and Ghana (no records from Sierra Leone and Liberia); Azores, Madeira, Canary Islands, Cape Verde Islands, São Tomé, Ilha do Principe ; throughout the Mediterranean.



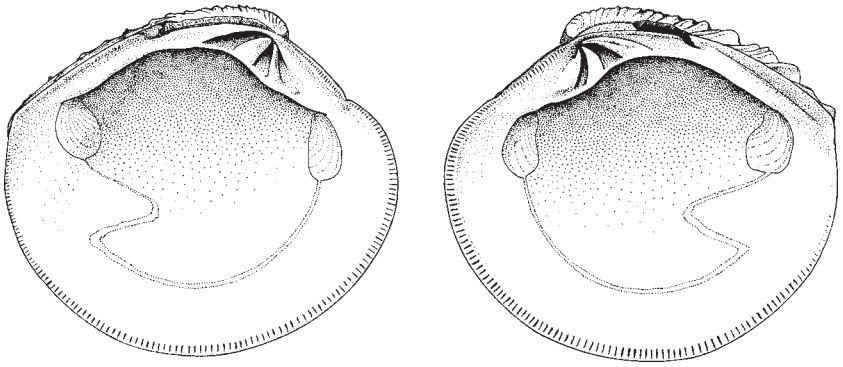
Biotope. In fine sand, mixed sand, coarse sand and gravel, both mineral and carbonate, also on calcareous algae or shell debris, from 5 to about 180 m, common in the northern part of its distribution area, becoming less common towards the tropical zone.

Remarks. This species was hitherto often placed in the genus *Circomphalus*, but in comparison with the respective type species, *V. casina* results being a true *Venus* and not a *Circomphalus* (see also *C. foliaceolamellosus*). The species is occasionally taken in trawls off Western Europe, where it grows larger than in West Africa and has a thicker shell with often more reflected lamellae. It is too rare to be exploited commercially.



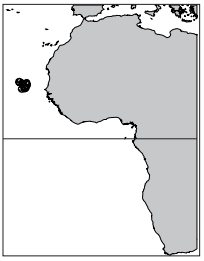
17.6. ***Venus casina*** **Linnaeus, 1758. A-B**, Baia de Tarrafal, São Tiago, Cape Verde Islands, 15°16.5'N, 23°47.5'W, 50-65 m (27.3 mm). **C**, Abéné, N-Casamance, Senegal, 13°01'N, 17°24'W, 51-55 m (22.1 mm). **D-H**, W of Iles de Los, Guinea, 9°30'N, 15°18'W, 41 m (28.5 mm). **I**, Abidjan region, Côte d'Ivoire (24.7 mm). **J**, Ghana, 4°36.5'N, 1°31'W, 50 m (32.5 mm).

Venus verdensis Dautzenberg & Fischer, 1906



17.7. Baia de Tarrafal, Sao Tiago, Cape Verde Islands, 40-45 m (29.6 mm).

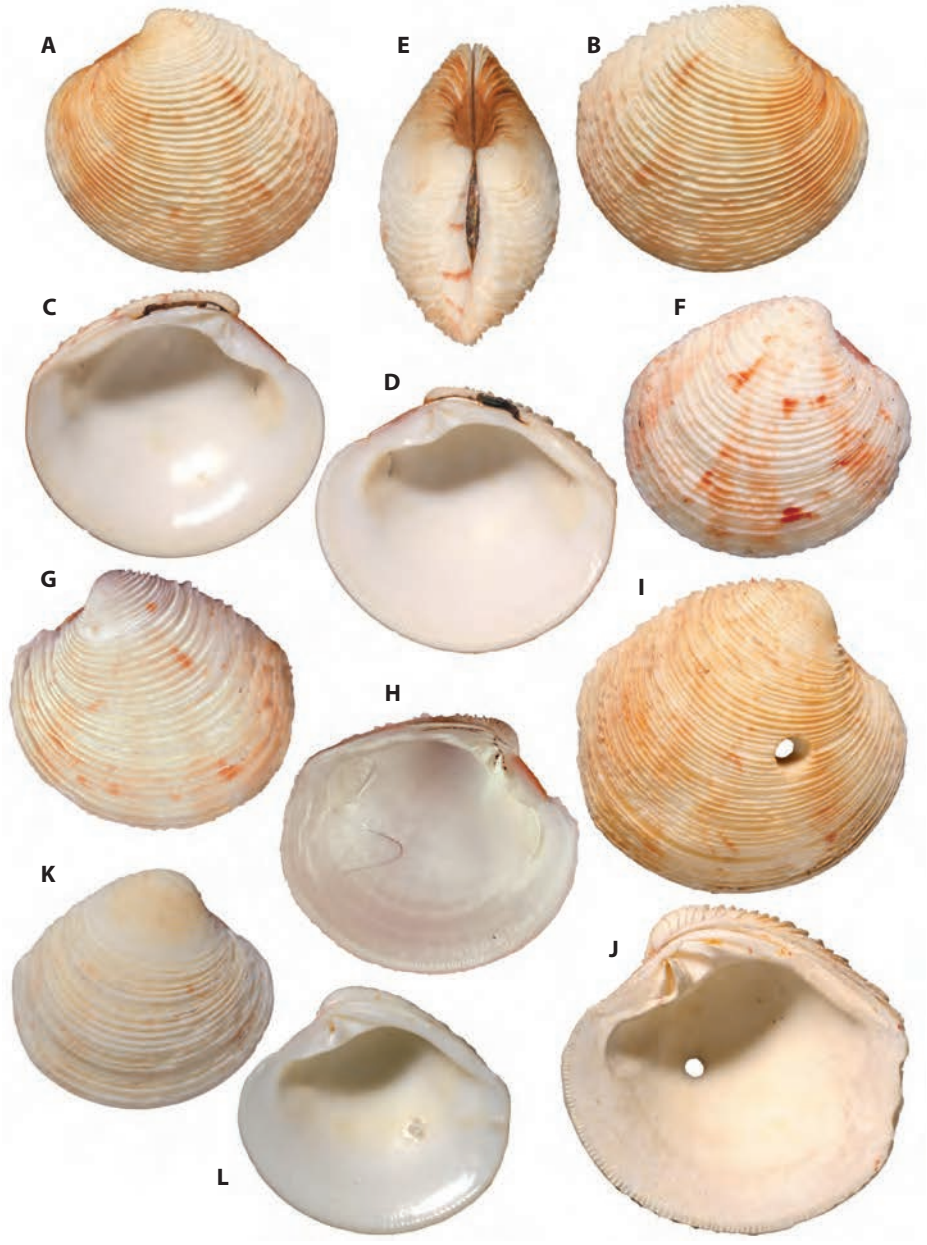
Shell up to 45 mm, somewhat variable in shape, subcircular to nearly circular, generally slightly longer than high, thick and solid, not very inflated. Beaks in front of the vertical midline. Surface with numerous thin, prominent and very close-set radial lamellae, on the very early teleoconch wider spaced. Interspaces with very faint radial threads, not always visible. Lunule and escutcheon well delimited. Inner margin of valves crenulate. Outside yellowish white, with light brownish rays or radial zones and scattered darker brown spots and streaks. Lunule with dense brown speckles, appearing brownish. Inside white.



Distribution. Cape Verde Islands, endemic.

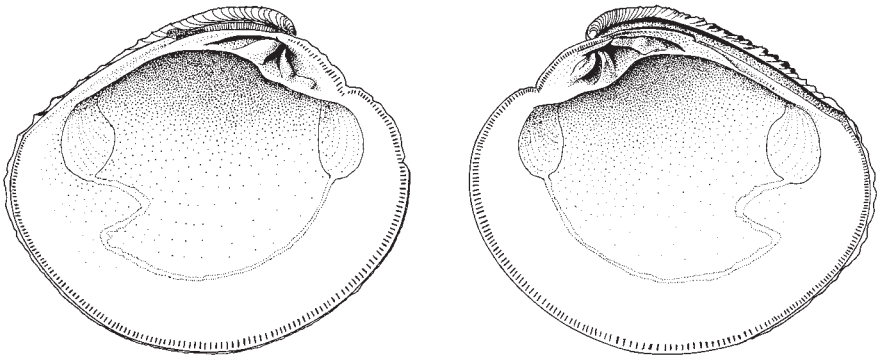
Biotope. In mixed and coarse sand, mostly with calcareous algae and shell debris, about 10-60 m, not common.

Remarks. The closest species on the continental shelf is *V. casina*. However, *V. verdensis* is distinguished by its more circular outline and the thinner and more close-set commarginal lamellae of more or less equal height, whereas in *V. casina*, they are of different height. Occasionally valves are washed ashore, *e.g.* on the west coast of Ilha do Sal.



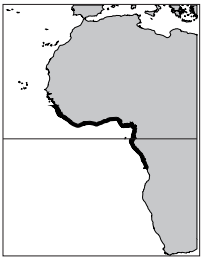
17.8. *Venus verdensis* Dautzenberg & Fischer, 1906. **A**-**E**, Baia de Tarrafal, São Tiago, Cape Verde Islands, 40-60 m (29.6 mm). **F**, Baia Mordeira, Ilha do Sal, Cape Verde Is., on beach (29.2 mm). **G**-**H**, Baia de Tarrafal, São Tiago, Cape Verde Islands, 15°16.5'N, 23°47.5'W, 40-45 m (28.9 mm). **I**-**J**, same locality (42.6 mm). **K**-**L**, Baia Algodoeiro, Ilha do Sal, Cape Verde Islands, beach drift (25.4 mm).

Venus declivis G.B. Sowerby II, 1853



17.9. Baie de Cap Lopez, Port-Gentil, Gabon (42.2 mm).

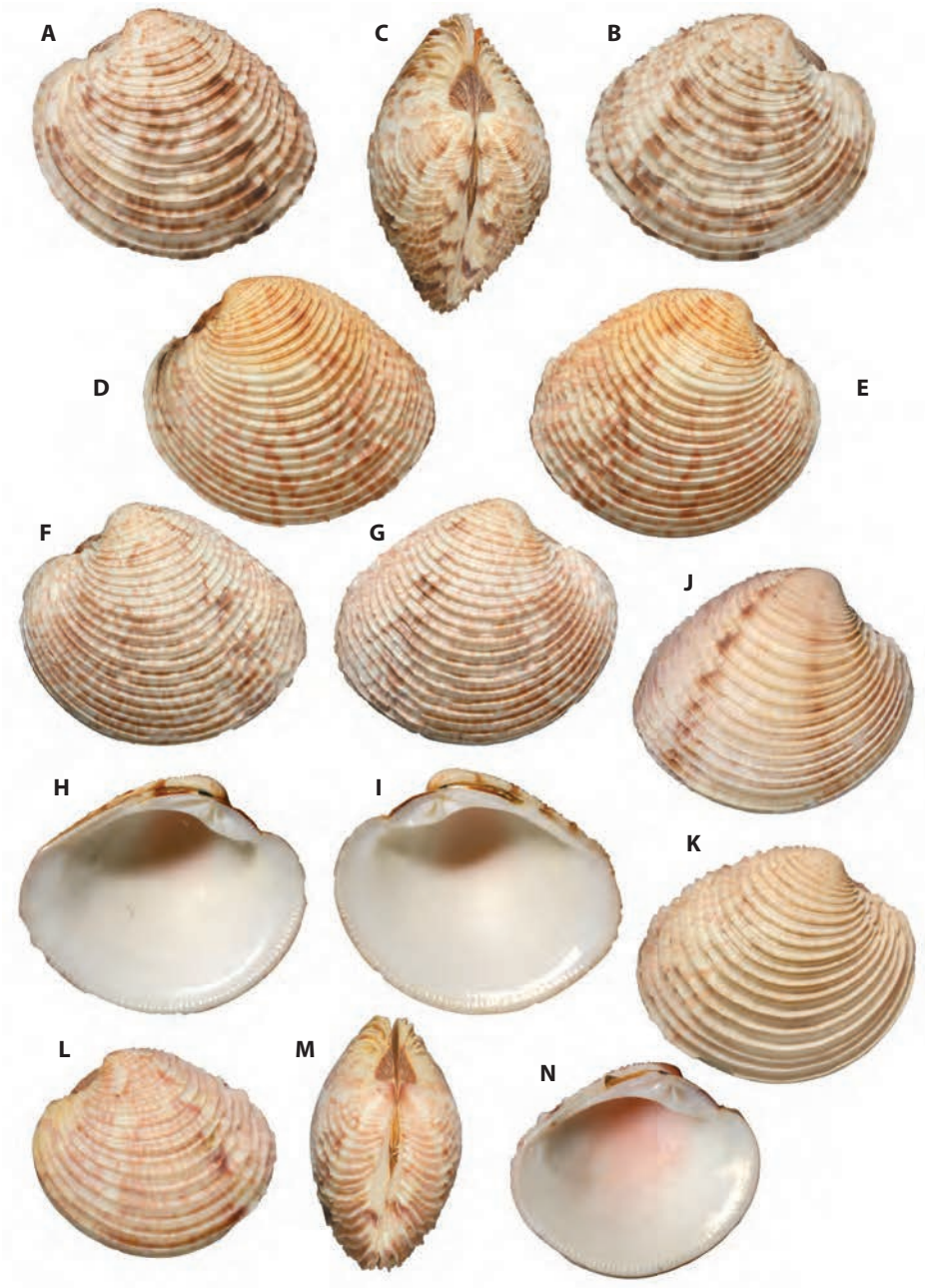
Shell up to 42 mm long, in certain limits variable in outline and sculpture, broadly suboval, slightly longer than high, thick and solid, moderately inflated. Beaks well in front of the vertical midline. Surface with more or less regular close-set commarginal lamellae; in each interspace a thin commarginal cord, towards the ventral margin occasionally becoming obsolete. Lunule with small, very close-set lamellae touching each other. Inner margin crenulate. Outside ivory whitish to brownish white, with rays, streaks, blotches or zigzag markings of light brown, dark brown, pink or reddish. Lunule mostly reddish-brown and well demarcated from the rest of the shell surface, but occasionally hardly darker. Inside white, with yellowish pink to pink hue under the beaks.



Distribution. Guinea (N of Cap Verga) to northern Angola (Luanda).

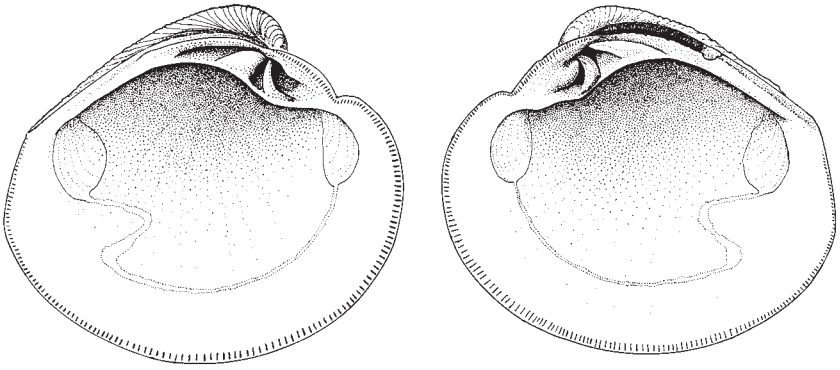
Biotope. In fine, clean sand and mixed sand, both carbonate and mineral, also with calcareous algae and shell debris, 5-60 m, not common anywhere.

Remarks. This species is the most common *Venus* in the three tropical regions, however, it is too rare for commercial exploitation. Beached shells are uncommon, if at all found.



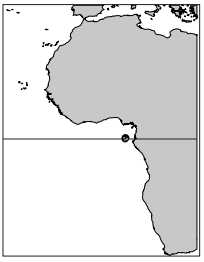
17.10. *Venus declivis* G.B. Sowerby II, 1853. **A**-**C**, W of Baie de Sangarea, Guinea, 9°42'N, 15°33'W, 35 m (39.2 mm). **D**-**E**, Grand Bassam, Côte d'Ivoire, 20 m (42.4 mm). **F**-**I**, Baie Cap Lopez, Port-Gentil, Gabon (40.5 mm). **J**, same locality (39.3 mm). **K**, Baia da Corimba, Luanda prov., N-Angola, 10-20 m (34.8 mm). **L**-**N**, same locality (17.1 mm).

Venus lyra Hanley, 1845



17.11. Ponta Diego Nunez, Sao Tomé, 4-5 m (39 mm).

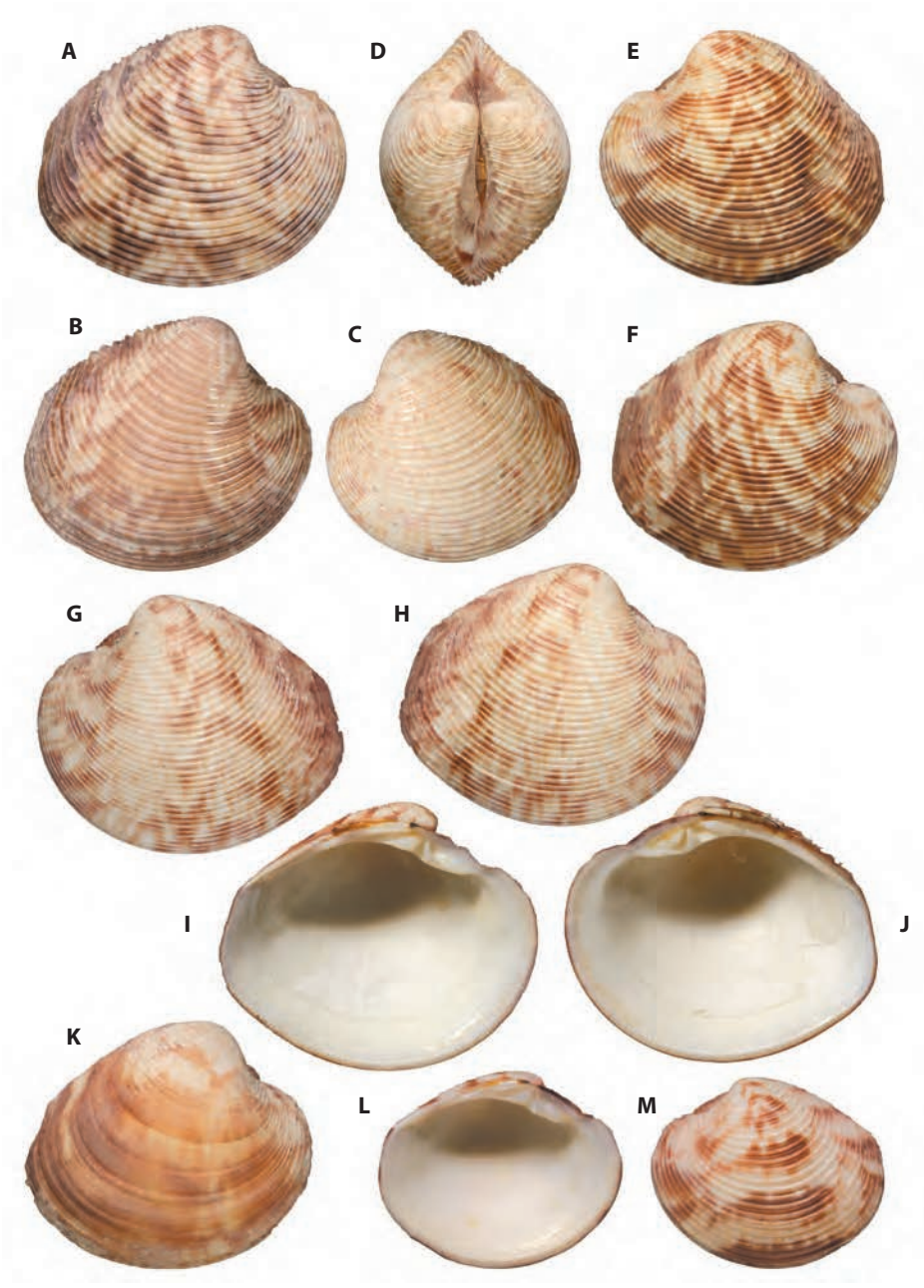
Shell up to 40 mm long, broadly suboval-triangular, slightly longer than high, solid, inflated. Anterior margin rounded, Beaks well in front of the vertical midline. Surface with numerous regular close-set commarginal lamellae, which, except on the posterior and the very anterior part of the valves, are bent upwards towards the beaks to form smooth regular cords, often touching each other. Inner margins crenulate. Outside dirty whitish, with dense light to dark brown zigzag markings. Lunule brownish. Inside white, often with pinkish hue under the beaks.



Distribution. Endemic to the islands in the Gulf of Guinea: São Tomé, Ilha do Principe and Annobon.

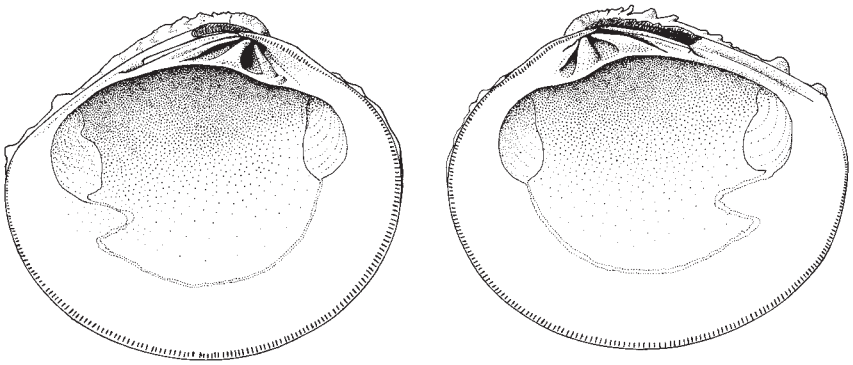
Biotope. In sand with calcareous algae and shell debris, from low water mark to about 20 m, also among rocks, common.

Remarks. This endemic species is most similar to *V. declivis*, but its sculpture is different with more densely spaced and curled commarginal lamellae, whereas in *V. declivis*, they are vertical. *V. lyra* has no cords in the interspaces. Its valves are slightly longer and posteriorly more truncated rather than rounded.



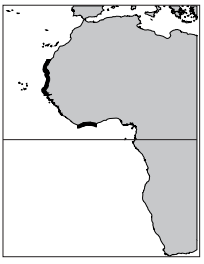
17.12. ***Venus lyra*** **Hanley, 1845. A**, Esprainha, near Neves, Ilha de São Tomé, sand between rocks, shallow water (32.4 mm). **B**, same locality (30.2 mm). **C-D**, Praia Grande, Ilha do Principe, 12-13 m among calcareous algae (30.0 mm). **E-F**, Ilha do Principe, 1°42.5'N, 7°28'E, 21 m among calcareous algae (32.0 mm). **G-J**, Ponta Oquedelrey, São Tomé, 4-5 m (38.5 mm). **K**, N of Santo Antonio, Annobon, 23 m (38.4 mm). **L-M**, between Ponta da Mina and Ilha Sta. Ana, Ilha do Principe, 10-12 m (19.4 mm).

Venus crebrisulca Lamarck, 1818



17.13. M'Bour, Petite Côte, Senegal, 20-30 m (40 mm).

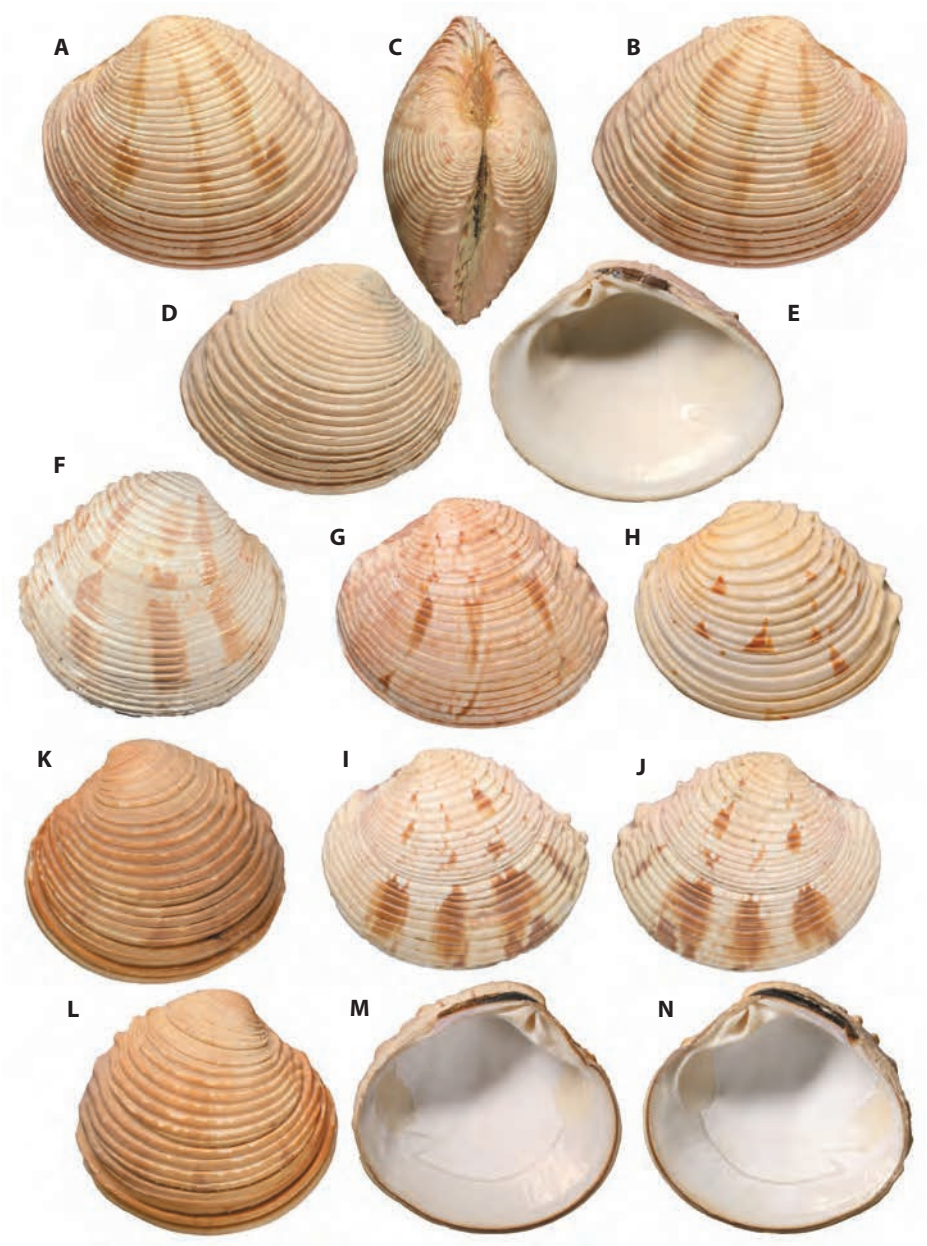
Shell up to 50 mm long, in certain limits variable in shape and sculpture, broadly suboval to subcircular, slightly longer than high, thick and heavy, rather inflated. Beaks in front of the vertical midline. Surface with thick, broad, close-set slightly irregular commarginal cords, which often touch each other and in adult specimens frequently diverge in a typical way on the anterior end at growth stages. Inner margin of the valves finely crenulate. Outside yellowish white to light pink, with brownish rays, streaks or zigzag markings, occasionally uniform white to fawn. Inside white, often with a pale purple zone on the dorsal margin under the ligament.



Distribution. West Sahara (Rio de Oro, 25°N), Mauritania and Senegal southward to the Petite Côte (M'Bour). Known from Côte d'Ivoire by one record.

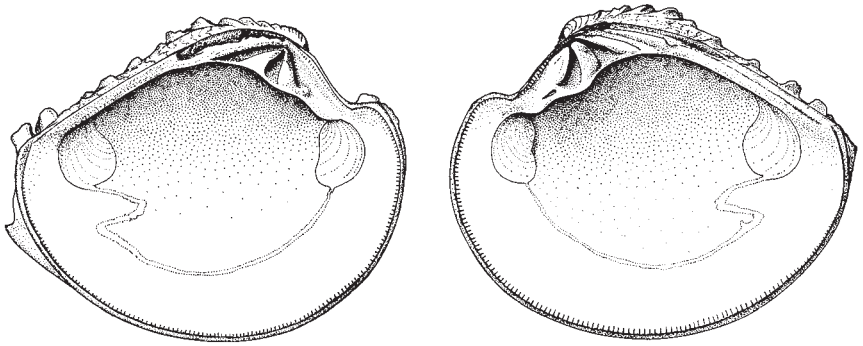
Biotope. In mixed sand, coarse sand, seagrass beds, 4-25 m, often occurring in dense populations.

Remarks. This species is exploited in Mauritania as "praire", especially in the northern part (W of Banc d'Arguin), where large standing stocks have been found in depths between 10 and 25 m (*e.g.* Diop & Glémarec 1990, see there also for more references). This is a warm-temperate species which occurs mainly in the northern transition zone with intensive upwelling; it is not penetrating into the tropical zone south of Gambia. The record from Côte d'Ivoire, in the "atypical tropical zone" indicates a disjunct distribution. The few known specimens (in MNHN) from there are extremely large and heavy. A well-known synonym is *V. rosalina* Rang, 1834, under which the species was treated for a long period.



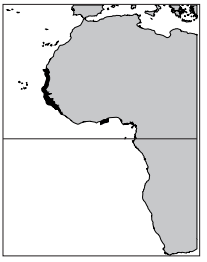
17.14. ***Venus crebrisulca*** **Lamarck, 1818. A-C**, Mauritania, 20°35'N, 17°00'W, 15-20 m (52.5 mm). **D-E**, same locality (47.4 mm). **F**, Gorée, Senegal, (syntype MNHN of *V. rosalina* Rang, 1834, 41.3 mm, photo Manuel Caballer/Recolnat). **G**, M'Bour, Petite Côte, Senegal, 20-50 m (36.0 mm). **H**, same locality (37.0 mm). **I-J**, same locality (38.9 mm). **K-N**, off Abidjan, Côte d'Ivoire (44.1 mm).

Venus subrosalina Tomlin, 1923



17.15. Baie de Hann, Dakar, Senegal, 10-20 m (35.5 mm).

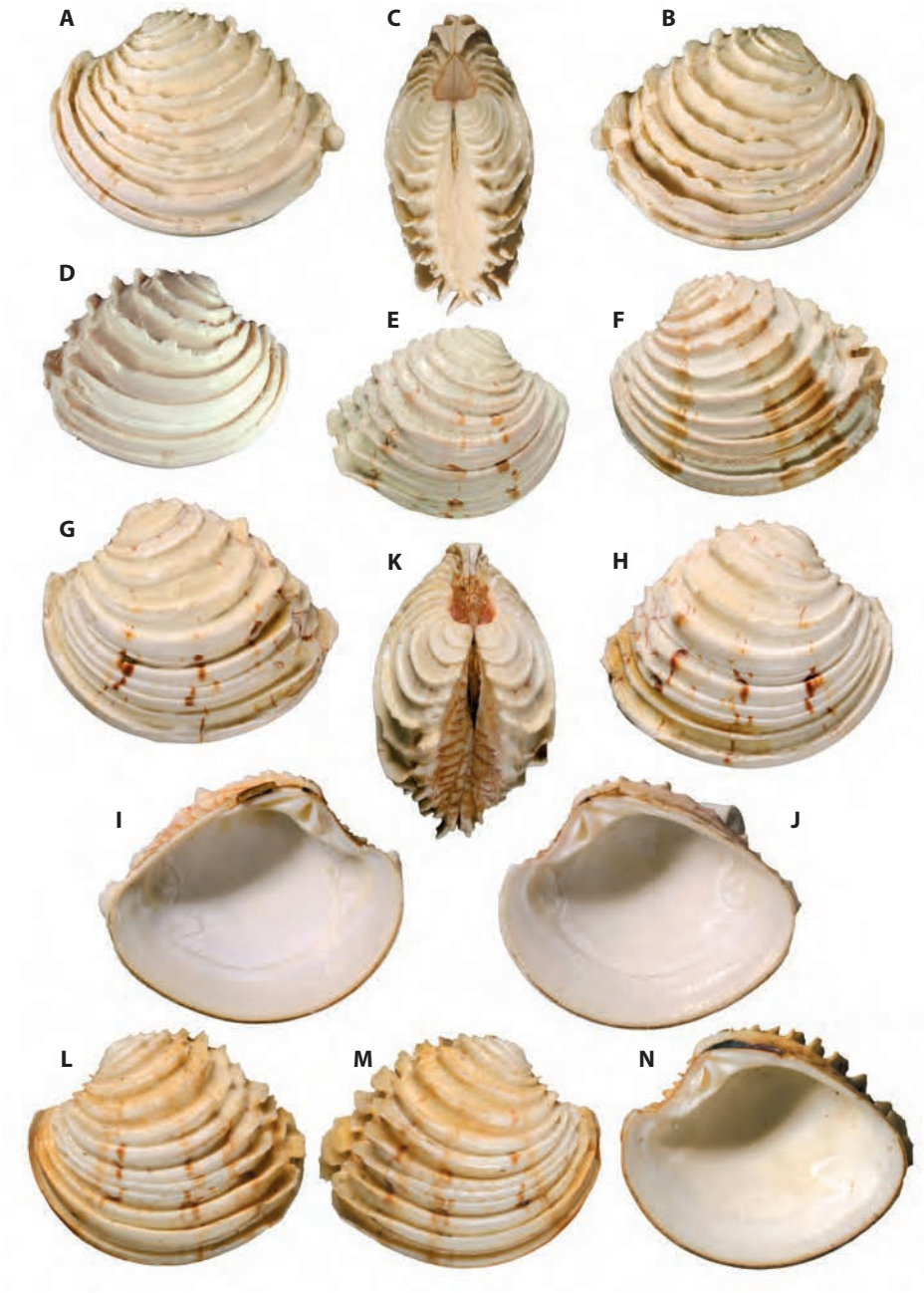
Shell up to 40 mm, broadly suboval-subtriangular, longer than high, thick and solid, rather inflated. Beaks well in front of the vertical midline. Surface with broad, irregular commarginal lamellae, folding towards dorsally, becoming more lamellate and vertical on the posterior part and showing an about 1.5 mm broad interruption which is situated *ca.* 2 mm anterior to the posterior end of the lamellae at the escutcheon. Interspaces with very fine commarginal threads. Inner margin of valves crenulate. Outside ivory white, with light to dark brownish rays, dots or streaks, ridges occasionally tinged with pink. Lunule brown. Inside entirely white.



Distribution. Mauritania (Cap Blanc) to Guinea (9°30'N); Ghana (Tema and Sekondi). Rather common in the North, becoming rare south of Dakar.

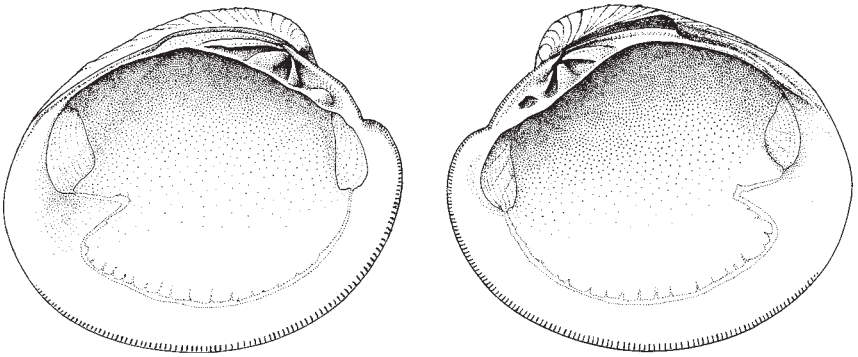
Biotope. In mixed sand and coarse sand, both mineral and carbonate, also on calcareous algae and shell debris, from 5 to 20 m, locally common.

Remarks. This is the second "praire" which is commercially exploited in Mauritania, but in less quantities than *V. crebrisulca*. It also occurs locally in exploitable standing stocks. The species is easily distinguished from *V. crebrisulca* by its widely separated commarginal cords and by the more triangular outline. It was for a long time known as *V. affinis* G.B. Sowerby II, 1853 (*non V. affinis* Gmelin, 1791). Two replacement names for Sowerby's *V. affinis* were published: *V. subrosalina* Tomlin, 1923 and *V. erronea* Fischer-Piette, 1975, under which the species was also cited. *Venus subrosalina* was also mistaken for *V. crebrisulca* (cited as *V. rosalina*) by various authors (*e.g.* Nicklès 1950). There is no record from Côte d'Ivoire but two isolated records from Ghana (in Ryall coll.)



17.16. ***Venus subrosalina*** **Tomlin, 1923. A-C**, Mauritania, 20°00'N, 17°10'W, 15 m (31.3 mm). **D**, Mauritania, 20°35'N, 17°00'W, 15-20 m (30.4 mm). **E**, Baie de Gorée, 5-20 m (28.1 mm). **F**, same locality (28.1 mm). **G-K**, same locality (33.1 mm). **L-N**, W of Cap Rouge, 14°38'N, 17°11'W (32.0 mm).

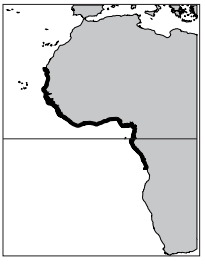
Venus chevreuxi Dautzenberg, 1891



17.17. Off St. Louis, Senegal, 100-300 m (51.4 mm).

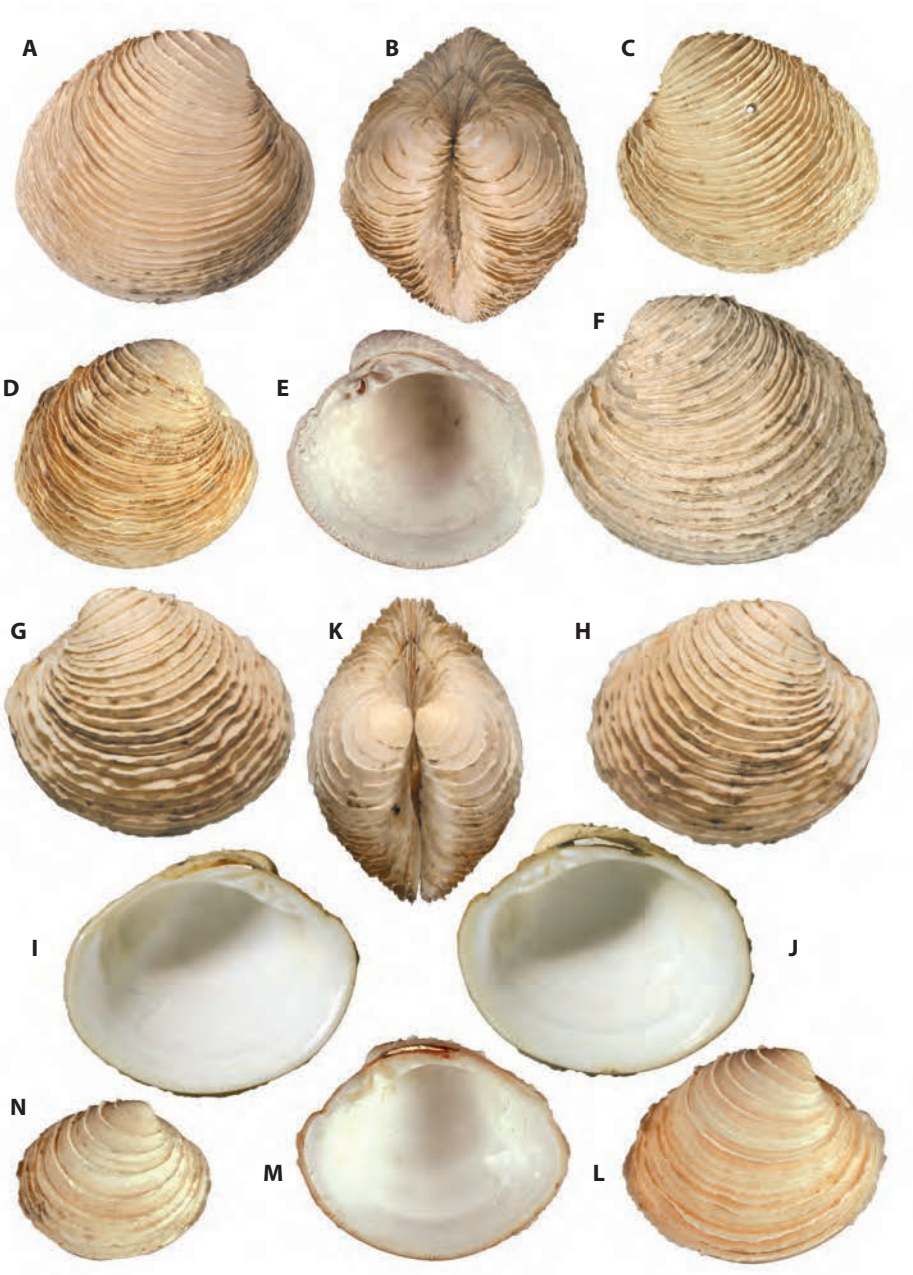
Shell up to 55 mm long, somewhat variable in outline and tumidity, broadly suboval, rather solid, inflated. Beaks well in front of the vertical midline. Surface with thin, densely spaced and irregularly set commarginal lamellae, with broad and smooth interspaces on the earlier part of the valve which become more and more close-set towards the ventral margin. Lunule moderately broad and well-marked by an incision but hardly sunken, escutcheon smooth and well-defined on the left valve, narrower and ill-defined on the right valve. Inner margin of the valves ventrally finely crenulate. Pallial sinus small and triangular. Outside creamy-whitish, inside white, occasionally with a very pale brownish hue in the umbonal cavity and below it.

Distribution. Mauritania (21°09') to northern Angola (Luanda).



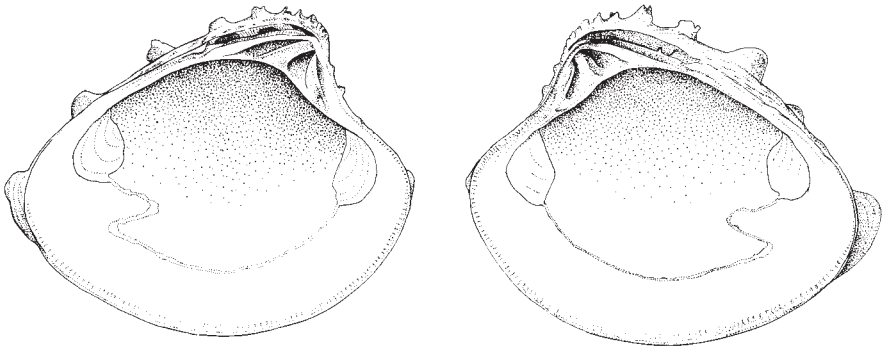
Biotope. In mud, muddy sand and fine sand, offshore from 40 to 300 m, not uncommon.

Remarks. This typical deeper shelf species is occasionally taken by shrimp boats and fish trawlers, but it is too rare to be exploited commercially. Generally not found on beaches. A very closely related species is *V. nux* Gmelin, 1791 from the Ibero-Moroccan Gulf, the Algerian coast and Morocco. It is smaller and often slightly more inflated; the commarginal lamellae are rather similar, but have a somewhat finer appearance and are often more close-set. However, in *V. chevreuxi* they are characteristically widely spaced on the earlier part of the valves whereas in *V. nux* they are equally densely spaced over the whole surface.



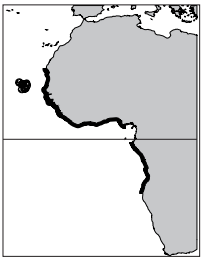
17.18. ***Venus chevreuxi*** **Dautzenberg, 1891. A-B**, off Mauritania (38.8 mm). **C**, off Mauritania, 17°52'N, 16°35'W, 205 m (37.6 mm). **D-E**, Dakar region, Senegal, 14°50.1'N, 17°29.5'N, 150 m (35.0 mm). **F**, Côte d'Ivoire, 5°01'N, 5°17'W, 40 m (51.4 mm). **G-K**, Bota-Batoke, Cameroon, 3°59'N, 8°58.5'W, 40-50 m (37.9 mm). **L-M**, Gabon, 0°38.3'S, 8°48.5'E, 35 m, mud (34.3 mm). **N**, same locality (21.7 mm).

Clausinella punctigera (Dautzenberg & Fischer, 1906)



17.19. Cacuaco, Bengo, N-Angola, 0-5 m (19.5 mm).

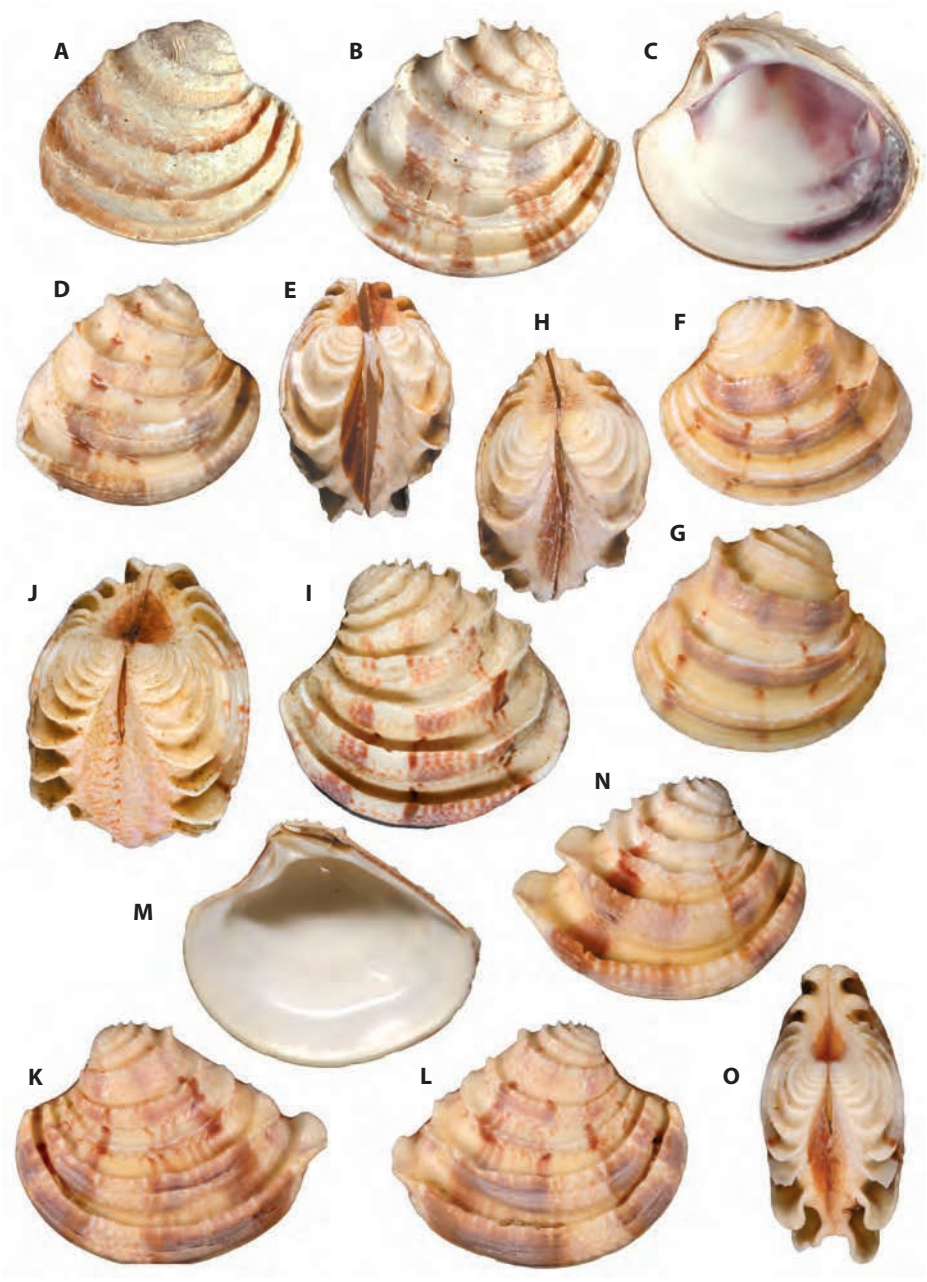
Shell up to 23 mm long, longer than high, triangular-suboval, thick and solid, rather inflated. Beaks prominent, well in front of the vertical midline. Surface with few thick, broad and prominent commarginal lamellae, folding towards dorsally and at the posterior ends becoming thinner and vertically lamellate. Interspaces and surface of the lamellae with very fine slightly irregular threads which are visible only under a lens (x 10-20). Inner margin of valves crenulate. Outside cream to pale-yellowish or pink, with brownish to brownish violet rays, streaks, blotches or fine zigzag markings. Inside whitish to ivory, occasionally with pink on the postero-dorsal or the umbonal area.



Distribution. Mauritania (Cap Blanc, rare) to Nigeria; Gabon (Port-Gentil) to southern Angola (Lucira, Moçâmedes); Cape Verde Islands. No records from Cameroon and northern Gabon.

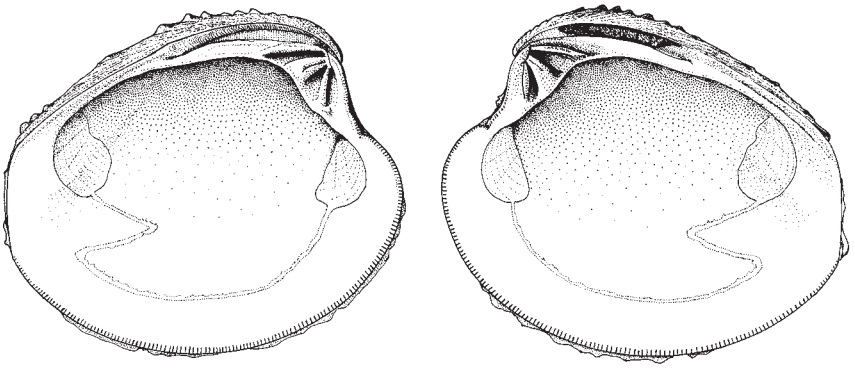
Biotope. In mixed and coarse sand, also with calcareous algae, gravel and shell debris, from 3 to 70 m, moderately common. Off Guinea, it was found sharing its biotope with the turritellid gastropod *Callostracum gracile* (Maltzan, 1883).

Remarks. This species is close to the Atlantic-Mediterranean *Clausinella fasciata* (da Costa, 1778) (= *Venus brongniarti* Payraudeau, 1826) (Norway and Orkney to Morocco, Mediterranean). However, it is distinguished by its fewer and much more prominent commarginal cords. Extremely similar looking Caribbean species are *Lirophora paphia* (Linnaeus, 1767) and *L. varicosa* (G. B. Sowerby II, 1853), but molecular data (Kappner & Bieler, 2006) showed that these similarities are based on convergence in different lineages.



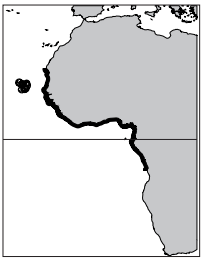
17.20. ***Clausinella punctigera*** **(Dautzenberg & Fischer, 1906). A**, Port-Etienne (now Nouadhibou), Mauritania, 20°29'N, 16°22'W, 10 m (20.7 mm). **B-C**, Mindelo, São Vicente, Cape Verde Islands, dredged (23.5 mm, MNCN). **D-E**, Baia de Tarrafal, São Tiago Cape Verde Islands, 15°16.5'N, 23°47.5'W, 40-45 m (22.5 mm). **F-H**, S of Dakar (Petite Côte), Senegal (17.6 mm, note the different tumidities of rv and lv). **I-J**, Grand Bassam, Côte d'Ivoire, 5°08.9'N, 3°48.6'W, 35 m (22.3 mm). **K-M**, Baia de Corimba, Luanda prov., N-Angola (20.5 mm). **N-O**, same locality (19.5 mm).

Circomphalus foliaceolamellosus (Dillwyn, 1817)



17.21. Abidjan region, Côte d'Ivoire (76 mm).

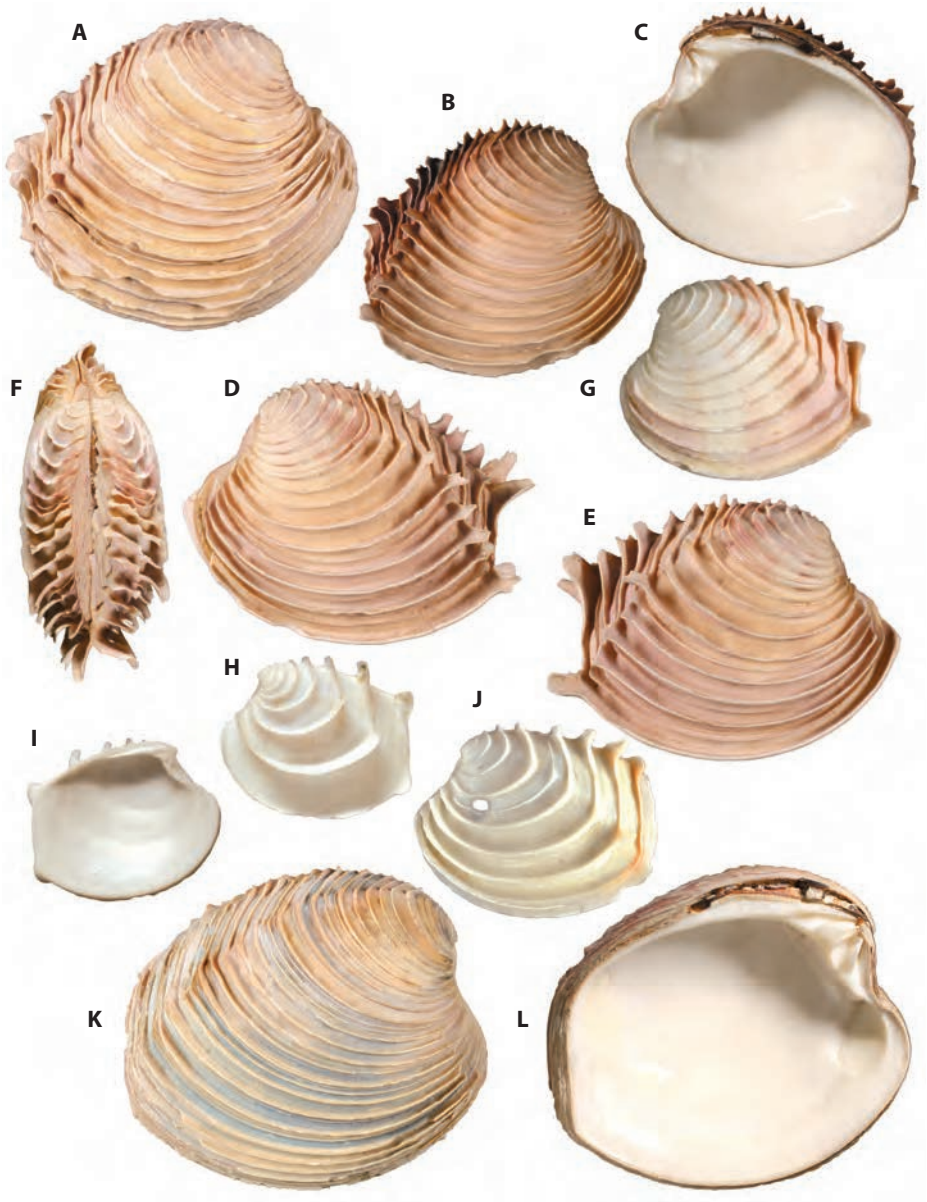
Shell up to 85 mm long, somewhat variable in shape, broadly suboval-subtriangular, longer than high, thick and solid, old specimens very thick and heavy, fairly compressed. Beaks situated characteristically forward, at the end of the anterior fourth of the valve. Surface with thin, fragile and prominent commarginal lamellae which in their upper part are slightly folded towards dorsally and which in juvenile specimens are rather widely spaced. Prolongations of the lamellae to short spines on two rows delimiting the postero-dorsal slope. Interspaces with very fine commarginal growth lines and occasionally smaller lamellae, no radial sculpture. Hinge plate very broad, with slight anterior lateral knob in the left valve. Inner margin of valves crenulate. Outside light reddish brown, posterior dorsal slope sometimes more intensely coloured. Inside entirely white.



Distribution. West Sahara (Rio de Oro) to northern Angola (Luanda); Cape Verde Islands.

Biotope. In fine sand and mixed sand, also calcareous algae and shell debris, from 10 to about 30 m, not uncommon.

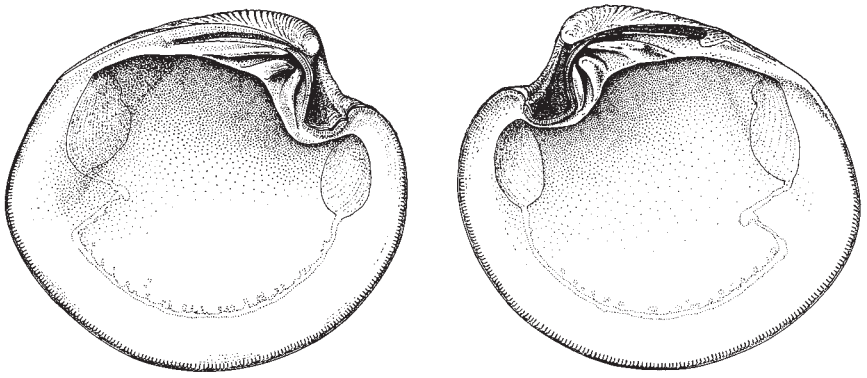
Remarks. This species is distinguished from the West African *Venus* by its characteristic commarginal lamellae and smooth interspaces, the conspicuously forward placed umbos and the rather compressed shell, and thus its separation in the genus *Circomphalus* of which it is the type species, is justified. The genus is represented in the Indo-Pacific by *C. hiraseanus* (Kuroda, 1930) in Japanese waters. Other similar Indo-Pacific species are *Bassina disjecta* (Perry, 1811) in the southern part of Australia and Tasmania and *B. yatei* (Gray, 1835) in New Zealand, which Ludbrook (1984) considered congeneric with *Circomphalus*. *C. foliaceolamellosus* has generated nomenclatural confusion for a long time. It was cited either as *Venus foliaceo-lamellosa* (Chemnitz) Schröter, 1788 or *V. plicata* Gmelin, 1791. However, Schröter's name is considered unavailable and the name *V. plicata* is preoccupied by Barbut, 1788. The current name was first made available as *Venus foliaceolamellosa* by Dillwyn (1817). This is the largest West African



17.22. *Circomphalus foliaceolamellosus* (Dillwyn, 1817). **A**, Cap des Biches, Dakar region, Senegal (71.6 mm). **B**-**C**, Gambia (60.1 mm), old coll. MNHN. **D**-**F**, Kafountine, N-Casamance, 12°50.4'N, 16°58.8'W, 13-14 m (50.5 mm). **G**, Cap Skirring, S-Casamance, Senegal, beach drift (31.1 mm). **H**-**I**, W of Ile Tannah, Guinea, 8°12'N, 13°40.5'W, 20 m (9.7 mm). **J**, Abidjan region, Côte d'Ivoire (23.1 mm) **K**-**L**, Congo Brazzaville (80.3 mm), old coll. MNHN.

venerid; it is occasionally taken in shrimp trawls but is too rare for being exploited commercially. Empty shells and valves are occasionally found on beaches. The species is also present in the Pliocene of Northern Italy (for details, see Sacco 1900).

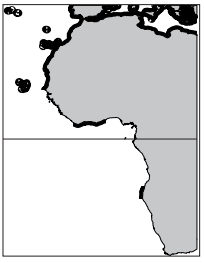
Globivenus effossa (Bivona, 1836)



17.23. Banc de la Malouine, West Sahara, 25°38'N, 14°55'W, 83 m (30 mm).

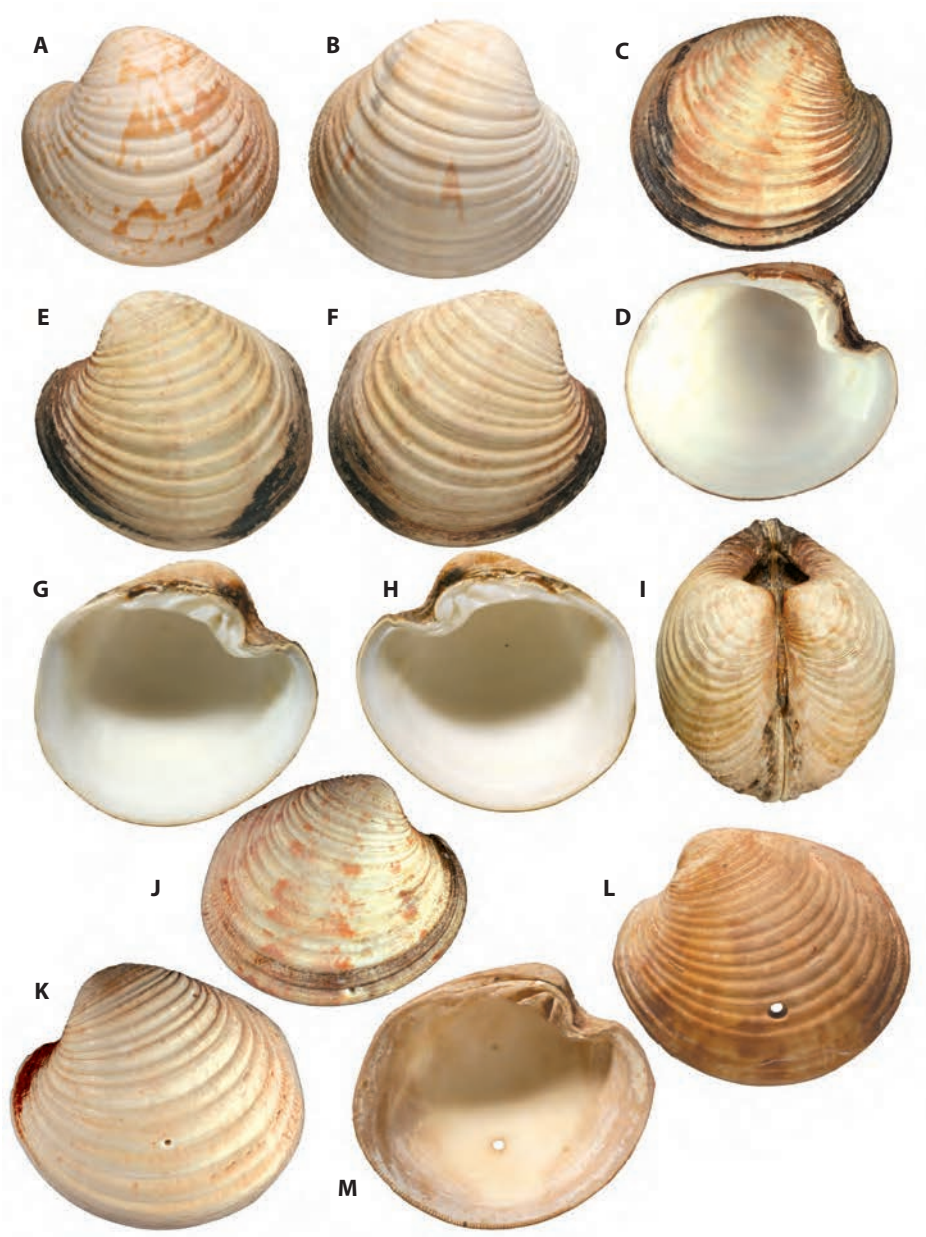
Shell up to 37 mm long, rounded, very slightly longer than high, thick and solid, very inflated, nearly spherical, with exceptionally deep sunken lunule. Beaks well in front of the vertical midline. Exterior with irregular low and broad commarginal undulations and numerous very fine, dense, narrow, commarginal ridges which are only visible under a lens (x 10-20). They are overlain by fine radial grooves on the anterior and posterior slope. Inner margin of valves crenulate. Outside cream with light brown to darker brown chevrons or zigzag markings, isolated or arranged commarginally or radially. Lunule often brown. Inside creamy white.

Distribution. Ibero-Moroccan Gulf to Senegal (Dakar area); eastern Liberia (9°W) and Côte d'Ivoire to Ghana; southern Angola (Lucira) to off the west coast of South Africa (Vema Seamount, SE of Walvis Ridge); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.



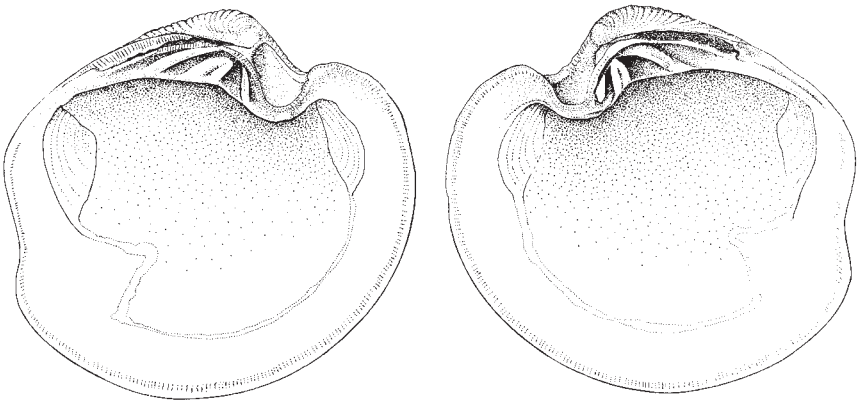
Biotope. In mixed and coarse sand, often within "rhodolith beds" formed by calcareous algae, in shell debris or gravel, from about 50 to 200 m, not common anywhere. Off Ghana, it was found together with *G. libellus* in the same dredge haul.

Remarks. *Globivenus effossa*, like the following species, is characterized by its peculiar deep-sunken lunule. It has less numerous and broader commarginal undulations and finer crenulations on the inner margin than *G. libellus*. The lack of records from Guinea, Sierra Leone and the greater part of Liberia as well as east and south of Ghana to northern Angola may indicate distribution gaps.



17.24. *Globivenus effossa* (Bivona, 1836). **A**, Senegal, from fishermen (36.1 mm). **B**, same locality (37.8 mm). **C-D**, Liberia, 5°21.5'N, 9°54.5'W, 73-80 m (24.3 mm). **E-I**, off Abidjan, Côte d'Ivoire (28.0 mm). **J**, Ghana, 4°37'N, 0°50'W, 90-100 m (21.2 mm). **K**, same locality (29.6 mm). **L-M**, Baia da Lucira, Namibe prov., S-Angola, 90-100 m, from fishermen (32.1 mm).

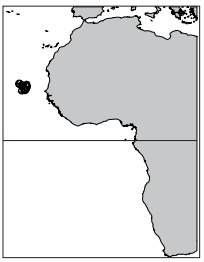
Globivenus pereffossa (Dautzenberg & Fischer, 1906)



17.25. Ponta Tantão, W of Brava, Cape Verde Islands, 56-70 m (21.0 mm).

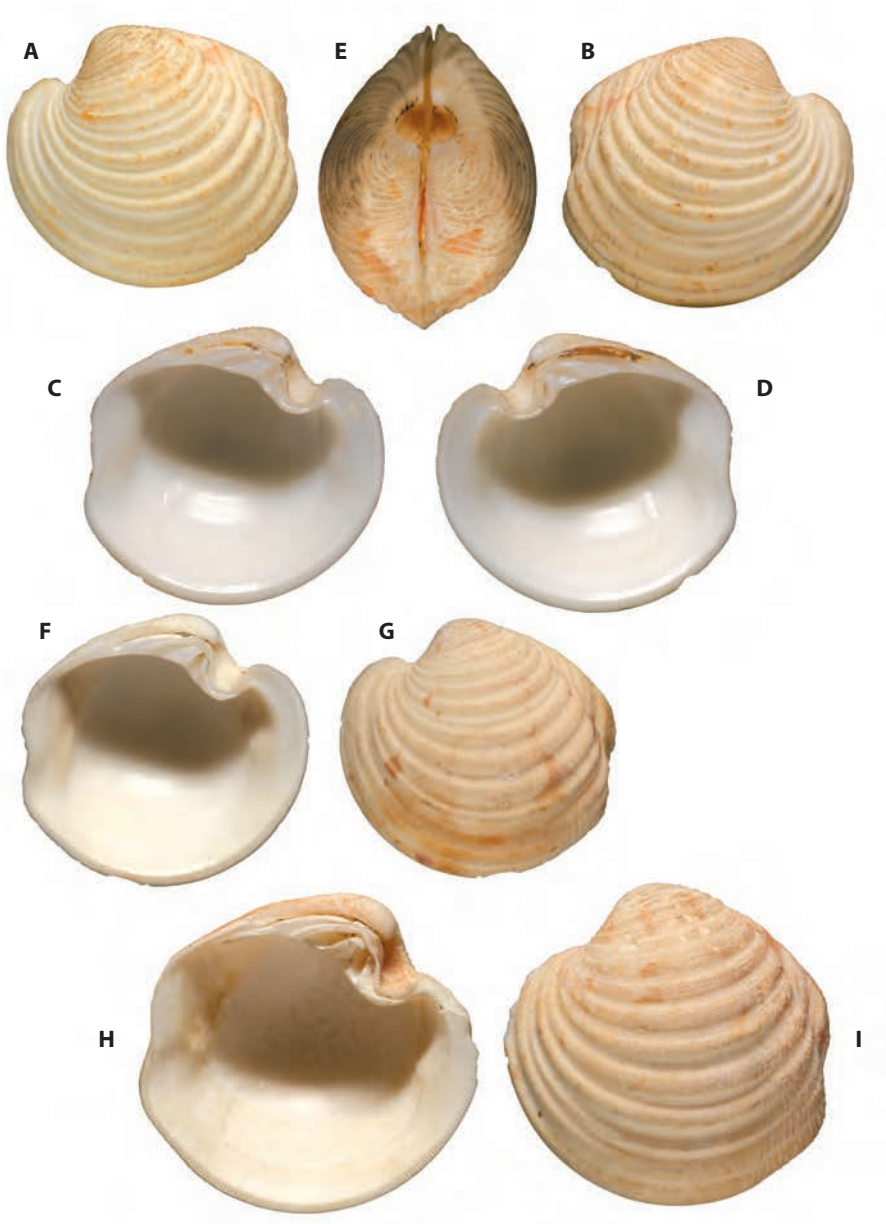
Shell up to 26 mm long, slightly less high or with nearly the same height, rounded with sinuosity on the posterior margin, thick and solid, very inflated, with extremely deep sunken lunule. Beaks well in front of the vertical midline. Exterior with more or less regular low and very broad commarginal undulations and numerous very fine, dense, narrow commarginal ridges which are only visible under a lens (x 10-20) and which are crossed by fine and dense radial grooves on the posterior slope, becoming obsolete towards the middle. On the anterior slope very fine radial striae. Inner margin of valves crenulate. Outside creamy white with few irregular light brownish chevrons or streaks, occasionally no markings at all. Inside white.

Distribution. Cape Verde Islands, endemic. The locality "Port-Etienne, Mauritanie" cited by Fischer-Piette (1975) is an error, the cited station 54 of "Calypso 1959" is in the Cape Verde Archipelago. Fischer's citation "le cap Vert" [Senegal] is also a misinterpretation of the type locality ("Princesse Alice" station 1190, 15°15'N, 23°04'W), which is also within the Cape Verde Islands.



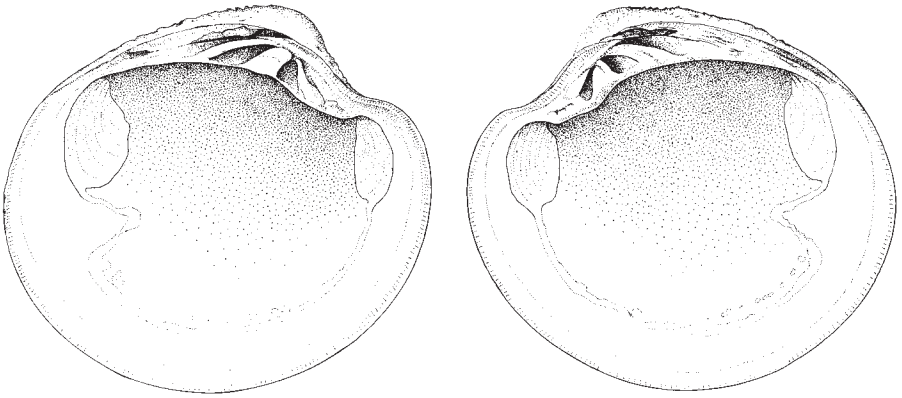
Biotope. In coarse sand with foraminifers, calcareous algae, shells and shell debris, from about 70 to 170 m [type loc.], not common.

Remarks. This species differs from *Globivenus effossa* by its smaller shell and the conspicuous sunken postero-dorsal slope which is separated from the rest of the shell by a rounded posterior angle and which ends in a sinuosity of the posterior margin. The commarginal waves are less numerous and somewhat broader than in *G. effossa*.



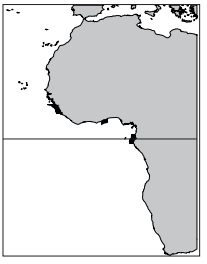
17.26. *Globivenus pereffossa* (Dautzenberg & Fischer, 1906). A-E, Ponta Tantão, W coast of Brava, Cape Verde Islands, 56-70 m (21.4 mm). F-G, same locality (22.5 mm). H-I, same locality (26.6 mm).

Globivenus libellus (de Rayneval, Van den Hecke & Ponzi, 1854)



17.27. W of Ile Tannah, Guinea, 9°12'N, 14°16.3'W, 33 m (27.9 mm).

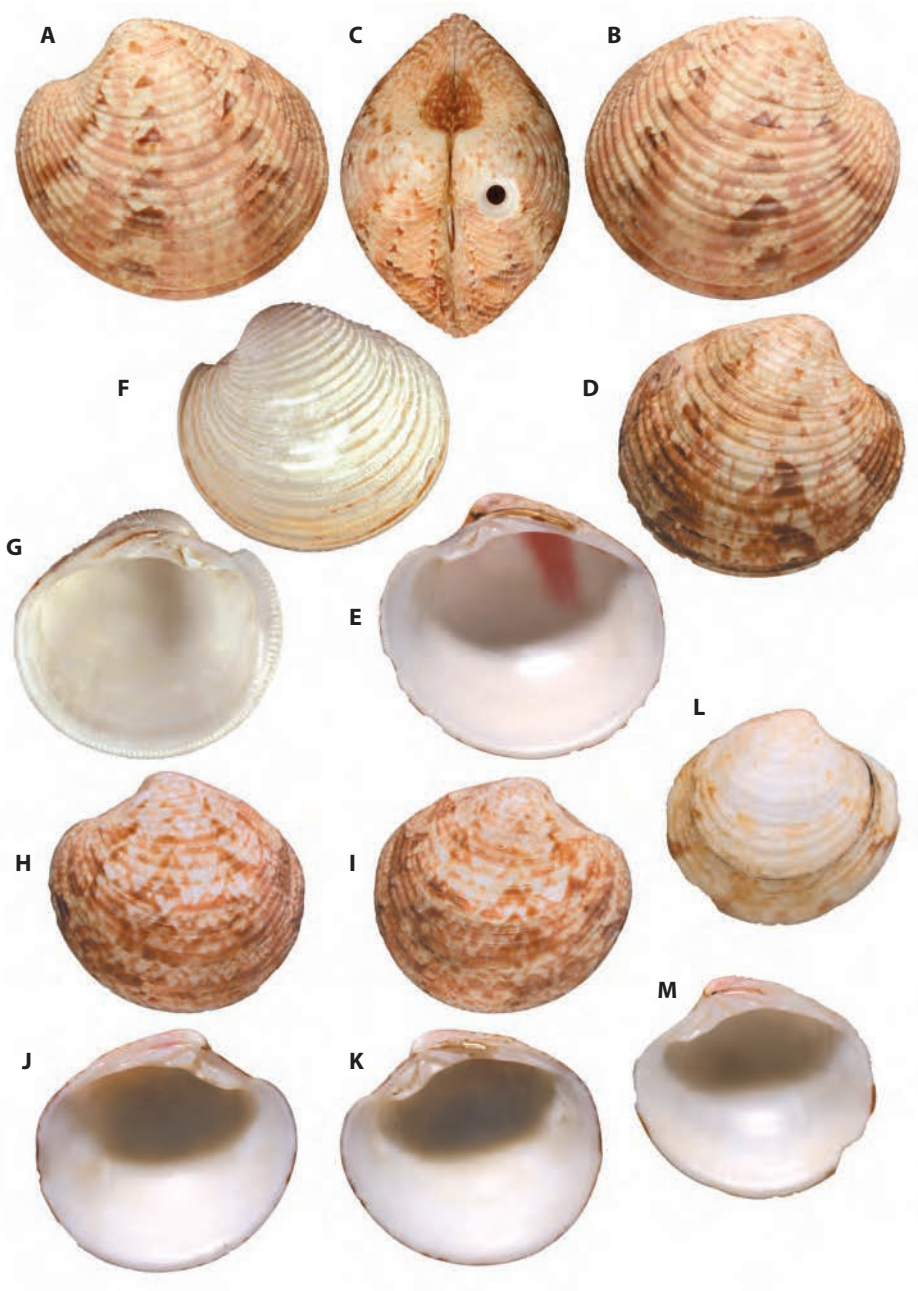
Shell up to 30 mm long, rounded-subcircular, very slightly longer than high, thick and solid, strongly inflated, nearly globose. Beaks in front of the vertical midline. Lunule not sunken. Surface with commarginal undulations and very fine, dense, narrow commarginal grooves which resemble tiny fissures and are well visible only under a lens (x 10-20). These are crossed by fine radial grooves on the anterior and posterior slope. Inner margin of the valves crenulate. Outside pale yellowish to ivory, either almost uniformly coloured or with more or less dense brownish to reddish streaks and V-markings, arranged in radial rays. Inside white, occasionally with pink on the dorsal part.



Distribution. Known from Guinea (Conakry area) southward to Ghana and Gabon (Port Gentil), probably with distribution gaps between the localities.

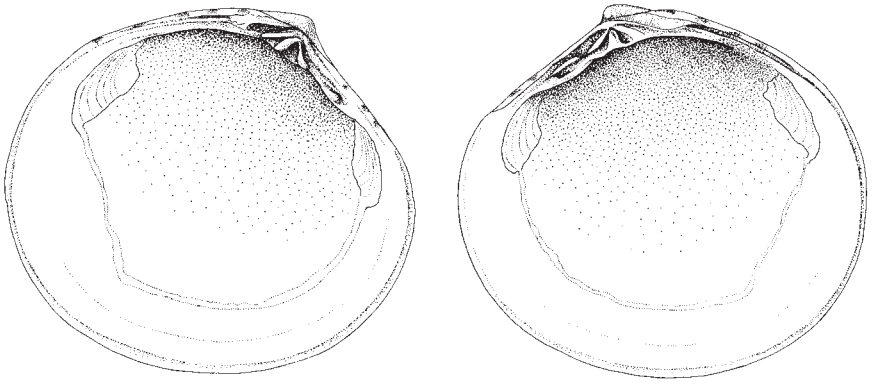
Biotope. On hard bottom with coarse sand and gravel, also with calcareous algae, shells, pebbles and stones, offshore from about 35 to 100 m, rare. In Gabon a few specimens were collected in shallower depths between the encrustations of an oil drilling platform drawn ashore for overhauling.

Remarks. This species is present in the Italian Pliocene and is also recorded from the Pleistocene of Sicily (Malatesta 1963). Fossil and Recent specimens being almost identical, there seems to be no reason for giving another name to the Recent form, which has only been discovered during work on this volume. The Pliocene *G. messanensis* (Seguenza, 1877) might also be this species. Similar Caribbean species are *Globivenus kempfi* (Fischer-Piette & Testud, 1970) from Brazil and *G. listeroides* (Fischer-Piette & Testud, 1967) from Colombia to Surinam which inhabit the same special type of biotope as *G. libellus*.



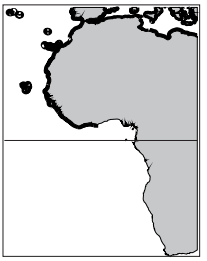
17.28. ***Globivenus libellus*** **(de Rayneval, Van den Hecke & Ponzi, 1854). A-C**, W of Ile Tannah, Guinea, 9°12'N, 14°15.1'W, 33 m (28.0 mm). **D-E**, W of Ile Tannah, Guinea, 9°11.9'N, 14°21'W, 41 m (25.5 mm). **F-G**, Ghana, 4°37'N, 0°50'W, 90-100 m (25.7 mm). **H-K**, Port-Gentil, Gabon, "Anguille" oilfield, 0°56'S, 8°40.8'E, 8-20 m on underwater structure of oil platform (16.2 mm). **L-M**, same locality (14.0 mm).

Gouldia minima (Montagu, 1803)



17.29. Ilha do Principe, 75 m (6.5 mm).

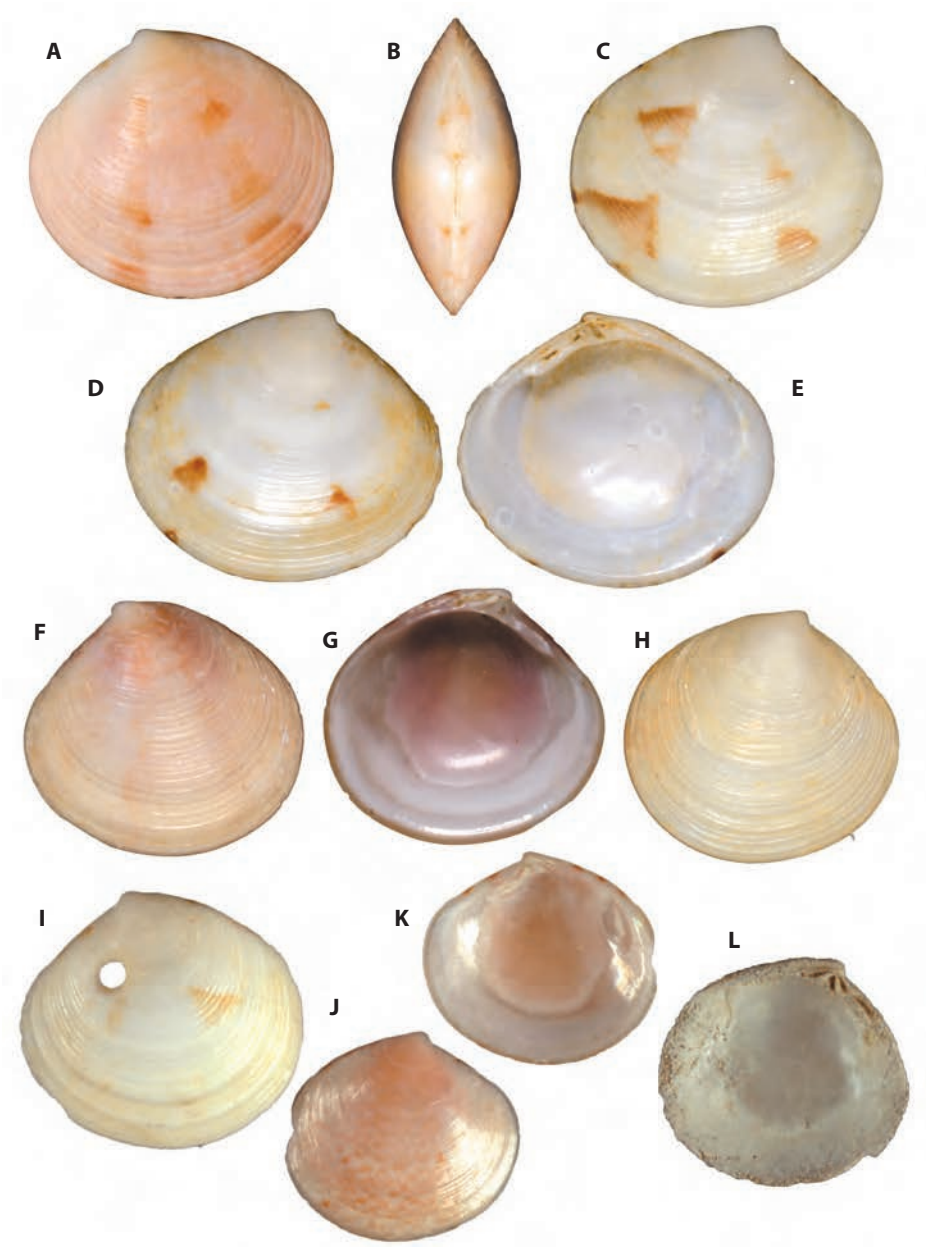
Shell very small, 5 -10 mm long, variable in outline, size, colouration and pallial line, subcircular, slightly longer than high, more or less thick and solid, compressed. Beaks in the middle or just in front of the vertical midline. Lunule rather long, escutcheon very small and ill-defined. Surface with numerous fine, somewhat irregular, commarginal ridges which become obsolete towards the beaks. Inner margin of the valves smooth. Outside whitish or cream to light pink, with irregular brownish to reddish brown spots, chevrons, streaks or blotches, occasionally arranged in radial rays. Inside white, often with a pink area under the beaks.



Distribution. Norway (60°N), Faroe and British Isles southward to Casamance; Côte d'Ivoire and Ghana; Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean. A few isolated valves, obviously from the Quaternary, were found off southern Gabon and Angola.

Biotope. In coarse sand and gravel, also with calcareous algae and shell debris, from 10 to 200 m, common.

Remarks. West African specimens are generally smaller (up to 8 mm), thinner-shelled and less coloured than specimens from Europe.

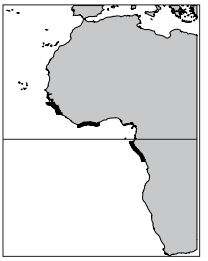


17.30. ***Gouldia minima*** **(Montagu, 1803).** **A**-**B**, Senegal, 14°35.8'N, 17°26.8'W, 36 m (6.2 mm). **C**, SW of Cap Manuel, Dakar region, Senegal (6.7 mm). **D**-**E**, Cap Skirring, Casamance, 12°32'N, 17°29'W, 45 m (7.1 mm). **F**-**G**, off Abidjan, Côte d'Ivoire (6.0 mm). **H**, same locality (5.9 mm). **I**, Ghana, 04°36.5'N, 01°31'W, 50 m (6.4 mm). **J**-**K**, same locality (5.1 mm). **L**, off Ilha de Luanda, Luanda prov., N-Angola, 120 m (6.4 mm).

Microcirce anteai Cosel & Gofas, 2018

17.31. Grand Bassam, Côte d'Ivoire, 5°09.2'N, 3°47.2'W, 30 m (holotype, 2.3 mm).

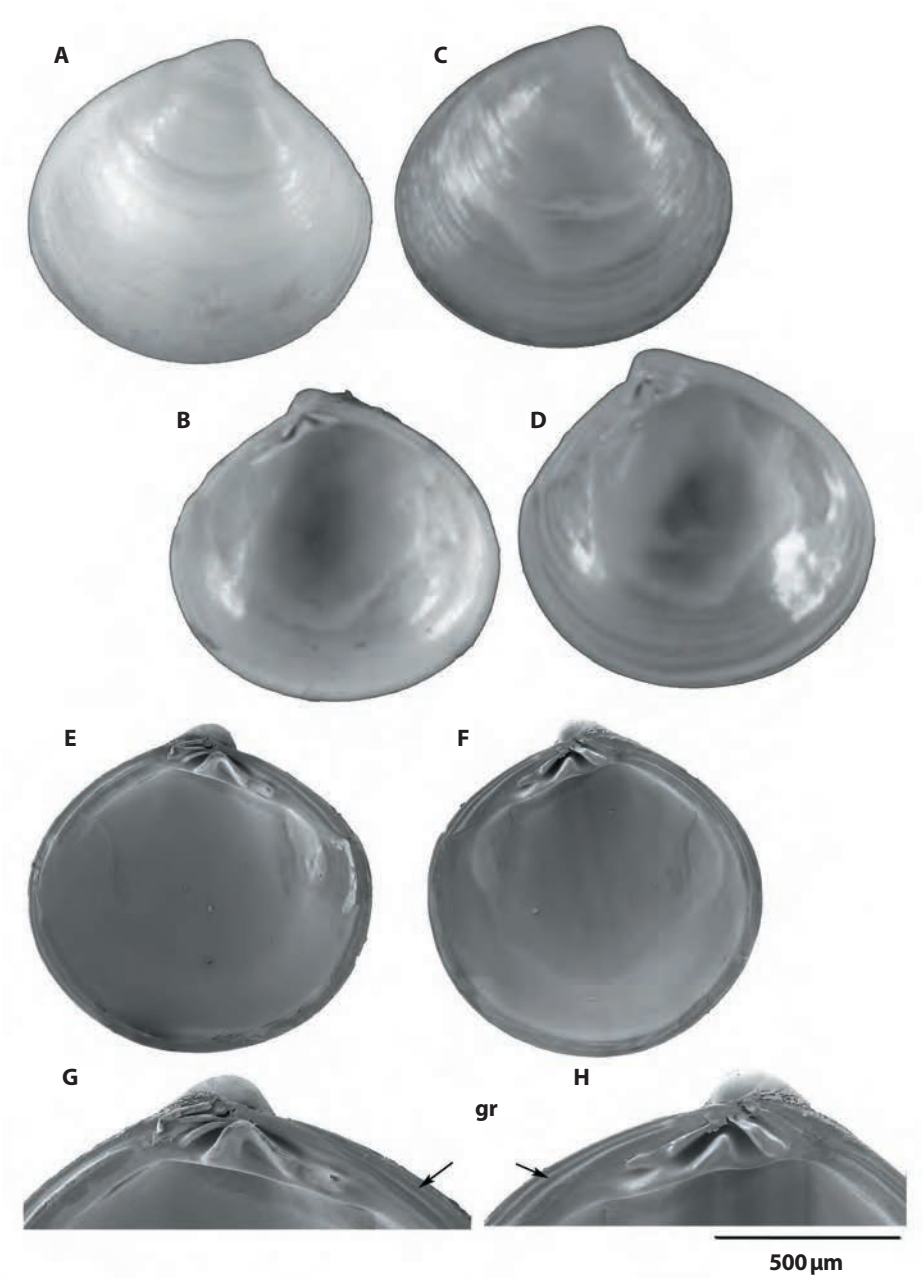
Shell extremely small, up to 2.5 mm long, somewhat variable in outline, almost circular, slightly longer than high, rather thin but solid, compressed. Beaks just in front of the vertical midline. Lunule long and broad, not sunken and only delimited by a weak lunular incision, escutcheon very narrow and hardly visible. Surface near the ventral margin with fine, somewhat irregular, commarginal ridges which may be well- to ill-defined and which become obsolete on the central part of the valves towards the beaks. Periostracum transparent and glossy. Inner margin of the valves smooth. Pallial sinus a very broad, as shallow indentation only. Valves white, occasionally on the postero-ventral part with a pale brownish hue. Inside white, outside colouration slightly showing through.



Distribution. Recorded from Guinea, Côte d'Ivoire, S-Gabon, the Quaternary of Gabon and Congo Brazzaville. This small species is not mentioned by Nicklès (1952) but in the box labelled "*Pitar belcheri*" (herein *Pitar nicklesi*) from the Quaternary of Gabon, a second tube containing several valves of *M. anteai* were encountered.

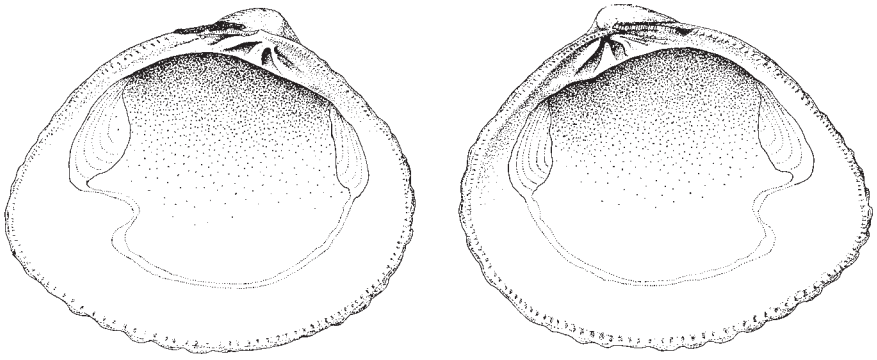
Biotope. In sandy bottom, from 20 to 60 m, only locally common, in the southern part of its range rare.

Remarks. The species is distinguished from *Gouldia minima* by its much smaller size, the higher and more circular shell and the light colouration.



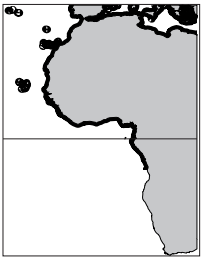
17.32. ***Microcirce anteai*** **Cosel & Gofas, 2018. A**, Grand Bassam, Côte d'Ivoire, 5°09.2'N, 3°47.2'W, 30 m (paratype, 2.4 mm). **B**, Grand Bassam, Côte d'Ivoire, 5°08.9'N, 3°49.6'W, 35 m (2.3 mm). **C-D**, W of Panga, S-Gabon, 3°13'S, 10°24'E, 25 m (2.2 mm). **E-F,** Grand Bassam, Côte d'Ivoire, 5º09.2'N, 3º47.2'W, 30 m (SEM micrograph, 2.2 mm). **G-H**, Hinge of the same specimen. gr, marginal grooves on the cardinal platform.

Timoclea ovata (Pennant, 1777)



17.33. Cap Blanc, Mauritania, 20°00'N, 17°29'W, 72 m (9.4 mm).

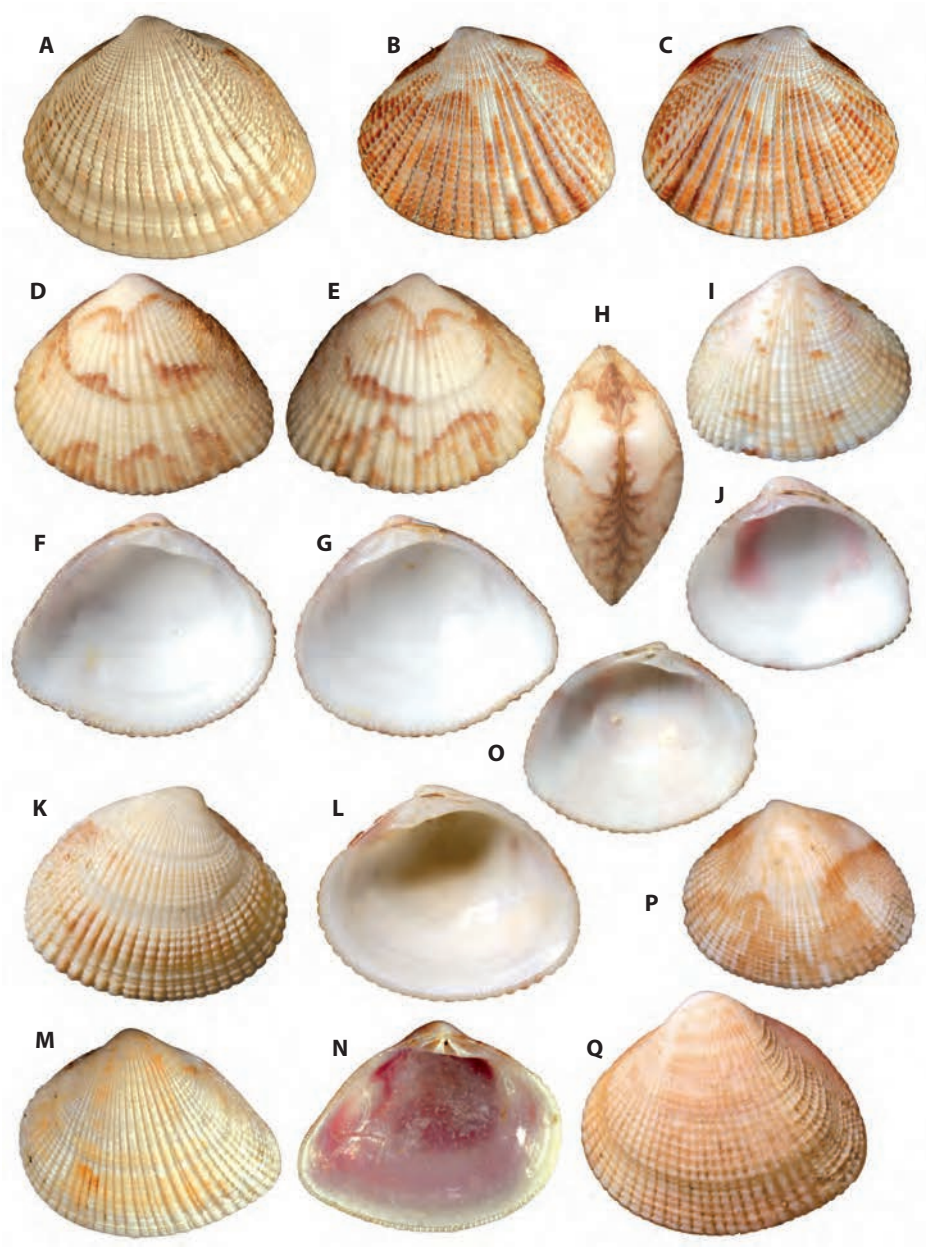
Shell up to 17 mm long (West African specimens smaller, only 6-12 mm), somewhat variable in outline, broadly suboval, moderately solid, inflated. Beaks just in front of the vertical midline. Surface with numerous, prominent radial ribs, slightly variable in thickness, sometimes showing paired ribs with a narrow interspace. They are crossed by thin, irregular commarginal lamellae which are most prominent on the postero-dorsal slope. Inner margin of valves crenulate. Outside cream to pale yellowish, with light to dark brown zones, spots, streaks, rays or zigzag markings, occasionally uniform brown. Inside white, often with pink or violet under the beaks and occasionally on the whole inside except the marginal area.



Distribution. Norway (whole coast), Faroe and Shetlands southward to northern Angola (Luanda); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean.

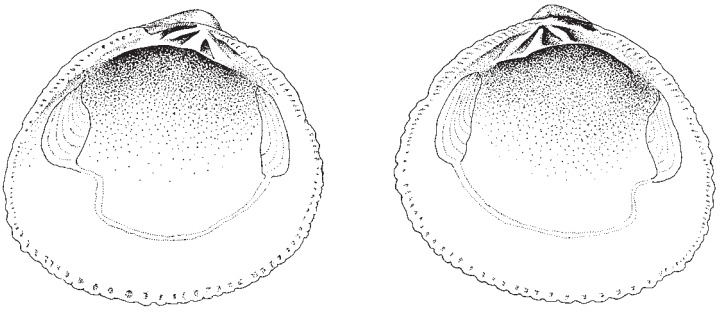
Biotope. In fine muddy sand, clean fine sand and mixed sand, also with gravel, calcareous algae and shell debris, from 5 to 200 m, in continental West Africa only from about 30 m downward, common.

Remarks. This species is, apart from the size differences, quite uniform throughout its whole distribution area. *Timoclea ovata* is the type species of the genus *Timoclea*.



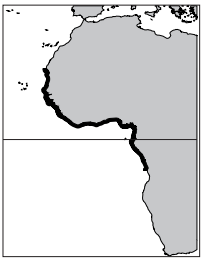
17.34. ***Timoclea ovata*** **(Pennant, 1777). A**, Mauritania, 20'36'N, 17°38'W, 108 m (12.0 mm). **B**-**C**, same locality (10.6 mm). **D**-**H**, Mindelo, São Vicente, Cape Verde Islands (10.3 mm, MNCN). **I**-**J**, Baia Matiota, São Vicente, Cape Verde Islands (8.3 mm, MNCN). **K**-**L**, Dakar region, Senegal, 129-150 m (8.3 mm). **M**-**N**, Kafountine, N-Casamance, Senegal, 12°44.5'N, 17°27.3'W, 40 m (9.8 mm). **O**-**P**, Ghana, 4°36.5'N, 1°31'W, 50 m (8.0 mm). **Q**, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (8.2 mm).

Timoclea congoensis (Thiele & Jaeckel, 1931)



17.35. Ile de Roume, Iles de Los, Guinea, N-side, fine muddy sand, 1.5-2 m (7.0 mm).

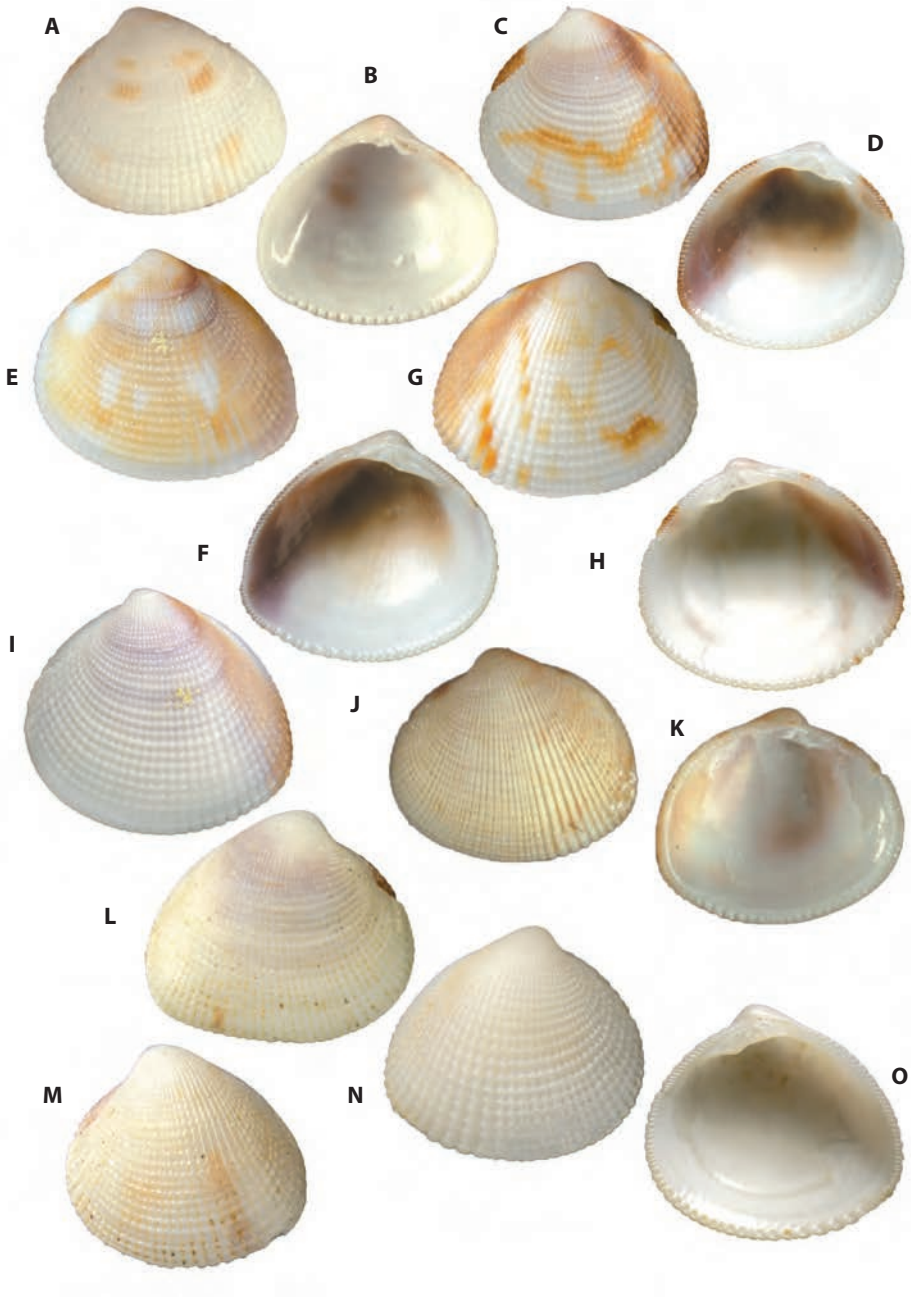
Shell very small, 4-6 mm long, variable in shape, broadly suboval to almost subcircular, solid, inflated to very inflated. Beaks more or less in front of the vertical midline. Surface sculpture variable, with numerous fine but prominent radial ribs, irregular in size, which are crossed by irregular commarginal ribs or lamellae. These lamellae can be more prominent or less prominent as the radial ribs, the distance and width of the interspaces is also quite variable. In general, the radial ribs are more predominant on the anterior part, the commarginal ribs on the posterior part. Inner margin crenulate. Outside dirty white to cream, often with reddish brown to violet on the postero-dorsal slope which less commonly extends over a larger area of the shell. Occasionally brownish spots or streaks. Inside white with the external colouration showing through in equal intensity.



Distribution. Mauritania (20°N) to southern Angola (Baia dos Tigres); São Tomé, Ilha do Principe.

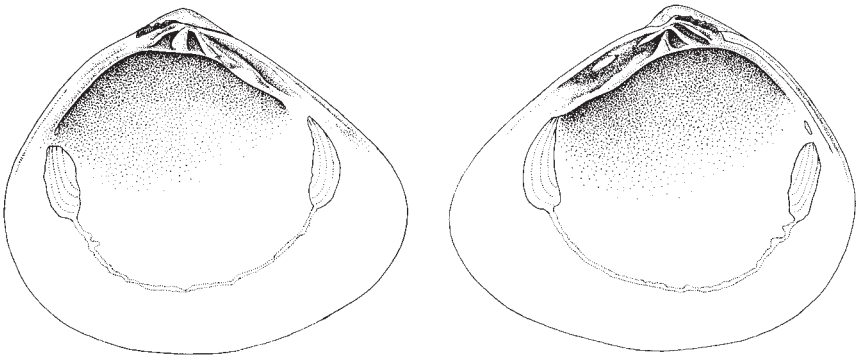
Biotope. In fine muddy sand, fine sand or mixed sand, from 1 to 20 m, rarely deeper, to 30 m. Most common in fine sediment in 1-15 m.

Remarks. This species has mostly been mistaken for the deeper water *T. ovata* (*e.g.* Huber 2010) and most reports of *T. ovata* in shallow water, in ecological papers on West Africa in fact refer to *T. congoensis*. The species is consistently distinguished from *T. ovata* by its much smaller, more globose and often slightly higher shell with generally less prominent commarginal ribs and a still shorter pallial sinus.



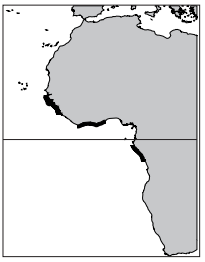
17.36. *Timoclea congoensis* (Thiele & Jaeckel, 1931). **A**-**B**, Mauritania, 19°00'N, 16°27'W, 21 m (4.2 mm). **C**-**D**, W of Sierra Leone border, Guinea, 9°06'N, 13°32.4'W, 16 m (lv, 3.8 mm). **E**-**F**, same locality (4.5 mm). **G**-**H**, same locality (4.5 mm). **I**, same locality (4.5 mm). **J**-**K**, Abidjan region, Côte d'Ivoire, 5°14.5'N, 4°02'W, 20 m (4.2 mm). **L**, Between Ponta da Mina and Ponta Novo Destino, Ilha do Principe, 6 m (4.2 mm) **M**, same locality (3.8 mm). **N**-**O**, Praia Etambar, Baia de Corimba, Luanda prov., N-Angola, 10-20 m (4.2 mm).

Parvicirce donacina Cosel, 1995



17.37. Punta do Mussulo, N-Angola, on beach (holotype, 3.4 mm).

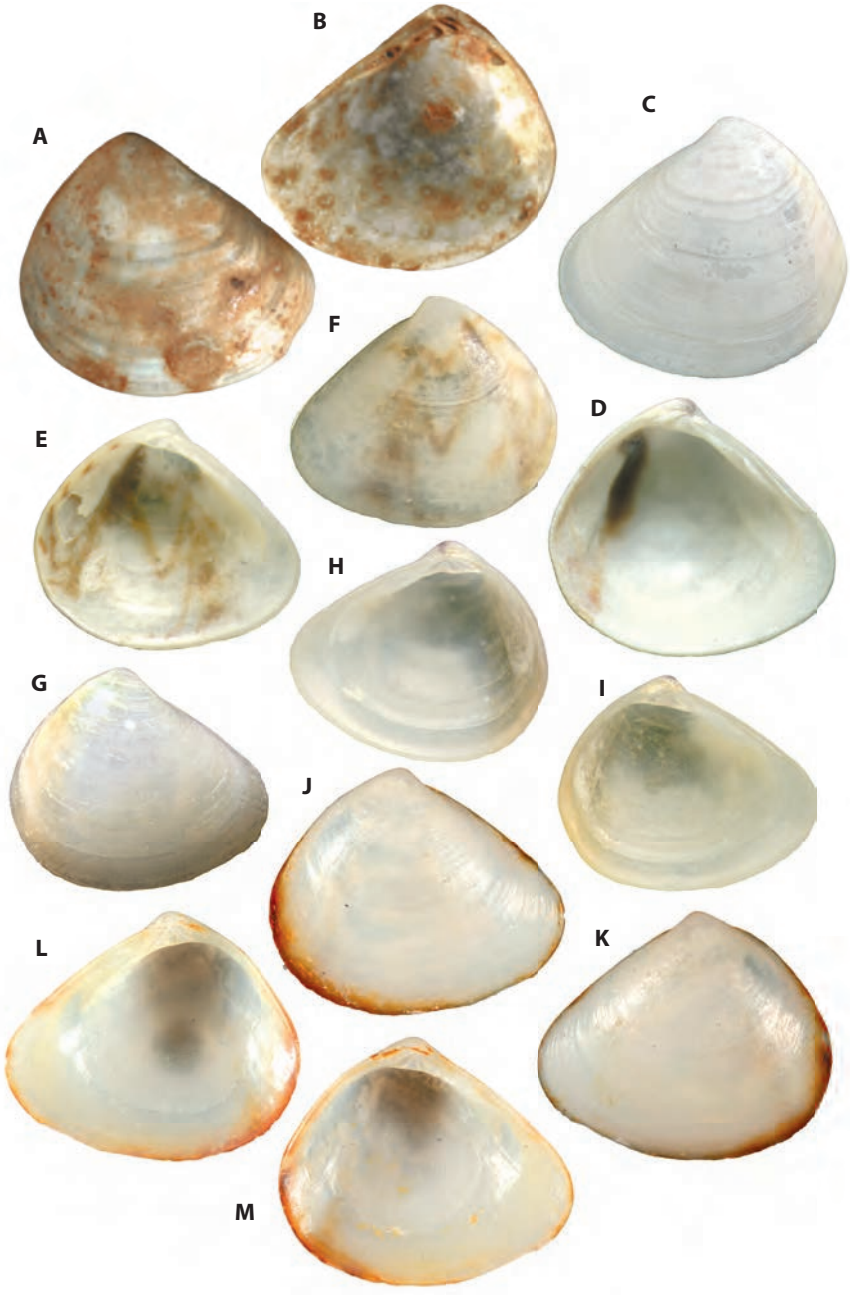
Shell minute, 2-4 mm long, somewhat variable in outline and tumidity, broadly suboval, thick and solid, more or less compressed. Beaks behind the vertical midline. Anterior part of the valve tapering, anterior margin rather narrowly rounded, posterior part shorter, with broadly rounded posterior margin. Lunule very small and ill-defined, no escutcheon. Surface smooth with fine, irregular growth lines and occasionally some indistinct commarginal waves on the anterior part near the margin. Inner margin of the valves smooth. Periostracum very thin, somewhat dull, nearly colourless to very pale straw-coloured near the margins. Outside and inside white to cream, the holotype from Angola has two faint, interrupted light brownish rays on the posterior slope.



Distribution. Senegal (Casamance) to Guinea (9°N); Côte d'Ivoire (Bassam) to Ghana (Takoradi area); southern Gabon to northern Angola (Mussulo, Luanda).

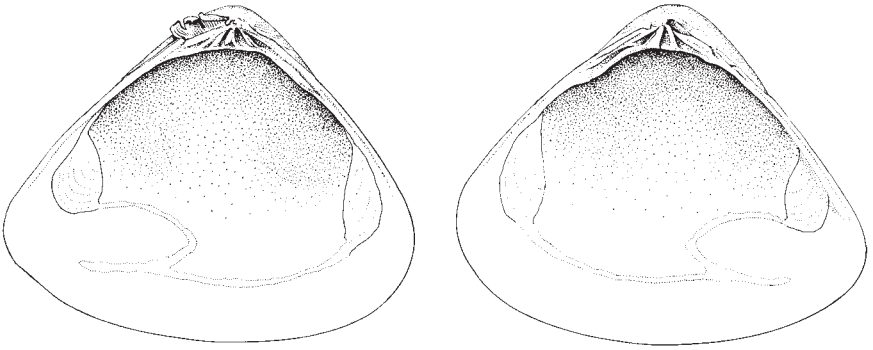
Biotope. Most probably fine, somewhat muddy sand or fine sand, from about 1 m to 30 m, very rare.

Remarks. Apart from its very small size, this unusual venerid is characterized by the nearly missing pallial sinus, and by its posteriorly-situated beaks, which make it resemble more a minute, short *Donax* than a venus shell. The only species with which it can be compared is *Circe goodallioides* Cossmann, 1886 from the Upper Eocene of the Paris Basin, which is quite close but is more compressed and has a more oval outline. *Parvicirce donacina* is the only living species and the type species of the genus *Parvicirce*, in which also the Eocene fossil species is now included. Very young *Tivela tripla* look rather similar but are more compressed, they have a longer posterior part and a well developed pallial sinus. The species may have distribution gaps in the typical tropical regions: between Ghana and the Congo and in Sierra Leone and Liberia.



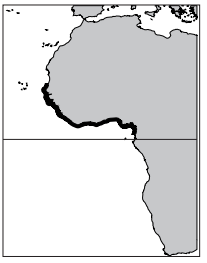
17.38. ***Parvicirce donacina*** **Cosel, 1995.** **A**-**B**, Ile Tristão, N of Guinea (3.9 mm). **C**-**D**, W of Sierra Leone border, Guinea, 9°03'N, 13°22.4'W, 4 m (3.1 mm). **E**-**F**, same locality (2.7 mm). **G**-**I**, off Abidjan, Côte d'Ivoire (2.9 mm), dredged R/V *Reine Pokou*. **J**-**M**, Ponta do Mussulo, Luanda prov., N-Angola, on beach (holotype, 3.4 mm, photo Manuel Caballer/Recolnat).

Tivela bicolor (Gray, 1838)



17.39. Dixinn Port, Conakry, Guinea, sandbank at low tide (25 mm).

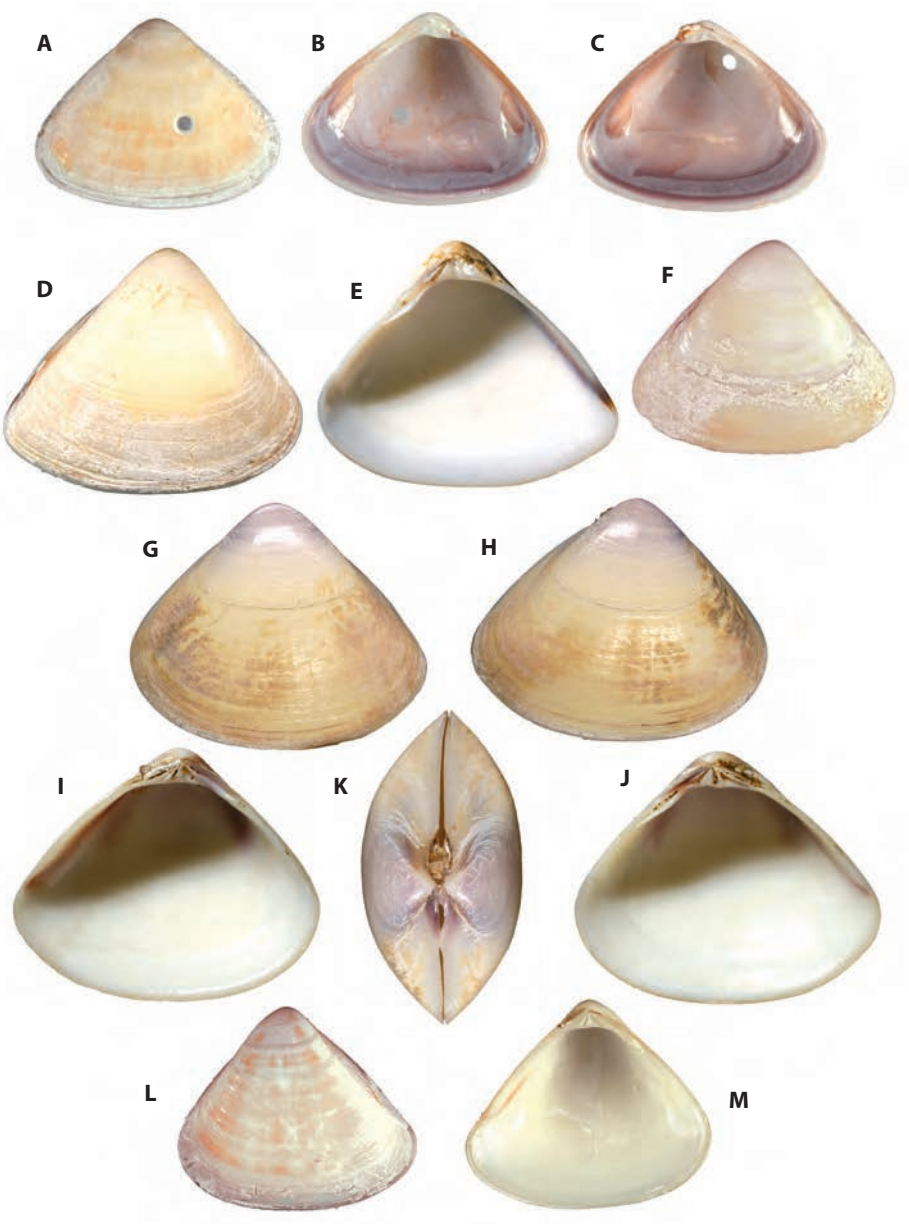
Shell up to 36 mm long, little variable in shape, triangular, always longer than high, rather thin but solid, inflated, with antero-dorsal slope slightly shorter than postero-dorsal slope. Beaks more or less median. Surface smooth, with irregular growth lines and occasional coarser growth stages. Periostracum very thin, glossy, almost colourless, transparent, on the marginal part of the valves with a velvety which consists of microscopic aragonitic needles (Glover & Taylor 2010). Outside pale yellowish white, postero-dorsal slope frequently marked with violet, often also lunular area and umbonal area. Inside white, often with violet under the umbos and deep violet at the postero-dorsal slope.



Distribution. Mauritania (19°18'N) to Gabon (Libreville).

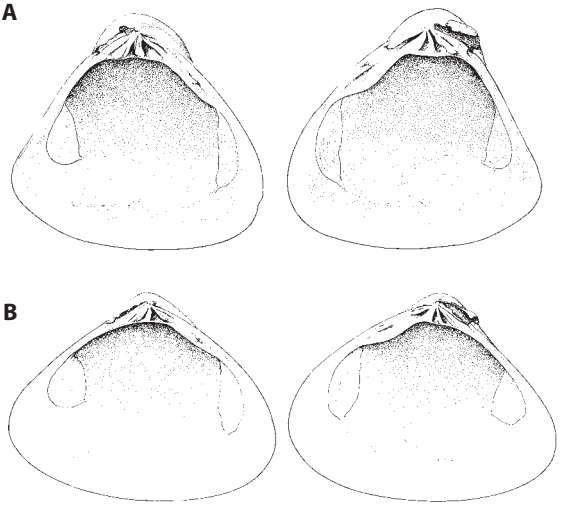
Biotope. In clean fine and mixed sand, mostly in more or less protected bays, also with turbid water or with slightly reduced salinity, from spring tide low water to about 15 m, only locally common to abundant.

Remarks. This species is distinguished from *T. tripla* by its somewhat thinner and slightly more rounded shell, the smaller pallial sinus and the velvety periostracum. It is not known to us if the species is consumed somewhere, but where abundant it could well be commercialized.



17.40. ***Tivela bicolor*** **(Gray, 1838).** **A-C**, Mauritania, 19°18'N, 16°36'W, 5 m (12.3 mm). **D-E**, Kafountine, Casamance, Senegal, sand, 3-6 m, in fishermen's nets (27.9 mm). **F**, Essoukoudiak Bôlon, Guinea-Bissau near Casamance border, 5-6 m (19.4 mm). **G-K**, Dixinn Port, Conakry, Guinea, on tidal flat (24.8 mm). **L-M**, Grand Bassam, Côte d'Ivoire, 15 m (14.6 mm).

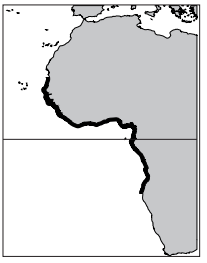
Tivela tripla (Linnaeus, 1771)



17.41. **A**, Cap Vert Peninsula, Senegal (30.4 mm). **B**, Cap Skirring-Diembéring, S-Casamance, on beach (25 mm).

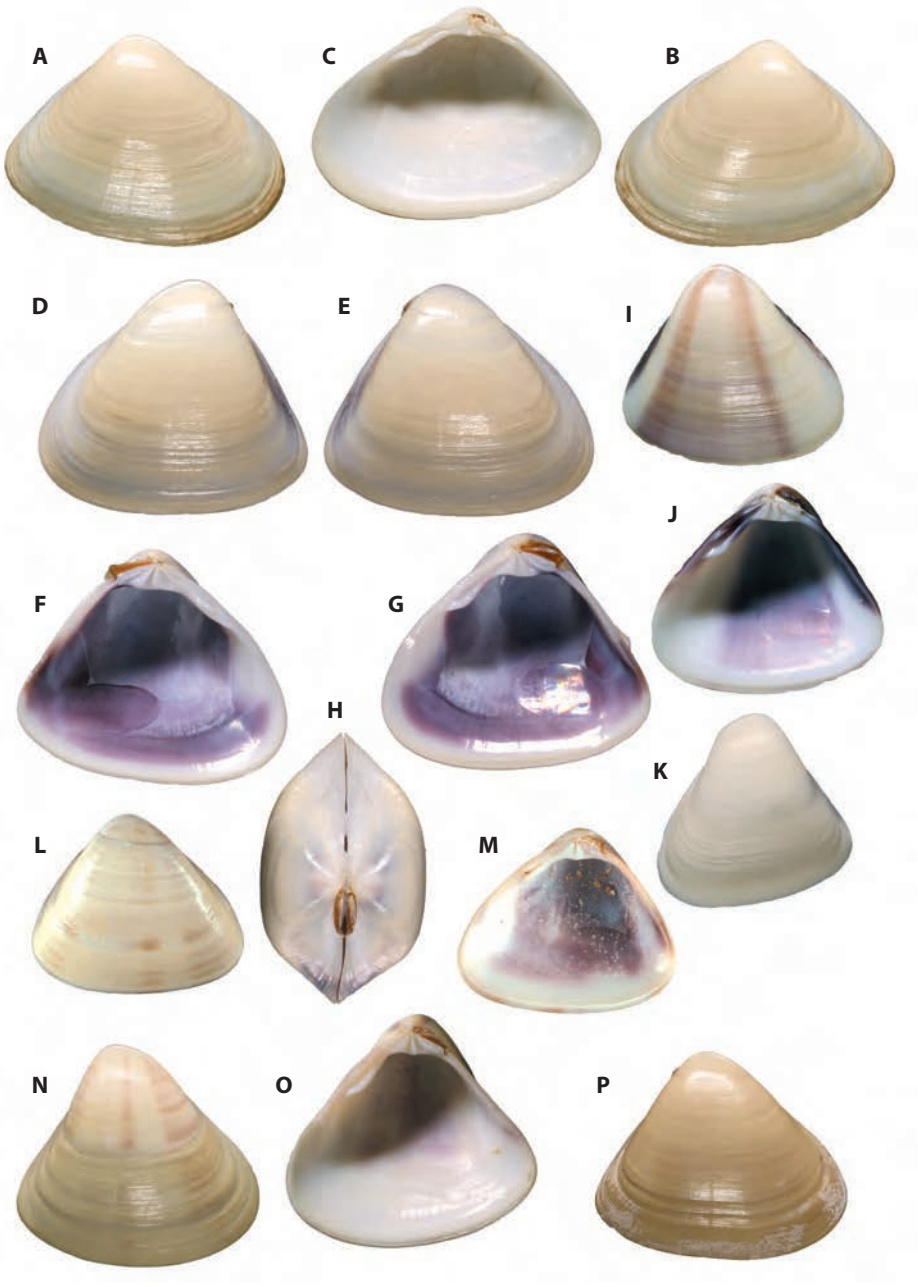
Shell up to 40 mm long, quite variable in outline, subtriangular, longer than high or as high as long, thick and heavy, inflated, with antero-dorsal slope slightly longer than postero-dorsal slope. Beaks more or less median or just behind the vertical midline. Surface smooth with fine irregular growth lines and occasional coarser growth stages. Periostracum thin, very pale yellowish to nearly colourless, and transparent. Velvety layer consisting of microscopic aragonitic needles (Glover & Taylor 2010) persisting only on rare occasions on the last millimetres parallel to the ventral margin. Outside generally ivory white or yellowish white, often with brown on the lunular area or the postero-dorsal slope, occasionally with brownish radial rays or zones or - rarely - entirely orange, brownish or brownish violet. Inside white, mostly tinged with violet or entirely deep violet except the ventral margin.

Distribution. Mauritania (Nouakchott) to southern Angola (Moçâmedes, Namibe province).



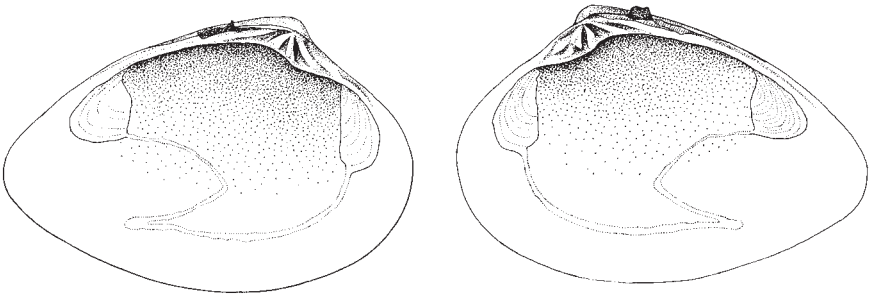
Biotope. In mixed or coarse sand on open, surf-beaten beaches, at extreme low tide and deeper, but still within the influence of the surf. It is often found together with *Donax rugosus* and is locally abundant.

Remarks. This species is more variable in outline, thicker and heavier than *T. bicolor* and has a longer antero-dorsal slope. Occasionally the distinction between the two species is difficult, and Huber (2010: 726) considers them synonymous, but *T. tripla* is always easily separated by its larger pallial sinus; moreover, the habitats of the two species are quite different. *T. tripla* is consumed in certain regions. This is "Le Tivel" of Adanson.



17.42. *Tivela tripla* **(Linnaeus, 1771). A**-**C**, Nouakchott, Mauritania, Grande Plage, beach drift (32.8 mm). **D**-**H**, S of Kafountine, Casamance, Senegal, on beach (22.5 mm). **I**-**J**, Cap Skirring-Diembéring, S-Casamance, Senegal, on beach, (22.3 mm). **K**, same locality (19.7 mm). **L**-**M**, Takoradi, Ghana, on beach (12.6 mm). **N**-**O**, Praia do Buraco, Palmeirinhas, Luanda prov., N-Angola, on beach (30.2 mm). **P**, Moçâmedes, Namibe prov., S-Angola, beach drift (31.4 mm).

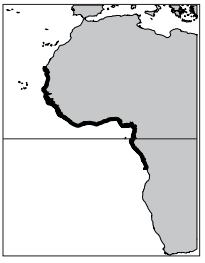
Callista floridella (Gray, 1838)



17.43. Guinea, W Sierra Leone border, 9°03.5'N, 13°26.5'W, 10 m (20 mm).

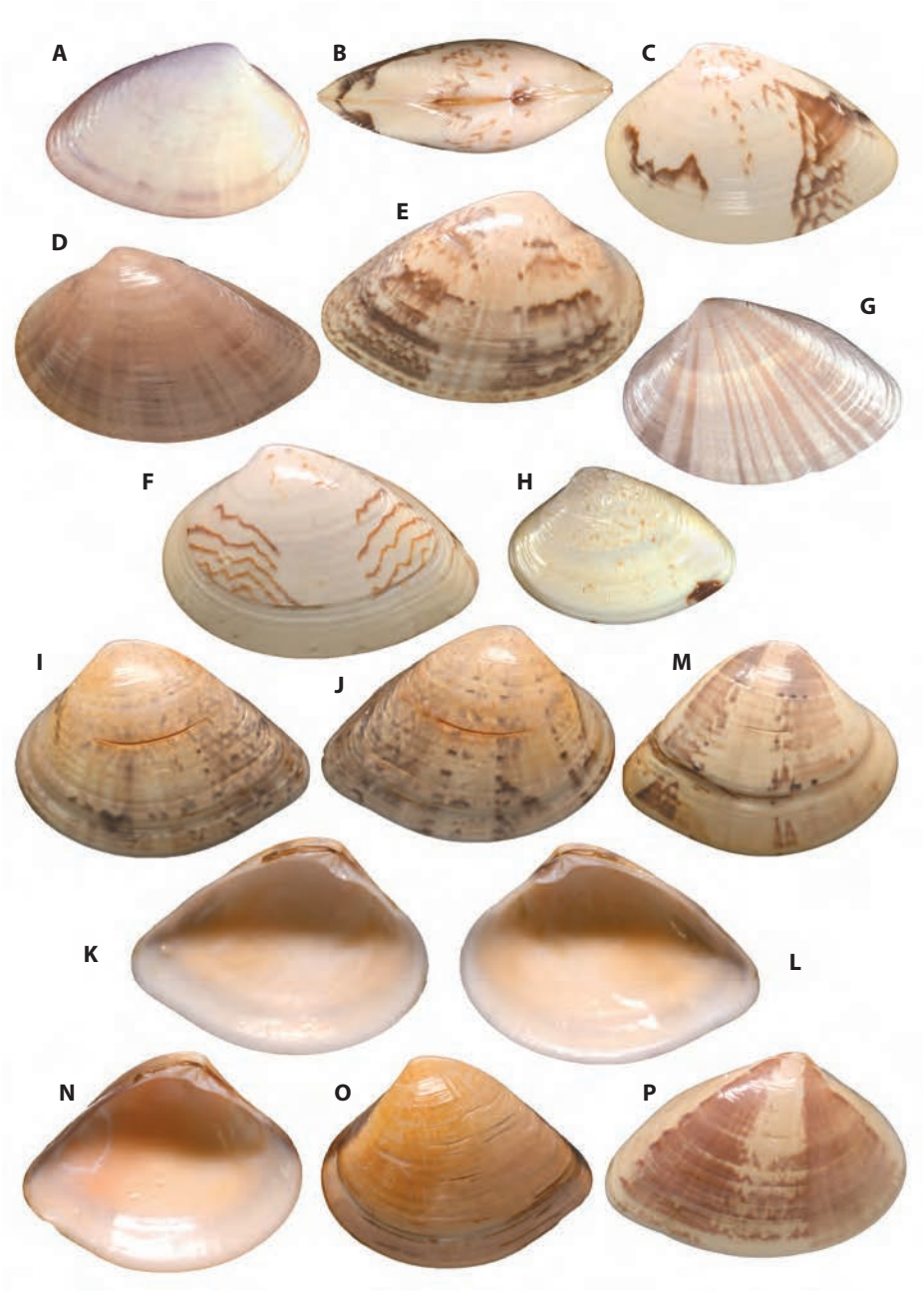
Shell up to 31 mm long, little variable in outline, triangular-suboval, not very thick but solid, rather inflated. Anterior margin well rounded, posterior part tapering, ventral margin regularly convex. Beaks well in front of the vertical midline. Surface smooth and glossy, with faint, irregular growth lines. Posterior angle with narrow, regular, commarginal grooves. Periostracum thin, transparent and nearly colourless. Inner margin of valves smooth. Outside colour extremely variable, mostly a pale ivory-yellowish to light brown ground colour with all kinds of fleck, rays, spots, streaks or zigzag markings in light brown to dark brown or brownish violet to greyish. Inside orange to orange-red, becoming whitish towards the marginal zone, postero-dorsally occasionally tinged with violet.

Distribution. Mauritania (Cap Blanc) to northern Angola (Luanda).



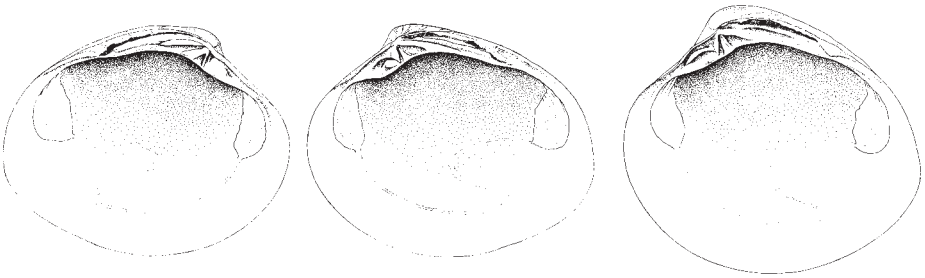
Biotope. In fine, slightly muddy sand, clean, fine sand or mixed sand, also with shell debris, on the open shelf as well as in calm bays, inlets, lagoons and the so-called "bôlons" (creeks and channels with sea water or water with raised resp. reduced salinity) of Casamance and the Sine-Saloum Estuary, from about 2 to 25 m. The species tolerates salinity changes in both senses in certain limits, it is common and locally abundant.

Remarks. This is the only *Callista* species of West Africa; in spite of its abundance, it is too small for being exploited commercially. *Dione africana* Philippi, 1863 is a synonym. This is the type species of *Lepidocardia* Dall, 1902, which Huber (2010) used as full genus.



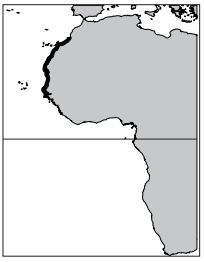
17.44. ***Callista floridella*** **(Gray, 1838). A**, Port-Etienne (now Nouadhibou), Mauritania, 20°20'N, 16°22'W, 10 m (rv, 21.6 mm). **B-C**, Kafountine, Casamance, 12°50.4'N, 16°59'W, 13-14 m (27.3 mm). **D**, same locality (31.1 mm). **E**, same locality (29.8 mm). **F**, same locality (30.5 mm). **G**, Cap Skirring–Diembéring, S-Casamance, beach drift (21.2 mm). **H**, Morton Bay, Victoria (now Limbe), Cameroon, 1-3 m (15.4 mm). **I-L**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, 1-3 m (29.8 mm). **M**, same locality (26.6 mm). **N-O**, same locality (26.2 mm). **P**, same locality (29.1 mm).

Pitar tumens (Gmelin, 1791)



17.45. Bel-Air - Marinas - Hann, Dakar, on beach (two specimens compl. shell 40.3 mm; rv, 42.2 mm).

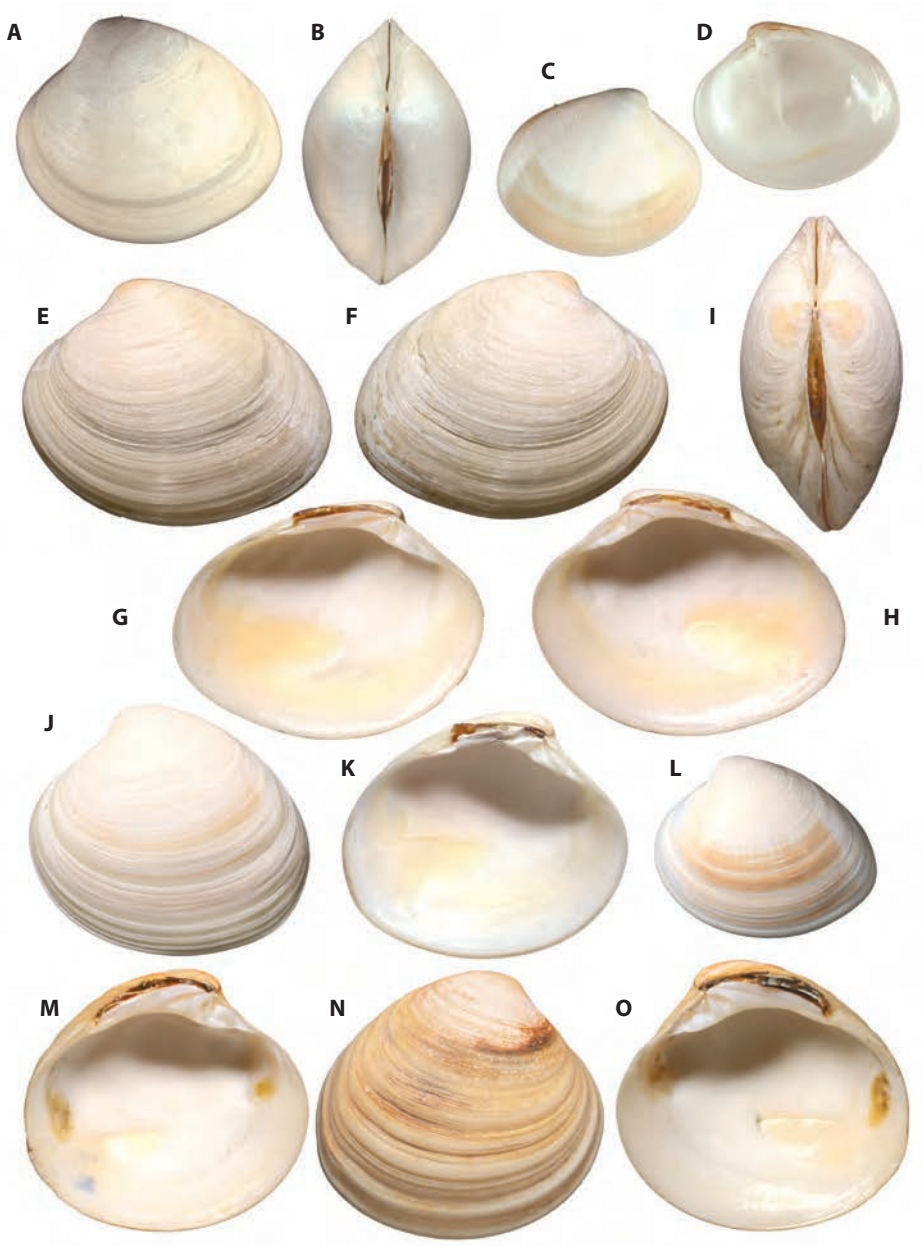
Shell up to 55 mm long, quite variable in outline, from slightly longer than high to more broadly suboval, thick and solid, moderately inflated to very inflated. Anterior margin rounded, posterior margin broadly rounded to very slightly angulate, beaks well in front of the vertical midline. Surface with very irregular and sometimes prominent growth lines and growth ridges, otherwise smooth. Inner margin of valves smooth. Outside whitish, ivory or yellowish, frequently with irregular, commarginal light brownish zones which often are interrupted on the postero-dorsal angle. Inside uniform white or pale yellowish to orange, often only on the marginal area and the pallial sinus.



Distribution. Atlantic Morocco (Agadir) to Senegal (Petite Côte and northern Casamance).

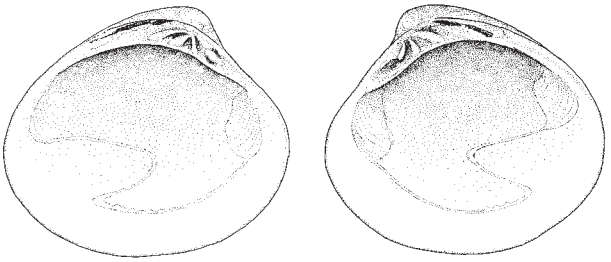
Biotope. In clean fine, mixed and coarse sand, also with shell debris, mostly in more or less sheltered bays (such as the Bel Air - Hann region near Dakar), from just under low tide to about 10 m, common to locally abundant.

Remarks. This species is restricted to the northern part of the West African coast within the influence of seasonal or permanent upwelling. It is so abundant in certain places on the coast of Senegal, that the shells (like those of *Senilia senilis*) have even been used for pavements of roads in the bush. Towards the south of the Petite Côte and N-Casamance, *P. tumens* becomes rarer. It is consumed in Mauritania and Senegal. This species is always easily distinguished from *Pitar virgo* (see next entry) by lacking the regularly formed commarginal grooves and ridges. In Senegal and Mauritania, *P. tumens* and *P. virgo* occur together, however, *P. virgo* is less common. All records of this species in older literature or ecological papers from south of Casamance are based either on *P. virgo, P. erubescens* or *P. elatus* (see next entries). This is "Le Pitar" of Adanson and the type species of the genus *Pitar*.



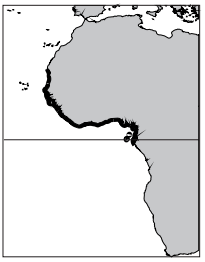
17.46. *Pitar tumens* (Gmelin, 1791). **A**-**B**, Pointe des Maures (20°55'N), Mauritania, between tides (45.0 mm). **C**-**D**, same locality (27.1 mm). **E**-**I**, Bel-Air-Marinas-Hann, Dakar, Senegal, on beach (43.3 mm). **J**-**K**, Thiaroye, Dakar, Senegal, on beach in front of CRODT (45.3 mm). **L**, same locality (35.5 mm). **M**-**O**, M'Bour, Petite Côte, Senegal, sand between rocks at low tide (39.8 mm).

Pitar virgo (Gray, 1838)



17.47. Conakry, Guinea, beach facing Palais du Peuple (24.9 mm).

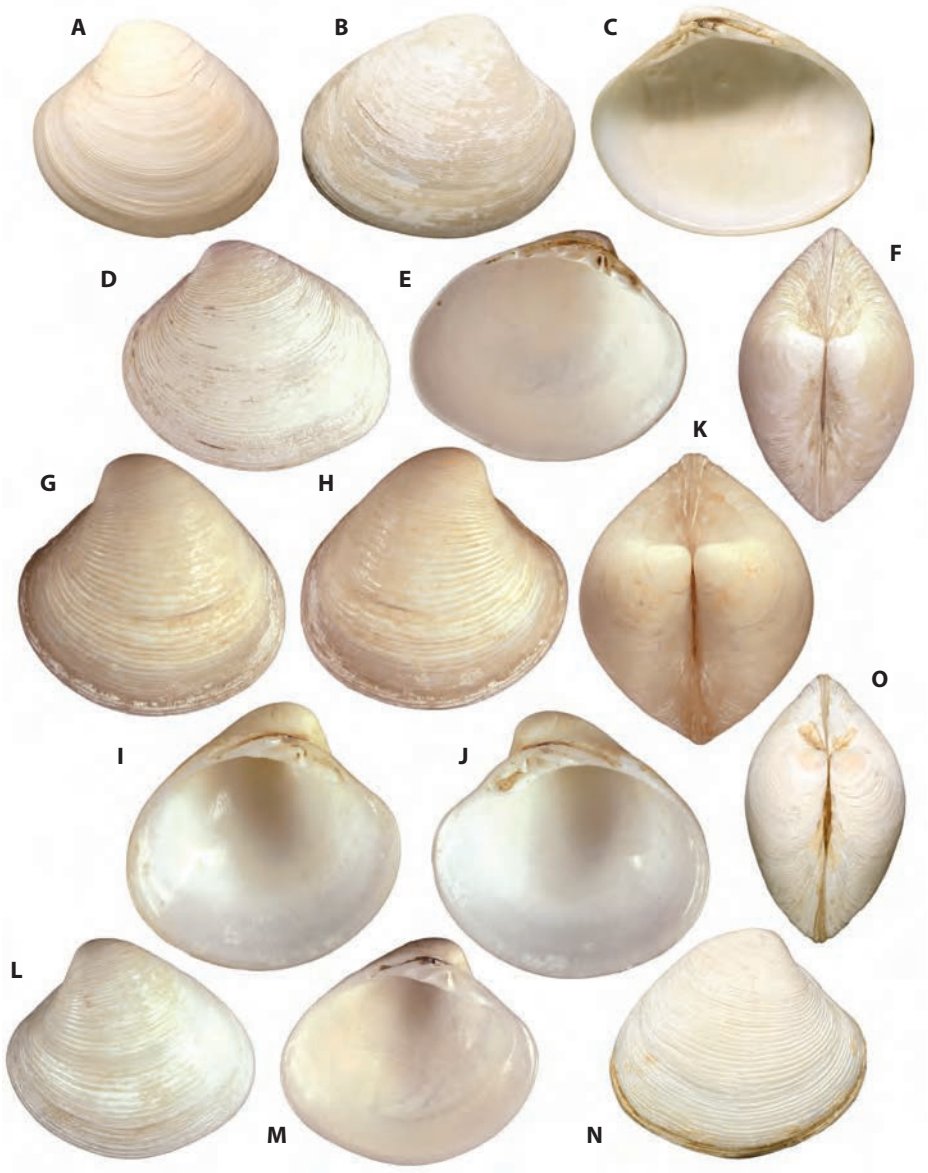
Shell up to 45 mm, rarely to 50 mm long, very variable in outline, tumidity, size and sculpture, moderately thick and solid to very thick. Anterior and posterior margin narrowly rounded to rather broadly rounded, ventral margin evenly convex, beaks well in front of the vertical midline. Surface dull to somewhat glossy, with more or less coarse, dense, slightly irregular, commarginal ridges, occasionally bifurcating and often obsolete on the postero-dorsal, postero-ventral or the whole posterior part. There are also fine irregular growth lines. Lunular incision shallow. Periostracum thin, dull and velvety, mostly eroded on the earlier part of the valves; intritacalx-like layer mostly present near the margins. Inner margin of valves smooth. Outside yellowish-white or cream to pale yellow, orange or pink. Inside whitish or cream, often with an orange to pink zone under the beaks or on the posterior part.



Distribution. Mauritania (Cap Blanc) to Gabon (Cap Lopez); São Tomé, Ilha do Principe.

Biotope. In muddy sand, fine, mixed or coarse sand, also in sand patches on hard bottom or between stones, gravel or shell concentrates, from the lower intertidal zone to about 20 m, most common in the upper 10 metres. The species can tolerate quite drastic salinity changes from low salinity rates to hypersalinity, as it occurs *e.g.* in the muddy sand of the Casamance River and the smaller "bôlons" as well as on hard bottom covered by detritus in murky water *e.g.* around the Conakry Peninsula, Guinea and the Man o'War Bay, Cameroon. Under more marine conditions, it was found intertidally in São Tomé and Principe (where it is particularly inflated, thick and heavy) and offshore in Guinea (on gravel).

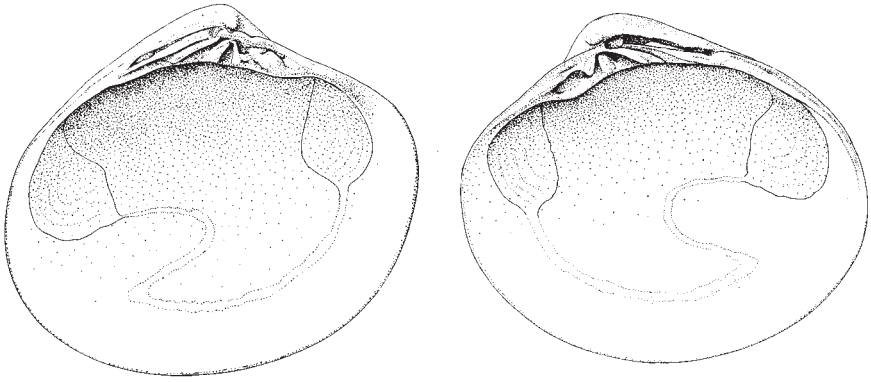
Remarks. This species is still not easy to understand. Two "forms" exist: one smaller, higher, in some regions more thick-shelled and more globose form which may also be more triangular, and another form tending to be more oval and less inflated. They are linked by intergrades and are most probably ecological variants: the heavily inflated specimens come from intertidal and shallow water hard bottom biotopes, sometimes with mud between grit, gravel and pebbles, whereas the more oval and compressed specimens inhabit soft bottom, often more offshore to about 25 m. The short and thick-shelled form from Principe Is. with broader and stronger commarginal ridges is figured in Römer (1864-1869: pl. 32, figs 5a-c) as "*P. belcheri*" and has subsequently been named *Pitaria roemeri* by Tomlin & Shackleford (1913), which is



17.48. *Pitar virgo* (Gray, 1838). **A**, Pointe des Maures, Mauritania (31.2 mm). **B**-**C**, same locality (39.4 mm). **D**-**F**, Kaporo Port, Conakry, Guinea, low tide, mud with gravel (24.5 mm). **G**-**K**, Praia Baleia, Ilha do Principe, 6-7 m (25.7 mm). **L**-**M**, Praia Emilia, São Tomé, intertidal rocky bottom (29.4 mm). **N**-**O**, Man o'War Bay, Cameroon, low tide, (30.6 mm).

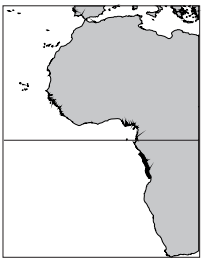
a synonym of *virgo* (Huber 2010). The same form occurs also in Côte d'Ivoire and Ghana. The more oval and compressed form was encountered *e.g.* in Mauritania and offshore in Guinea. The probable holotype of *P. virgo* in BMNH is of the shorter and more globose form but with finer commarginal striae than the specimens from São Tomé.

Pitar erubescens (Dunker, 1853)



17.49. Pointe-Noire, Congo, Plage Mondaine, fine sand, 3 m (41 mm).

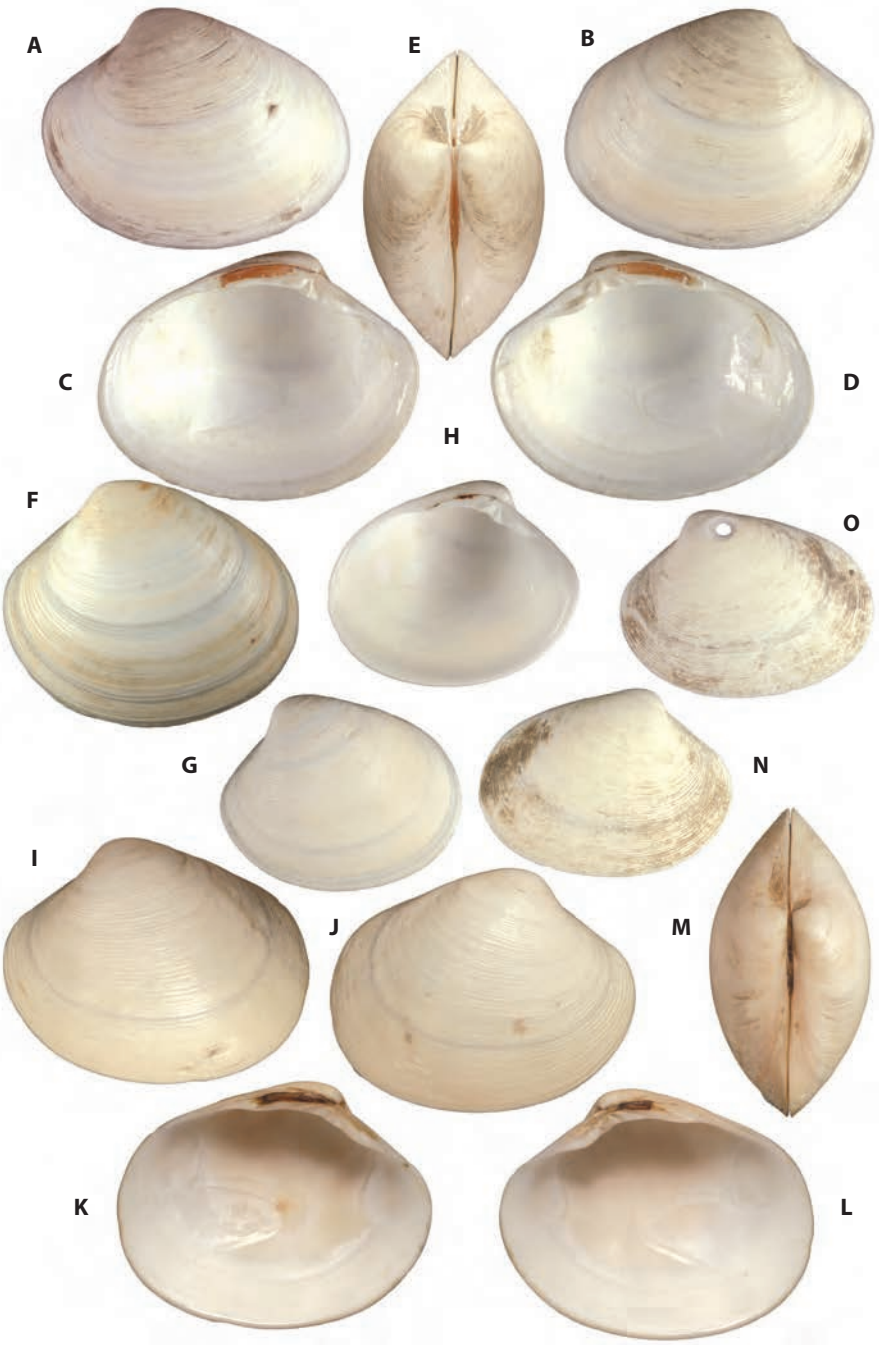
Shell up to 40 mm long, little variable in outline and only somewhat variable in length-height ratio, oval-oblong, moderately inflated, rather thin-shelled to more thick and solid. Anterior margin broadly and evenly rounded, posterior margin broadly rounded, ventral margin evenly convex, beaks well in front of the vertical midline. Surface somewhat glossy to more dull, with slightly irregular, only rarely bifurcating commarginal ridges, on the earlier part of the valves very narrow and appearing more regular, becoming coarser and more broad towards the ventral margin, on the posterior part frequently becoming obsolete except the growth stages. Periostracum with intritacalx-like layer persistent near the ventral margin and on the lunule. Lunular incision well marked, ligament deeply inset. Inner margin of valves smooth. Outside ivory or cream to occasionally pale pinkish, sometimes with a few very pale greyish commarginal bands along stronger growth lines. Inside pure white or cream, occasionally with pinkish area under the beaks or on the posterior part. Greyish growth bands on the exterior hardly showing through.



Distribution. Restricted to the Congo Brazzaville to northern Angola south to Luanda province, where it replaces *P. virgo*.

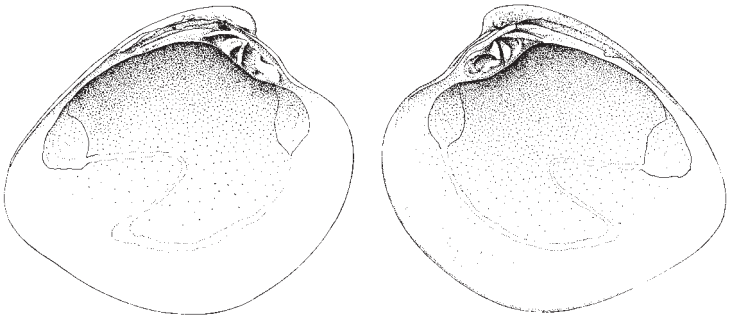
Biotope. In muddy sand, fine sand or mixed sand, from about 5 to 25 m, in open bays and offshore, locally common.

Remarks. *Pitar erubescens* is very close to *P. virgo*, especially to the less tumid and lighter offshore form but differs by its regularly oval, thinner and more compressed shell, the finer sculpture, especially on the upper (earlier) part, the still more set-off lunule, the more sunken ligament and occasionally the tendency to more pink-coloured valves. It remains subtidal, prefers sandy bottom in clearer water, it seems to avoid murky water near mangroves.



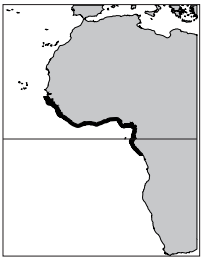
17.50. ***Pitar erubescens*** **(Dunker, 1853).** **A**-**E**, Conkouati, Congo Brazzaville, 20 m (29.2 mm). **F**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (32.2 mm). **G**-**H**, same locality (25.2 mm). **I**-**M**, Cacuaco, Bengo prov., N-Angola, 5-10 m (26.6 mm). **N**-**O**, Palmeirinhas, Luanda prov., N-Angola, 20-30 m (24.0 mm).

Pitar elatus (G.B. Sowerby III, 1908)



17.51. Fresco, Côte d'Ivoire, 5°00'N, 5°28'W, 27 m (39 mm).

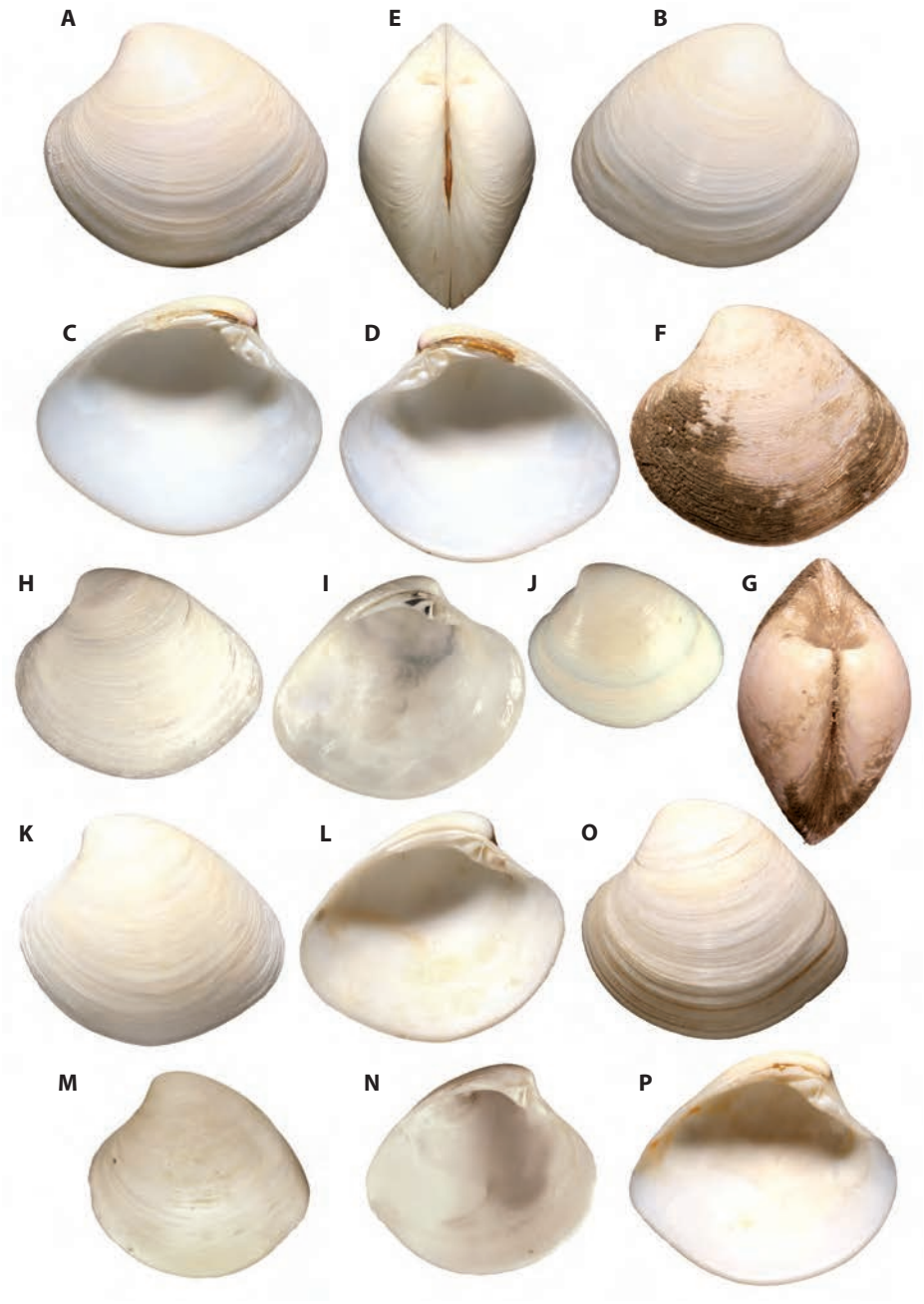
Shell up to 45 mm long, somewhat variable in outline and sculpture, slightly longer than high, in general triangular-lozenge-shaped, thick and solid, very inflated. Anterior margin mostly narrowly rounded, posterior margin characteristically pointed. Ventral margin in its anterior part slightly, in its central part typically well curved and in the posterior part less convex to nearly straight. Beaks well in front of the vertical midline. Surface with fine, dense, slightly irregular commarginal ridges, which are often hardly visible or partly obsolete, mostly on the posterior part or the umbonal region. There are also irregular growth lines. Periostracum thin and dull, with a velvety chalky layer consisting of densely packed microscopic aragonitic pins (see Glover & Taylor 2010), to which in live specimens often a thin layer of sediment is adhering. Inner margin of valves smooth. Outside white or cream to very pale yellowish, sometimes with a few irregular commarginal, light greyish growth bands; inside white, very rarely with a pinkish hue.



Distribution. Senegal (Casamance) to the mouth of the Congo River, possibly also northern Angola.

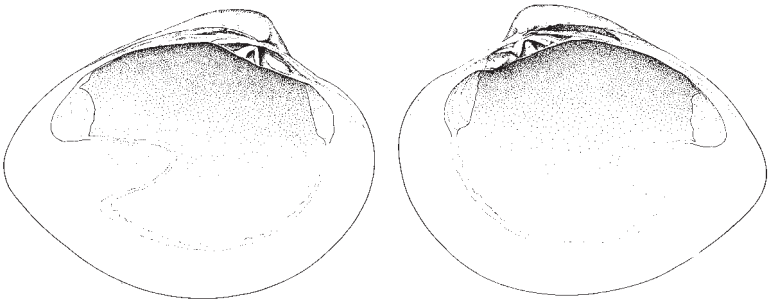
Biotope. In fine muddy sand, fine sand or mixed sand, also with shells and shell debris, offshore from 5 to 30 m.

Remarks. This species is superficially close to *P. virgo*, it is larger, not coloured, posteriorly more pointed and differs from other *Pitar* by the peculiar curvature of the ventral margin, a character seen also in very young specimens. In offshore biotopes in the northern part of the distribution area, where both species occur together, hybrids might occasionally be found. Specimens from Gabon and southward to Congo (Kinshasa) are somewhat higher and have a more pointed posterior end and stronger growth lines. They are thicker-shelled and mostly lack the commarginal grooves, the bend in the ventral margin is less pronounced or not at all; only DNA-analysis will reveal if a separate, close (cryptic) species is involved. Beached valves are only locally common, *e.g.* in eastern Côte d'Ivoire, Bénin and the Bay of Ponte-Noire, but mostly old and partly worn valves with subrecent appearance. Fresh empty shells of this species as well as of *Pitar virgo* might occasionally be entangled in the nets of local fishermen using dugout canoes.



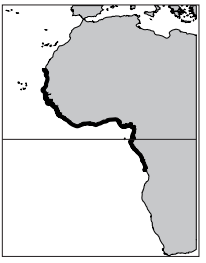
17.52. *Pitar elatus* (G.B. Sowerby III, 1908). **A**-**E**, Kafountine, Casamance, Senegal, sand, 3-6 m, in fishermens' nets (40.2 mm). **F**-**G**, Kafountine, N-Casamance, Senegal, 12°46.6'N, 17°19.2'W, 30-32 m (36.8 mm). **H**-**I**, Liberia, 4°34.5'N, 8°31'W, 64 m (32.1 mm). **J**, Grand Bassam, Abidjan, Côte d'Ivoire, 35 m (20.0 mm). **K**-**L**, Cap Esterias–lle Banié, Gabon, shallow water (40.0 mm). **M**-**N**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (29.7 mm). **O**-**P**, Cabinda, N-Angola, beach drift (37.5 mm).

Pitar nicklesi Cosel & Gofas, 2018



17.53. Ponta das Lagostas, Luanda, N-Angola, 30-50 m (29.0 mm).

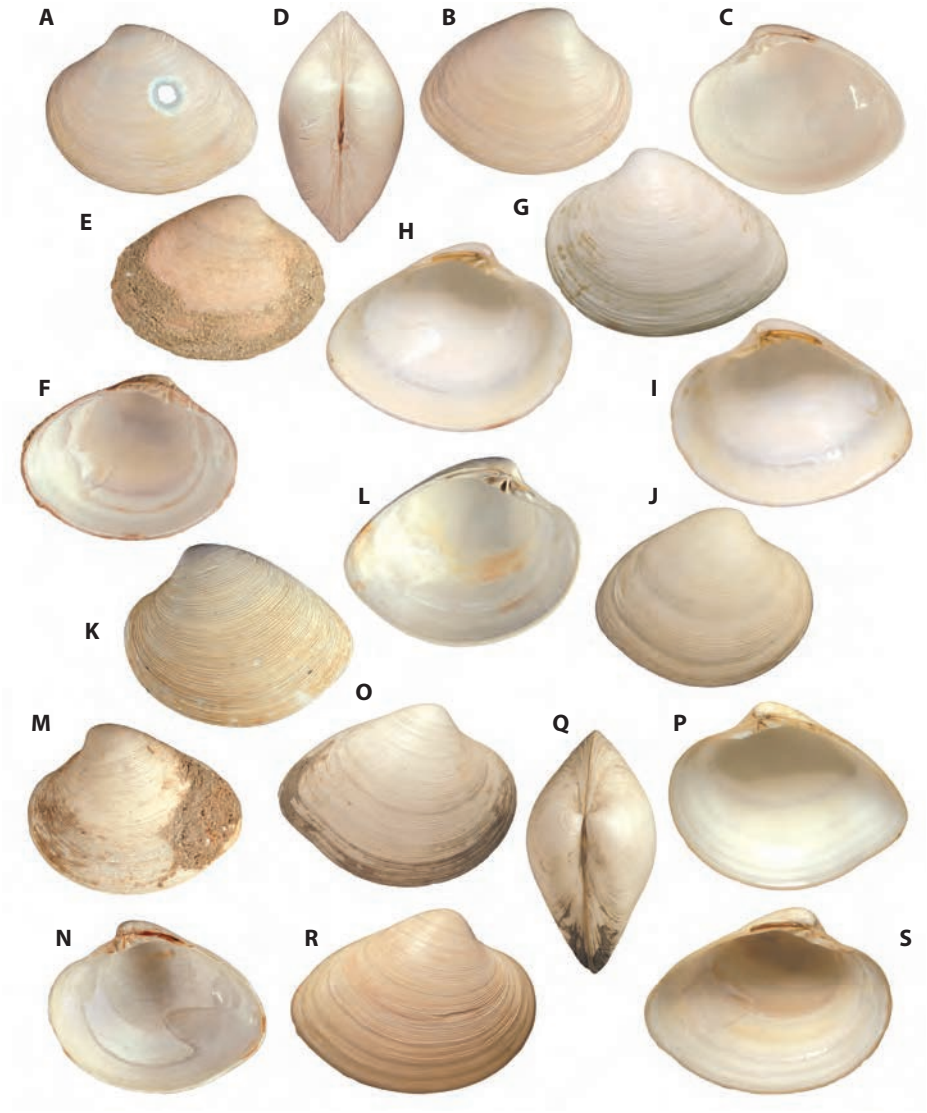
Shell up to 30 mm long, extremely variable in shape, rounded-triangular to broadly suboval, quite thin but solid, inflated. Anterior margin broadly rounded, posterior margin more or less pointed or narrowly rounded. Ventral margin evenly rounded or with a short straight part postero-dorsally. Beaks well in front of the vertical midline. Surface with fine, dense, irregular, occasionally bifurcating commarginal ridges, which in some populations are partly obsolete. Periostracum thin, dull, nearly colourless, not translucent, occasionally with sediment adhering to the posterior or postero-ventral part. Outside white to cream, with a few pale greyish commarginal growth bands. Inside white.



Distribution. Mauritania (20°N) to northern Angola (Luanda area).

Biotope. In muddy sand and fine sand from 15 to 100 m, most common between 20 and 50 m.

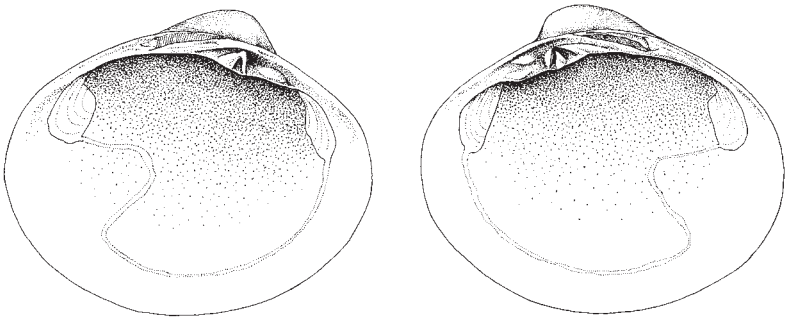
Remarks. The name *P. belcheri* (G.B. Sowerby II, 1851) was first used by Dautzenberg (1912: 91) and after him by Nicklès (1955: 177) for the species intended here. However, Sowerby's original figure shows a quite different shell with strong commarginal ridges and a rounded outline. Kilburn (2000) listed *Pitar belcheri* as South-East Asian species, which is just as consistent as West Africa with the areas visited by Captain Belcher, collector of the type specimen. This was subscribed by Huber (2015: 764) who discussed the issue at length and placed *Pitar belcheri* in *Costellipitar*. *Pitar belcheri* was also cited from Principe Island by Römer (1864-1869) and Dohrn (1880) but this record is based on a specimen of *P. virgo* (see that entry). This is the most variable and most "problematic" West African *Pitar*, and therefore a large array of specimens from all principal localities is shown here. Smaller and more oval specimens with broader posterior part, less pronounced commarginal grooves and a larger pallial sinus, are found from Senegal (Cape Verde Peninsula) to Guinea (Conakry). They even show sometimes characters in common with *P. virgo*, *e.g.* an intritacalx-like layer on parts of the surface and a pinkish hue on the beaks. These forms co-occur with the more pointed "normal" form with shorter pallial sinus and well-developed commarginal ridges. All kinds of intermediates are frequently encountered; a distinction in two different species is



17.54. *Pitar nicklesi* Cosel & Gofas, 2018. **A**-**D**, Mauritania, 20°06'N, 17°33'W, 76 m (17.5 mm). **E**-**F**, Mauritania, 17°54'N, 16°17'W, 58 m (17.5 mm). **G**-**I**, SE of Gorée, Senegal, 14°41'N, 17°23.2'W, 17 m (holotype, 22.7 mm). **J**, W of Ile Yomboya, Guinea, 10°27'N, 15°37.5'W, 39 m (25.2 mm). **K**-**L**, Pointe-Noire, Congo Brazzaville, 104 m (28.6 mm). **M**-**N**, Cacuaco, Bengo prov., N-Angola, 5-10 m (16.8 mm). **O**-**Q**, Ponta das Lagostas, Luanda prov., N-Angola, 30-50 m (27.9 mm). **R**-**S**, same locality (28.6 mm).

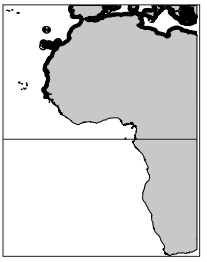
hence difficult. Some specimens, especially from Mauritania, are partly smooth on the outside. The Angolan specimens are somewhat larger and more triangular with tapering posterior part and narrowly rounded posterior margin. All are provisionally grouped here under *P. nicklesi* and only DNA analysis of the different populations could clarify their systematic position and reveal possible cryptic species.

Pitar mediterraneus (Aradas & Benoit, 1872)



17.55. Cap Blanc, Mauritania, 20°34'N, 17°47'W, 90 m (17.5 mm).

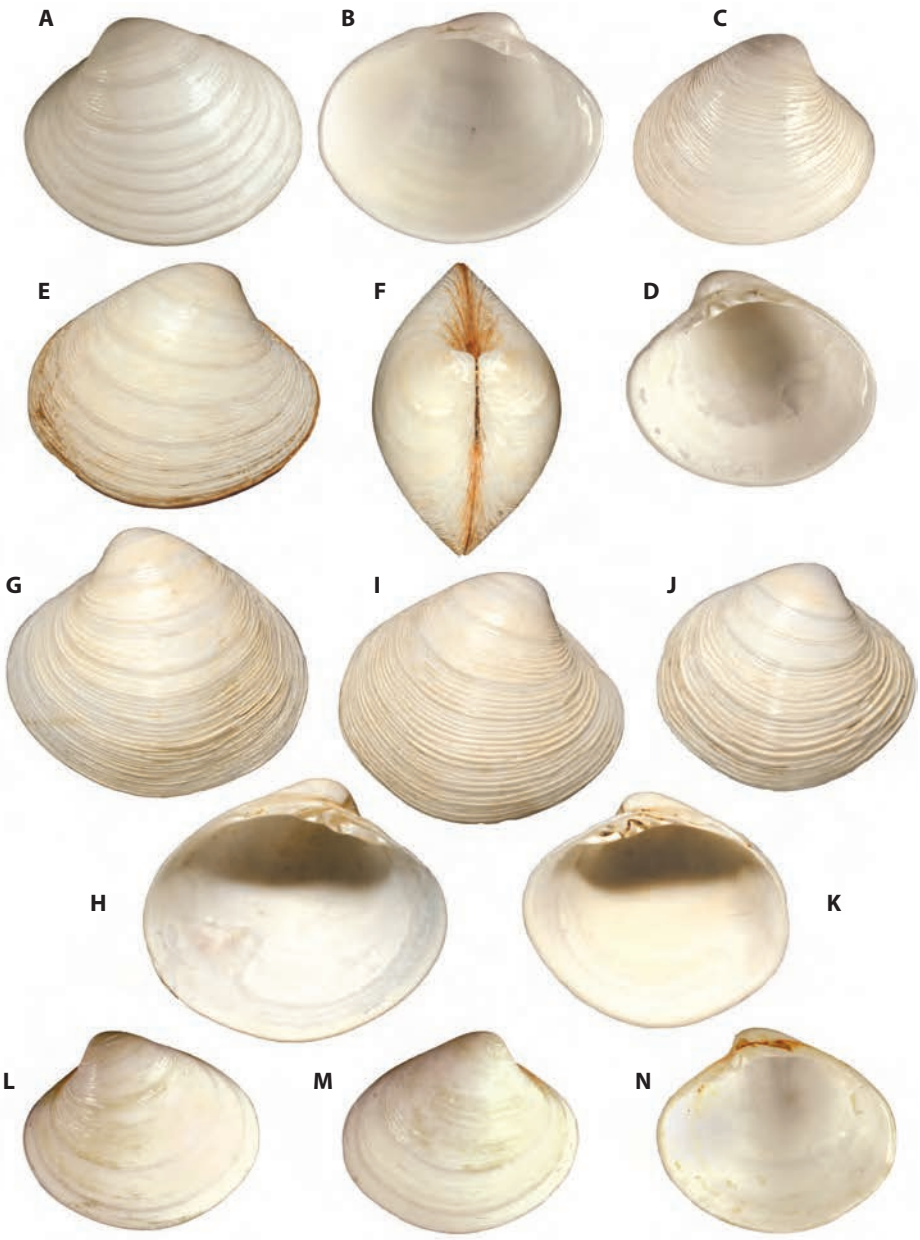
Shell up to 21 mm long, somewhat variable in outline and sculpture, slightly longer than high, broadly suboval, quite thin but solid, very inflated. Anterior and posterior margin broadly rounded, ventral margin in the middle slightly more convex than towards the ends; beaks in front of the vertical midline. Surface with irregular, dense, rather coarse and more or less prominent commarginal ridges, often bifurcating and sometimes obsolete on the umbonal part or the whole middle part of the valves. There are also irregular growth lines. Outside dirty white, often with slightly darker to pale greyish commarginal growth bands. Inside white, with growth bands showing through.



Distribution. Bay of Biscay (46 27'N) to Senegal (Dakar), one record from N-Angola (Luanda); Madeira, Canary Islands; western Mediterranean eastward to Italy.

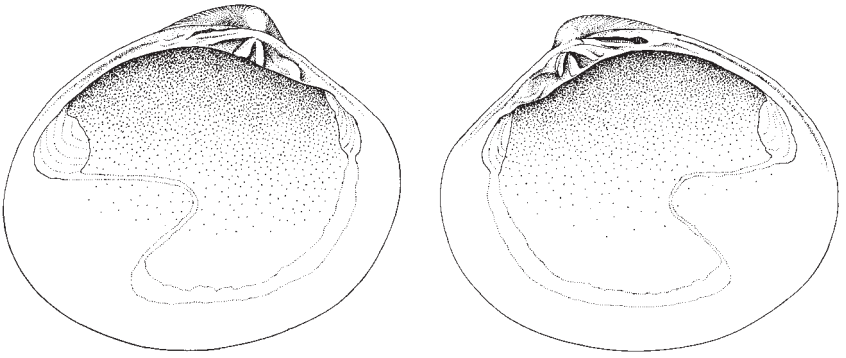
Biotope. In sandy mud and fine muddy sand, in the Mediterranean also on "coralligène", from 65 to 200 m, not common anywhere.

Remarks. *Pitar mediterraneus* seems to have a bipolar distribution. The only specimen from N- Angola shares all characters of the northern population, having in comparison to equally small *P. nicklesi* the higher beaks, the shorter pallial sinus, the still more rounded posterior margin and the occurrence in deeper water. However, in the Angolan specimen, the broader commarginal cords are less pronounced. This species has frequently been treated as a form or subspecies of *P. rudis* (see following entry), even in recent publications, notwithstanding the differences in sculpture and colouration. Those differences and the fact that it occurs sympatrically with *P. rudis* but in a different biotope within a great part of its range, with no intergrades, indicate that it is a separate species.



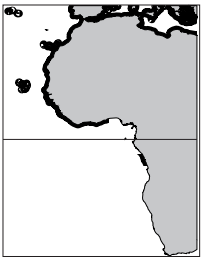
17.56. ***Pitar mediterraneus*** **(Aradas & Benoit, 1872).** **A**-**B**, Mauritania, 17°54'N, 16'26'W, 108 m (16.5 mm). **C**-**D**, Mauritania, 17°12'N, 16°32'W, 106 m (17.2 mm). **E**-**F**, Dakar region, Senegal, 14°50.1'N, 17°29.3'W, 150 m (16.7 mm). **G**-**H**, same locality (17.1 mm). **I**, same locality (16.4 mm). **J**-**K**, same locality (14.8 mm). **L**-**N**, off Mussulo, Luanda prov., N-Angola, 90-100 m (11.5 mm).

Pitar rudis (Poli, 1795)



17.57. Gorée, Senegal, 50 m (6.5 mm).

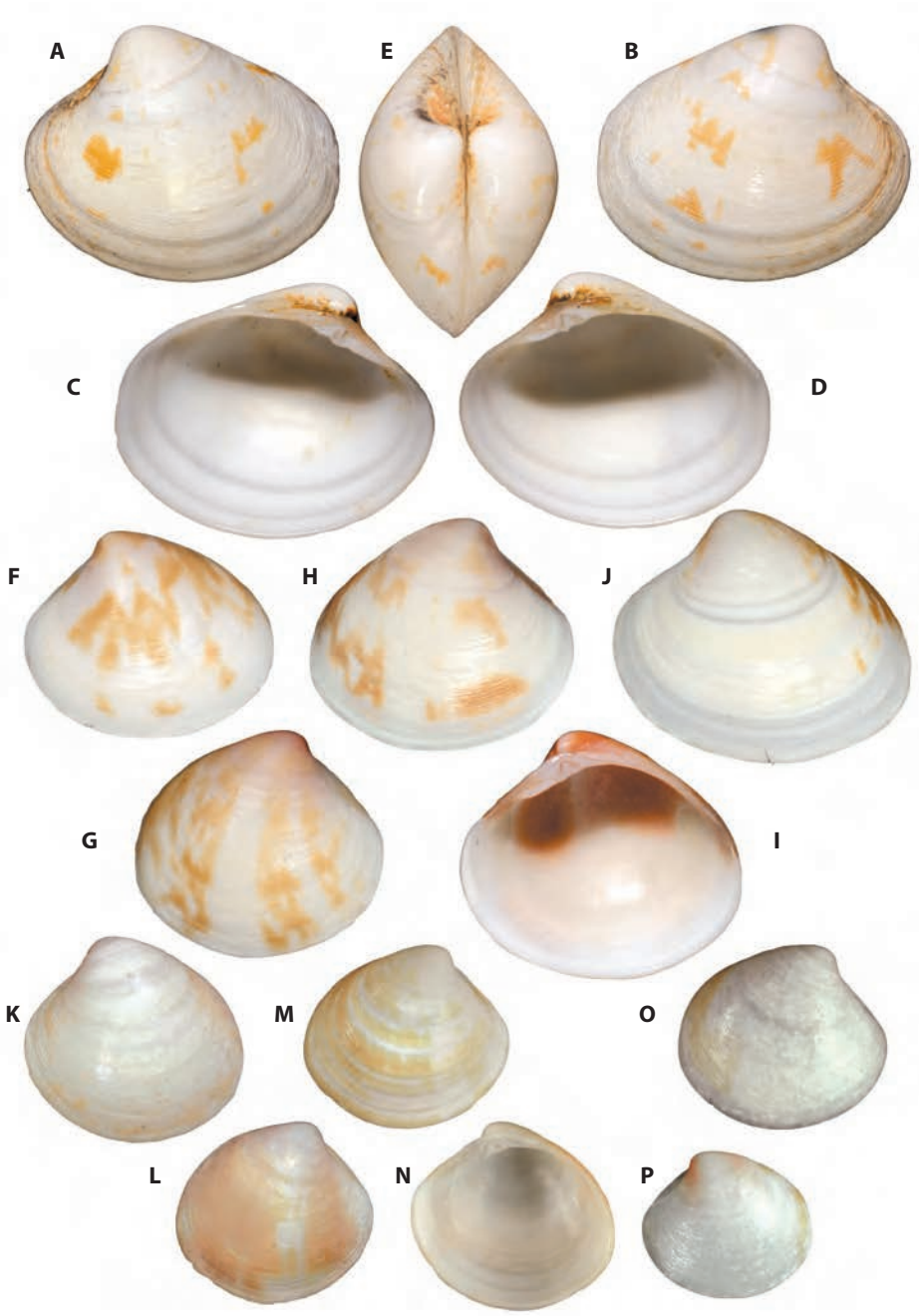
Shell up to 25 mm long (West African specimens from the continental shelf only up to 9 mm), variable in outline and size, slightly longer than high, broadly suboval, thin but solid, very inflated. Anterior margin rounded, posterior margin broadly rounded to occasionally slightly pointed, ventral margin evenly convex, beaks well in front of the vertical midline. Surface of the greater part of the valves smooth, on the extreme anterior and posterior part very fine, dense, commarginal ridges. There are also fine, irregular growth lines. Periostracum very thin, nearly colourless, chalky and velvety, only remaining on the extremities and the marginal part. Inner margin of valves smooth. Outside yellowish white to cream, with light brown rays, zones, spots and zigzag markings. Inside cream, often with brownish, reddish brown or pink under the beaks or antero- and postero-dorsally, this colouration at a less extant also showing through on the outside.



Distribution. Southern Portugal southward to Ghana; northern Angola (Ambrizete, Zaïre province); Azores, Canary Is., Cape Verde Islands; Ilha do Principe; throughout the Mediterranean.

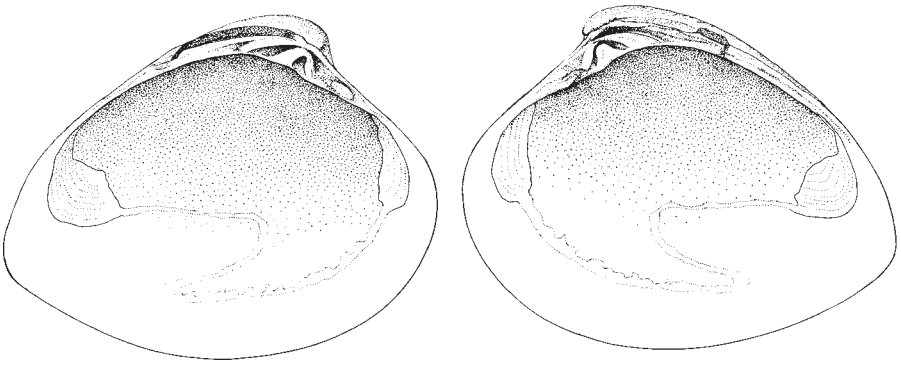
Biotope. In clean fine sand, mixed sand and coarse sand, also with gravel or shell debris, from 30 to 80 m, occasionally deeper, in the Mediterranean also shallower, from about 10 m.

Remarks. West African specimens of *P. rudis* are considerably smaller than most specimens from the Mediterranean, however, there is no reason for separating the West African and the Mediterranean population on subspecies level. Such small specimens are also reported from the eastern Mediterranean and Atlantic Morocco. The species is distinguished from *P. mediterraneus* by its less developed commarginal grooves and the brown markings, whereas *P. mediterraneus* is always uniform white and also occurs in deeper water. A probable distribution gap exists in the southern typical tropical region and southward to the Congo. *Venus nux* Costa, 1829 (*non* Gmelin, 1791) and *Cytherea venetiana* Lamarck, 1818 are synonyms.



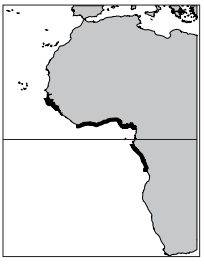
17.58. ***Pitar rudis*** **(Poli, 1795). A**-**E**, SW of Ponta Tantão, Brava, Cape Verde Islands, 56-70 m (13.1 mm). **F**, Kafountine, N-Casamance, 12°44.5'N, 17°27.3'W, 40m (7.7 mm). **G**, same locality (6.8 mm). **H**-**I**, same locality (7.2 mm). **J**, same locality (8.5 mm). **K**-**L**, Abidjan, Côte d'Ivoire, 48 m (4.1 + 3.7 mm). **M**-**N**, Ilha do Principe, 1°37'N, 7°22'E, 30 m (5.0 mm). **O**-**P**, Ambrizete region, Zaïre prov., N-Angola, 7°07'S, 12°21'E, 80 m, box-corer (5.0 + 4.0 mm).

Pitar (*Costellipitar*) *peliferus* Cosel, 1995



17.59. Kipundji, Congo Kinshasa, 5°56'S, 12°07'E, 22-25 m, mud with sand (26.6 mm).

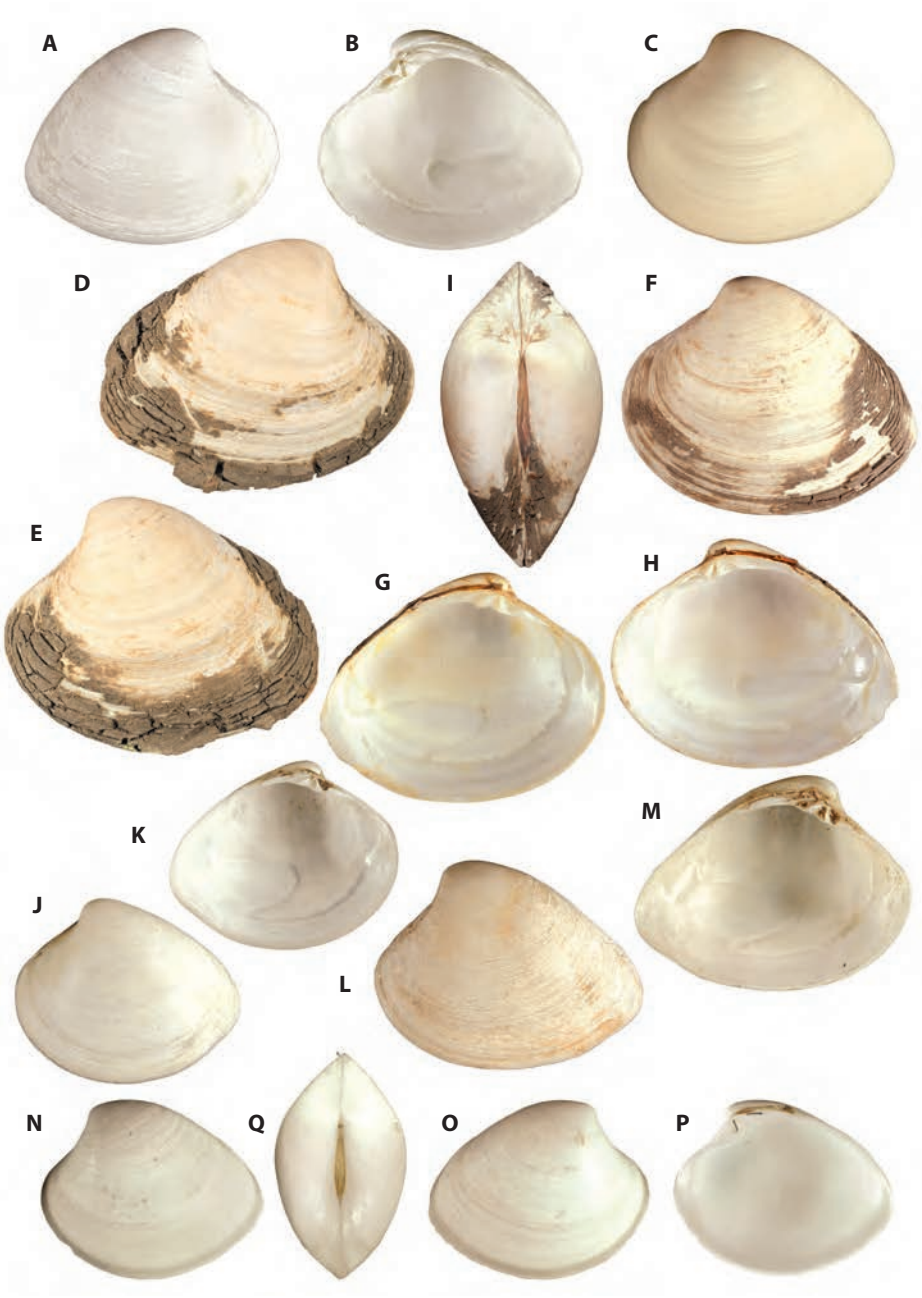
Shell up to 35 mm long, somewhat variable in outline, longer than high, broadly suboval-triangular, quite thin but solid, moderately inflated. Anterior margin narrowly rounded, posterior margin narrowly rounded to sharply pointed, postero-dorsal margin typically convex, ventral margin gently convex, beaks well in front of the vertical midline. Surface with fine to pronounced irregular commarginal growth lines, occasionally an additional sculpture of very fine irregular commarginal ridges is visible. Periostracum thin and dull, with a thick layer of sediment adhering to the marginal parts of fully grown specimens and to the whole shell of juvenile specimens. Valves entirely dirty white.



Distribution. Senegal (Kayar and Casamance) to Guinea (Conakry); Côte d'Ivoire to northern Angola (Luanda). Not yet recorded from Sierra Leone, Liberia and Gabon.

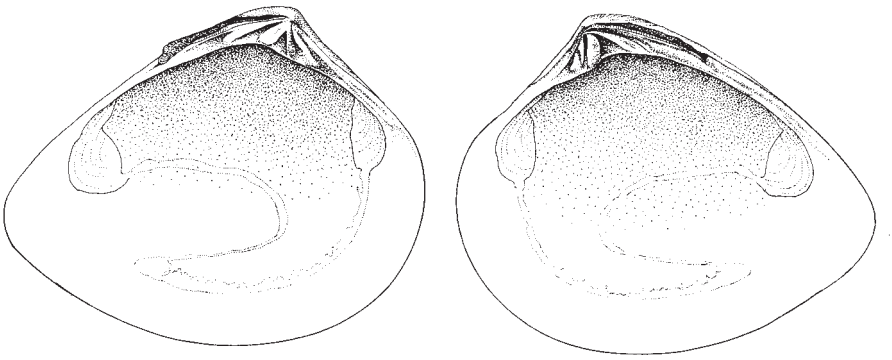
Biotope. In sandy mud and fine muddy sand, from about 3 to 25 m. Smaller specimens appear in the dredge samples as small mud balls during sifting, only breaking of this shows if it is just an agglomeration of sticky mud or if it is a *Pitar* with its also quite firm and sticky mud layer around it.

Remarks. Living specimens are easily recognized with their peculiar mud aggregates. This species is distinguished from *P. tumens*, *P. virgo* and *P. nicklesi* by its deeper horizontal pallial sinus, from *P. virgo*, *P. nicklesi* and *P. cor* by the lack of any sculpture. The southern form of *P. elatus* is similar, but larger, somewhat higher and more tumid. Some specimens encountered repeatedly in Casamance and the Congo Brazzaville (Pointe-Noire area) have a sharply bent posterior margin. (see Fig. 17.60A-B). They may represent an undescribed species, but it would be premature to describe it with no live specimens for DNA analysis and few specimens at hand. - Also other *Pitar* species may be found surrounded by a (mostly thinner) mud layer, but only occasionally. Larger specimens of *P. peliferus* may sometimes be found without the mud layer. Empty shells and valves are occasionally encountered on beaches.



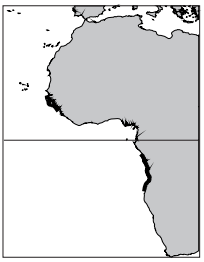
17.60. *Pitar (Costellipitar) peliferus* Cosel, 1995. **A**-**B**, Abéné–Kafountine, N-Casamance, Senegal, beach drift (28.8 mm). **C**, Cap Skirring - Diembéring, S-Casamance, Senegal, beach drift (25.2 mm). **D**-**E**, Grand Lahou, Côte d'Ivoire, 26 m (holotype, 31.4 mm, photo Manuel Caballer/Recolnat). **F**-**I**, same locality (paratype, 34.6 mm). **J**-**K**, Victoria (now Limbe)–Bota, Cameroon, 8-10 m (19.9 mm). **L**-**M**, Wouri estuary–Cap Nachtigal, Cameroon, 3°44'N, 9°22'E, 13 m (24.8 mm). **N**-**Q**, Cacuaco, Bengo prov., N-Angola, beach drift (19.3 mm).

Pitar (*Costellipitar*) *cor* (Hanley, 1844)



17.61. Kafountine, Casamance, 3-6 m (22 mm).

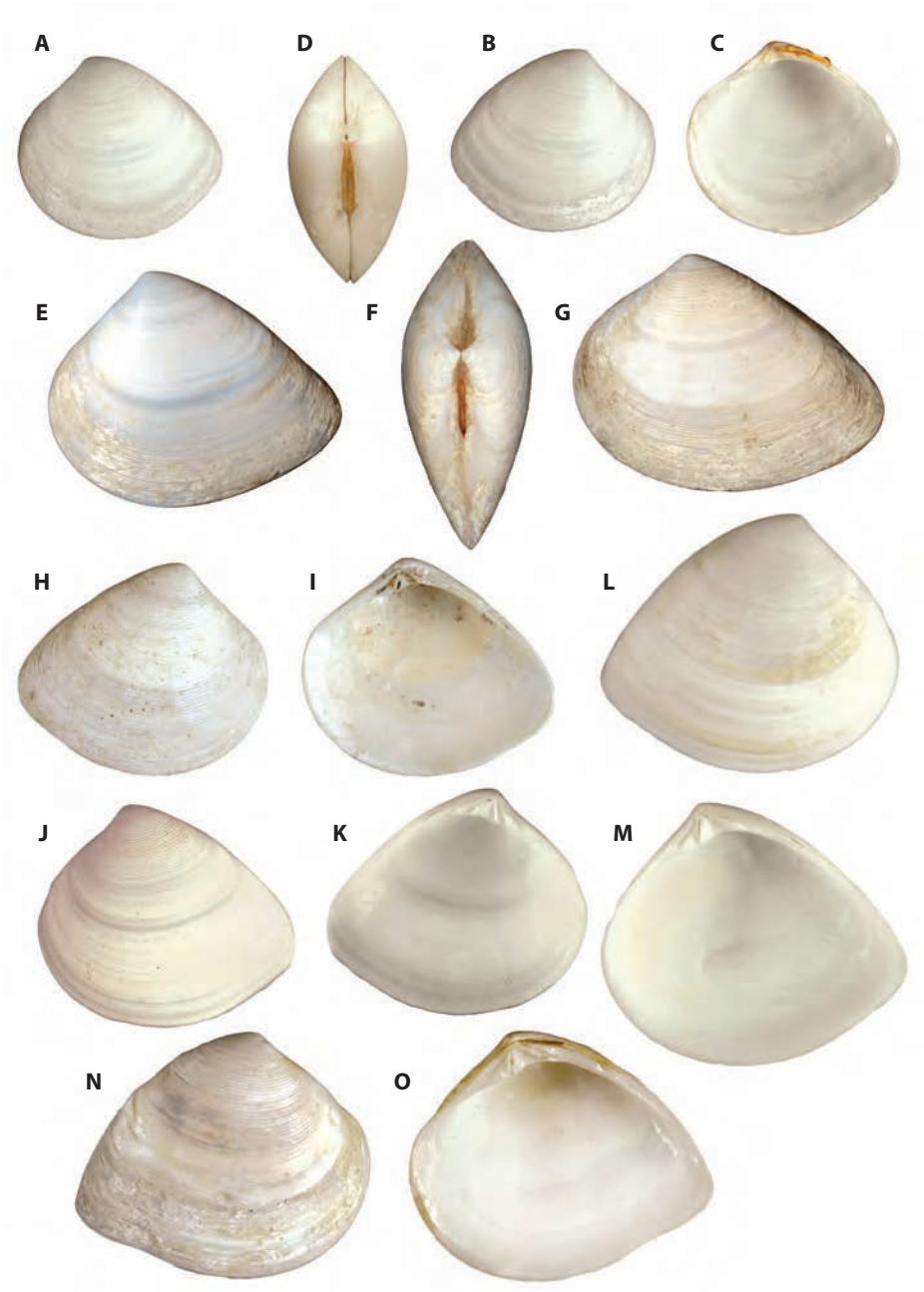
Shell up to 25 mm long, trigonal, quite variable in outline, from only slightly longer than high to rather elongate, thin but solid, compressed. Anterior margin broadly rounded, antero-dorsal margin almost straight, postero-dorsal margin gently convex. Posterior part more or less prolonged, posterior end rather sharply pointed. Beaks forming the upper angle of the triangular valves and hardly protruding, situated well in front of the vertical midline. Surface with very fine, dense, slightly irregular commarginal ridges and growth lines. Periostracum thin, dull, colourless and translucent, with a calcareous velvety layer on the marginal part of the shell, consisting of microscopic aragonitic calcifications. Inner margin of valves smooth. Pallial sinus almost horizontal, reaching forward to under the beaks. Outside white to cream, with light grey, irregular commarginal growth bands. Inside white, growth bands slightly showing through.



Distribution. Senegal (Casamance) to Guinea; Congo Brazzaville (Bay of Pointe-Noire) to northern Angola (Cacuaco) and S-Angola (Moçâmedes, Namibe prov.). Not yet recorded from the tropical zone (Sierra Leone, Liberia, Cameroon, Gabon).

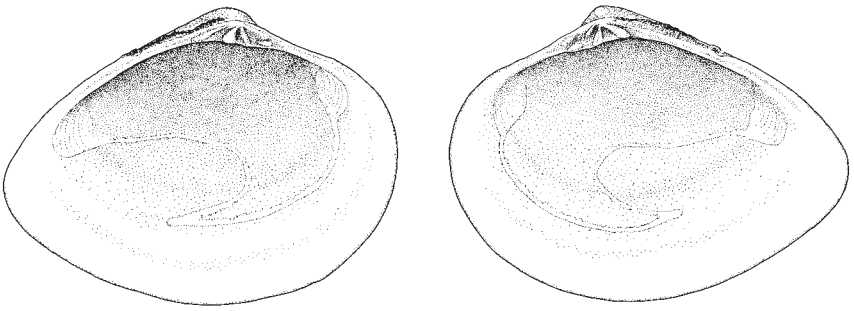
Biotope. In sandy mud and fine muddy sand, from 3 to 25 m, most common in the upper 15 meters.

Remarks. This species is characterized by its compressed and rather high shell, the typically pointed posterior end and the widely forward situated and typically not protruding beaks. *Cytheraea tellinoidea* G. B. Sowerby II, 1851, possibly based on the same specimen in BMNH, is a well-known synonym.



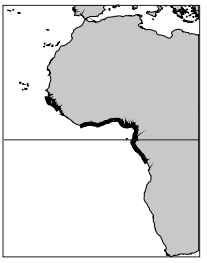
17.62. *Pitar (Costellipitar) cor* (Hanley, 1844). **A**-**D**, Diembéring, S-Casamance, 12°30.4'N, 17°16'W, 21 m (15.6 mm). **E**, Cap Roxo, S-Casamance, Senegal, 12°20.7'N, 15°53.1'W, 15 m (19.2 mm). **F**-**G**, same locality (20.2 mm). **H**-**I**, W of Ile Dodo, Guinea, 9°50'N, 14°14'W, 16 m (14.7 mm). **J**-**K**, Pointe-Noire, Congo Brazzaville, Plage Sauvage, beach drift (16.7 mm). **L**-**M**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (21.8 mm). **N**-**O**, Cacuaco, Bengo prov., N-Angola, 0-5 m (20.6 mm).

Pitar (*Costellipitar*) *longior* Cosel & Gofas, 2018



17.63. Abidjan region, Côte d'Ivoire (17.5 mm).

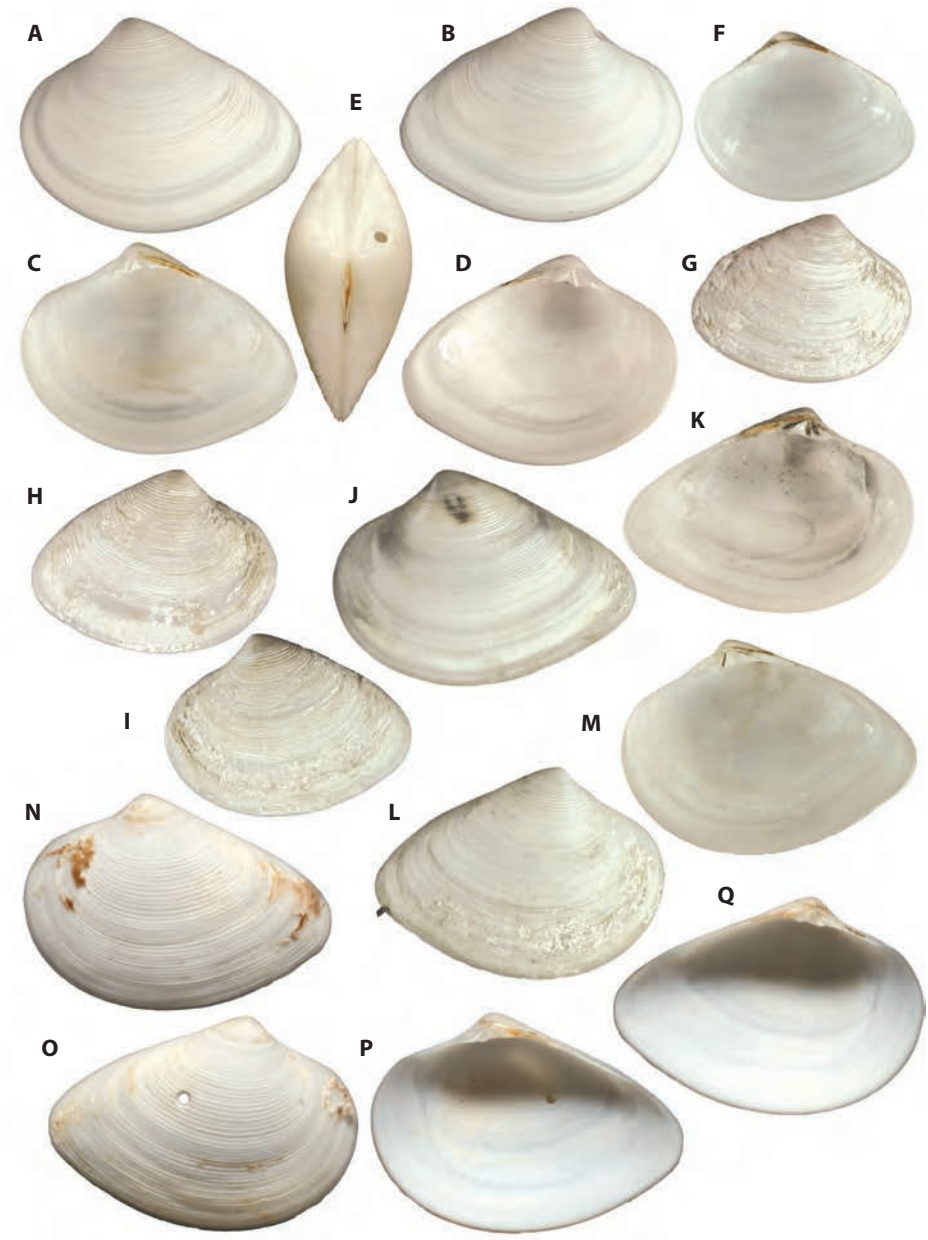
Shell up to 20 mm long, occasionally to 25 mm, elongate, suboval-triangular, thin and brittle, rather compressed. Anterior margin broadly rounded, posterior part prolonged and tapering, posterior margin narrowly rounded, beaks well in front of the vertical midline. Surface with strong and well-developed, dense, slightly irregular commarginal ridges and growth lines. Periostracum thin, dull, colourless and translucent, with a sometimes quite thick calcareous velvety layer on the surface, mostly persisting on the marginal part of the shell and consisting of microscopic aragonitic calcifications. Inner margin of valves smooth. Pallial sinus long and almost horizontal, reaching to under the beaks. Outside white to cream, with light grey, irregular commarginal growth bands. Inside white, growth bands slightly showing through.



Distribution. Southern Casamance and Guinea (few records); Côte d'Ivoire to Gabon (also Quaternary of Port-Gentil) and Congo (Brazzaville and Kinshasa).

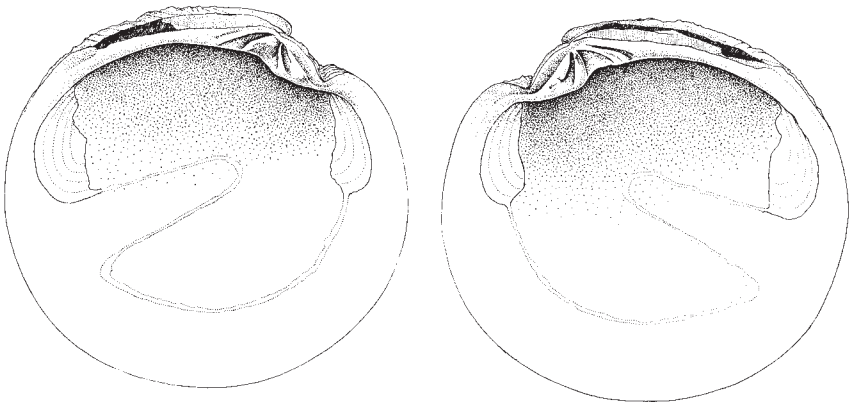
Biotope. In sandy mud and fine muddy sand, from about 18 to 50 m.

Remarks. This species is very close to the preceding species, and it was hitherto included as a variety of it. However it is distinguished by its more elongate shell with the anteriorly more set-off umbos, and its sculpture of densely spaced, fine but prominent commarginal ridges with concave interspaces instead of finer, more flat and still more close-set commarginal cords. Also the biotope seems to be different: muddy bottom in deeper water.



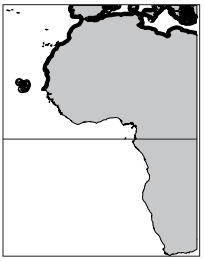
17.64. ***Pitar (Costellipitar) longior*** **Cosel & Gofas, 2018.** **A**-**E**, San Pedro, Côte d'Ivoire, 4°45'N, 6°35'W, 30 m (holotype, 18.2 mm). **F**-**G**, Abidjan region, Côte d'Ivoire, off CRO Abidjan, 44 m (14.2 mm). **H**-**I**, Grand Lahou, Côte d'Ivoire, 40 m (13.6 mm). **J**-**K**, Port-Gentil, Gabon, drilling site "Anguille", 0°47.4'S, 8°43.6'E, 25 m (19.1 mm). **L**-**M**, Conkouati, Congo Brazzaville, 4°10'S, 11°15'E, 19 m (20.0 mm). **N**-**Q**, Kipundji, Congo Kinshasa, 5°56'S, 12°07'E, 22-25 m (17.3 mm).

Dosinia exoleta (Linnaeus, 1758)



17.65. Dakar, 14°26'N, 17°05'W (40 mm).

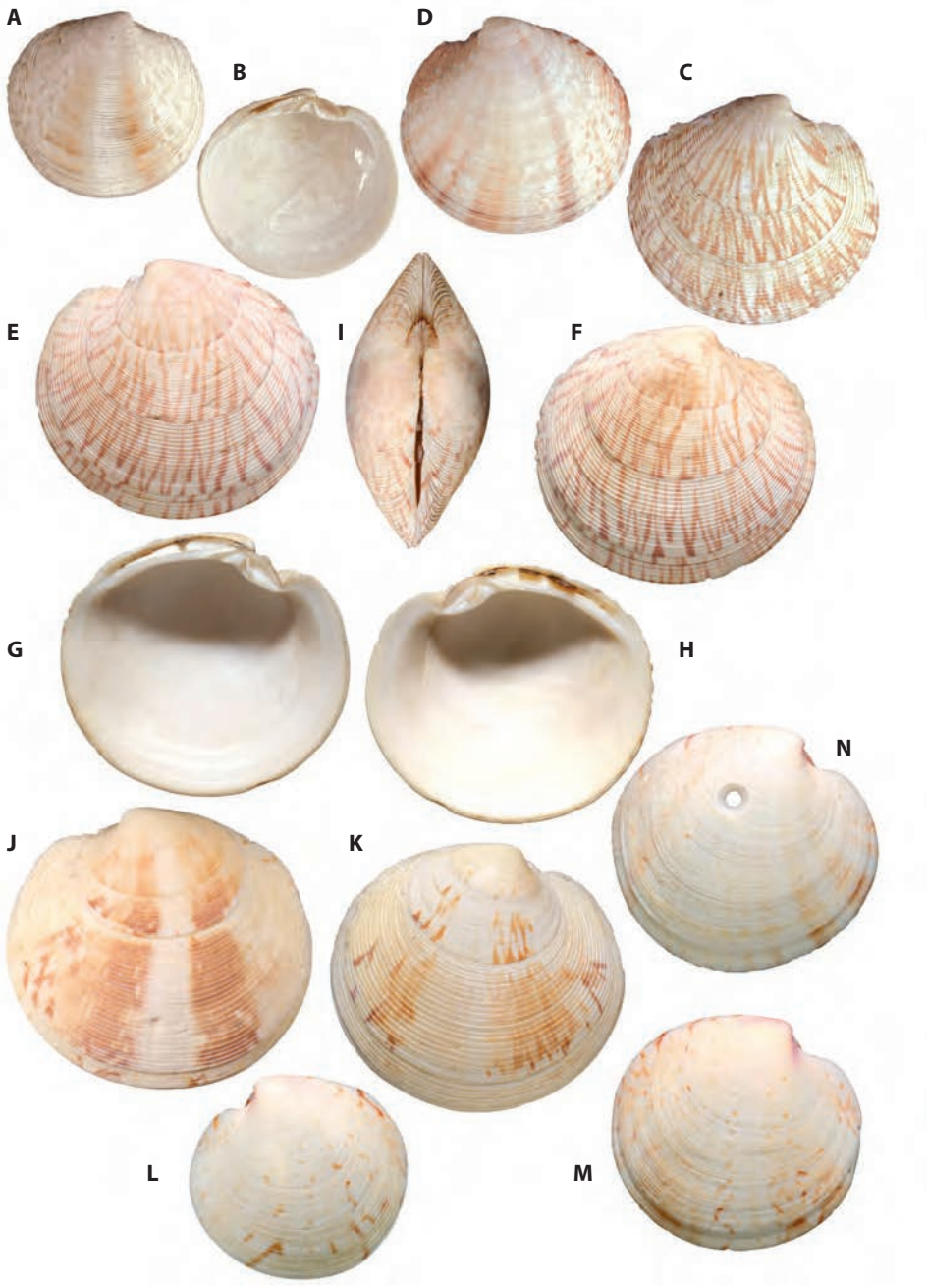
Shell up to 50 mm long, somewhat variable in outline, almost circular, very slightly longer than high, thick and solid, compressed. Beaks well in front of the vertical midline. Lunule small and sunken, no visible escutcheon. Surface with numerous commarginal ridges and some stronger growth lines. Inner margin of valves smooth. Outside cream to pale yellowish, with very variable, pale to dark brownish or pink zigzag markings, rays, streaks or flecks. Inside cream, occasionally with pinkish brown mostly around the pallial sinus.



Distribution. Norway (68°N) and Shetlands southward to Senegal (Dakar); Cape Verde Islands; throughout the Mediterranean.

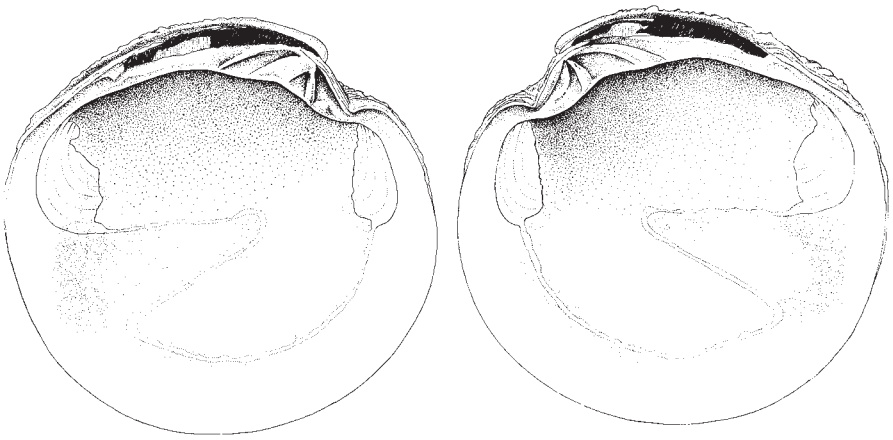
Biotope. In fine, mixed and coarse sand from about 3 to 20 m, in Europe down to 80 m.

Remarks. In European and Mediterranean specimens, a narrow, not very sharply delimited escutcheon is present, which, however, is absent in specimens from West Africa; moreover, in West Africa, the species never reaches the large size of European specimens. Beached shells are common at many places in Europe, in West Africa at Dakar. *Dosinia exoleta* is consumed in Europe. This is "Le Cotan" of Adanson.



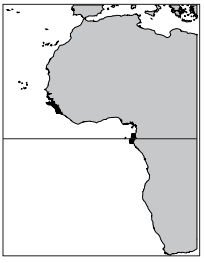
17.66. *Dosinia exoleta* (Linnaeus, 1758). **A**-**B**, Port-Etienne (now Nouadhibou), Mauritania, 20 m (21.8 mm). **C**, same locality (29.5 mm). **D**, Pointe des Maures, Mauritania, 20°55'N, intertidal (23.1 mm). **E**-**I**, Cap Vert, Dakar, Senegal (34.2 mm). **J**, Dakar region, Senegal (39.3 mm). **K**, same locality (3.0 mm). **L**, Baia Matiota, Mindelo, São Vicente, Cape Verde Islands, 2-3 m (30.8 mm). **M**, same locality (25.6 mm). **N**, same locality (28.8 mm).

Dosinia gabonensis Cosel, 1989



17.67. Baie de Port Gentil, Gabon, 3 m (48 mm).

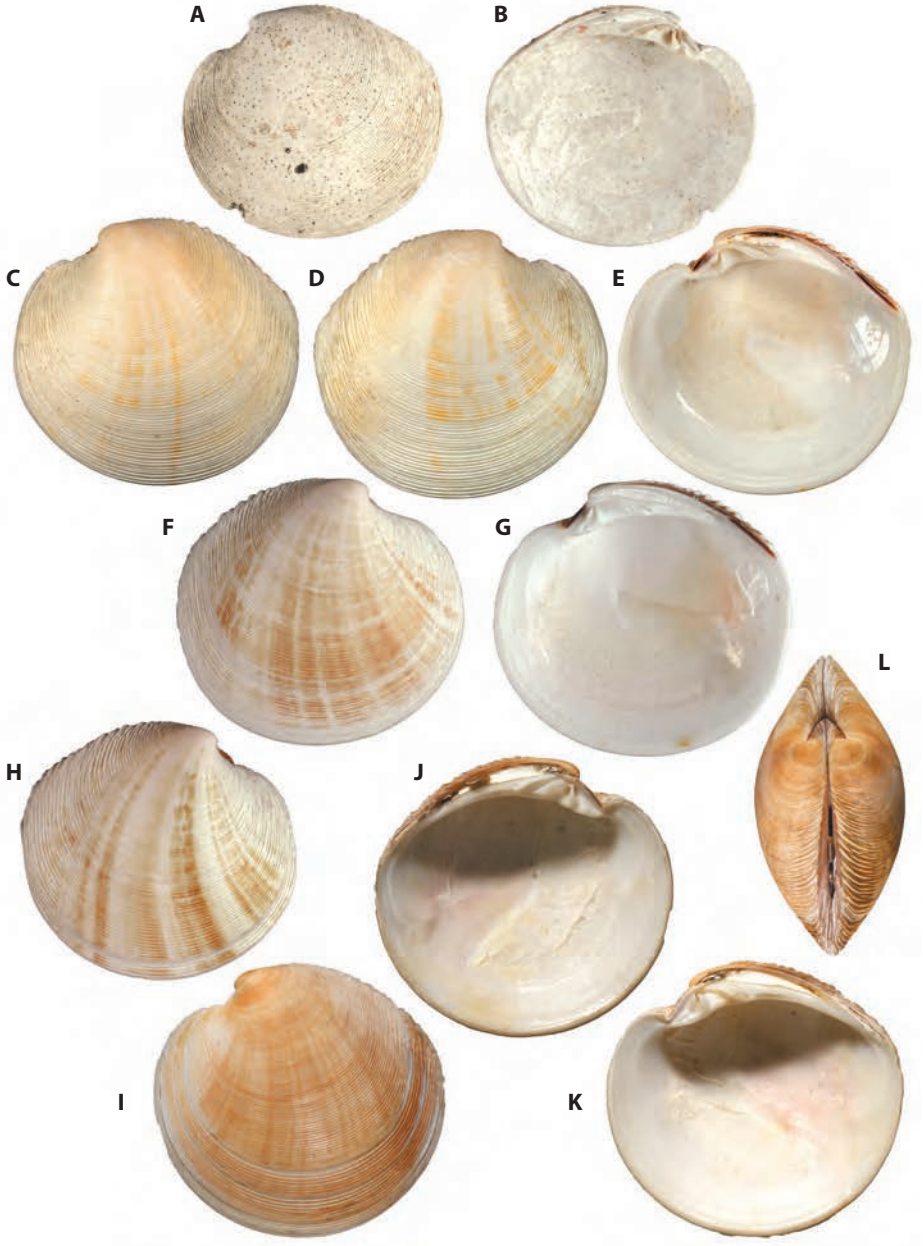
Shell up to 60 mm long, somewhat variable in outline, very slightly longer than high to nearly as high as long, subcircular to almost circular, quite thick and solid, compressed. Beaks well in front of the vertical midline. Lunule short, broad and heart-shaped, deep; escutcheon narrow and deeply sunken, delimited by a keel with fine, spine-like lamellae. Surface with numerous very fine, regular commarginal ridges, which become lamellate towards antero- and postero-dorsally. Inner margin of the valves smooth. Outside ivory-whitish, light beige to pale brownish, with curved radial brownish rays, lines or streaks, occasionally zigzag markings. Lunule and escutcheon distinctly reddish brown to dark brown. Inside white, often with pale salmon, mostly in the posterior half.



Distribution. Guinea (Ile Kouffin, 10°30'N); Liberia (1 valve); northern Gabon (Ile Banié to Port Gentil). The lack of any record from Liberia to Cameroon may indicate a probable distribution gap.

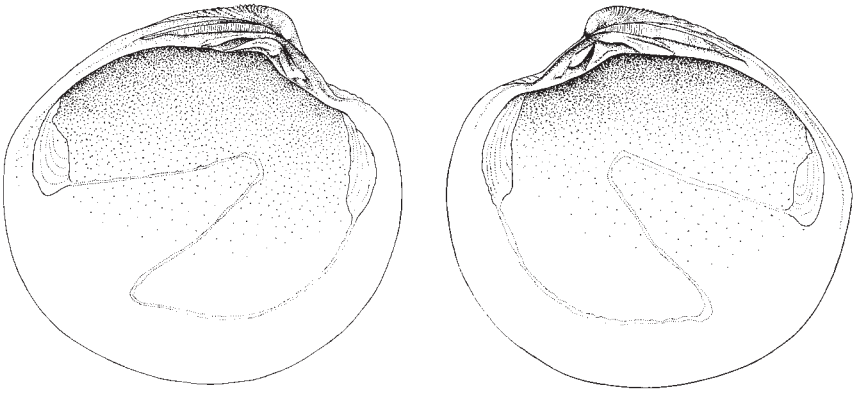
Biotope. In fine sand with detritus, also with shells, shell debris and calcareous algae, from 3 to 50 m; not common in Gabon, very rare in the north, where it was only found in deeper water (18-50 m).

Remarks. This strictly tropical species is the largest eastern Atlantic *Dosinia*, and because of its rarity it remained unnamed up to quite recently. The few known valves had been identified as *D. exoleta*, although *D. gabonensis* is easily distinguished by its dark brown lunule and escutcheon in combination with the spine-like lamellae delimiting the latter. It belongs to an easily recognizable species group (Subgenus *Phacosoma* Jukes-Browne, 1912) otherwise represented only in the Indo-Pacific, *e.g.* by the Japanese *D. troscheli* Lischke, 1873.



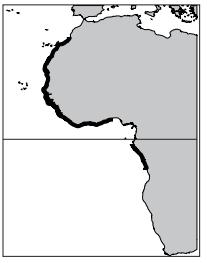
17.68. ***Dosinia gabonensis*** **Cosel, 1989.** **A**-**B**, W of Ouendi-Taboria, Guinea, 9°55.5'N, 14°27'W, 18 m (50.8 mm) [the few specimens from Guinea are all worn]. **C**-**E**, Ile Banié, N of Cap Esterias, Baie de Corisco, Gabon, 3-5 m (holotype, 54.4 mm, photo Manuel Caballer/Recolnat). **F**-**G**, Ile Banié, Gabon, 5-7 m, fine sand with detritus (paratype, 43.3 mm). **H**, same locality (paratype, 41.7 mm). **I**-**L**, Port-Gentil, Gabon (58.6 mm), MNHN old coll.

Dosinia adami Nicklès, 1955



17.69. S-Mauritania, 17°17'N, 16°25'W, 85 m (15.7 mm).

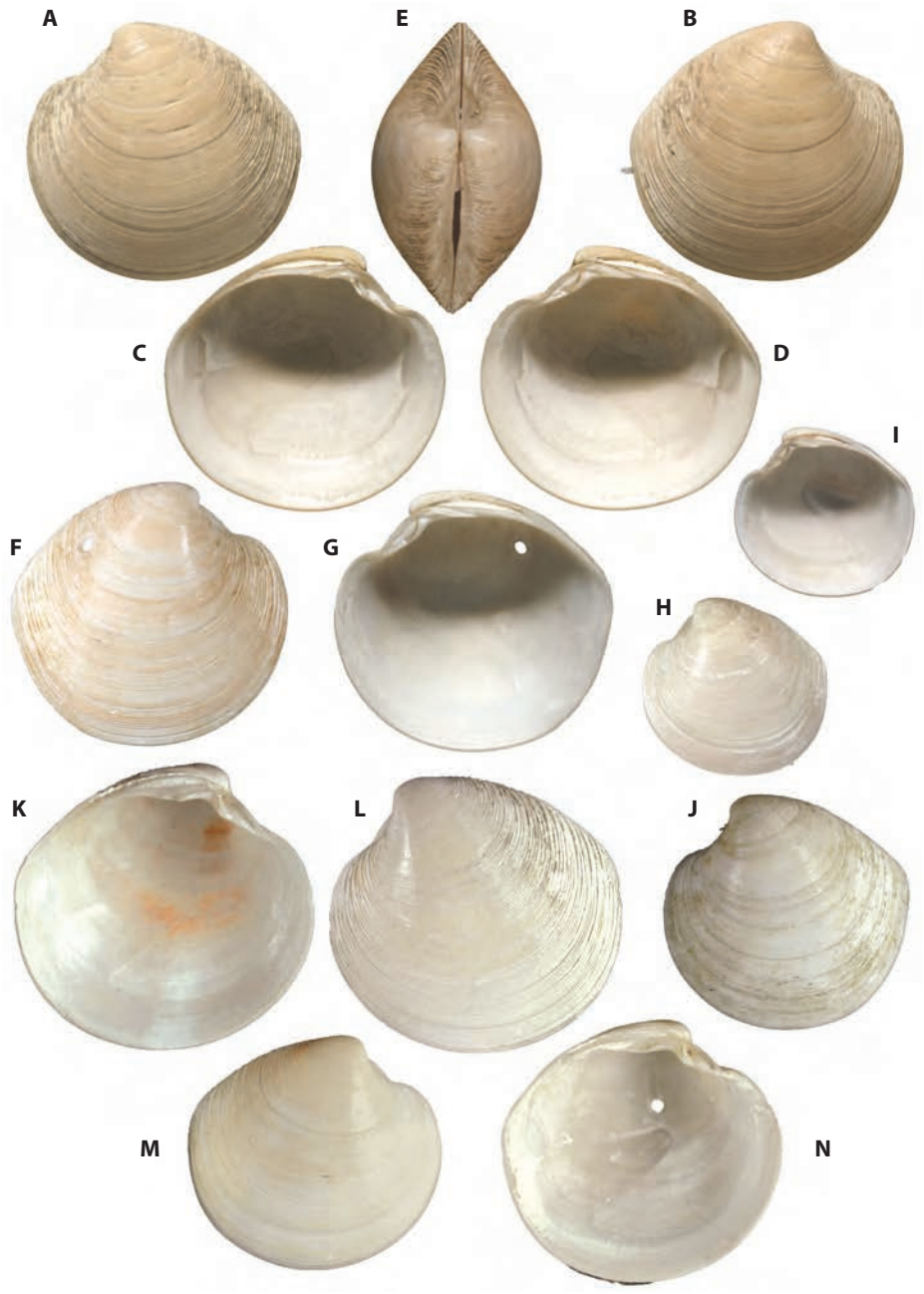
Shell up to 22 mm long, almost as long as high, subcircular, thin but solid, rather inflated. Beaks well in front of the vertical midline. Lunule short, broad and heart-shaped, escutcheon narrow and well marked, but not sunken, delimited by a rounded keel. Surface with numerous very fine, regular commarginal ridges of which, at the limit to the postero-dorsal area and also towards the antero-dorsal area, every second or third one becomes more prominent and lamellate whereas the remaining ones disappear gradually. Inner margin of valves smooth. Outside and inside dirty white to uniform greyish white or very pale brownish.



Distribution. Atlantic Morocco (30°40'N) to Ghana (Accra); Gabon (2°S) to northern Angola (Luanda).

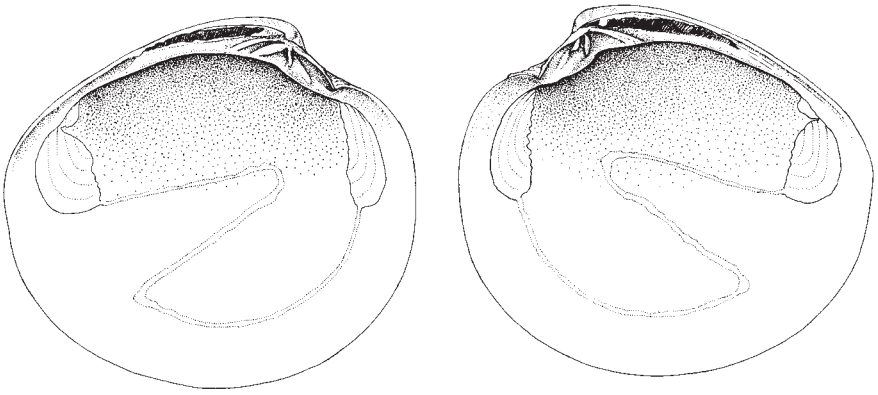
Biotope. In sandy mud and fine muddy sand, from 40 to 150 m, not common.

Remarks. This species is superficially close to *D. afra*, but it is distinguished by its smaller size, the more inflated shell, the narrow hinge plate (see Fig. 17.70), the typical embayment of the lower margin of the hinge plate under the posterior cardinal and the very typical lamellate sculpture on the antero- and postero-dorsal slope. The species closest to *D. adami* are from the Indo-West Pacific. The absence of records east of Ghana to Gabon of this deeper shelf species not found on beaches may possibly be due to insufficient sampling but perhaps also may indicate a distribution gap.



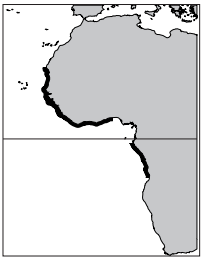
17.70. ***Dosinia adami*** **Nicklès, 1955. A**-**E**, Mauritania, 17°17′N, 16°25′W, 85 m (16.0 mm). **F**-**G**, Mauritania, 17°44′N, 16°27′W, 100 m (17.9 mm). **H**-**I**, same locality (12.0 mm). **J**, S of Gorée, Dakar, Senegal, 95-98 m (15.1 mm). **K**-**L**, Côte d'Ivoire, 4°57′N, 2°42′W, 40 m (18.4 mm). **M**, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (17.7 mm). **N**, same locality (18.6 mm).

Dosinia afra (Gmelin, 1791)



17.71. Baie de Cansado, Mauritania, 10 m (32.9 mm).

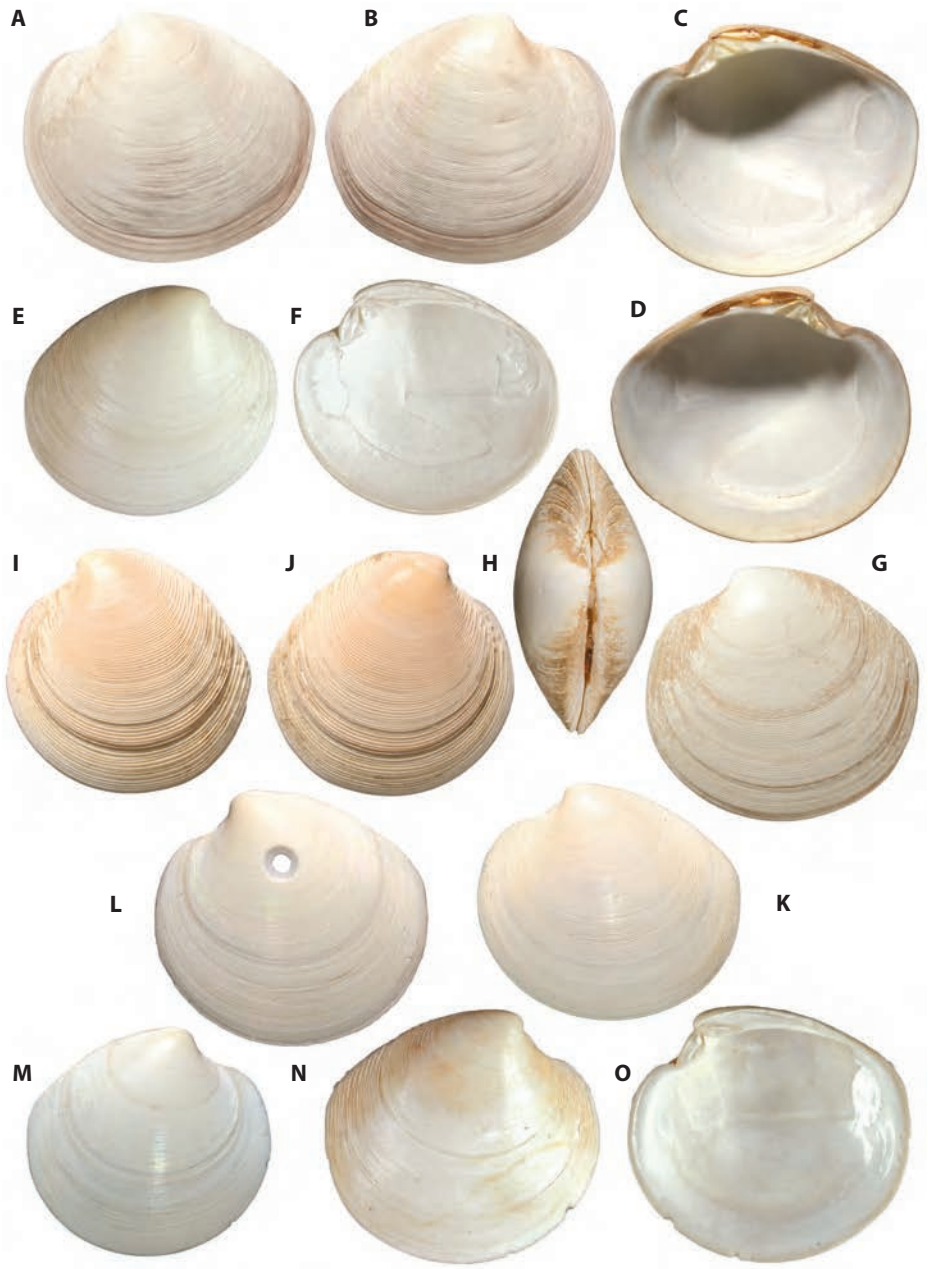
Shell up to 40 mm long, often longer than high, subcircular, rather thick and solid, compressed, with prolonged posterior part and the beaks well in front of the vertical midline. Lunule small and heart-shaped, escutcheon narrow and well visible, delimited by a rounded angle which is still more rounded in the right valve than in the left valve. Surface glossy, with numerous, very fine, regular commarginal threads which become lamellate towards antero- and postero-dorsally. There are also a few stronger growth lines. Inner margin of valves smooth. Outside very pale yellowish, ivory, cream or white, inside white.



Distribution. Mauritania (Cap Blanc) to Ghana; Gabon (Port-Gentil) to northern Angola (Santo Antonio, Benguela).

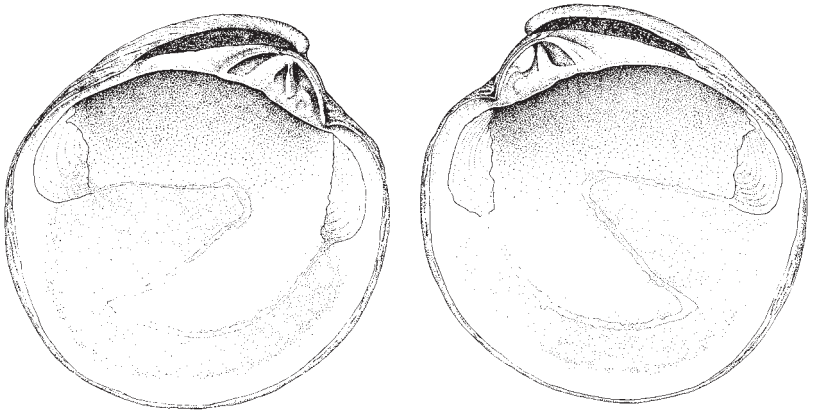
Biotope. In fine and mixed sand, also with shell debris, from about 3 to 25 m, common in the Northern Alternant Region, rare south of Guinea.

Remarks. This species is part of the European-West African *Dosinia lupinus* complex, together with *D. lupinus lupinus* (Poli, 1791) in the Mediterranean and *D. lupinus lincta* (Pulteney, 1799) in the European Atlantic from Norway (70°N) to Portugal and Morocco; however, recent authors (*e.g.* Huber 2010) separate the west African specimens as a full species, which is followed here. The main difference to *D. lupinus* is the much longer posterior part and the often larger size. *Dosinia l. lupinus* is smaller, higher and more triangular and is often tinged with pale violet or yellowish in the umbonal area. *Dosinia l. lincta* reaches nearly the same size as *D. afra* but is thicker, heavier, more inflated, not glossy and has a less prolonged posterior part; it is uniformly dirty white. Empty valves and shells can occasionally be found on beaches or brought ashore by dugout canoe fishermen. *Dosinia africana* (Gray, 1838) and *D. adansoni* (Philippi, 1844) are synonyms of the African species which is "Le Gordet" of Adanson.



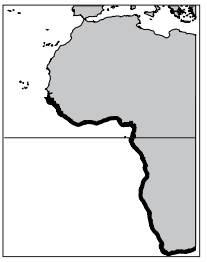
17.72. *Dosinia afra* (Gmelin, 1791). **A**-**D**, Baie de Cansado, Mauritania, 10 m (34.7 mm). **E**-**F**, Baie de Gorée, Dakar, Senegal (38.5 mm). **G**-**H**, Casamance, Senegal, 10-20 m (32.1 mm). **I**-**J**, Kafountine, Casamance, 3-6 m, in fishermen's' nets (25.7 mm). **K**, Ghana, 4°40'N, 0°55'W, 50 m (31.8 mm). **L**, Pointe Chapuis, Port-Gentil, Gabon, 0°39.3'S, 8°45.5'E, 0-2 m (31.8 mm). **M**, same locality (28.4 mm). **N**-**O**, Pointe-Noire, Congo Brazzaville, Plage Orstom, 3-4 m (27.0 mm).

Dosinia orbignyi (Dunker, 1845)



17.73. Pointe-Noire, Plage Mondaine, on beach (28.5 mm).

Shell up to 45 mm long, variable in outline, slightly longer than high, as high as long or even a bit higher than long, subcircular, thick to very thick, inflated. Beaks prominent, well in front of the vertical midline. Lunule small, broad and heart-shaped, escutcheon narrow, delimited by a rounded but well marked keel. Surface glossy, with numerous, fine, regular, commarginal threads and a few growth lines. Inner margin of valves smooth. Outside whitish, cream or light greyish, towards the umbonal area often becoming yellowish, light brownish or tinged with violet. Growth lines in many specimens marked light greyish. Inside white, frequently with yellow or brownish violet parallel to the ventral margin and on the pallial sinus, sometimes on the whole inner surface except a narrow zone parallel to the margin. Specimens from Gabon and northward are marked with rich salmon on the inside, slightly showing through on the exterior.



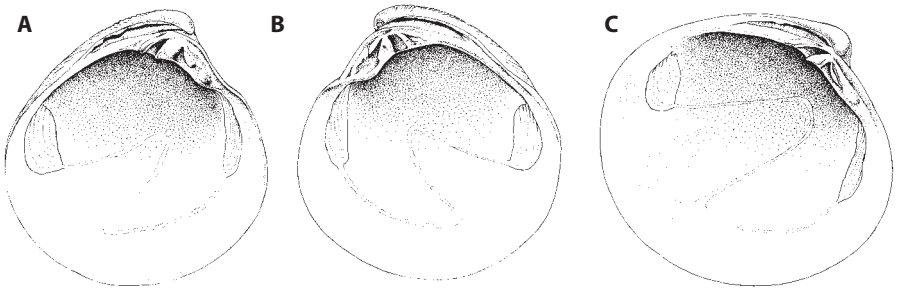
Distribution. Senegal (Casamance) to southern Angola (Baia dos Tigres) and further southward to Namibia and South Africa (East London).

Biotope. In clean medium and mixed sand, from low tide to 10 m. In the northern and middle part of its range uncommon to very rare, from Gabon southward becoming more common, abundant in the Congo, Angola and Namibia.

Remarks. This species is occasionally treated as another subspecies of *D. lupinus*, however, as *D. afra* and *D. orbignyi* are found sympatrically without intergrades between Casamance and Gabon, they are regarded as two species, in spite of their close relationship. *Dosinia orbignyi* is higher, thicker, heavier and more inflated than *D. afra* and, in contrast to the latter, is frequently coloured. Specimens from Namibia are here considered conspecific. Synonyms are *D. torrida* (Reeve, 1850), *D. solidula* G.B. Sowerby II, 1852 and *D. obliquata* Römer, 1862. The species is marketed in Angola as "ameijoa"; it is consumed also in Congo Brazzaville, empty shells and valves are common on beaches.

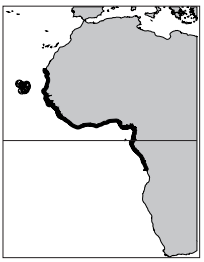
17.74. *Dosinia orbignyi* (Dunker, 1845). **A**-**B**, Ile Banié, Baie de Corisco, Gabon, 2-6 m (33.2 mm). **C**-**D**, Pointe Chapuis, Port-Gentil, Gabon, 0°39.3'S, 8°45.5'E, 0-2 m (35.3 mm). **E**-**F**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, near lighthouse, beach drift (28.5 mm). **G**-**H**, same locality (28.3 mm). **I**-**J**, same locality (27.4 mm). **K**-**L**, same locality (24.1 mm). **M**-**N**, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (32.8 mm). **O**-**P**, Walfishbai, Namibia, beach drift (37.5 mm).

Dosinia isocardia (Dunker, 1845)



17.75. A-B, Somone, Petite Côte, Sénégal (21.0 mm), complete shell high elongate. C, Pointe-Noire, Plage Mondaine, on beach (lv, 13.3 mm).

Shell up to 23 mm long and to 25 mm high, very variable in outline, tumidity, thickness, hinge teeth and sculpture, as long as high to considerably higher than long, subcircular to high-subtriangular, moderately thin to very thick and solid, compressed to quite inflated. Beaks small to very prominent, in front of the vertical midline. Lunule rather narrow to broad, not sunken, escutcheon very narrow and delimited by a rounded keel. Surface with fine to very fine, regular, more or less prominent commarginal ridges. Inner margin of valves smooth. Hinge line variable from narrow to broad or very broad and thick. Pallial sinus large, somewhat variable in length, pointing upwards in an angle of about 45°. Outside whitish to pale yellowish, often with the umbonal area marked bluish-violet or with bands in the same colour. Inside whitish often with pale yellowish pallial sinus, or partly or entirely violet to brownish violet often only on the adductor scars, the ventral zone and the pallial sinus.



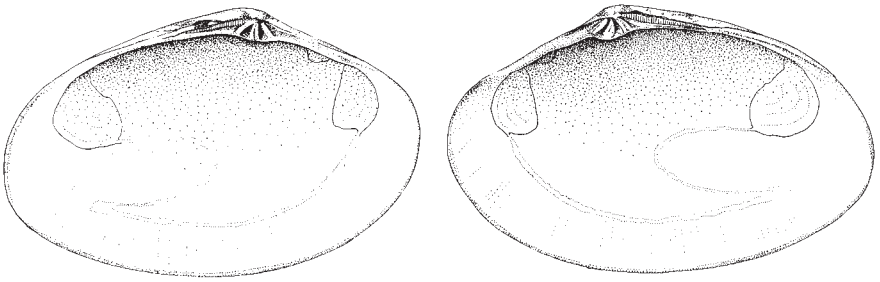
Distribution. Mauritania (Cap Blanc; Banc d'Arguin; as Holocene subfossil abundant at Nouakchott and towards inland, vast material from Mission Gruvel in MNHN) to northern Angola (Luanda), Cape Verde Islands.

Biotope. In muddy sand and clean fine sand, from low tide to about 6 m, mostly in protected bays, inlets, lagoons, creeks, estuaries. The species can tolerate low salinity as well as hypersalinity and is locally abundant.

Remarks. In spite of its variability, *D. isocardia* is not to be mistaken for any other west African *Dosinia*. There is a similar species, *D. hepatica* (Lamarck, 1818) from East Africa (Red Sea to Still Bay, South Africa) and Madagascar, to which certain specimens of *D. isocardia* are very close. However, *D. hepatica* never attains the high-triangular outline and thickness of many specimens of *D. isocardia*.

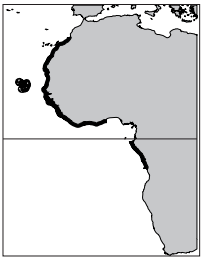
17.76. *Dosinia isocardia* (Dunker, 1845). **A**-**B**, Banc d'Arguin, Mauritania, intertidally (16.5 mm, RMNH). **C**-**D**, same locality (13.2 mm). **E**-**F**, same locality (rv, 18.1 mm). **G**-**H**, Ourong Bôlon, S-Casamance, sand bank at low tide (8.8 mm). **I**-**J**, same locality (9.3 mm). **K**-**L**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, (11.6 mm). **M**-**N**, same locality (13.0 mm). **O**-**Q**, Pointe-Noire, Congo Brazzaville (19.6 mm). **R**-**U**, Baia do Mussulo, Luanda prov., N-Angola, 0-2 m (11.2 mm).

Polititapes durus (Gmelin, 1791)



17.77. Cap de Naze, Senegal, 20-30 m (52 mm).

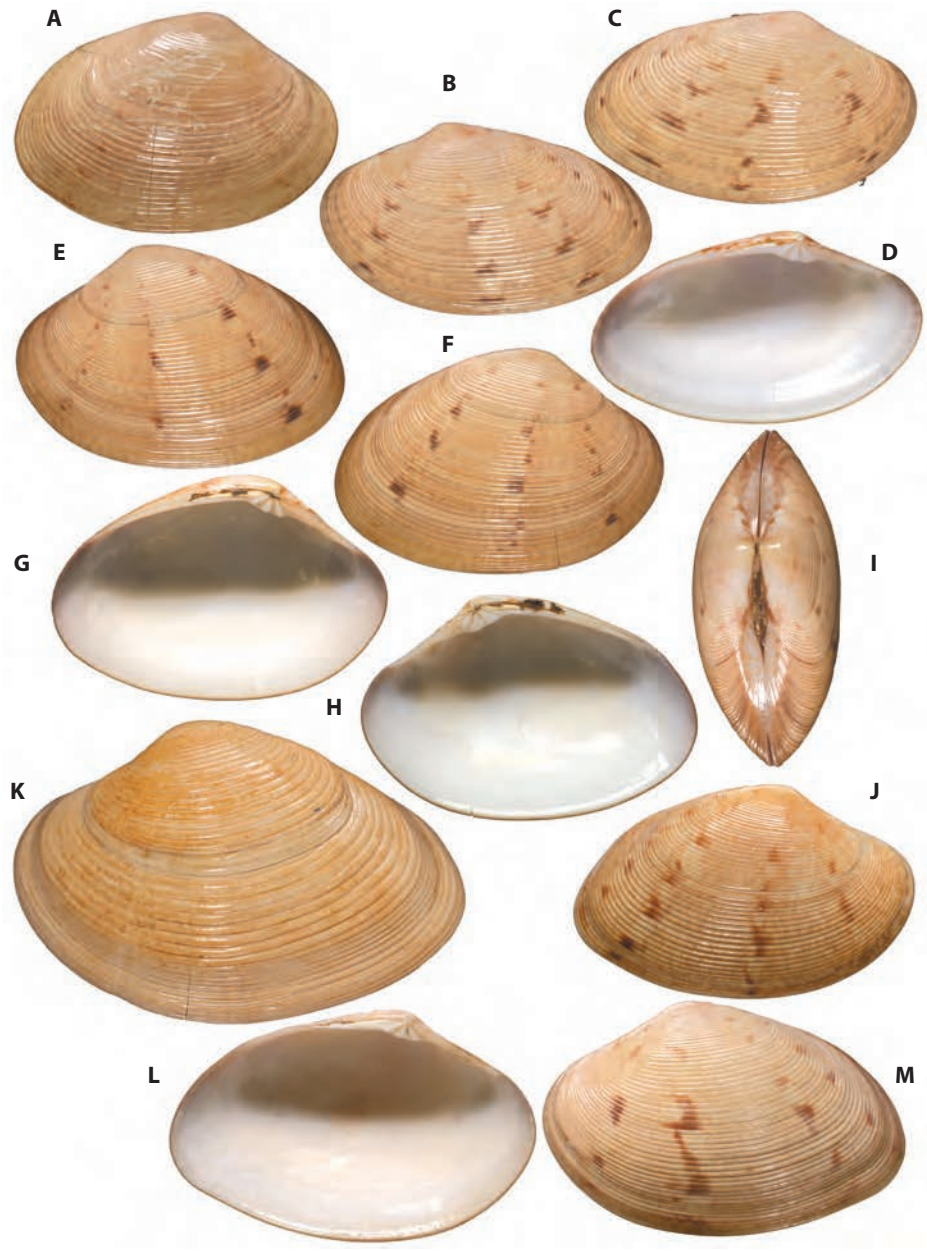
Shell up to 77 mm long, elongate, narrowly suboval, somewhat variable in outline and size, thin but solid and nevertheless quite fragile, moderately inflated. Antero-dorsal margin almost straight, anterior margin not too broadly rounded, ventral margin evenly convex, posterior margin more broadly rounded, postero-dorsal margin slightly convex. Beaks in front of the vertical midline. Surface glossy, with numerous, regular, rounded commarginal ribs, contiguous with no interspaces. Inner margin smooth. Outside yellowish to light brown, occasionally uniform, but mostly with four radial lines of dark, irregular, brown spots and more or less faintly visible, dense zigzag markings between these rays. Inside white to cream, occasionally with light yellowish to pink under the beaks; in younger specimens exterior pattern showing through.



Distribution. Atlantic Morocco (Agadir) to Ghana; Gabon (Port-Gentil) to northern Angola (Lobito); Cape Verde Islands (Guerreiro & Reiner 2000). No record from the southern typical tropical region (Nigeria to Cap Lopez).

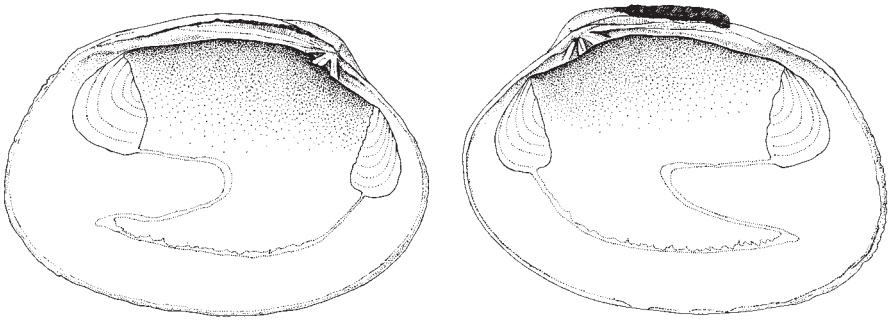
Biotope. In fine muddy sand, fine sand or mixed sand, also with calcareous algae, gravel and shell debris, from about 10 to 30 m, in calm bays also in shallower water, common from Mauritania to Senegal, becoming more uncommon to rare southward. A distribution gap exists in the southern typical tropical region.

Remarks. This species has often been wrongly included in the Indo-Pacific genus *Paphia*. Huber (2010) treated as a synonym *Venerupis rufiscensis* Fischer-Piette & Métivier, 1971, represented in collections by few, large specimens (Fig. 17.78K) collected long ago. Actually, nowhere along the area studied could two different species be distinguished among recent collections of *Polititapes*. This is the type species of *Callistotapes* Sacco, 1900, over which *Polititapes* has only two months nomenclatural priority. This is "Le Pegon" of Adanson.



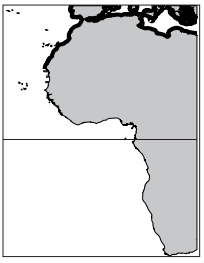
17.78. ***Polititapes durus*** **(Gmelin, 1791).** **A**, Baie de Cansado, Mauritania, 10 m (42.2 mm). **B**-**D**, S of Dakar, Senegal, 14°41'N, 17°23.2'W (32.5 mm). **E**-**I**, Abéné, N-Casamance, Senegal, 13°03'N, 17°03'W, 20 m (43.1 mm). **J**, Port-Gentil, Gabon, 0°43'S, 8°47.5'E, near wharf and port dredging (52.3 mm). **K**, Angola, ex R. E. Petit (paratype of *Venerupis rufiscensis* Fischer-Piette & Métivier, 1971, 77 mm). **L**-**M**, Baia do Lobito, Benguela prov., S-Angola, beach drift (49.7 mm).

Ruditapes decussatus (Linnaeus, 1758)



17.79. Port Etienne (Nouadhibou), low tide (45 mm).

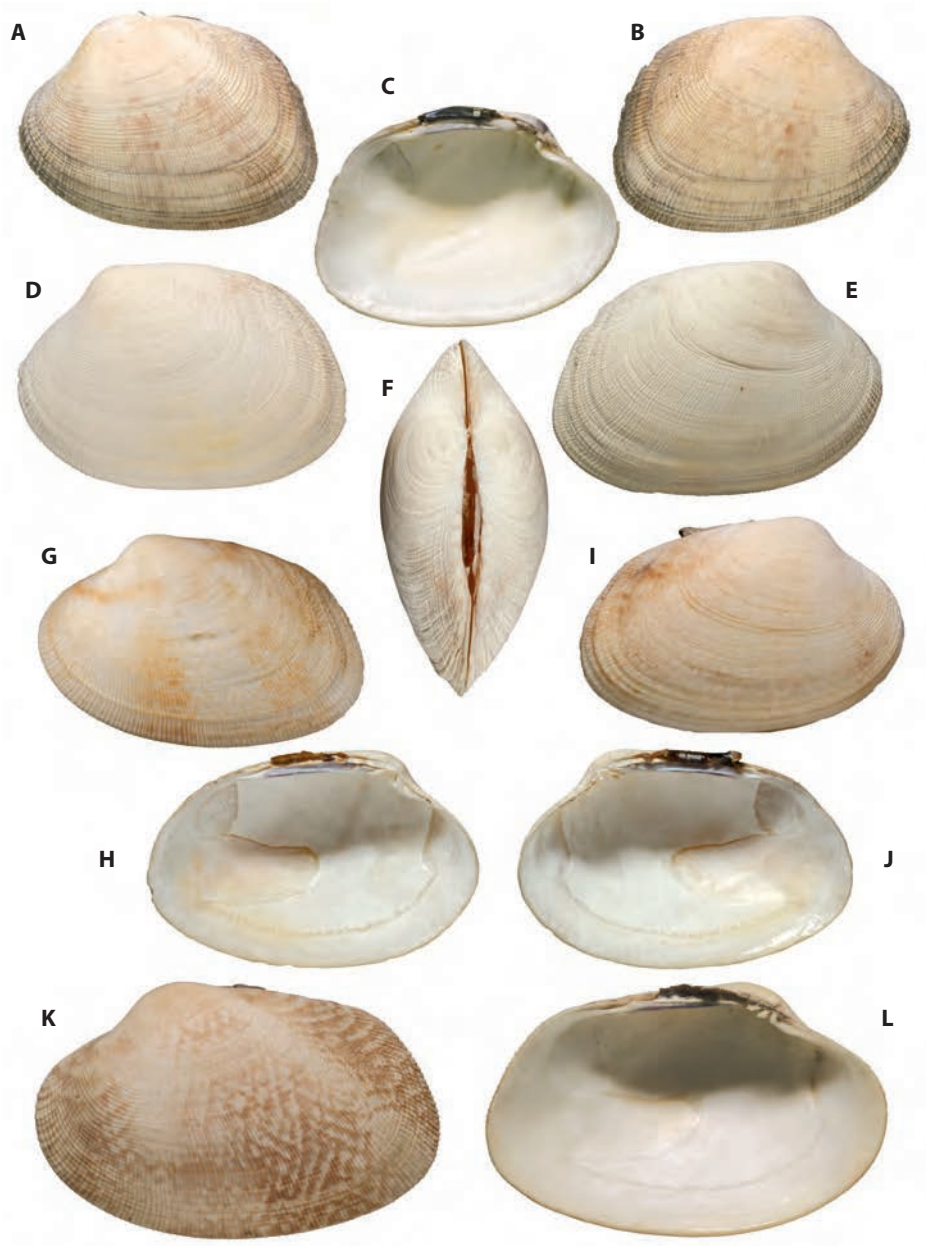
Shell up to 60 mm long (in Europe up to 75 mm), variable in shape and size, subrectangular, solid, inflated. Anterior margin rounded, posterior margin obliquely truncated, with rounded corners. Beaks within the first third of the valves. Surface with numerous, very fine, irregular radial ribs, most prominent on the posterior third of the shell and especially the postero-dorsal slope. There are also fine irregular commarginal waves which are particularly developed on the anterior third of the shell, where they occasionally bifurcate. The crossing of commarginal and radial sculpture gives especially the postero-dorsal area a typical granulose aspect. Outside whitish to pale yellowish or light brownish, with irregular brownish zones, rays, flecks or zigzag markings. Inside white, hinge plate under the ligament sometimes deep violet.



Distribution. NW-Scotland southward to Mauritania (Cap Blanc); throughout the Mediterranean.

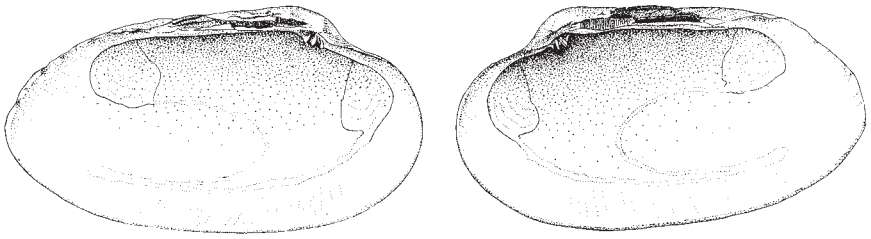
Biotope. Mostly in lagoons, calm bays and inlets in muddy sand and fine sand, in shallow water from spring low water mark to a few metres, common.

Remarks. This is a northern-temperate species which reaches its southern limit at the northernmost point of tropical influence (Cap Blanc). Subrecent shells from the Holocene are found more southward to Nouakchott. In Western and Southern Europe the species was fished and consumed as "palourde" or regionally as "clovisse" (Poutiers, pers. comm. 2012), however, there it is more and more replaced by the introduced NW Pacific species *R. philippinarum* (Adams & Reeve, 1850).



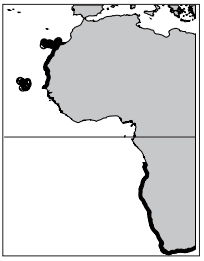
17.80. *Ruditapes decussatus* (Linnaeus, 1758). **A**-**C**, Port-Etienne (now Nouadhibou), Mauritania, innermost part of the bay, intertidal mud (46.8 mm). **D**-**F**, same locality (46.8 mm). **G**-**H**, Arguin, Mauritania (40.4 mm). **I**-**J**, same locality (41.0 mm). **K**-**L**, Baie de l'Etoile, "La Rivière" (21°N), Mauritania, low tide (52.7 mm).

Venerupis corrugata (Gmelin, 1791)



17.81. Futungo, Bay of Mussulo, Angola (55 mm).

Shell up to 73 mm long, very variable in shape and size, oblong, rectangular-suboval to irregular in outline, quite thick and solid but with tendency to break, rather inflated. Beaks within the anterior third of the valves. Surface dull, with extremely variable sculpture consisting of very irregular, fine, commarginal ridges which on the postero-dorsal part become coarser, wavy, prominent and occasionally lamellate near the margin. Radial sculpture on the marginal half of adult valves becoming wrinkled and merging into more or less fine to coarse irregular small pits and knobs or sometimes zigzag sculpture. There are also very fine, irregular radial striae. Inner margin of valves smooth. Outside cream, often with irregular brown rays and zigzag markings, mostly on the posterior part. Inside whitish, posterior end frequently marked with purple, brownish violet or deep violet.



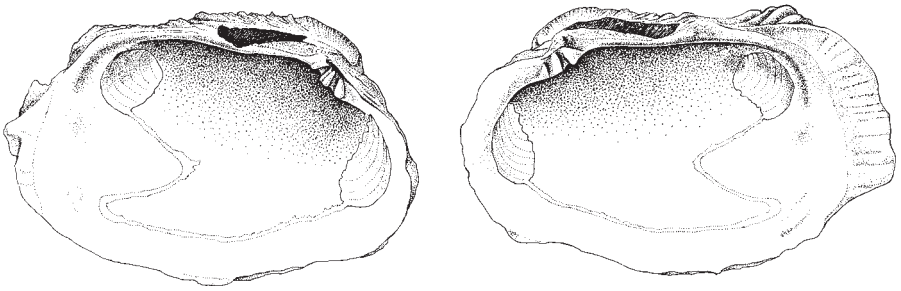
Distribution. Morocco to Senegal (Dakar); Congo Brazzaville (Pointe-Noire) to Namibia and South Africa (Durban); Madeira (?), Canary Islands, Cape Verde Islands.

Biotope. In sandy bottom as well as on hard substrate, *e.g.* in crevices between rocks, also in empty holes of boring bivalves, from low tide to about 20 m.

Remarks. *Venerupis corrugata* belongs to a species complex which is represented in the European Atlantic by morphs known in the Atlantic as *V. pullastra* (Montagu, 1803) and in the Mediterranean as *V. geographica* (Gmelin, 1791), and which some authors consider as separate species or subspecies. Typical West African *V. corrugata* (map is for this only) is distinguished from the European forms by the peculiar wrinkled sculpture; European specimens (*V. pullastra*) have only fine irregular commarginal ridges; occasionally such "smooth" specimens are also found between Morocco and Dakar. The name *V. senegalensis* (Gmelin, 1791) ("Le Lunot" of Adanson) is based on the West African form. An alternative view has been presented by Fischer-Piette & Métivier (1971) who unite all forms under the name *V. corrugata,* thereby acting as first revisers. Only molecular study of all morphs would give a clearer view. The species has a disjunct distribution in West Africa. Angolan specimens grow very large and are more slender.

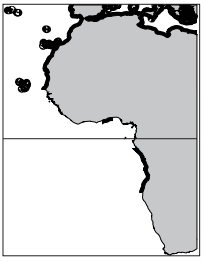
17.82. *Venerupis corrugata* (Gmelin, 1791). **A**-**C**, Pointe des Maures (20°55'N), Mauritania, intertidally (35.4 mm). **D**-**G**, Futungo, Luanda prov., N-Angola, low tide (73.0 mm). **H**, same locality (72.5 mm). **I**, Baia dos Tigres, Namibe prov., S-Angola, (50.2 mm). **J**-**K**, same locality (52.6 mm).

Irus irus (Linnaeus, 1758)



17.83. Mohammedia, Atlantic Morocco, Plage Mannesmann, on beach (14.0 mm).

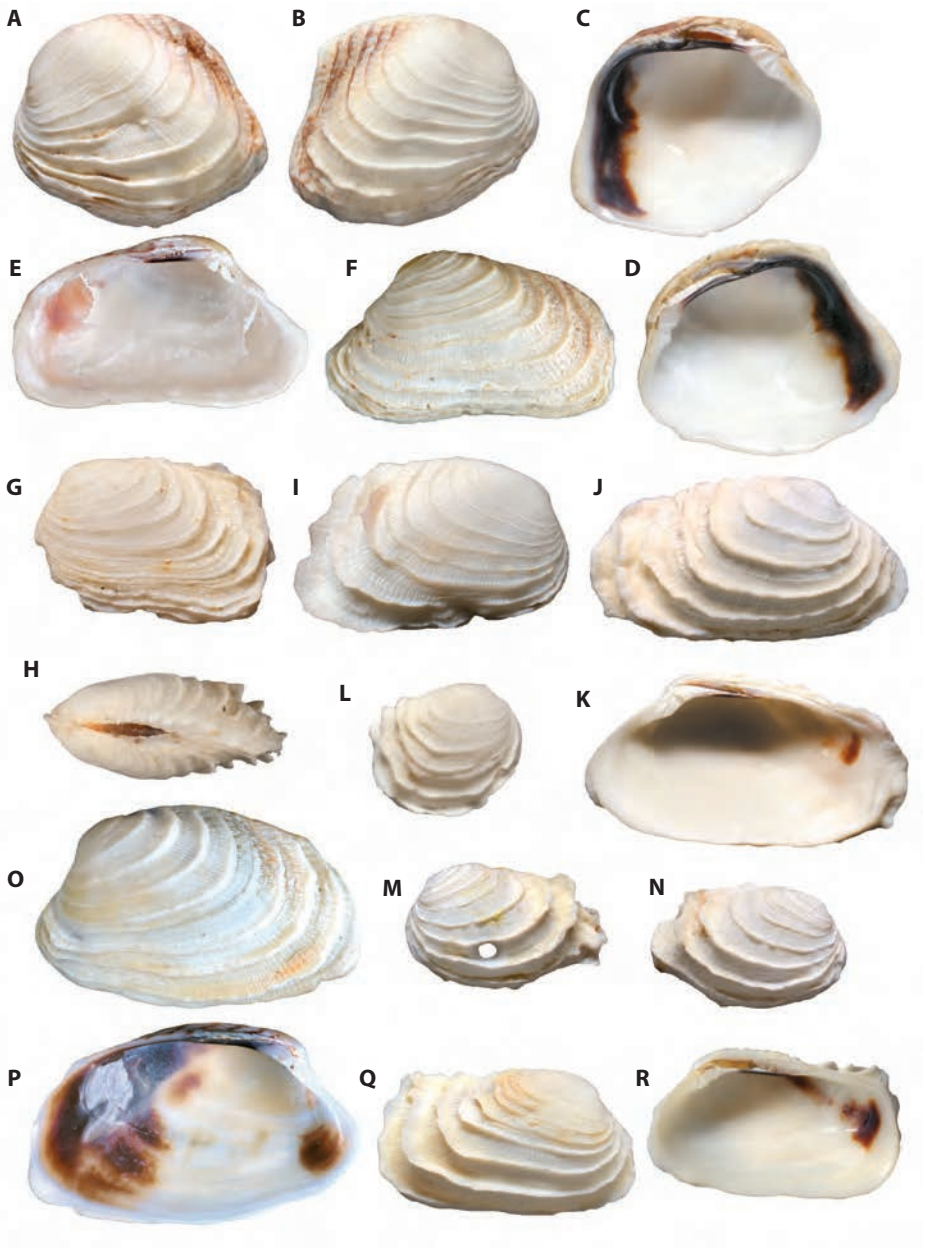
Shell up to 25 mm long, very variable in shape, more or less elongate, irregular-rectangular, often deformed, quite thick and solid, rather inflated. Beaks at the end of the anterior third of the valves. Surface with widely spaced, thin, commarginal lamellae becoming foliate on the posterior part and with fine, somewhat irregular, radial striae on the interspaces and extending also on the dorsal side of the lamellae. Inner margin of valves smooth. Outside white to cream, occasionally with yellow, pink or orange on the earlier part of the valves or with brown on the postero-dorsal slope where sometimes only the lamellae are coloured. Inside white, with dark violet on the posterior hinge plate under the ligament and often with brownish-purple to violet on the posterior end. Occasionally salmon pink or yellow on the posterior part or the whole inside.



Distribution. Northern Ireland, W-coast of Ireland and the western part of the Channel southward to Senegal (Dakar); Ghana (Takoradi, material in Ryall coll.); Congo (Loango; Pointe Indienne) to southern Angola (Moçâmedes, Namibe prov.); Azores, Madeira, Canary Islands, Cape Verde Islands; throughout the Mediterranean; eastern South Africa.

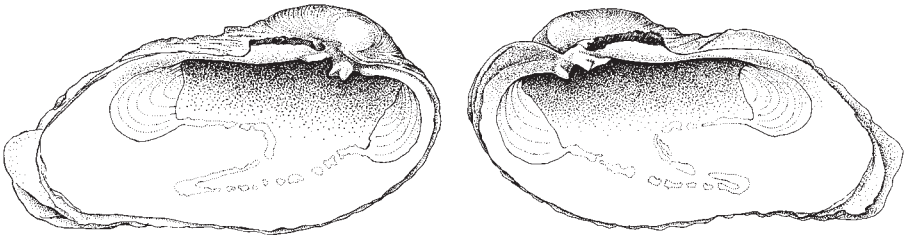
Biotope. On rocky shores between stones and on intertidal or subtidal rocky terrasses, in crevices, under stones, in coarse sand between stones and between algae, or in bore holes of perforating bivalves, from low tide to 1-3 m.

Remarks. Like the preceding species, *Irus irus* has a disjunct distribution and has not yet been recorded in the typical tropical zones but only in the regions with influence of upwelling. A close Indo-Pacific species is *I. macrophylla* (Deshayes, 1853).



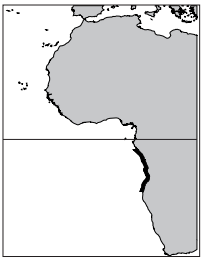
17.84. *Irus irus* (Linnaeus, 1758). **A**-**D**, Rabat, Atlantic Morocco (15.9 mm). **E**-**F**, Port-Etienne (now Nouadhibou), Mauritania (21.6 mm). **G**-**I**, Ilha do Sal, Cape Verde Islands (11.6 mm). **J**-**K**, Cap Vert Peninsula, Senegal (19.4 mm). **L**, same locality (9.8 mm). **M**-**N**, same locality (12.0 mm). **O**-**P**, Loango, extreme S of Gabon (21.0 mm). **Q**-**R**, Porto Alexandre, Namibe prov., S-Angola, dredged 2 m in sand (14.5 mm).

Petricola angolensis Cosel, 1995



17.85. Cabo Ledo, Luanda, Angola, 10-40 m (12.4 mm).

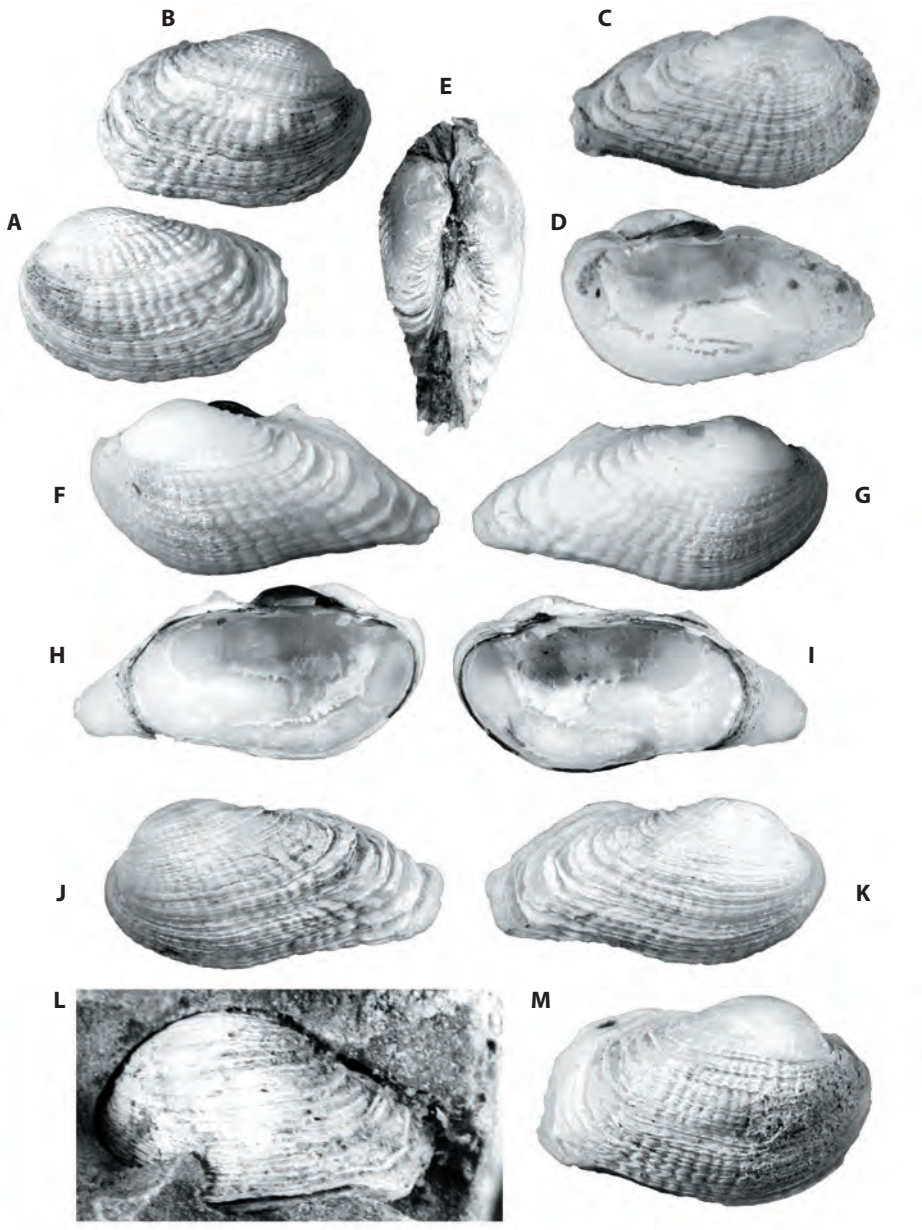
Shell up to 16 mm long, irregular, very variable in shape, more or less oblong, short-oval to somewhat cuneiform, with broadly rounded anterior end and more or less pointed posterior end. Beaks at the end of the anterior third of the valves. Surface with irregular, coarse, rounded radial ribs which are most prominent in the middle and on the posterior part and flattened and partly absent on the anterior part. They are also irregular commarginal growth ridges, on the anterior part very dense and slightly lamellose, on the postero-dorsal slope coarse and somewhat foliate. Outside dirty white, occasionally light brownish, inside white.



Distribution. Congo Brazzaville (Pointe-Noire) to southern Angola (Porto Alexandre, Namibe province).

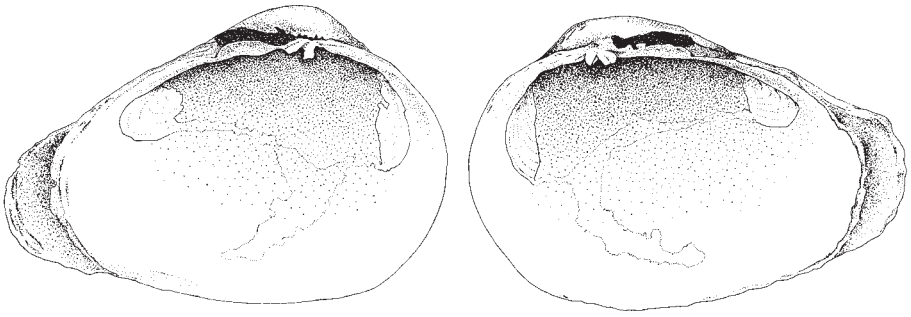
Biotope. Boring in limestone and sandstone, from shallow water to about 40 m.

Remarks. This species is still very imperfectly known, it is close to *P. bicolor* G.B. Sowerby II, 1854 (Fig. 17.88O-Q) which is known from Namibia and South Africa but which has a reddish-brown posterior third. *P. angolensis* does not resemble any other *Petricola* from the Atlantic or Tropical American Pacific but is rather close to *Petricola* (*Petricolirus*) *rugosa* G.B. Sowerby I, 1834 from Peru and Chile (see Coan & Valentich-Scott 2012). *Petricola angolensis* is restricted to the southern zone of seasonal upwelling.



17.86. *Petricola angolensis* Cosel, 1995. **A**-**B**, Pointe-Noire, Congo Brazzaville (15.0 mm, ANSP). **C**-**E**, same locality (paratype, 12.5 mm). **F**-**I**, Cabo Ledo, Bengo prov., N-Angola, 10-40 m, in grey sandstone (paratype, 11.2 mm). **J**-**L**, same locality (holotype, 11.9 mm). **M**, same locality (paratype, 12.7 mm).

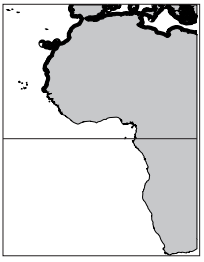
Petricola lithophaga (Retzius, 1788)



17.87. Pointe des Maures, Mauritania, low water (26.4 mm).

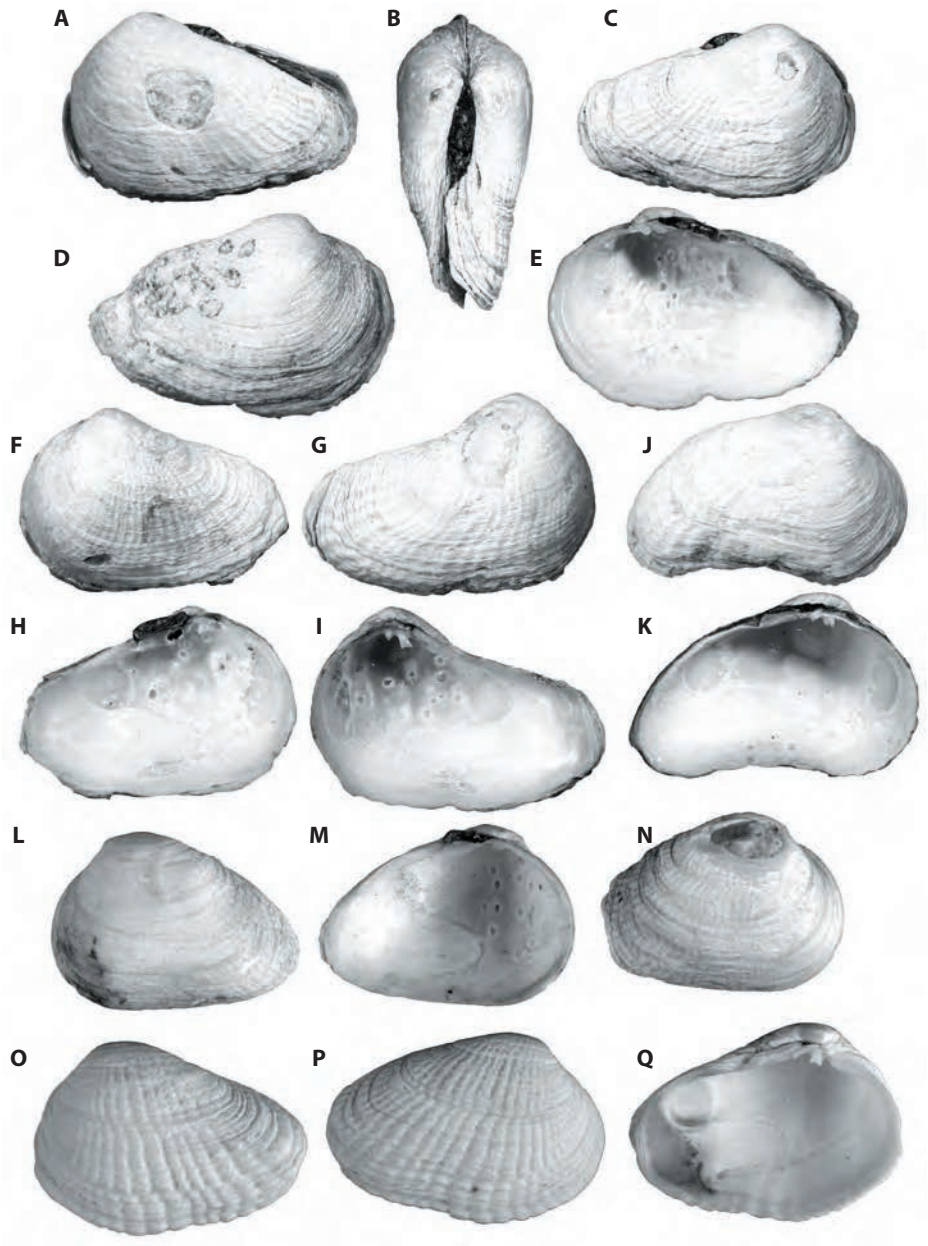
Shell up to 30 mm long, very variable in shape, irregular-oval, quite solid, very inflated. Anterior margin broadly rounded, posterior margin more or less pointed. Beaks well in front of the vertical midline. Surface dull, with fine, irregular radial ribs which are most prominent on the posterior half, then disappear gradually in the middle and are missing on the anterior half. There are also coarse and irregular growth lines on the whole shell. Outside dirty white, occasionally with brownish red on the postero-dorsal slope or the posterior end. Inside white, with exterior colour showing through.

Distribution. Atlantic France (South coast of Brittany) to Mauritania (Cap Blanc), occasionally found more southward to Senegal (Petite Côte); also in the Canary Is., throughout the Mediterranean and in the Black Sea.



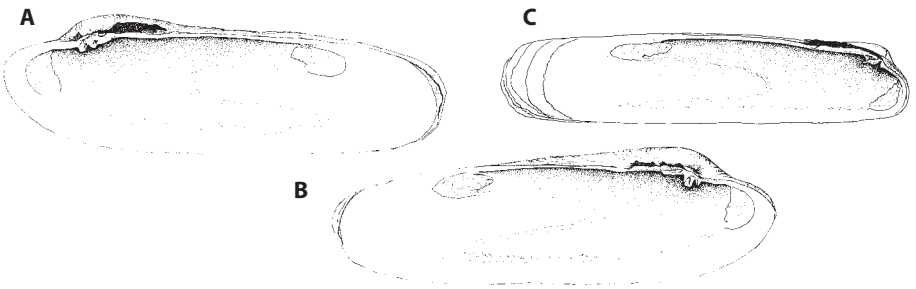
Biotope. Boring in rock such as hard limestone and volcanic tuff, from shallow water to about 100 m.

Remarks. This is a warm-temperate species with a rather restricted Atlantic distribution; in West Africa it remains within the influence of the upwelling, and south of Cap Blanc it is occasionally found only in deeper water.



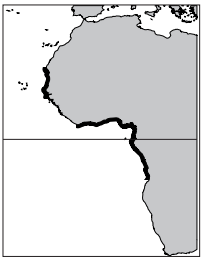
17.88. *Petricola lithophaga* (Retzius, 1788). **A-C**, Pointe des Maures, Baie du Lévrier, Mauritania (23.0 mm). **D-E**, same locality (25.7 mm). **F-I**, same locality (23.3 mm). **J-K**, same locality (24.0 mm). **L-N**, Senegal, 13°53'N, 17°07'W, 100 m (17.2 mm). **O-Q**, *Petricola bicolor* **G.B. Sowerby II, 1854**, between Walfishbay and Swakopmund, Namibia (19.4 mm).

Petricolaria gracilis (Deshayes, 1853)



17.89. A-B, Baie de Pointe-Noire, Congo, on beach near the refinery (44.8 mm). C, Morton Bay, Victoria (Limbe), Cameroon, on beach (17.8 mm).

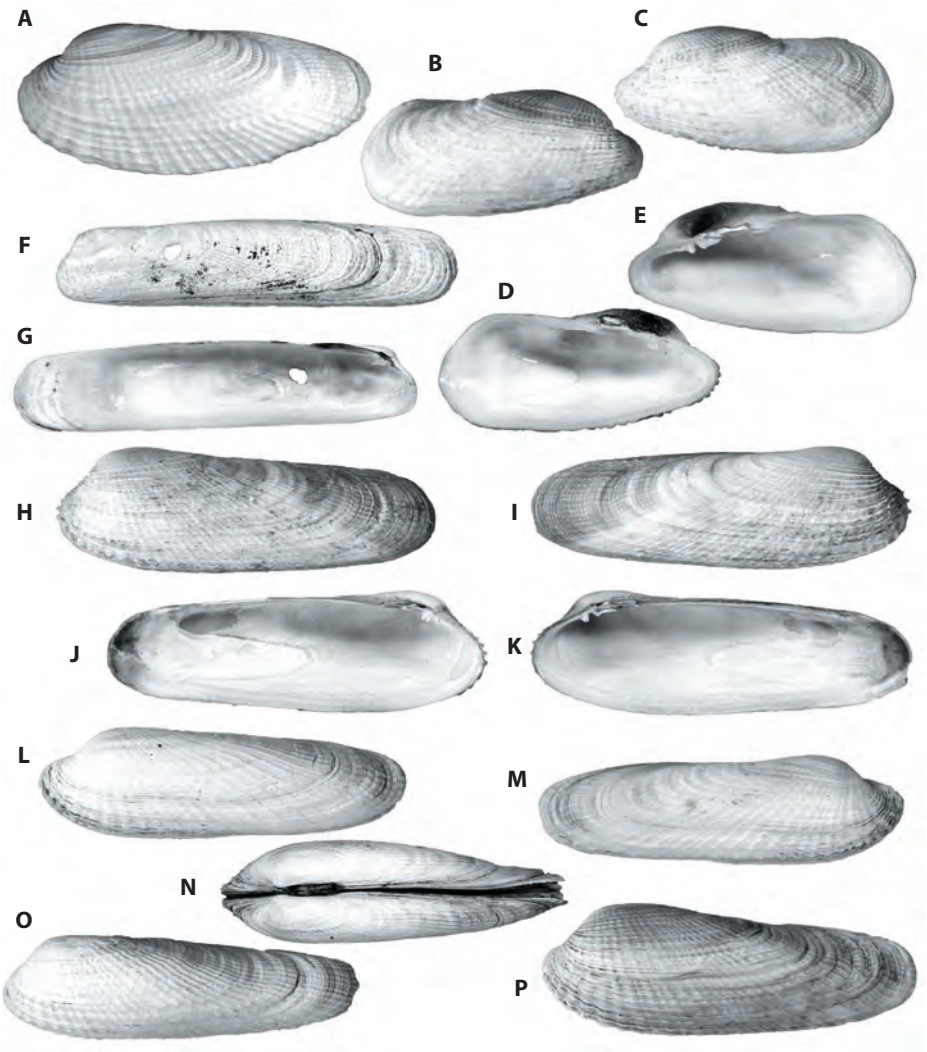
Shell up to 45 mm long, extremely variable in outline and shape, from oblong to very elongate with convex to nearly parallel dorsal and ventral margin, thin, rather strong to fragile, inflated. Beaks within the anterior fourth of the valves. Surface dull, with numerous irregular, radial ribs which are most prominent on the anterior tird of the valve and become thinner towards posterior. The ribs are crossed by irregular, more or less dense commarginal lamellae, which are scaly on the radial ribs and gradually disappear towards the posterior end where there are only irregular growth lines. Pallial sinus horizontal to slightly pointing upwards. Outside whitish to pale yellowish, often with reddish brown on the postero-dorsal slope or the posterior end. Inside white, outside colouration showing through.



Distribution. Eastern Atlantic: Mauritania (Cap Blanc) to Senegal (Casamance); Côte d'Ivoire to southern Angola (Lobito); Western Atlantic: Colombia to Surinam (see Regteren-Altena 1971a, b; Cosel, 1986); Indo-Pacific: Indian Ocean (Aden, Oliver 1992).

Biotope. Boring in firm mud, clay, peat, wood and certain types of rock such as volcanic tuffs, limestone and sandstone as well as occasionally in shells of live or dead molluscs, from low tide to about 30 m.

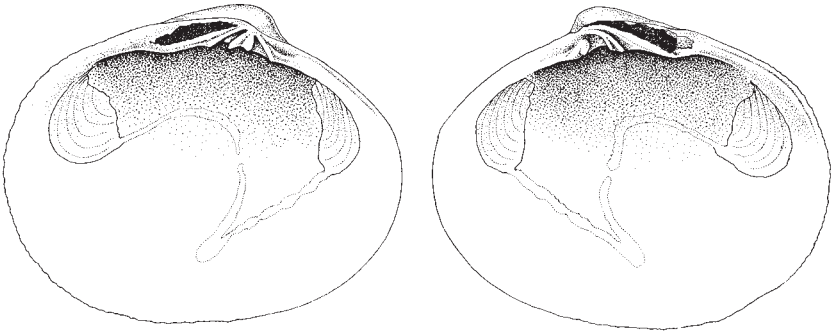
Remarks. This species is difficult to understand because of its very high variability. It was almost always treated as *Petricola pholadiformis* Lamarck, 1818 or as a subspecies of this (Cosel, 1986). The latter, however, is a larger, cold-temperate species occuring on the Atlantic coast of North America, which became accidentally introduced in NW-Europe at the end of the 19th century and now has a rather limited distribution from Denmark to SE-England and the Channel; Poutiers (1987) cited it also from the extreme western Mediterranean and Atlantic Morocco but no original material from those areas could be traced. Specimens from the Red Sea and Indian Ocean (see Oliver 1992) are very similar to Western and eastern Atlantic specimens and are considered conspecific. Huber (2010) used the name *Petricolaria serrata* (Deshayes, 1853) for the Atlantic representatives of this group (with *Petricolaria stellae* (Narchi, 1975) from Brazil as a synonym), and restricted *P. gracilis* to the Indian Ocean populations. A close Panamic-Pacific species is



17.90. *Petricolaria gracilis* (Deshayes, 1853). **A**, Lemsid, West Sahara (Saguia al Hamra) (32.0 mm). **B**-**E**, Casamance, Senegal, 10-20 m (20.8 mm). **F**-**G**, Victoria (now Limbe), Cameroun, beach drift (19.1 mm). **H**-**K**, Cap Esterias - Pointe Idolo, Libreville, Gabon, beach drift (31.0 mm). **L**-**N**, Pointe-Noire, Congo Brazzaville, Plage Raffinerie (45.4 mm). **O**, same locality (34.4 mm). **P**, same locality (40.3 mm).

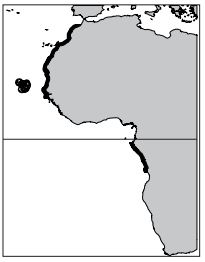
P. cognata (C.B. Adams, 1852). *Petricolaria gracilis* is distinguished from *P. pholadiformis* by its thinner, smaller and often more elongate shell (when undisturbed), the posterior cardinal in the left valve which is horizontal and not inclined, and the posterior end which is often more coloured. The specimens from tropical West Africa, especially from the southern part, fall into the variability of *P. gracilis* from the Caribbean coast of South America, and so this name is used for them. Specimens from the northern part of the disjunct distribution area are frequently shorter, stouter and often thicker-shelled (Fig. 17.90A-E) and look more like *P. pholadiformis*. For details on the anatomy of this species see Narchi 1975.

Lajonkairia substriata (Montagu, 1808)



17.91. S of Ambrizete, N-Angola (7.5 mm).

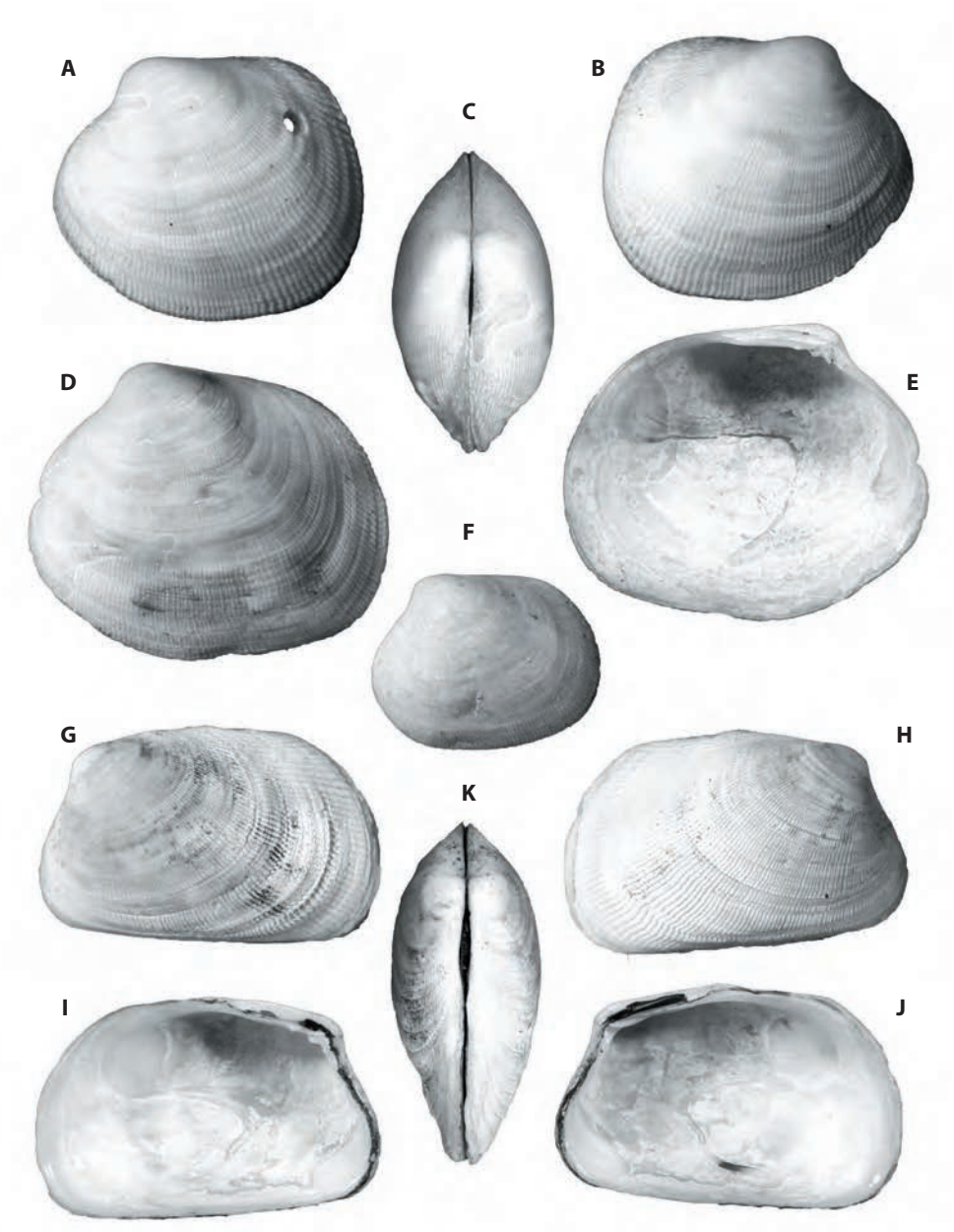
Shell up to 15 mm long, very variable in outline, subquadrangular to subrectangular, irregular, as high as long to slightly longer than high, moderately thick and solid, rather compressed. Beaks well in front of the vertical midline. Surface with numerous very fine, irregular but regularly spaced, radial ribs which may be secondary absent where the surface of the shell touches the crevice or hole in which the specimen lives. There are also coarse commarginal growth lines. Outside and inside whitish to cream.



Distribution. Atlantic Morocco (Rabat) to Senegal (Dakar), one empty valve from Guinea (9°28'N); Gabon (Port-Gentil) to northern Angola (Luanda); Cape Verde Islands. Possibly also in the Mediterranean.

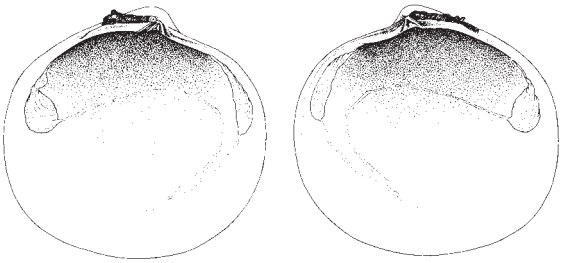
Biotope. Most probably shell and gravel bottoms and other hard substrate, where *L. substriata* lives in crevices and between stones, from shallow water to a depth of about 50 m.

Remarks. This is a rare and rather poorly known species, originally described in error from the British coast. It is distinguished from the Mediterranean *L. lajonkairei* (Payraudeau, 1826) by its smaller and thicker shell and the more even radial sculpture which, in contrast to *L. lajonkairei*, is not bifurcating. The species has a disjunct distribution, there are no records from the tropical zone between Guinea and Angola. In the Angolan specimens, the posterior cardinal in the right valve is almost horizontal and only very slightly diverging from the hinge plate, whereas in the northern specimens, it is inclined at an angle of about 30°.



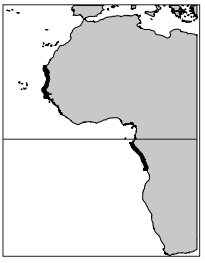
17.92. *Lajonkairia substriata* (Montagu, 1808). **A-C**, Baia Matiota, São Vicente, Cape Verde Islands (16.1 mm). **D-E**, W Ile Yomboya, Guinea, 10°27'N, 15°43.5'W, 20 m (20.2 mm). **F**, W Ile Tannah, Guinea, 9°12'N, 14°37.5'W, 45 m (11.9 mm). **G-K**, Cabo Ledo, Bengo prov., N- Angola, 10-40 m (19.1 mm).

Mysia marchali Cosel, 1995



17.93. Port Gentil, Gabon (holotype, 19.3 mm).

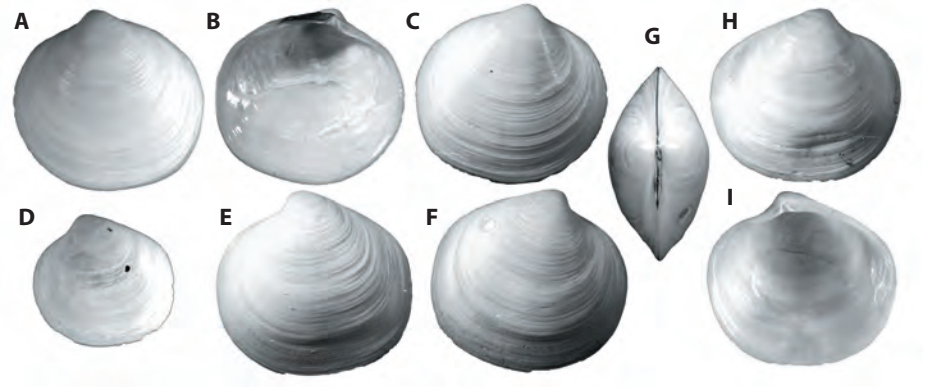
Shell up to 19 mm long, subcircular-quadrangular, somewhat variable in shape, quite thin and fragile, rather inflated. Beaks just in front of the vertical midline. Surface with irregular commarginal growth lines and growth waves and extremely fine and dense radial striae, visible only under a lens (x 20-40), often slightly bifurcating just anterior to the postero-dorsal angle and mostly absent on the earlier (umbonal) part of the valves. Periostracum very thin and colourless. Outside and inside white to cream, rarely with a light purple hue on the postero-dorsal slope.



Distribution. Mauritania (Nouadhibou) to Senegal (Casamance); Gabon (Port Gentil) to northern Angola (Luanda).

Biotope. Most probably in mixed and coarse sand, also with gravel and shells, from shallow water to about 20 m, rare.

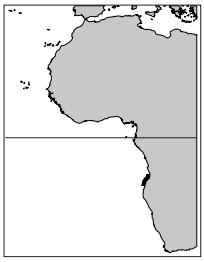
Remarks. *Mysia marchali* is distinguished from the European and Mediterranean *M. undata* (Pennant, 1777) by its smaller size, the more quadrangular outline and the presence of a microsculpture which is visible under a strong lens only and which is slightly stronger in the only valve from Casamance than in the material from Gabon to Angola.



17.94. *Mysia marchali* Cosel, 1995. A-C, Port-Etienne (now Nouadhibou), Mauritania (21.3 mm). D, off Rio Koumba, Guinea, 10°21'N, 15°01'W, 12 m (14.1 mm). E-G, Port-Gentil, Gabon, plage de la Sogara, 0°38'S, 8°43'E (holotype, 19.3 mm). H-I, Pointe-Noire, Congo Brazzaville, Plage Mondaine, N of lighthouse, beach drift (paratype, 18.5 mm).

Neolepton benguelensis Salas & Gofas, 1998

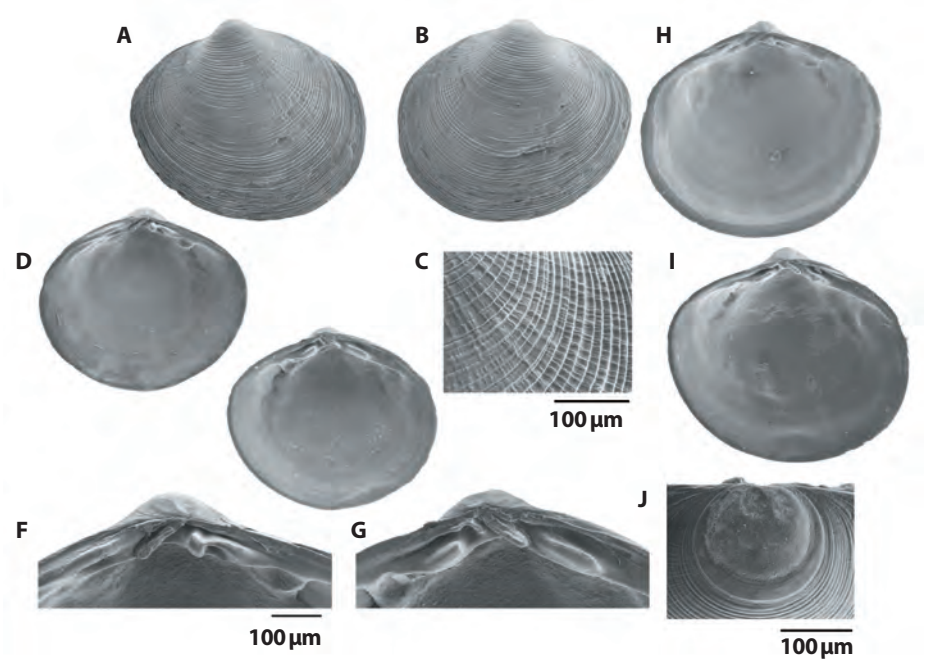
Shell minute, 1.0 to 1.3 mm long, subcircular, rather compressed, with rounded anterior margin and broadly rounded posterior margin; postero-dorsal margin raising higher than antero-dorsal margin. Beaks slightly in front of the vertical midline. Surface with numerous, fine and densely spaced but well developed commarginal ridges and numerous irregular radial riblets crossing the commarginal sculpture, mostly on the anterior and posterior slope of the valves. Protoconch well separated from teleoconch and circular. Hinge plate rather strong but somewhat narrowing just under the beaks. Upper two anterior cardinals of the right valve very narrow and small. Pallial line entire. Outside and inside white.



Distribution. Southern Angola (Benguela).

Biotope. On rocky shores in algal mat with accumulated sediment particles, from deep low tide to 5 m.

Remarks. The closest species is *Neolepton cancellatum* Salas & Gofas, 1988 from the Azores, which has a slightly stronger and less irregular radial sculpture and a somewhat smaller protoconch.



17.95. *Neolepton benguelensis* Salas & Gofas, 1998. **A-B,** Chapeu Armado, Namibe prov., S-Angola (paratype, 1.25 mm). **C**, detail of the microsculpture of the same specimen. **D-E**, same locality (holotype, 1.1 mm). **F-G,** detail of the hinge of the holotype. **H-I**, Caotinha, Namibe prov., S.-Angola (1.3 mm). **J**, Protoconch of a specimen from Caotinha. Scale bars are 100 µm (all reproduced from Salas & Gofas 1998).

Superfamily **MYOIDEA**

Family **MYIDAE**
- Genus ***Tugonia*** Gray, 1842 – 1 species
- Genus ***Cryptomya*** Conrad, 1848 – 1 species

Family **CORBULIDAE**
- Genus ***Corbula*** Bruguière, 1797
  - Subgenus ***Corbula*** Bruguière, 1797 – 1 species
  - Subgenus ***Caryocorbula*** Gardner, 1926 – 1 species
  - Subgenus ***Anisocorbula*** Iredale, 1930 – 3 species
  - Subgenus ***Varicorbula*** Grant & Gale, 1831 – 2 species
- Genus ***Potamocorbula*** Habe, 1955 – 1 species

Superfamily **DREISSENOIDEA**

Family **DREISSENIDAE**
- Genus ***Mytilopsis*** Conrad, 1857 – 1 species

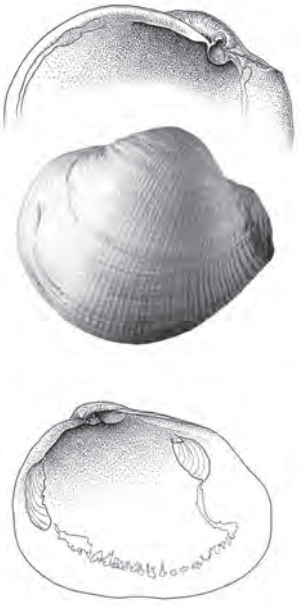
Superfamilies Myoidea and Dreissenoidea

Superfamily MYOIDEA

This group comprises two quite distinct Recent families, the Myidae and the Corbulidae. Both share a hinge structure where the internal ligament plays an important role and is situated on an often prominent chondrophore, and have shells tending to inequivalve with little, if any, radial sculpture.

Family MYIDAE

Shells small to large, inequivalve, suboval to oblong, thin to rather thick, more or less inflated, widely gaping posteriorly. Surface chalky, with growth lines or radial sculpture. Beaks anterior to or behind the vertical midline. Hinge line with internal ligament and a chondrophore in the left valve. Pallial sinus short to rather long or absent. There are 36 species known worldwide, most of them from Northern latitudes, only 2 from West Africa.



Genus *Tugonia* Gray, 1842. Shells medium-sized, inequivalve, broadly suboval, thin, globose, often with broad anterior and narrow posterior part, widely gaping posteriorly. Hinge without well-marked teeth, on both valves with a chondrophore which is oblique, more protruding in the left valve and pointing into the interior of the right valve. Pallial sinus short.

Genus *Cryptomya* Conrad, 1848. Shells rather small, inequivalve, broadly suboval to rounded-trapezoidal, rather thin and fragile, not very inflated to compressed, not or nearly not gaping. Surface mostly with growth lines and growth stages and a more or less pronounced posterior angle. Hinge line with a large, projecting chondrophore on the left valve and the corresponding resilifer in the umbonal cavity of the right valve. Pallial sinus very short to absent. For gross anatomy and biology, see Yonge (1951).

Species treated (2)
Tugonia anatina (Gmelin, 1791); *Cryptomya africana* Cosel, 1995.

Family CORBULIDAE

Shells small to medium-sized, inequilateral, inequivalve, right valve generally larger and more or less overlapping the left valve, oblong, suboval or suboval-trigonal to trapezoidal, thin to mostly thick and solid, very inflated, not gaping. Posterior end often rostrate. Surface in general

with commarginal sculpture. Beaks mostly anterior to, occasionally behind the vertical midline. Hinge dentition variable, mostly with one large cardinal in the right valve and a corresponding socket in the left valve. Laterals mostly absent. Ligament wholly internal, left valve usually with a protruding chondrophore, right valve with a resilifer in a deep pit behind the cardinal tooth. Pallial sinus very small or absent. Periostracum more or less strong. The worldwide species number is estimated at about 100, eight species are West African. The phylogeny of tropical American Neogene Corbulidae has been tackled by Anderson & Roopnarine (2003), and the relationships of the brackish-water species were addressed by Hallan *et al.* (2013). However, a modern supraspecific revision of the whole family is still needed.

Genus *Corbula* Bruguière, 1797. Shells small to rather small, suboval to suboval-trigonal, with more or less larger left valve and often with rostrate posterior end, generally thick and solid, inflated. Surface with commarginal sculpture or smooth.

Subgenus *Corbula* Bruguière, 1797. Shells rather small, inequivalve, with strong commarginal sculpture, thick and solid, inflated. Hinge plate broad, hinge with a large anterior cardinal and a small posterior lateral in the right valve and one smaller cardinal in the left valve. No protruding chondrophore, the internal ligament inserts in the left valve in a resilifer between the anterior socket and the posterior cardinal tooth.

Subgenus *Caryocorbula* Gardner, 1926. Shells small, oblong, with more or less rostrate posterior margin, rather thin to thick and solid, inflated, right valve only slightly more convex than left valve. Surface with commarginal sculpture on both valves. Posterior angle sharp. Hinge with one cardinal in front of a deep resilial pit in the right valve and with a protruding, tooth-like chondrophore in the left valve.

Subgenus *Anisocorbula* Iredale, 1930. Shells rather small, thin to rather thick, trapezoidal, oblong to elongate, with somewhat tapering posterior part, obliquely truncated posterior margin, rather compressed. Posterior angle more or less sharply keeled to carinate and almost lamellate towards the postero-ventral corner. Regular to irregular commarginal to slightly oblique sculpture on both valves. Chondrophore in the left valve small. No pallial sinus. The subgenus is otherwise Indo-Pacific.

Subgenus *Varicorbula* Grant & Gale, 1831. Shells small, inequivalve, suboval to high-oval, very inflated, with right valve much larger, higher and more inflated than left valve. Hinge in the right valve with a single cardinal in front of a resilial pit, left valve with a rather short chondrophore behind the socket and a small projection behind it which functions as a tooth and inserts in the posterior part of the resilial pit in the right valve. Pallial sinus very short.

Genus *Potamocorbula* Habe, 1955. Shells small to medium-sized, slightly inequivalve, inflated, with rounded anterior end and more or less tapering posterior part with narrowly rounded posterior margin. Surface smooth, only with growth lines. Posterior angle rounded. Hinge with a cardinal in the right valve and a not very much protruding chondrophore with a small tooth behind it in the left valve. Pallial sinus short.

Species treated (8)
Corbula (Corbula) sulcata Lamarck, 1801; *Corbula (Anisocorbula) laticostata* Lamy, 1941; *Corbula (Anisocorbula) roumei* Dautzenberg, 1910; *Corbula (Caryocorbula) chudeaui* Dautzenberg, 1910; *Corbula (Anisocorbula) cadenati* (Nicklès, 1955); *Corbula (Varicorbula) gibba* (Olivi, 1792); *Corbula (Varicorbula) granum* Cosel, 1995; *Potamocorbula adusta* (Reeve, 1844).

Superfamily DREISSENOIDEA

Shells small, mytiliform to quadrate, more or less inflated, with beaks terminal or nearly so. Interior not nacreous. Surface only with growth lines. Hinge without teeth. A septum at the inside under the beak serves as support for the anterior adductor. Posterior adductor scar long. Myophore under the septum present or absent. Ligament long and slightly sunken. No pallial sinus. The phylogenetic affinity of the Dreissenoidea with the Myoidea is not intuitive from morphology, but is convincingly supported by molecular data (see *e.g.* Hallan *et al.* 2013).

Family DREISSENIDAE

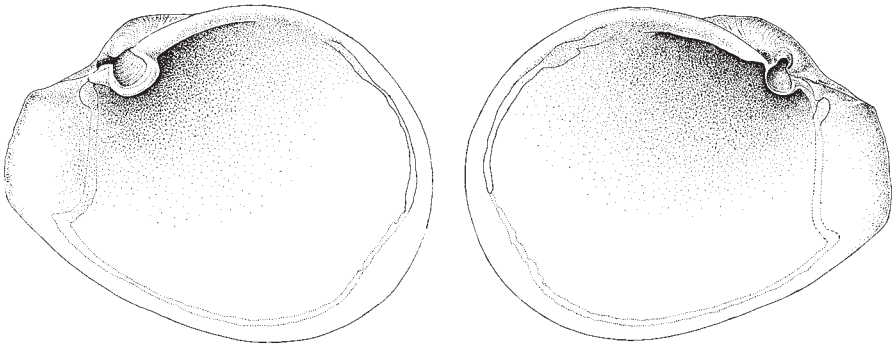
Characters of the superfamily. The species live byssally attached in fresh water or brackish water with regular changes of salinity. There are 17 extant species known worldwide, and a large number of Neogene fossils.

Genus *Mytilopsis* Conrad, 1857. Shells small, mytiliform, with terminal beaks. Surface with growth lines only and a strong periostracum. Beaks with a septum at the inside and on the dorsal side nearly under the septum with a protruding myophore which is directed towards the valve cavity and which serves as support for the pedal retractor muscle. Literature on this group regarding West Africa is very scarce and scattered. Seven taxa are listed by Pilsbry & Bequaert (1927) for West Africa, but probably only a few will stand and only one species is treated here.

Species treated (1)
Mytilopsis africana (van Beneden, 1835).

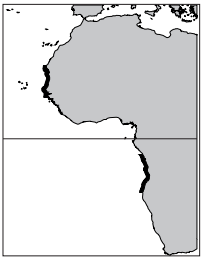
Other species reported in the area (2)
Mytilopsis lacustris (Morelet, 1860). Lagune Ébrié, Côte d'Ivoire (Morelet 1885).
Mytilopsis ornata (Morelet, 1885). Congo Kinshasa (Morelet 1885; Pilsbry & Bequaert 1927).

Tugonia anatina (Gmelin, 1791)



18.1. Senegal, MNHN old coll. (24.1 mm).

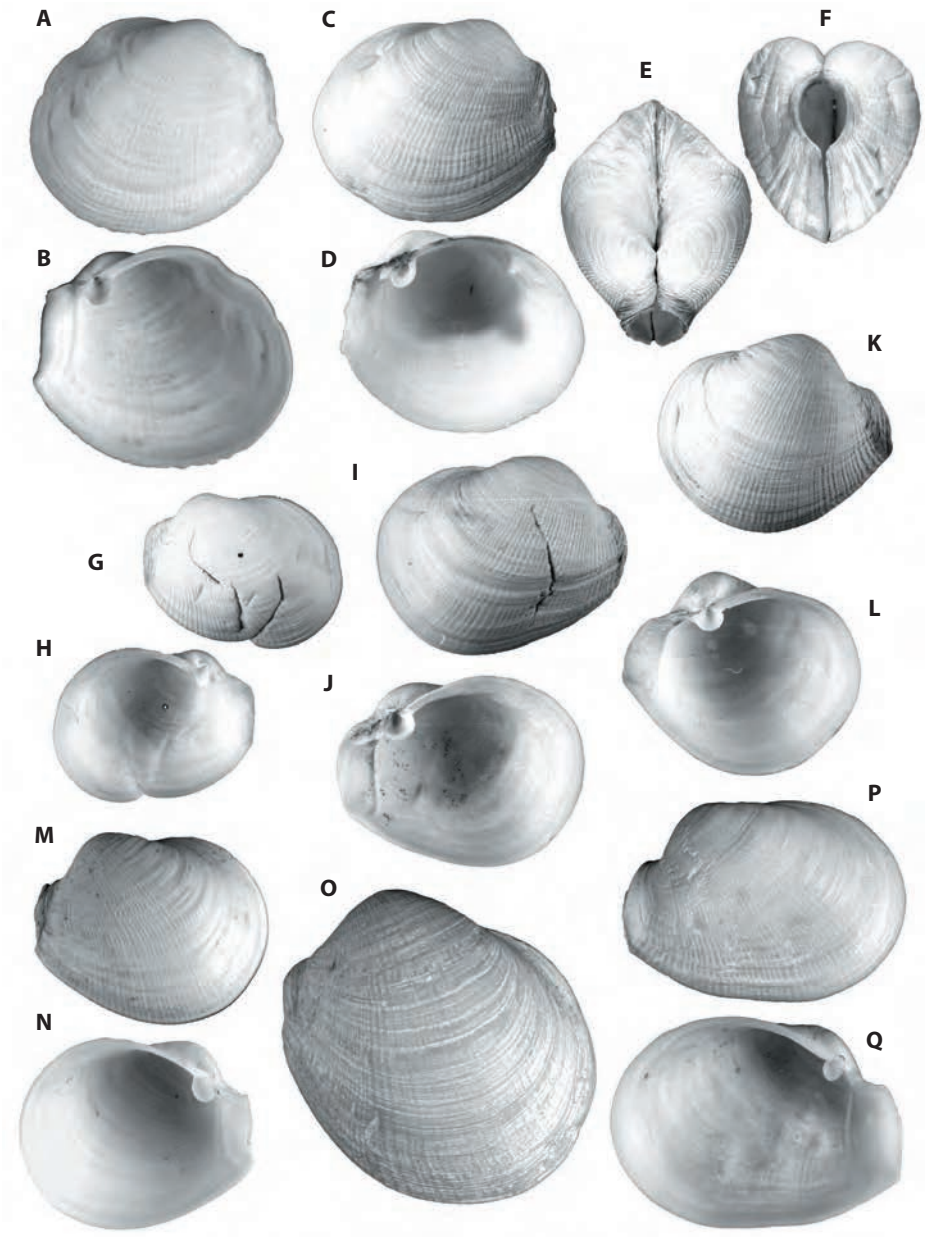
Shell up to 40 mm long, quite variable in outline, broadly suboval, rather thin and brittle, anteriorly globose, with anterior margin nearly semicircular and posterior margin truncated. Beaks close to the posterior end, in adult specimens beak of the right valve pierced by the beak of the left valve. No lunule nor escutcheon. Surface with numerous, close-set, somewhat irregular, radial riblets overriding dense growth lines and growth stages, resulting in a weakly decussate pattern. Posterior area small, with no ribs, separated by a strong constriction from the rest of the valve and surrounding the short and broad gape. Periostracum thin, very pale yellowish grey, nearly colourless. Inner margin smooth. Outside and inside dirty white.



Distribution. Mauritania (Pointe des Maures, 20°55'N) to Senegal (southern Casamance); Côte d'Ivoire (one record from Assinie); Congo Brazzaville (Pointe-Noire) to southern Angola (Baia dos Tigres).

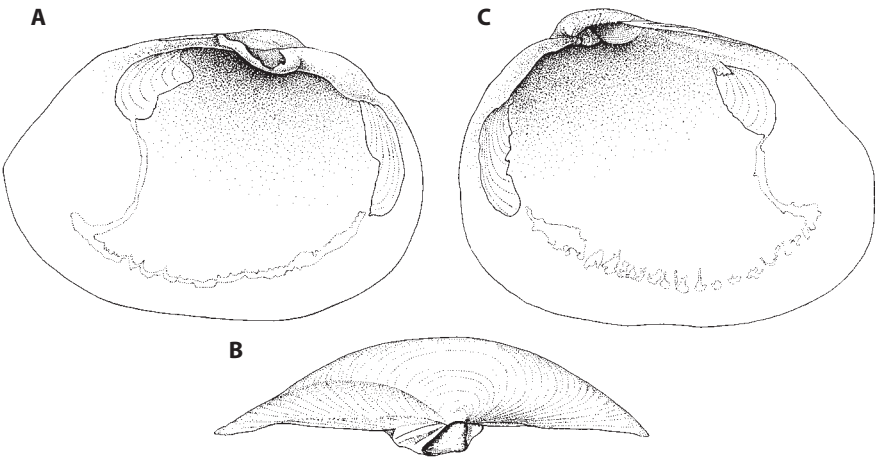
Biotope. In sandy bottom in shallow water, not common.

Remarks. The habitat of this peculiar species, which is "Le Tugon" of Adanson, is not precisely known. Empty valves are regularly washed up on some open beaches, but are not frequent, complete shells are extremely rare. The absence of records between Guinea-Bissau and the western part of Côte d'Ivoire and from Cameroon and Gabon indicates distribution gaps in the typical tropical zones. This is the type species of the genus *Tugonia*. *Mya guineensis* Spengler, 1803 and *Anatina globulosa* Lamarck, 1818 are synonyms. A similar species from the Red Sea and southern Arabia eastward to Masirah Is. is *T. nobilis* A. Adams, 1856.



18.2. *Tugonia anatina* (Gmelin, 1791). **A**-**B**, Pointe des Maures (20°55'N), Mauritania, intertidal (30.2 mm).**C**-**D**, Dakar (29.2 mm), old coll. MNHN. **E**-**F**, Sénégal (30.1 mm), old coll. MNHN. **G**-**H**, S of Cap Skirring, Casamance, Senegal, beach drift (26.6 mm). **I**-**J**, same locality (30.0 mm). **K**-**L**, same locality (29.8 mm). **M**-**N**, Assinie–Mafia, eastern border of Côte d'Ivoire, beach drift (29.8 mm). **O**, Ponta do Mussulo, Luanda prov., N-Angola, beach drift (36.4 mm). **P**-**Q**, Barra do Cuanza, Bengo prov., N.Angola, beach drift (31.5 mm).

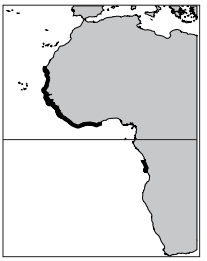
Cryptomya africana Cosel, 1995



18.3. **A-B**, W of Kiaoné, Mauritania, 20°02'N, 16°22'W, 6 m (lv, 16.7 mm). **C**, Barra do Dande, Bengo, N-Angola, 0-2 m (16.7 mm).

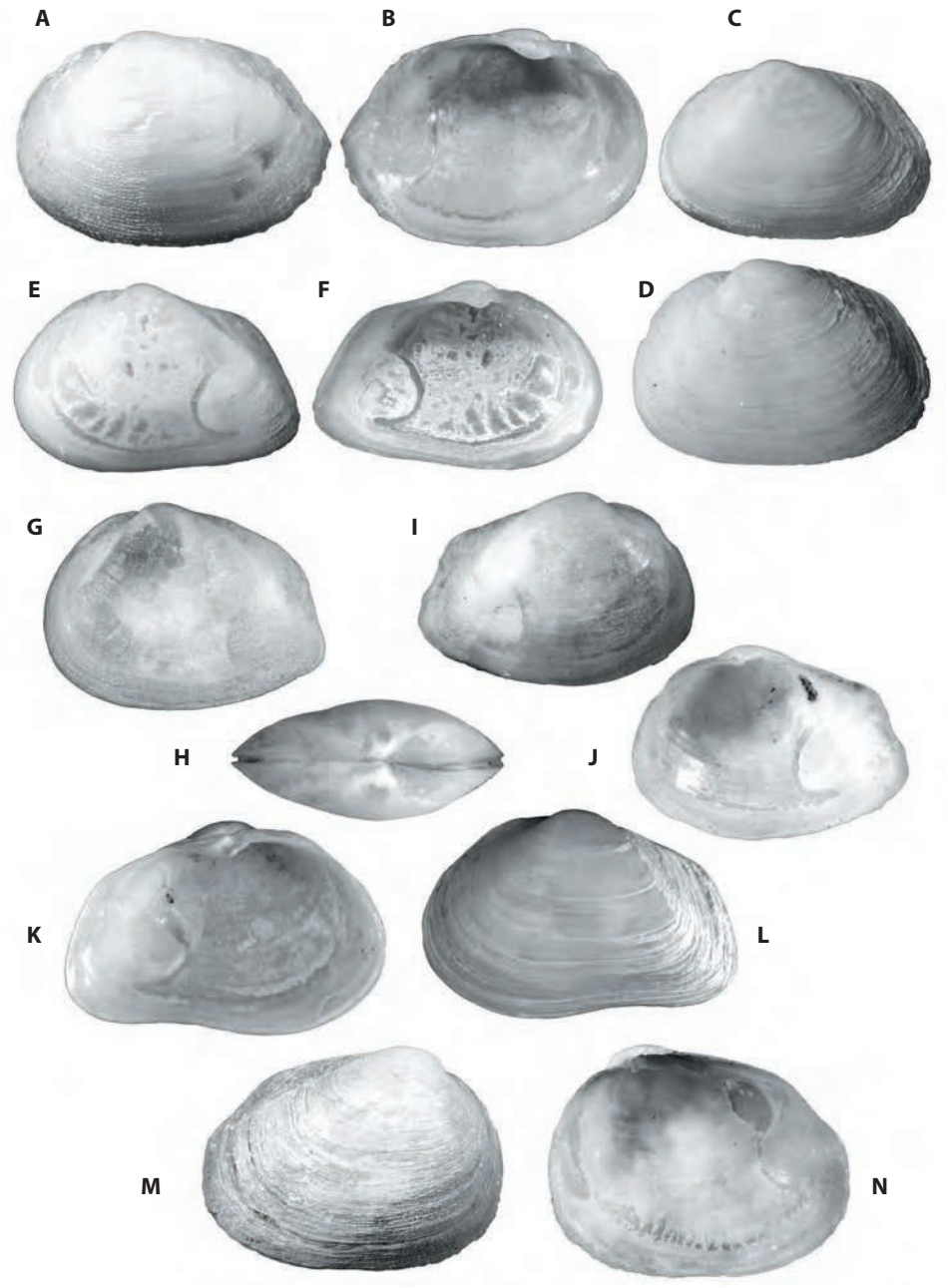
Shell up to 16 mm long, variable in outline, broadly suboval, somewhat trapezoidal, compressed, juveniles fragile, adults rather thin, not gaping. Anterior margin obliquely rounded, posterior margin obliquely truncated, slightly convex. Postero-ventral corner angulate or rounded-angulate. Beaks in front of the vertical midline. Surface with well marked commarginal growth lines and growth stages and with close-set, irregular, tiny granules arranged along the growth lines and occasionally merging to short, commarginal folds, best visible under a lens (x 5-10) and becoming weaker or obsolete on the central part of the valves. Posterior angle marked by a more or less visible keel. Periostracum thin, light yellowish brown to nearly colourless, somewhat stronger on the posterior area. Inner margin smooth. Outside and inside dirty white.

Distribution. West Sahara (Rio de Oro, Dakhla [formerly Villa Cisneros], 23°40'N), Mauritania (20°N) to Côte d'Ivoire; Congo Brazzaville (Pointe-Noire) to northern Angola (Luanda). Not yet recorded from Ghana to Gabon.



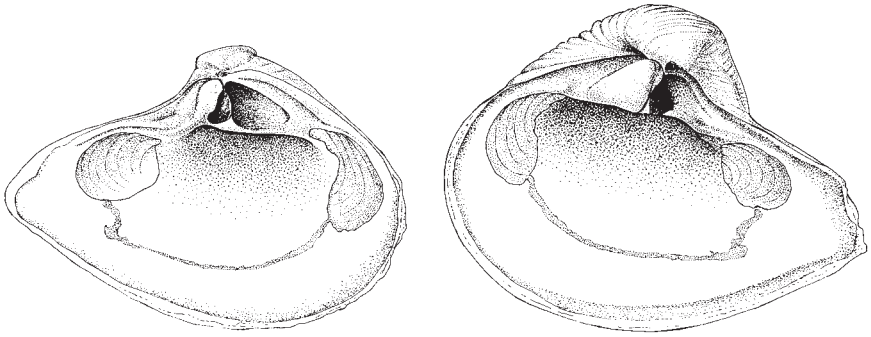
Biotope. In sandy mud, muddy sand, and fine sand, in shallow water (*ca.* 3-5 m), mostly in lagoons, creeks, inlets with changing salinities, but also found offshore (30 m), locally not uncommon. Most probably deeply buried and commensal in burrows of some crustaceans together with echiuroid worms, like *C. californica* (Conrad, 1837) from California and tropical West America and *C. elliptica* (A. Adams, 1851) from Japan (Nara *et al.* 2008).

Remarks. This species represents the first record of the otherwise Indo-Pacific and Eastern Pacific genus *Cryptomya* in the eastern Atlantic; the type species is *C. californica*. *Cryptomya africana* is distinguished from the latter by its peculiar punctate surface and the short but well marked pallial sinus. A very close species from the northwestern Arabian Gulf is *C. thryptica* Oliver & Chesney, 1997 (see also Oliver 1995).



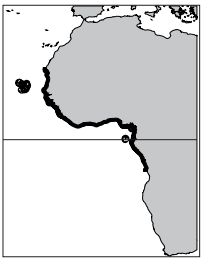
18.4. ***Cryptomya africana*** **Cosel, 1995. A**-**B**, Ile Kiaoné, Mauritania, 20°02'N, 16°22'W, 6 m (16.8 mm). **C**, Abéné–Kafountine, N-Casamance, beach drift (11.0 mm). **D**, bôlon opposite of Elinkine, S-Casamance, 3 m, shell sand (12.4 mm). **E**-**F**, W of Rio Morébaya, Guinea, 9°24'N, 13°48'W, 13 m (9.1 mm). **G**-**H**, Grand Lahou, Côte d'Ivoire, 22 m (holotype, 7.8 mm). **I**-**J**, off Abidjan (7.7 mm). **K**-**L**, Baie de Pointe-Noire, Congo Brazzaville, 4°42.2'S, 11°47.2'W, 15 m (10.4 mm). **M**-**N**, Barra do Dande, Bengo prov., N-Angola (14.6 mm).

Corbula (*Corbula*) *sulcata* Lamarck, 1801



18.5. Casamance, 12°46'N, 17°12'W, 22 m, clean fine sand (lv, 22.9 mm; rv, 24.3 mm).

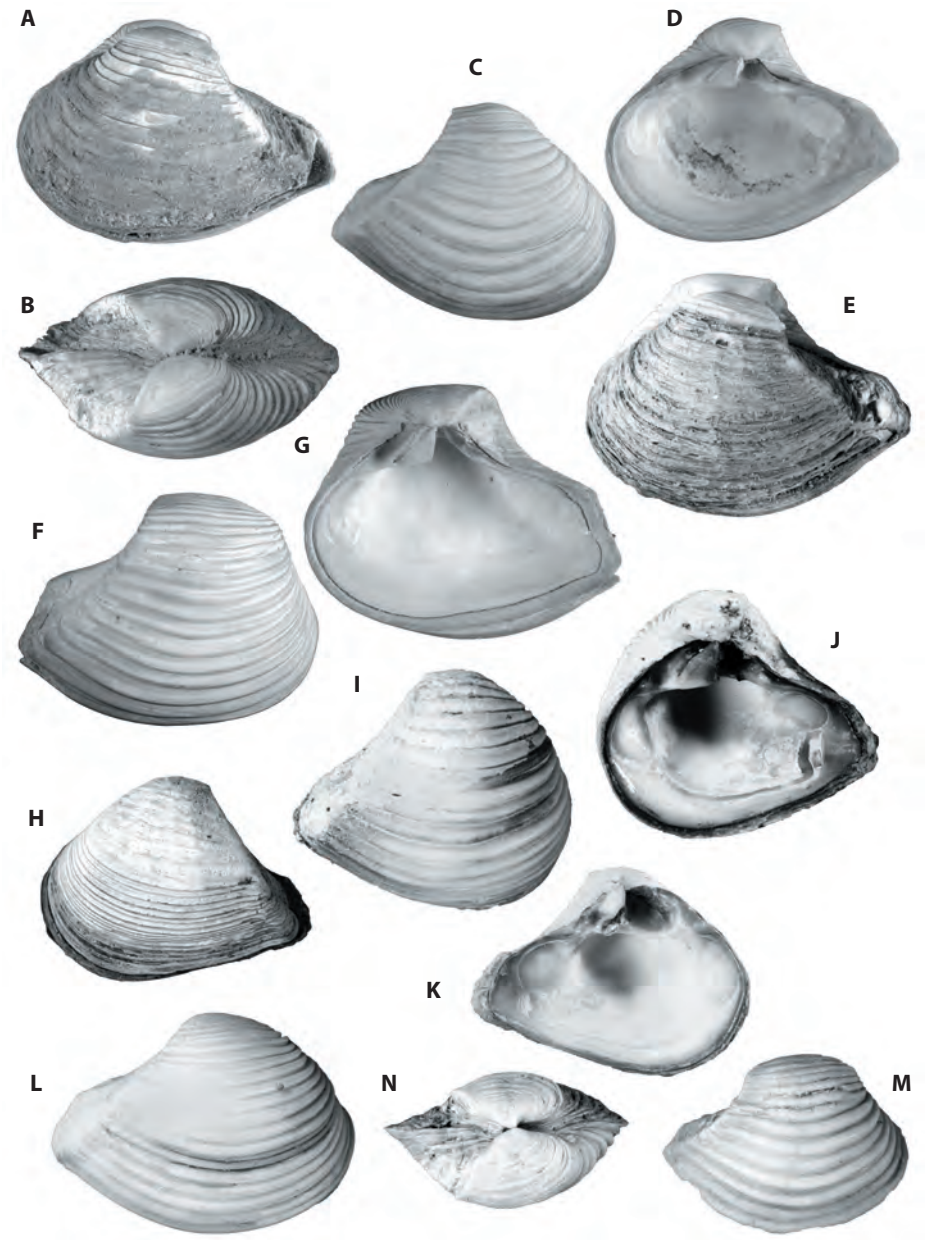
Shell up to 25 mm long, variable in shape, suboval-subtrigonal, very thick and solid, with anterior margin rounded, posterior part tapering and posterior margin rostrate. Right valve slightly larger and much more inflated than left valve. Beaks more or less median or slightly behind the vertical midline. Surface with strong, rounded, slightly irregular, smooth, commarginal cords on the right valve. Left valve with fewer, less prominent and more irregular commarginal ridges and occasionally a few weak and shallow, radial waves. Posterior angle sharp and prominent, posterior area with more or less ill-defined, irregular, commarginal ridges. Periostracum brownish, on the right valve thin, on the left valve strong, wrinkly and more persistent. Pallial sinus very small. Outside white, with scattered, pale pinkish or reddish rays. Beaks sometimes with pinkish hue. Inside white, often with reddish brown or brown.



Distribution. Mauritania (Cap Blanc) to northern Angola (Luanda); Cape Verde Islands (no modern records); São Tomé, Ilha do Principe.

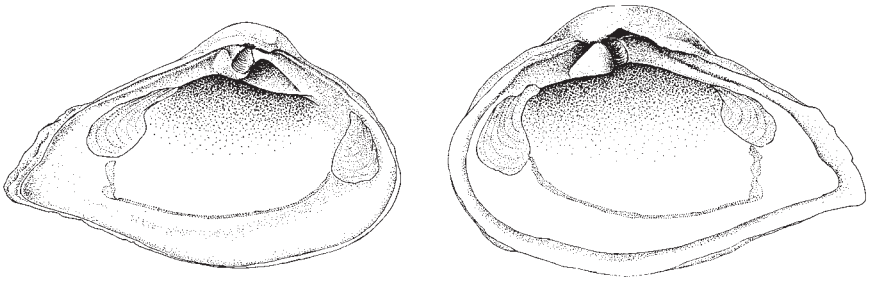
Biotope. On clean, fine sand, medium sand, mixed sand and coarse sand, from shallow water (1-5 m), to offshore (50-70 m), very common to locally abundant in the north (Mauritania, Senegal), becoming uncommon in the south (Cameroon to Angola). The species occurs often together with *Glycymeris stellata*, *Cardiocardita tankervillii*, *Bucardium ringens*, *Polititapes durus*, *Venus declivis* and the snails *Persicula persicula* (Linnaeus, 1758) and *Agaronia acuminata* (Lamarck, 1822).

Remarks. This is the type species of the genus *Corbula*. It is distinguished from most other members of the family by the presence of one cardinal in each valve.



18.6. *Corbula (Corbula) sulcata* Lamarck, 1801 ["normal", thick-shelled form]. **A**-**B**, W of Cap Rouge, Mauritania (23.8 mm). **C**-**D**, Mauritania, 18°30'N, 16°12'W, 12 m (21.6 mm). **E**, Abéné, Casamance, Senegal, 13°00.4'N, 17°00.6W, 18 m (22.1 mm). **F**-**G**, Sassandra, Côte d'Ivoire, 4°50'N, 5°57'W, 70 m (24.6 mm). **H**-**K**, Ponta da Mina–Santa Ana, Ilha do Principe, 8-10m (21.6 mm). **L**, Ile Conga, Baie de Corisco, N of Gabon (22.8 mm). **M**-**N**, Baia da Corimba, Luanda prov., N-Angola, 10-20 m (17.3 mm).

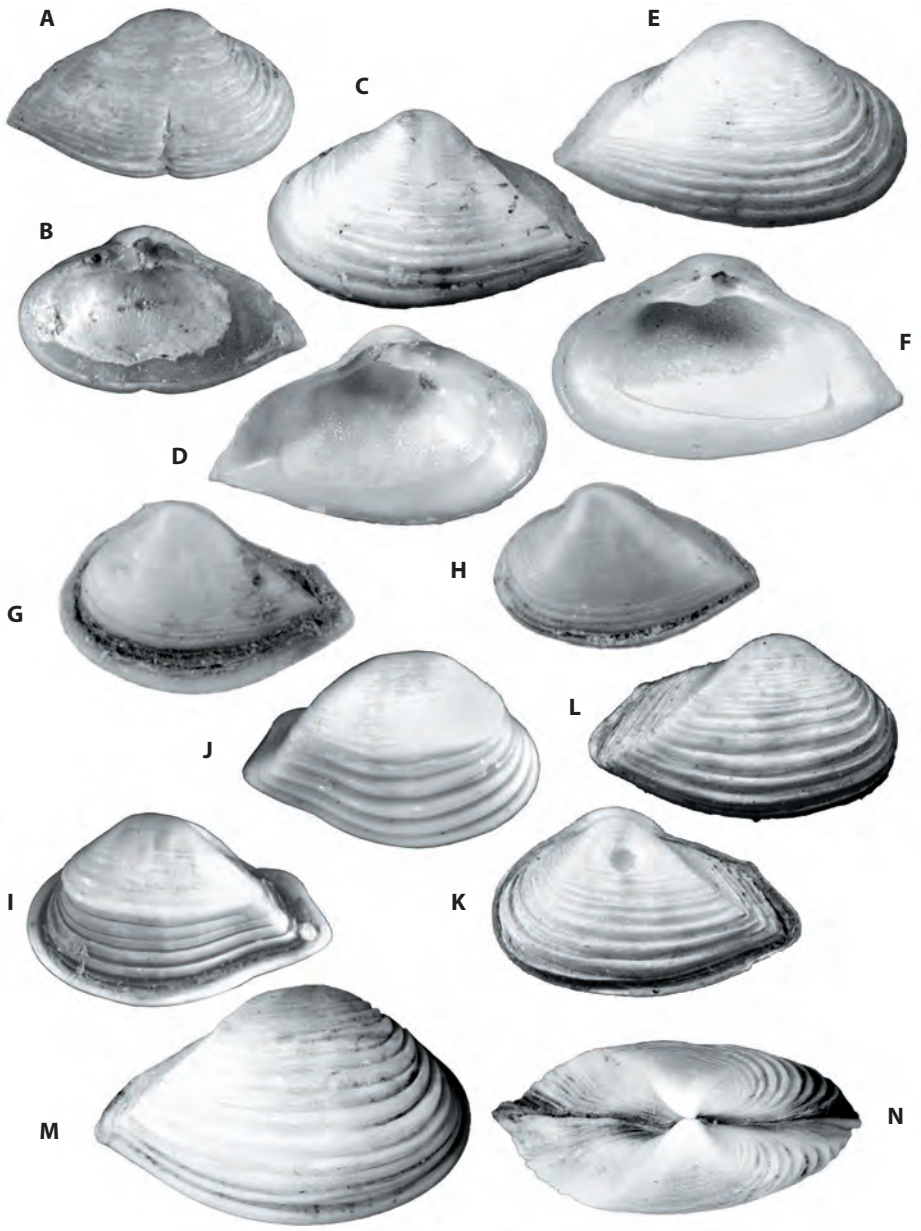
Corbula (*Corbula*) *sulcata* Lamarck, 1801 (small form)



18.7. W of Cap Rouge (rv, 6.5 mm).

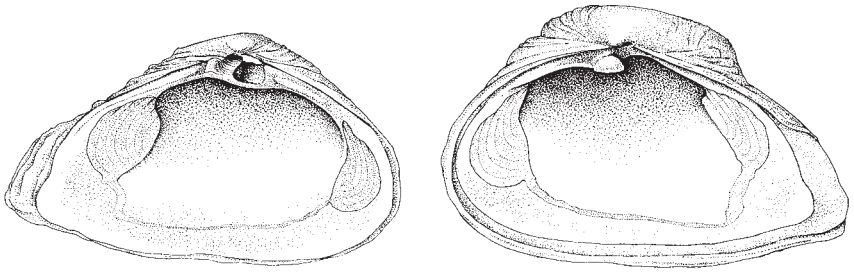
Shell up to 11 mm long, occasionally larger, slightly variable in shape, elongate, thin to rather thick, inflated, with rounded anterior margin, somewhat tapering posterior part and sharply truncated, oblique posterior margin. Right valve larger and a bit more inflated than left valve and slightly overlapping it. Beaks in front of the vertical midline. Surface of both valves with numerous, irregular, commarginal ridges or folds which are thin and rather ill-defined on the umbonal half, become broader and thicker towards ventrally and are very prominent along the margin. Sculpture on the posterior area less marked to obsolete. There are also extremely fine, radial threads which persist only on fresh specimens and which are visible only under a lens (x 5-10). Posterior angle very sharp. Periostracum thin, light brownish, generally persistent on the immediate marginal area only. Outside white to pinkish or light brownish, with reddish anterior and posterior area. Inside white, light brownish or pink.

Remarks. This "form" is distinguished by its sharply truncated and weakly rostrate posterior end, the often pink colouration and the very irregular commarginal ridges and cords. There is no doubt that these are juvenile or small specimens of *C. sulcata*; in larger lots with continuous growth series, a distinction in two well separated entities is not possible. Occasionally there are sharp limits between the fine sculpture and the strong, bold sculpture closer to the ventral margin. However, in some localities or environments, the species attains the thick and heavy adult form already at a smaller size. Other specimens remain in the more elongated form even at a larger size, and "normal", shorter and thicker-shelled specimens may occur together with the elongated form, as is the case with a lot from Corimba (N-Angola) (see Figs 18.6M-N and 18.8M-N). The original labels of the figured specimens of Mission Gruvel from Rufisque bears the erroneous identification "*Corbula chudeaui* Dautz." (see below). Huber (2010: 465) figured this form as "*Corbula cadenati* (M. Nicklès, 1955)". Only molecular research may reveal if both "forms" are conspecific or separate species.



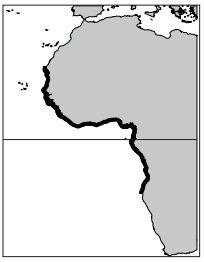
18.8. *Corbula (Corbula) sulcata* Lamarck, 1801 [small "juvenile" form]. **A**-**B**, Baie de Cansado, Mauritania, 9-10 m (7.2 mm), leg. Mission Gruvel. **C**-**D**, Baie de Rufisque, Sénegal, 18-20 m (8.7 mm), leg. Mission Gruvel. **E**-**F**, same locality (9.7 mm).**G**, same locality (5.9 mm). **H**, same locality (6.5 mm). **I**-**J**, Senegal (no precision but most probably between Dakar and Petite Côte) (7.5 mm, note sharp limit between fine and coarse sculpture). **K**-**L**, Grand Bassam, Côte d'Ivoire, 20 m (7.7 mm). **M**-**N**, Baia da Corimba, Luanda prov., N-Angola, 10-20 m (16.0 mm).

Corbula (*Anisocorbula*) *laticostata* Lamy, 1941



18.9. Dakar region, 14º23.1'N, 17º24.1'W, 65-70 m (lv, 6.4 mm; rv, 6.7 mm).

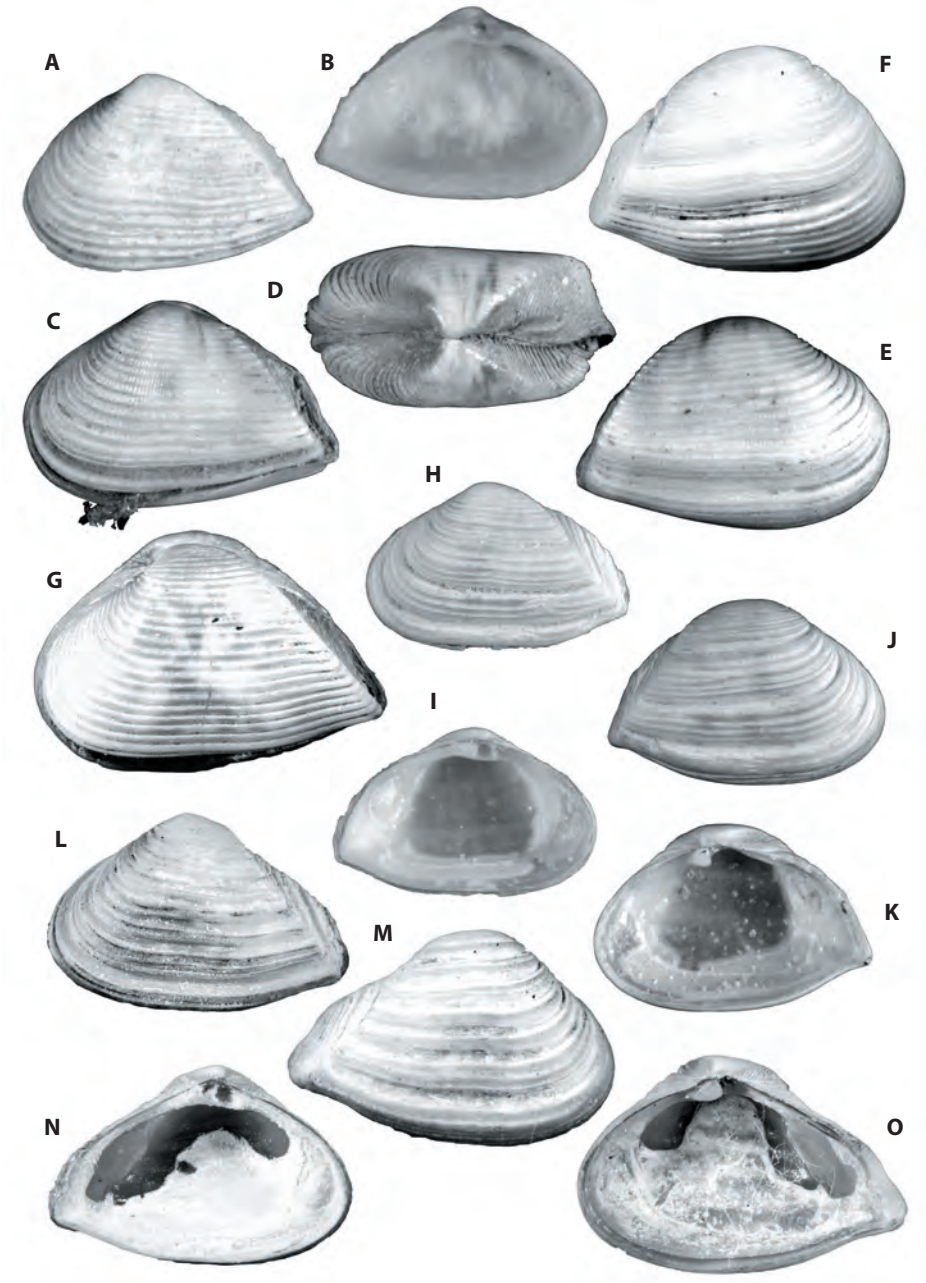
Shell up to 9 mm long, somewhat variable in shape, suboval-trapezoidal, rather thick and solid, very inflated, with rounded anterior margin, nearly straight to straight ventral margin, obliquely truncated posterior margin and sharp postero-ventral corner. Right valve slightly larger and more inflated than left valve and slightly overlapping it. Surface of both valves with numerous, close-set, rather regular, commarginal ridges and very often with 1-6 intercalated and very deeply cut growth constrictions which occasionally let the surface areas between them appear as very strong cords. No radial striae. Posterior angle always sharp. Posterior area with the same sculpture as the rest of the shell. Periostracum thin, translucent, pale yellowish brown. Anterior and posterior adductor scar in fully grown specimens on a slightly raised plate. Outside whitish, brownish white or light brown, occasionally with pinkish purple hue on both sides of the umbos. Inside whitish to brown.



Distribution. Mauritania (Cap Blanc) to southern Angola (Lucira, Namibe Province).

Biotope. In medium sand and mixed sand, often with shell debris, gravel and stones, from shallow water (2-5 m) to offshore (40-60 m), common.

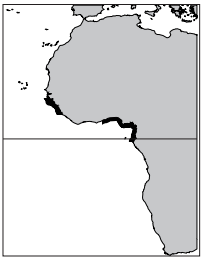
Remarks. This species is distinguished from juvenile *C. sulcata* by the trapezoidal-subrectangular, more bluntly rostrate shell with mostly straight ventral margin, the often very strong growth constrictions and the otherwise regular commarginal sculpture. It was misidentified by Dautzenberg (1910, 1912) as *Corbula roumei* which is much smaller, its sculpture is shallower, less dense and not strictly commarginal, and the posterior angle is often more rounded. The names *Corbula laticostata* Lamy, 1941 and *C. striatissima* Lamy, 1941 had been used for two morphs of the same *Corbula*, however, comparisons with the material cited by Lamy (1941) and examined in MNHN, as well as study of numerous additional lots revealed that both are conspecific, and that there are intergrades between specimens without and with growth constrictions. This is the species reported from Ouidah (Wydah), Bénin by Smith (1872) as "*C. modesta* Hinds, 1843" (described from the Philippines) (see Fig. 18.10L-O). The name *laticostata* is here preferred because it is based on "*C. roumei* Dautzenberg (*non striata* Smith)", therefore not formally a replacement name for *roumei*; the other name *striatissima* is definitely a replacement name, in the sense of ICZN and therefore an objective synonym of *C. striata* Smith, 1872 (next entry).



18.10. *Corbula (Anisocorbula) laticostata* Lamy, 1941 "form" *striatissima*. A-B, Baie de Rufisque, Senegal, 18-20 m (7.5 mm). C-E, Guinea-Bissau (no precision) (7.3 mm), leg. Mission L. Gain, 1913. F, Banc Crawford, Iles de Los, Guinea (7.6 mm), leg. Mission Gruvel. G, Ilha de Luanda, Luanda prov., 40-60 m (8.4 mm). H-O, "form" *laticostata*. H-I, Mauritania, 18°30'N, 16°12'W, 12 m (7.4 mm). J-K, same locality (6.8 mm). L-O, Ouidah, Bénin (9.4 mm, specimen cited as *C. modesta* Reeve, 1843 by Smith 1872, BMNH).

Corbula (*Anisocorbula*) *roumei* Dautzenberg, 1910

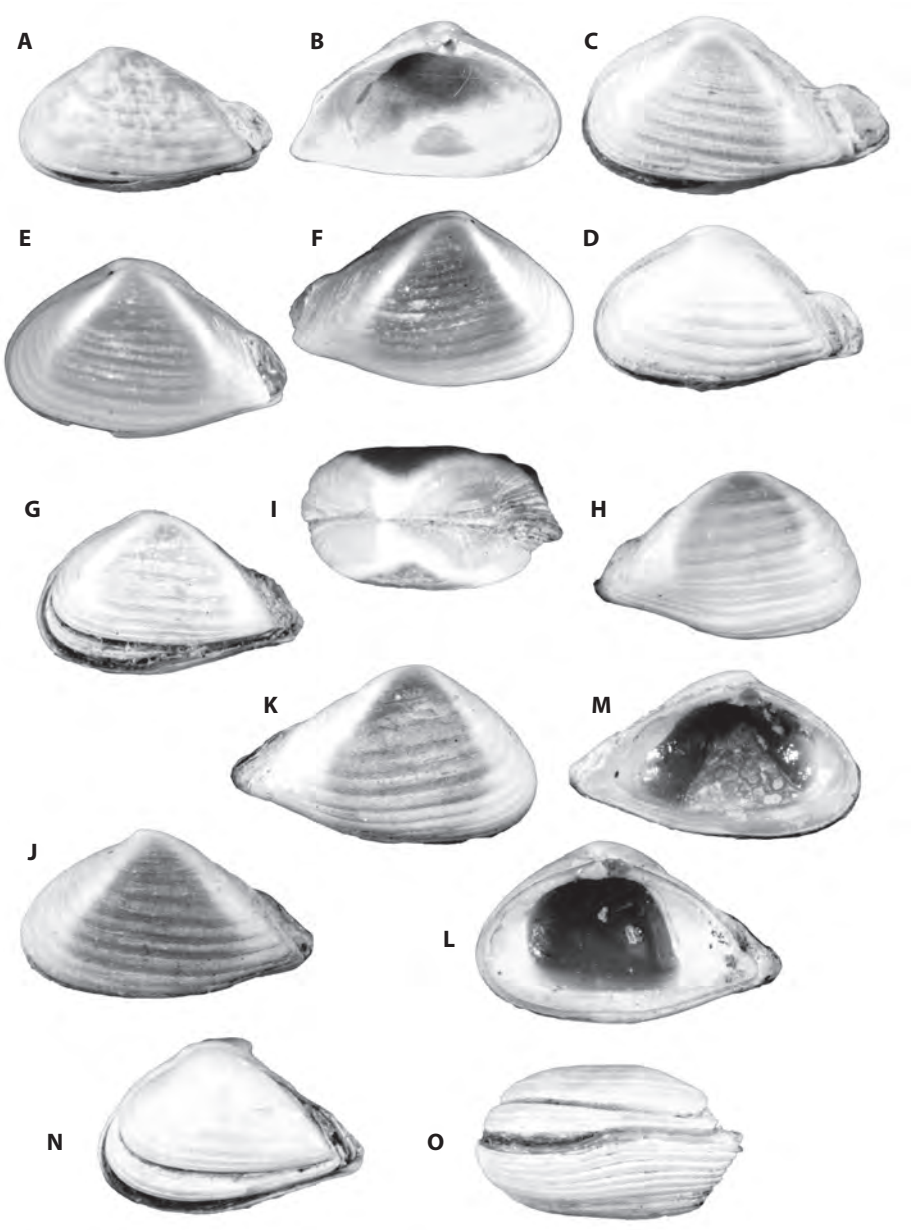
Shell small, up to 6 mm long, somewhat variable in shape, oblong-trapezoidal, rather thick and solid (juveniles thin), inflated to very inflated, with nearly straight to straight ventral margin. Postero-ventral corner rather sharp, in fully-grown specimens ending in an additional irregular rostrum. Right valve slightly larger and more inflated than left valve and slightly overlapping it. Beaks slightly in front of the vertical midline. Surface of both valves with rather few broad, shallow, slightly oblique waves which are not commarginal and which become more dense and irregular near the ventral margin and may appear as cords. Sculpture ill-defined to obsolete near the umbos. There are also extremely fine radial threads which are best visible on fresh specimens but only under a lens (x 5-10). Posterior angle well-defined, somewhat rounded to rather sharp. Posterior area with denser sculpture than the rest of the shell. Periostracum dark brown, only persistent in fresh specimens near the ventral margin. Anterior and posterior adductor scar in fully grown specimens on a raised plate. Outside whitish, brownish white, pinkish or light brown, often with pinkish purple, reddish with paler speckles and spots or whitish with a triangular dark pinkish field on the middle part of the valves below the umbos which disappears near the ventral margin. Inside whitish to light brown or pinkish, with the external pinkish zone occasionally showing through.



Distribution. Guinea-Bissau (Rio Cacheu, 12°05'N) to Sierra Leone; Ghana to N-Gabon (Bahia de Corisco). No record from Côte d'Ivoire and only a few single valves from Ghana. A disjunct distribution with a gap in the atypical tropical zone is probable.

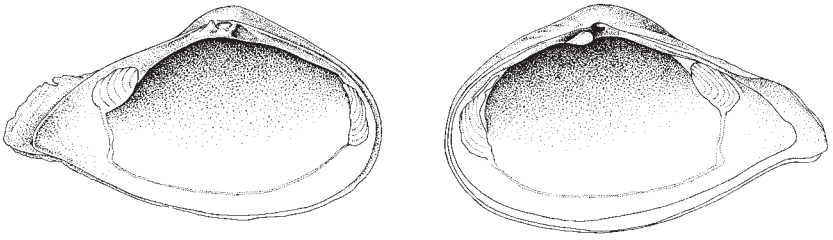
Biotope. In fine and mixed sand, often with shell debris, in shallow water from 1.5 to about 30 m, rarely deeper, locally not uncommon.

Remarks. This species is distinguished from *C.* (*Caryocorbula*) *chudeaui* (see next entry) by the much smaller, trapezoidal-subrectangular shell with mostly straight ventral margin, the regular commarginal wave-like sculpture and the often pink umbonal and subumbonal region. *Corbula laticostata* Lamy, 1941 (previous entry) is larger and has numerous narrower commarginal cords, often with conspicuous broad growth constrictions. This species, like the following, has an intricate nomenclatural history. It was first described from Wydah (Ouidah), Bénin, as *Corbula striata* E.A. Smith, 1872 (*non C. striata* Lamarck, 1801, an Eocene fossil), and renamed C. *roumei* by Dautzenberg (1910). However, Dautzenberg (1910, 1912) misapplied the name to specimens collected in Mauritania. Lamy (1941: 141-142), on the grounds that Dautzenberg's specimens were not correctly identified, introduced two names: *Corbula laticostata* for "*C. roumei* Dautzenberg (*non striata* Smith)" and *Corbula striatissima* for what he believed to be the "real" *C. striata* Smith. The specimens examined by Lamy actually belong to the preceding species (see previous entry), not to the "real" *C. striata* which does not occur in Mauritania. The species was renamed a third time by Cosel (1995) as *Corbula virginiae*. Although this is at odds with nomenclatural rules, subsequent authors have ignored the name *C. roumei* which is an objective synonym of *striata* and the valid name according to current nomenclatural rules.



18.11. *Corbula (Anisocorbula) roumei* Dautzenberg, 1910. **A**, S off Ilha do Mel, Guinea-Bissau, 10°41'N, 14°44.5'W, 25 m (4.5 mm). **B**, same locality (5.0 mm). **C**, Banc Crawford, Iles de Los, Guinea, 2-3 m (5.3 mm). **D**, same locality (4.8 mm). **E**-**F**, W of Ile Tannah, Guinea, 9°12'N, 13°40.5'W, 20 m (5.5 mm). **G**-**I**, Ouidah, Benin ["Wydah"] (syntype of *C. striata* E.A. Smith, 1872, 5.2 mm, BMNH). **J**-**M**, same locality (figured syntype, 6.1 mm, BMNH). **N**-**O**, same locality (possible syntype, 5.1 mm, BMNH), all leg. Capt. Knocker.

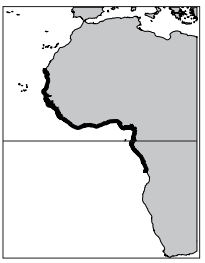
Corbula (*Caryocorbula*) *chudeaui* Dautzenberg, 1910



18.12. Pointe-Noire, Congo Brazzaville, off Plage Orstom, 3-4 m (lv, 9.6 mm; rv, 9.8 mm).

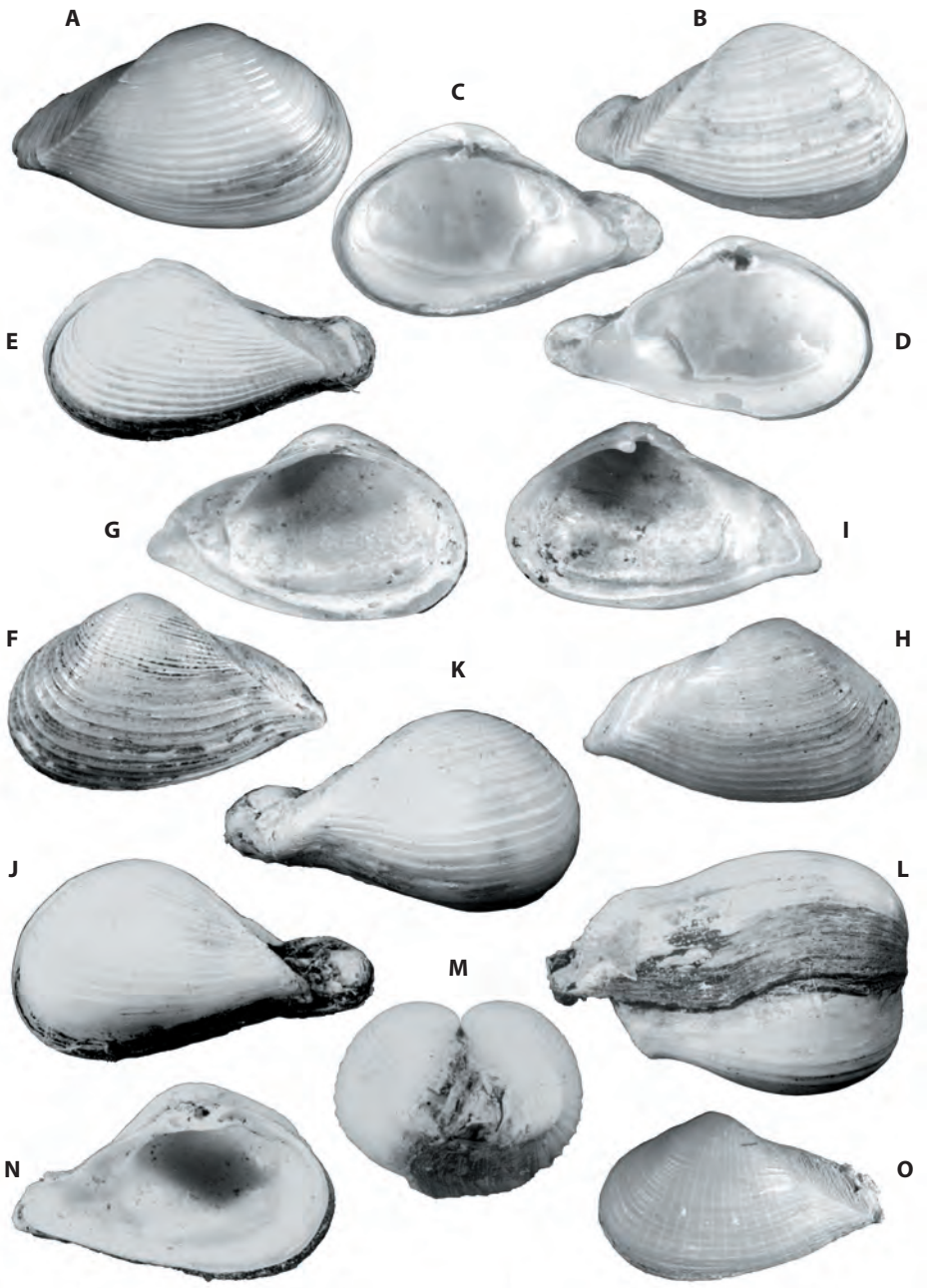
Shell up to 10 mm long, somewhat variable in shape, suboval, rather thick and solid, inflated, with rounded anterior margin, tapering posterior part and well rostrate posterior margin. Right valve longer and somewhat more inflated than left valve and slightly overlapping it. Beaks in front of the vertical midline. Surface with numerous strong, close-set, slightly irregular, commarginal ridges on both valves, on the posterior area less developed to obsolete; some specimens may show delicate radial threads which do not override the commarginal sculpture. Posterior angle sharp. Periostracum very thin, light brownish, on the posterior area somewhat wrinkly, on the disk showing extremely fine and thin, radial lines which are visible only under a lens (x 5-10). Posterior adductor scar on a small, slightly elevated plate. Pallial sinus very small and short. Outside dirty whitish to light brown. Inside whitish, yellowish or light brown.

Distribution. Mauritania (20°N) to northern Angola (Luanda).



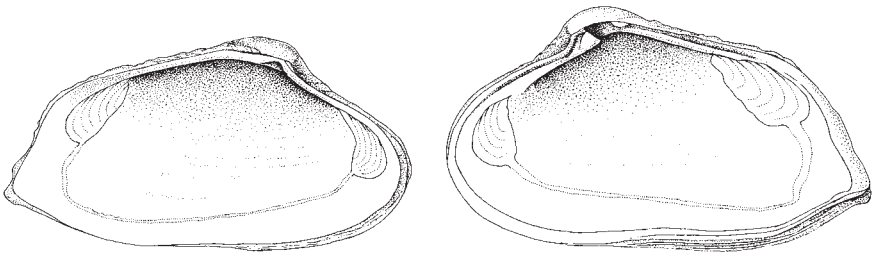
Biotope. In muddy sand and fine sand, also with shell debris, byssally attached to sand grains, shell fragments or other specimens of the same species, predominantly in sheltered or semi-sheltered areas, from 1 to about 20 m, occasionally deeper, common. The species is often encountered together with *Nasopharus elegans*, *Sinupharus curtus*, *Pitar cor*, *Scissodesma micronitida*, and the turrid gastropod *Pusionella nifat* (Bruguière, 1789).

Remarks. The nomenclatural history of this species is intricate, like for the previous one. It was first described as *Corbula lirata* E.A. Smith, 1872 (*non Corbula lyrata* J. de C. Sowerby, 1840, a Callovian fossil), which was renamed *Corbula chudeaui* by Dautzenberg (1910). It was however misidentified by Dautzenberg (1910, 1912) who applied the name *C. chudeaui* to small or juvenile *C.* (*Corbula*) *sulcata* (see that entry) and who identified the present species (1912: 99) as *Corbula nasuta* G.B. Sowerby I, 1833, a very similar Panamic-Pacific species. On the grounds that Dautzenberg's (1910, 1912) specimens are misidentified, Lamy (1941) renamed it again *Corbula dautzenbergi*. Under current nomenclatural rules, *lirata* Smith, 1872, *chudeaui* Dautzenberg, 1910 and *dautzenbergi* Lamy, 1941 are objective synonyms conserving the same type specimens as the original *lirata*, despite any different usage given to the name. The junior synonym *dautzenbergi* has nevertheless some usage (Nicklès 1950, 1955; Bernard 1984; Huber 2010). A similar Caribbean species is *C.* (*C.*) *swiftiana* C.B. Adams, 1852 (North Carolina to Florida, Caribbean to Brazil) which inhabits a comparable biotope.



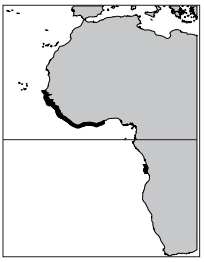
18.13. ***Corbula (Caryocorbula) chudeaui*** **Dautzenberg, 1910. A**, Diembéring, S-Casamance, 12°27'N, 17°23.6'W, 45 m (10.3 mm). **B-D**, Saloum River estuary, Senegal (9.2 mm). **E**, Sherbro River, Sierra Leone (8.3 mm). **F-G**, Ouidah ["Wydah"], Benin (syntype BMNH of *C. lirata* E.A. Smith, 1872, 6.8 mm). **H-I**, same locality (syntype BMNH, 6.7 mm). **J-M**, Victoria (now Limbe)-Bota, Cameroon, 8-10 m (9.0 mm). **N**, same locality (7.4 mm). **O**, Baie de Pointe-Noire, Congo Brazzaville, 4°42.4'S, 11°47.3'E, 14 m (6.6 mm).

Corbula (*Anisocorbula*) *cadenati* (Nicklès, 1955)



18.14. Abidjan region, Côte d'Ivoire (lv, 10.3 mm; rv, 11.5 mm).

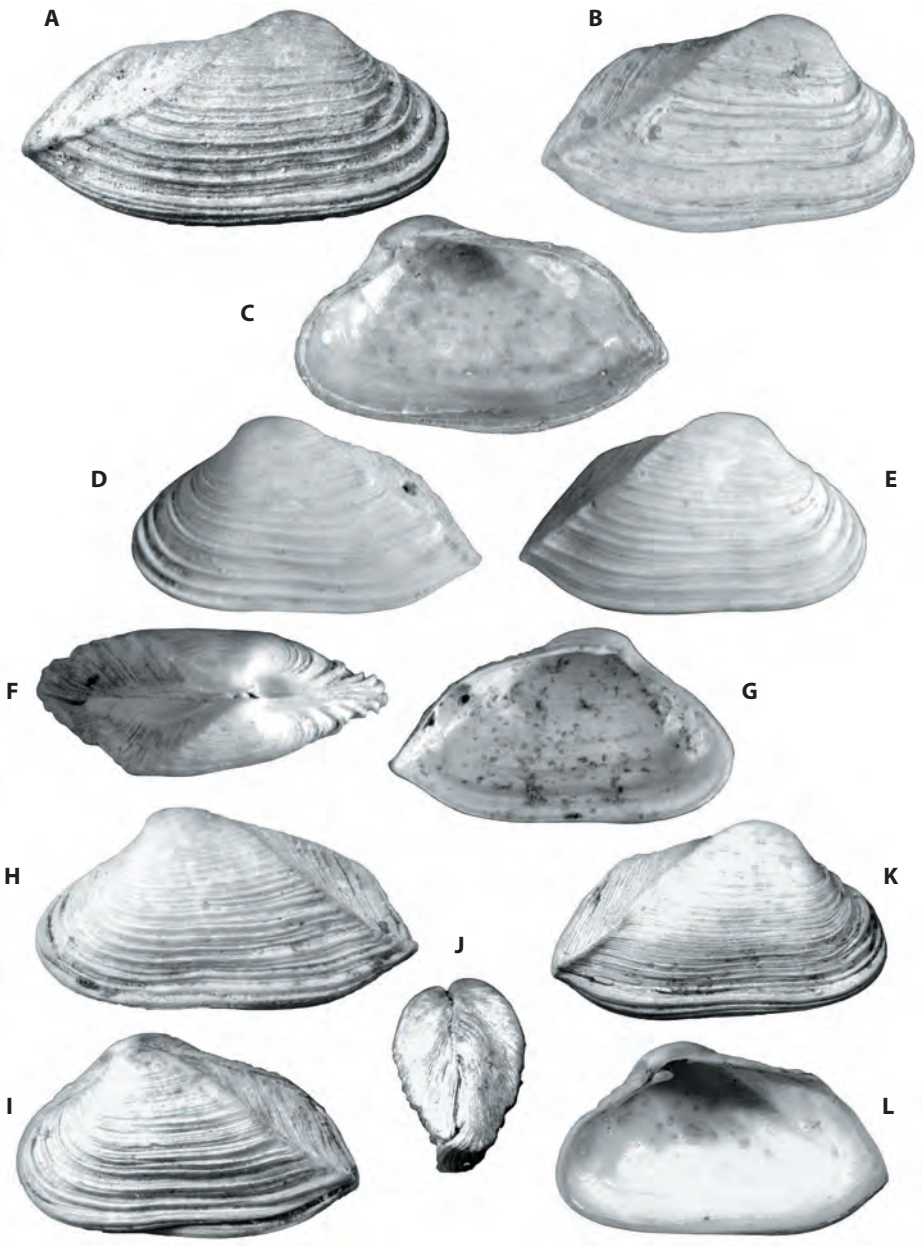
Shell up to 15 mm long, slightly variable in outline, elongate-trapezoidal, rather thin but strong, compressed, with narrowly rounded anterior margin, obliquely truncated posterior margin, sharp and raised postero-ventral corner and well convex postero-ventral margin. Right valve slightly larger than left valve. Beaks well anterior to the vertical midline. Surface with rather widely spaced, irregular, commarginal waves and smaller ridges or threads between them. Waves especially well developed on the marginal part of the posterior area, a larger and thicker cord on the margin of the valves. Posterior angle sharp and keel-like, towards the postero-ventral margin somewhat protruding. Periostracum not seen in the study material. No pallial sinus. Outside and inside dirty white.



Distribution. Senegal (Dakar region) to Ghana; northern Angola (Luanda).

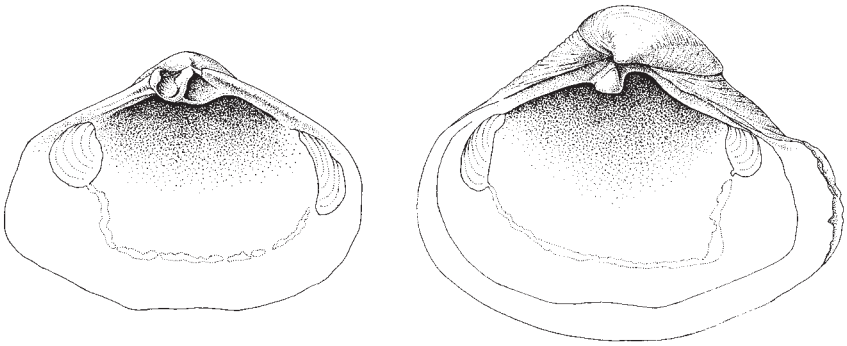
Biotope. Unknown, most probably in fine, muddy sand, offshore from 30-130 m, rare.

Remarks. This species is distinguished from any other West African *Corbula* by its elongate, thin and rather compressed shell, the quite forward placed beaks and the keeled posterior angle. The species was originally placed in the subgenus *Anisocorbula* but looks also close to the subgenus *Tenuicorbula* Olsson, 1932, which is known from tropical West America. In that subgenus, the postero-ventral margin is less convex, and the sculpture is finer. The absence of records from Bénin to the Congo may indicate a distribution gap. *Corbula revoluta* (Brocchi, 1814) from the Pliocene of Italy and the Pleistocene of Sicily may be an ancestor.



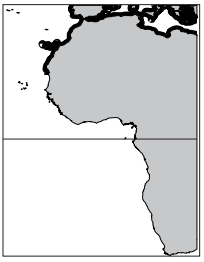
18.15. *Corbula (Anisocorbula) cadenati* (Nicklès, 1955). **A**, off Gorée, Dakar, Senegal, 132 m (14.5 mm). **B**-**C**, Liberia, 5°21.5'N, 9°54.5'W, 73-80 m (11.2 mm). **D**-**G**, Abidjan region, Côte d'Ivoire (9.1 mm). **H**, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (11.7 mm). **I**-**J**, same locality (11.3 mm). **K**-**L**, same locality (8.2 mm.)

Corbula (*Varicorbula*) *gibba* (Olivi, 1792)



18.16. Port Etienne (now Nouadhibou), 6 m (lv, 8.8 mm; rv, 10.4 mm).

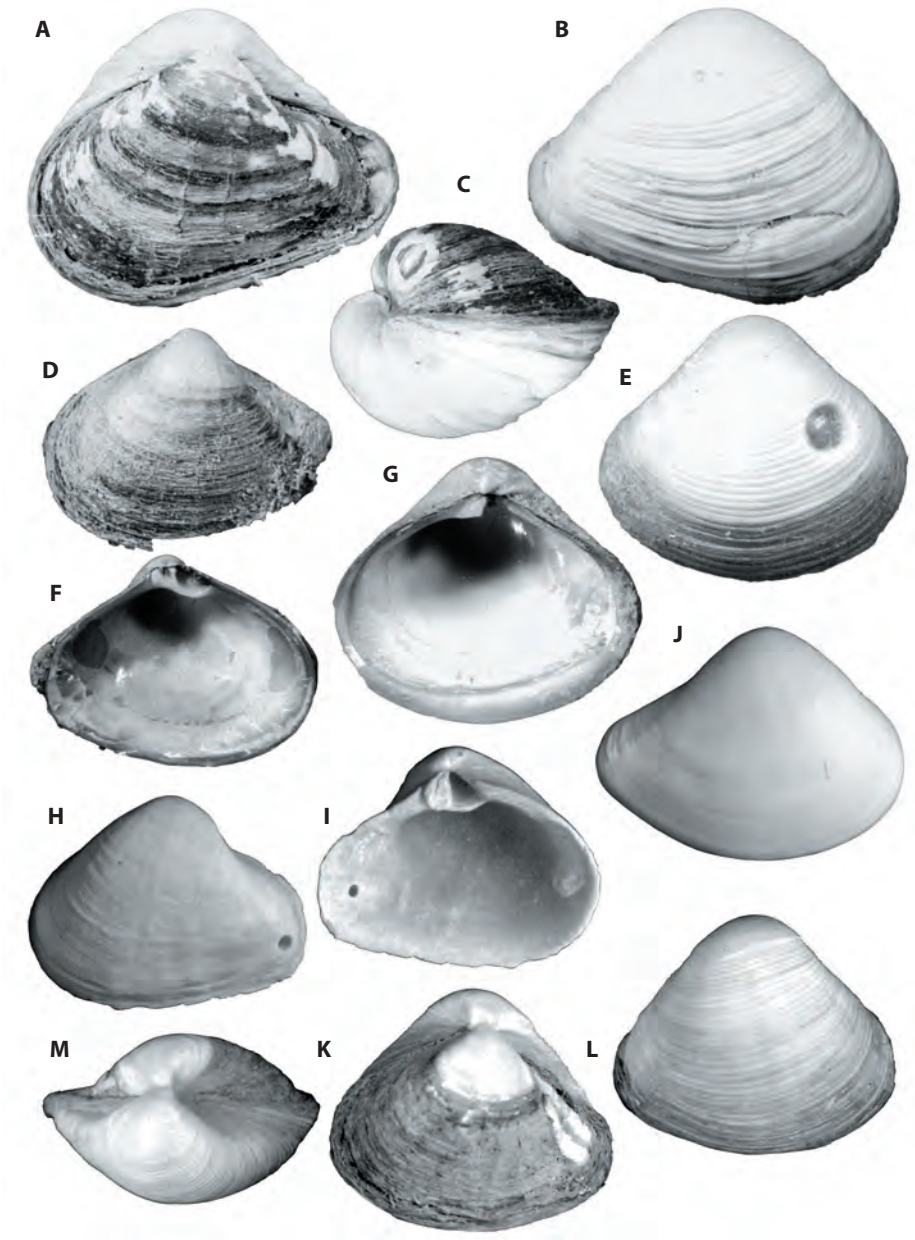
Shell up to 12 mm long, variable in shape and tumidity, suboval-subtrigonal, rather thick and solid, inflated, with rounded anterior margin, tapering posterior part and more or less rostrate posterior margin. Right valve larger and more inflated as left valve and considerably overlapping it. Beaks slightly in front of to slightly behind the vertical midline. Surface of the right valve with numerous, close-set, low, commarginal ridges, often obsolete towards the umbos. Left valve with growth lines only and few very faint radial lines. Posterior angle rounded and ill-defined. Periostracum pale yellowish brown to dark brown, on the right valve thin and mostly eroded, on the left valve thicker, somewhat wrinkly and persistent. Outside whitish, cream, light yellowish to light brown, occasionally with a few lighter, irregular rays. Inside white, often tinged with pinkish or light purple.



Distribution. Northern Norway (70°N), Faroe, British Isles, North Sea, Atlantic coast southward to Mauritania (19°N); throughout the Mediterranean.

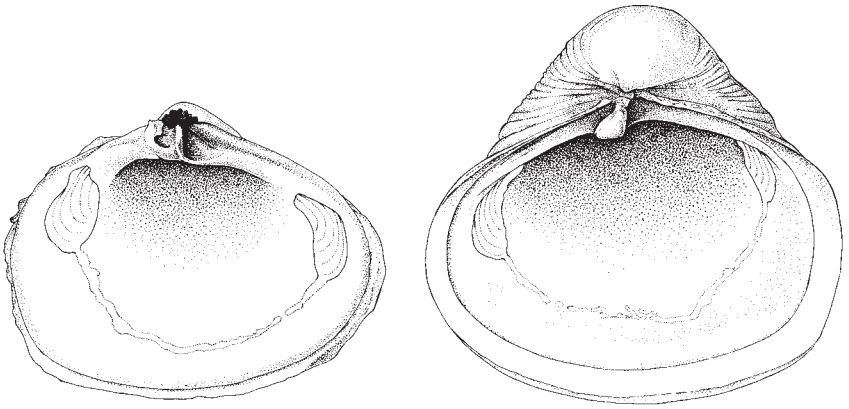
Biotope. In sandy mud and muddy sand, also with gravel, from 3 to about 100 m, common and quite ubiquitous.

Remarks. This is a northern species which is only present in West Africa the regions with permanent or nearly permanent upwelling; in the tropics, it is entirely replaced by *C. granum* Cosel, 1995 (see next entry). Within its European range, where there is no competition with *C. granum*, *C. gibba* can be variable in shape. A shortened form, which resembles *C. granum* but grows larger, was named *C. curta* Locard, 1886. On the Mauritanian coast, where both species occur sympatrically, there are no intermediates, and *C. gibba* is found only in its normal more triangular form.



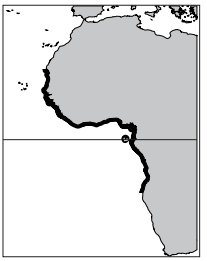
18.17. *Corbula (Varicorbula) gibba* (Olivi, 1792). A-C, Mauritania, 20°42′N, 17°18′W, 42 m (12.4 mm). D-G, Mauritania, 21°54′N, 17°01′W, 27-35 m (8.0 mm). H-I, Port-Etienne (now Nouadhibou), Mauritania, 20°20′N, 16°22′W, 10 m (7.7 mm). J, same locality (8.9 mm). K-M, Mauritania, 19°12′N, 16°40′W, 47 m (8.6 mm).

Corbula (*Varicorbula*) *granum* Cosel, 1995



18.18. Off Gorée, Senegal, 132 m (holotype lv, 6.4 mm; rv, 7.1 mm).

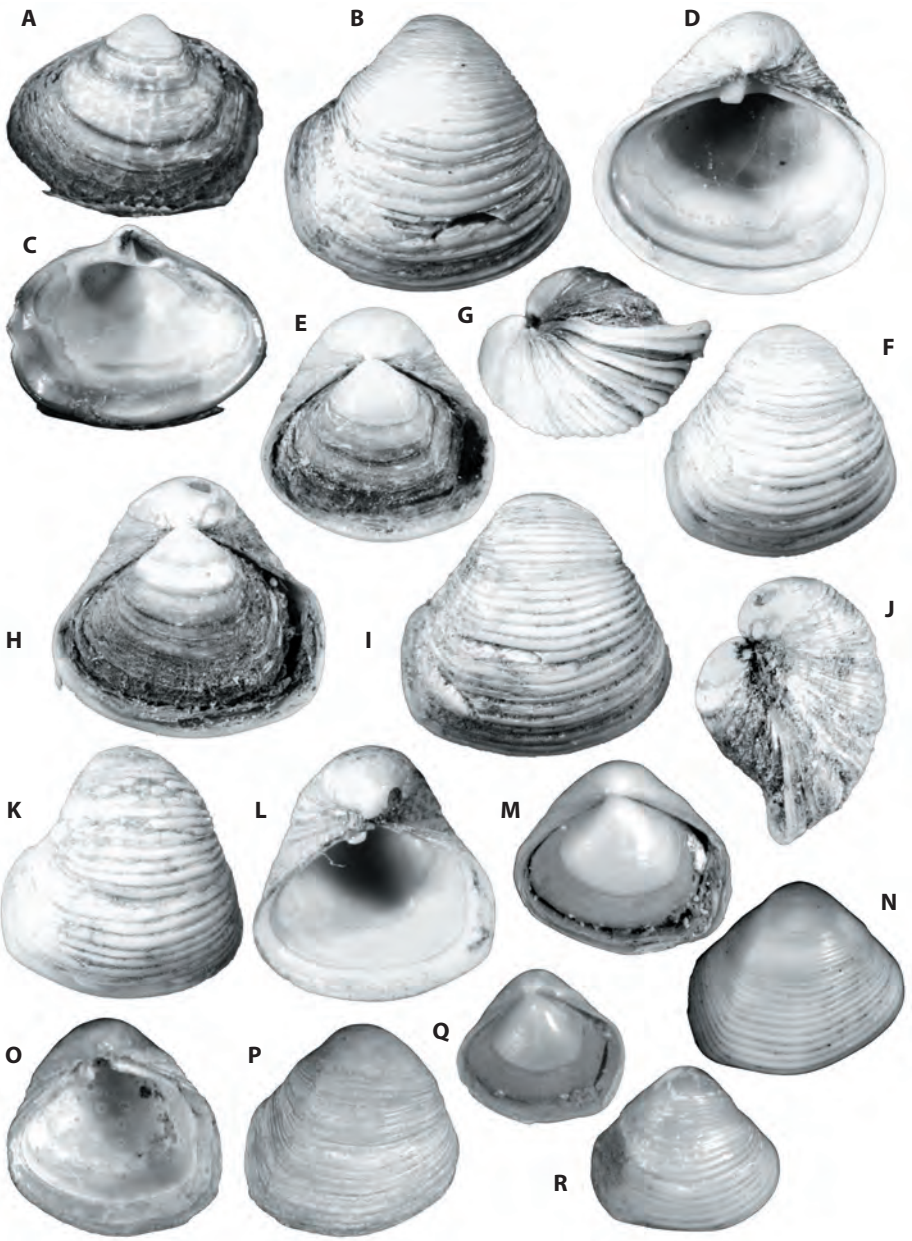
Shell up to 8 mm long, somewhat variable in shape, high-oval-trigonal, rather thick and solid, very inflated, with rounded anterior margin, tapering posterior part and narrowly rounded posterior margin. Right valve much larger, often higher than long and very much more inflated than left valve and considerably overlapping it. Beaks slightly in front of to slightly behind the vertical midline. Surface of the right valve with numerous, close-set, strong commarginal cords, also on the umbonal part. Left valve with growth lines only and few very faint radial lines. Posterior angle rounded and ill-defined. Periostracum pale yellowish brown to dark brown, on the right valve thin and mostly eroded, on the left valve thicker, somewhat wrinkly and persistent. Outside whitish, cream, light yellowish to light brown. Inside white, often tinged with pinkish or light purple.



Distribution. Mauritania (Cap Blanc) to southern Angola (Praia Amelia, Namibe province); São Tomé.

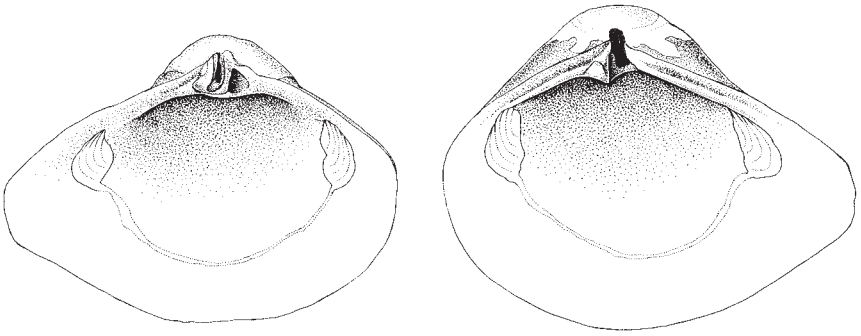
Biotope. In sandy mud and muddy sand, also with gravel, from 3 to about 100 m, common in Mauritania, Senegal and Angola, uncommon in the tropical zone.

Remarks. This species is distinguished from *Corbula gibba* by its smaller size and the exceptionally short, high and inflated shell, especially of the right valve.



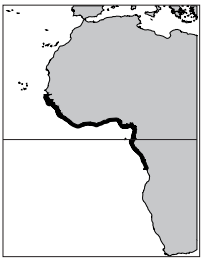
18.19. *Corbula (Varicorbula) granum* Cosel, 1995. A-D, off Gorée, Dakar region, Senegal, 132 m (holotype, 7.1 mm). E-G, same locality (paratype, 5.0 mm). H-J, same locality (paratype, 5.8 mm). K-L, S of Gorée, Dakar, Senegal, 110-112 m (5.0 mm l. x 5.7 mm ht). M-N, Ilha de São Tomé, 0°25.3'N, 6°40.1'E, 50 m (4.5 mm). O-P, Gabon, 2°34.1'S, 9.00'E, 120 m, drilling site "N'Kondo 1" (4.7 mm). Q, Ilha de Luanda, Luanda prov., N-Angola, 90 m (3.5 mm). R, same locality (4.0 mm).

Potamocorbula adusta (Reeve, 1844)



18.20. Côte d'Ivoire, beach between San Pedro and Tabou (lv,18.9; rv, 20 mm).

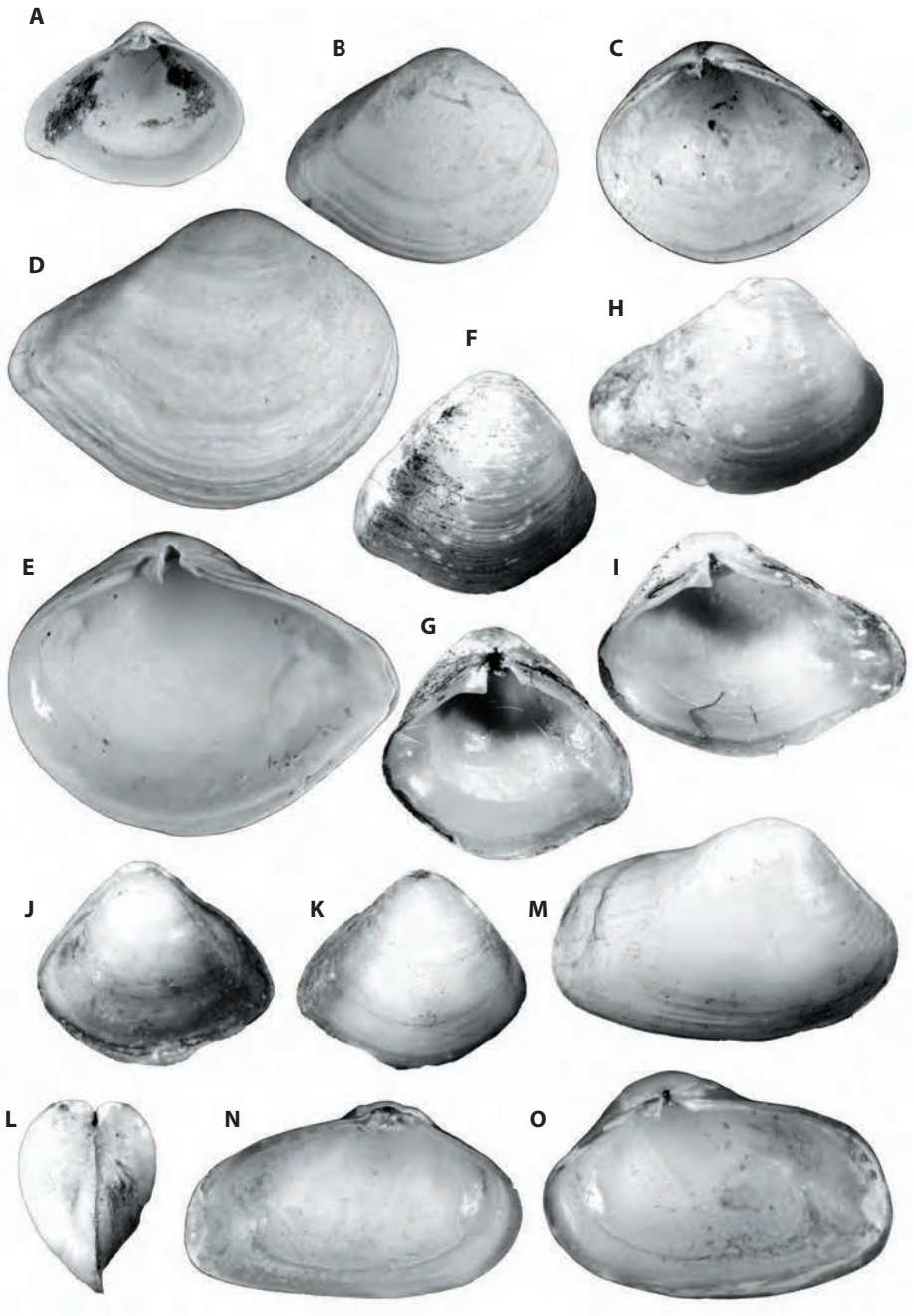
Shell up to 20 mm long, very variable in outline, more or less suboval-trigonal, rather thin but solid, inflated, with rounded to narrowly rounded anterior margin, tapering posterior part and narrowly rounded posterior margin. Right valve larger and slightly more tumid than left valve and slightly overlapping it. Surface smooth, with growth lines only. Posterior angle rounded, but well marked. Periostracum rather thin but strong, greenish brown, on the ventral part darker, occasionally eroded on the beaks. Pallial sinus not well marked. Outside white to brownish, occasionally purplish pink. Inside white to pale purplish.



Distribution. Mauritania (subfossil only); Senegal (Casamance) to the Congo Estuary (Banana, Congo Kinshasa) and northern Angola (Barra do Cuanza, Luanda).

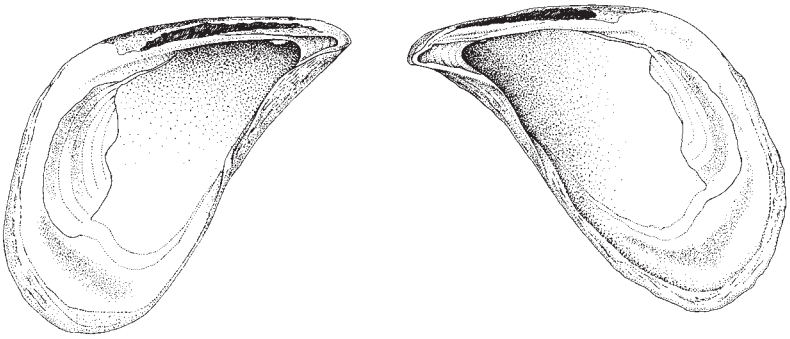
Biotope. In sandy mud, in lagoons, estuaries, inlets and creeks with seasonal salinity changes, in shallow water, locally common.

Remarks. This species is characterized by its smooth exterior and the peculiar narrow chondrophore in the left valve with small tooth behind it (see drawing). Huber (2010) placed it in the genus *Potamocorbula* from India. Another suitable subgenus might be *Panamicorbula* Pilsbry, 1932, but this question could only be solved in a worldwide revision of the family with DNA analysis. This is *C. trigona* Hinds, 1843 (*non* Römer, 1836), *C. procera* Reeve, 1844 and *C. assiniensis* Chaper, 1885. Huber (2010) reinstated *Corbula adusta* Reeve, 1844 as the valid name for this species, which was described in error from New Zealand; however, the type lot in BMNH, which coincides with this species, bears the label "West Africa" (*fide* Huber). Although the name *adusta* has never been in use since Reeve, it has to be used and cannot be declared *nomen oblitum* because the alternative name *assiniensis* does not meet the ICZN requirement of at least 25 different instances of usage. For details on ecology and population dynamics, see Maslin (1986, 1989).



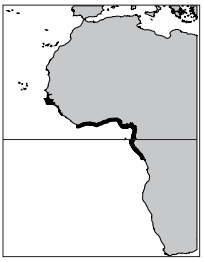
18.21. *Potamocorbula adusta* (Reeve, 1844). **A**, Ziguinchor, Fleuve Casamance, Senegal, 3-5 m (8.4 mm). **B**-**C**, same locality (10.5 mm). **D**-**E**, Assinie-Mafia, eastern Côte d'Ivoire near Ghana border, beach drift W of mouth of Lagune Abi (20.4 mm). **F**-**G**, Abidjan region, Côte d'Ivoire (9.9 mm). **H**-**I**, same locality (11.7 mm). **J**-**L**, Ichoa, Bénin (8.8 mm). **M**-**O**, Banana Creek, Congo Kinshasa (19.6 mm).

Mytilopsis africana (Van Beneden, 1835)



18.22. Lagune d'Azuretti, Côte d'Ivoire, on mangroves (23.4 mm).

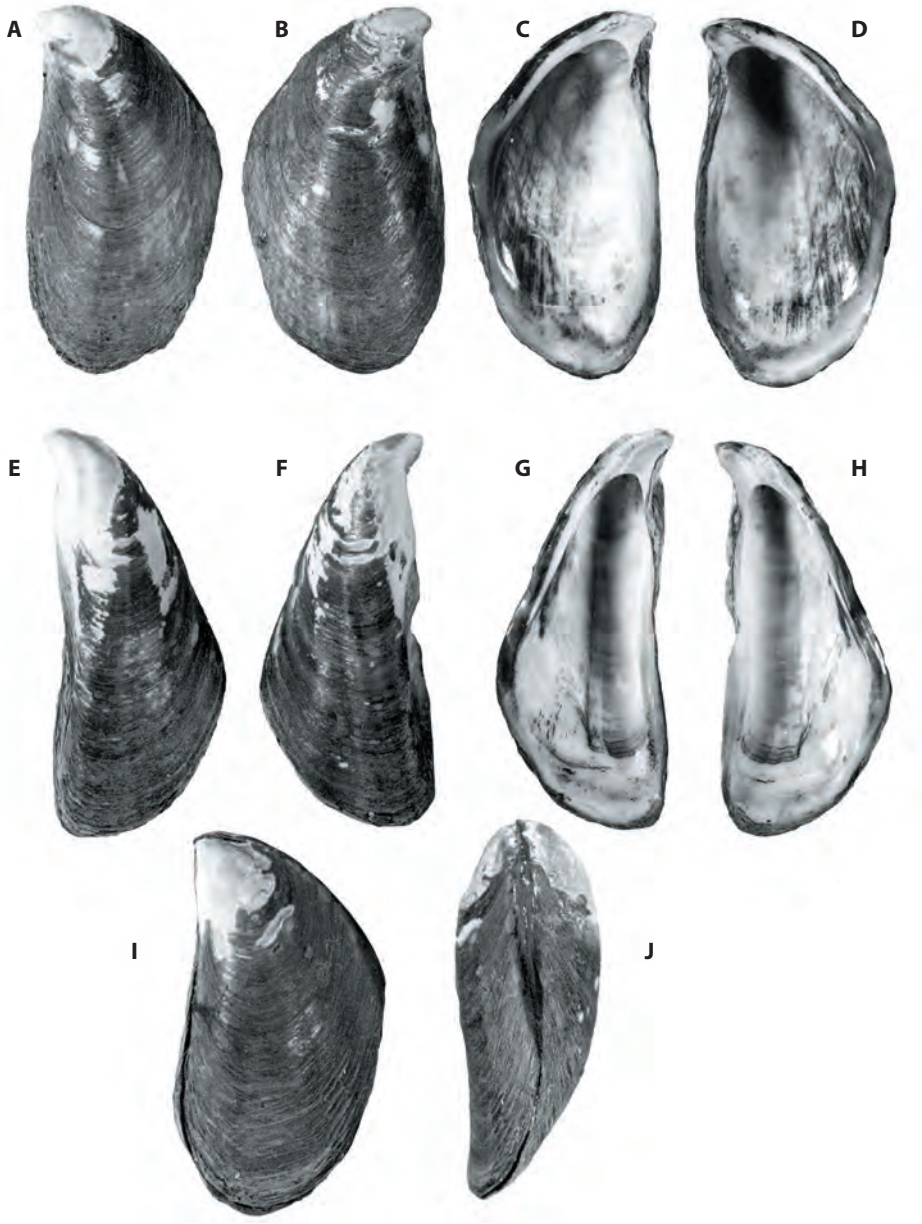
Shell up to 30 mm long, very variable in shape, with general outline like a mussel, rather solid, inflated. Dorsal margin convex, behind the ligament with a rounded angle. Posterior margin well rounded, ventral margin straight to more or less concave. Beaks terminal and mostly bent downwards. Surface with coarse to very coarse, irregular growth lines and still more accentuated growth stages. Periostracum quite strong, dark brown and slightly wrinkly, in adult specimens eroded on the umbonal area. Outside greyish or dirty whitish with brownish zones. Inside greyish white, often with bluish or brownish hue.



Distribution. Known from Senegal (Casamance) and Côte d'Ivoire to the Congo.

Biotope. Attached with byssus on hard substrate such as rocks, stones, mangrove roots, shells, and on secondary hard substrate such as wharfs, jetties and ship hulls, in lagoons and estuaries with reduced salinity and regular seasonal influence of fresh water, locally abundant.

Remarks. This species is mostly known as *Congeria africana, Dreissena africana*, or *Dreissensia africana*, the latter name being a misspelling. The genus *Dreissena* Van Beneden, 1835 lacks the additional myophore under the septum. *Dreissensia gibberosa* Preston, 1909, *Dreissensia lacustris* Morelet, 1860 and *Dreissensia ornata* Morelet, 1885 are held as separate by Pilsbry & Bequaert (1927) but might be synonyms (see Binder 1968). Similar species from the West Atlantic are *Mytilopsis leucophaeata* (Conrad, 1831) and *M. sallei* (Récluz, 1849).



18.23. *Mytilopsis africana* (Van Beneden, 1835). A-D, Lagune Azuretti, Côte d'Ivoire (28.1 mm). E-H, same locality (23.1 mm). I-J, same locality (28.6 mm).

Family **PHOLADIDAE**
- Genus ***Pholas*** Linnaeus, 1758
  - Subgenus ***Thovana*** Gray, 1847 – 2 species
- Genus ***Barnea*** Leach *in* Risso, 1826
  - Subgenus *Barnea* Leach *in* Risso, 1826 – 1 species (not treated)
  - Subgenus ***Anchomasa*** Leach, 1852 – 2 species
- Genus ***Talona*** Gray, 1842 – 1 species
- Genus ***Martesia*** G.B. Sowerby I, 1824 – 1 species
- Genus ***Parapholas*** Conrad, 1848 – 1 species
- Genus ***Pholadidea*** Turton, 1819 – 2 species
- Genus ***Jouannetia*** Desmoulins, 1828
  - Subgenus ***Pholadopsis*** Conrad, 1849 – 2 species

Family **TEREDINIDAE**
- Genus ***Lyrodus*** Gould, 1870 – 2 species
- Genus ***Psiloteredo*** Bartsch, 1922 – 1 species
- Genus ***Teredora*** Bartsch, 1921 – 1 species
- Genus ***Teredothyra*** Bartsch, 1921 – 1 species
- Genus ***Uperotus*** Guettard, 1770 – 1 species
- Genus ***Bankia*** Gray, 1842 – 3 species
- Genus ***Nototeredo*** Bartsch, 1923 – 1 species

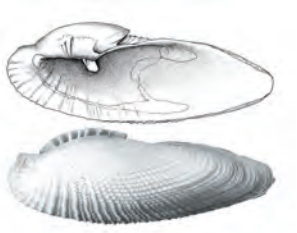
Superfamily Pholadoidea

The Pholadoidea are highly specialized boring bivalves which perforate mechanically firm mud and clay, peat, wood, plant products, rather soft rock, coral and shells. Species can be transported over large distances with driftwood. They include the medium-sized to large Pholadidae or piddocks, most of which are benthic borers on clay or soft rock, and the highly specialized Teredinidae, or shipworms, which were a major hazard to wooden ship hulls and infrastructures. A third family, the Xylophagaidae, comprises species which superficially resemble the Teredinidae but lack pallets and are more closely related to (or considered a subfamily of) the Pholadidae. Xylophagaidae are not recorded so far in shallow environments of West Africa.

Family PHOLADIDAE

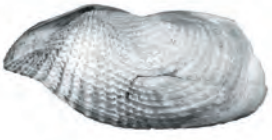
Shells small to large, globular to very elongate, normally thin and more or less fragile, narrowly to widely gaping anteriorly, this pedal gape in adult specimens of many species closed by the callum, a non sculptured calcareous layer. Surface with prominent commarginal and often also radial sculpture, which is most developed on the anterior part and which serves as a file or cutting tool for boring. Anterior part in many species separated by an umbonal-ventral sulcus from the posterior part, the disk. Shells with one to four accessory plates which are more or less developed and which are situated over the shell. Thin, blade-like, curved projection, known as apophysis, in the umbonal cavity of many species. Pallial sinus well-developed. Siphons normally fused, fully or only partly retractible, mostly situated in a periostracal sheath. Foot rounded and serving as a sucker during the boring process. There are 75 species worldwide, at least 11 of them in West Africa; however the pholadids from that region are still very imperfectly known, which is underlined by three recently discovered species.

Genus *Pholas* Linnaeus, 1758. Shells medium-sized to large, elongate to very elongate, thin and brittle, anteriorly narrowly gaping with rounded margin or broadly gaping with obliquely truncated margin. Umbos well anterior to the vertical midline. Surface with strong, commarginal lamellae or ridges bearing spines or scales an the anterior part. Umbonal reflection double, connected by vertical septae between them. Three dorsal accessory plates.



Subgenus *Thovana* Gray, 1847. Shells medium-sized, elongate, with rounded anterior margin, protoplax longitudinally divided in two plates.

Genus *Barnea* Leach *in* Risso, 1826. Shells medium-sized, elongate, thin and fragile, anteriorly widely gaping with obliquely truncated anterior margin or narrowly gaping with rounded margin. Umbos well in front of the vertical midline. Surface



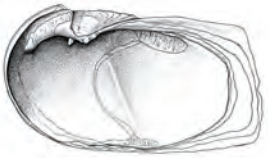
with commarginal ridges or lamellae and radial ribs over the whole shell or the anterior and middle part. Umbonal reflection simple, without septae. One dorsal accessory plate.

Subgenus *Anchomasa* Leach, 1852. Shells small to medium-sized, elongate, with tapering anterior margin and rounded or obliquely to vertically truncated posterior margin, widely gaping anteriorly and posteriorly. Five species known from the eastern Atlantic and South Africa. The nominal subgenus *Barnea* (*Barnea*) has a rounded anterior and posterior margin, only narrowly gaping at both ends.

Genus *Talona* Gray, 1842. Shells medium-sized, elongate, anteriorly closed, posteriorly gaping. Anterior and posterior margin rounded. Surface with commarginal lamellae and radial ribs, postero-dorsally obsolete. Mesoplax consisting of two small pieces. Posterior end moderately gaping and provided with an elastic corneo-calcareous appendix consisting of four inflated lobes (two on each valve) which are extremely fragile when dry. Pallial sinus deep, narrow and V-shaped.

Genus *Martesia* G.B. Sowerby I, 1824. Shells small to medium-sized, short and Teredo-like in juvenil stage, elongate when adult, thin, young specimens anteriorly widely gaping, in adult specimens, the gape is closed by a calcareous callum. Shells with three accessory plates, protoplax lacking. Surface with dense, commarginal lamellae, denticulated on the anterior part which is separated from the posterior part by an umbonal-ventral sulcus. The species are wood-borers.

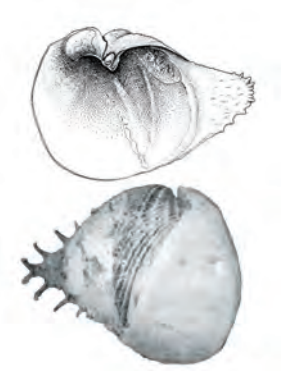
Genus *Parapholas* Conrad, 1848. Shells medium-sized to large, oblong, rather thin, anteriorly widely gaping when young, in adults gape closed by a callum, posteriorly closed. Anterior and posterior margin rounded. Surface divided into three sections: the anterior part with dense, denticulate, commarginal lamellae, the middle part with commarginal ridges and the posterior part with overlapping plates mostly of periostracum material. Three accessory plates: mesoplax, metaplax and hypoplax. The species are rock-borers.



Genus *Pholadidea* Turton, 1819. Shells medium-sized, elongate-oval to rectangular, anteriorly widely gaping when young and closed by a callum in adult stage, posteriorly closed, with rounded margin. Beaks anterior to the vertical midline. Surface with commarginal, dentate lamellae on the anterior part and smooth,

irregular, often indistinct ridges on the posterior part. Protoplax absent, other accessory plates variable.

Genus *Jouannetia* Desmoulins, 1828. Shells small to medium-sized, globose, equivalve in juvenile stage, inequivalve when adult, thin and fragile. Immature specimens widely gaping anteriorly and closed posteriorly. Fully grown specimens inequivalve with anterior callum, which in the right valve is as usual but in the left valve enlarges considerably, overlapping the callum of the right valve as well as the umbos and covering the anterior adductor. Right valve prolonged by a siphonoplax with smooth, dentate or spinose margin. Posterior adductor attached to special laminae or the shell directly. Surface except the callum with dense, commarginal lamellae and an umbonal-ventral sulcus. Species bore in soft rock and shale.



Subgenus *Pholadopsis* Conrad, 1849. Shells small to medium-sized, globose to short-oval, with rather small mesoplax, always with serrated or spinose margins. Posterior adductor scar attached directly to the valves. Small mesoplax, in adults fused to the callum. Haga & Kase (2008) recently published on this subgenus.

Species treated (11)

Pholas (Thovana) campechiensis Gmelin, 1791; *Pholas (Thovana) bissauensis* Cosel & Haga, 2018; *Barnea (Anchomasa) truncata* (Say, 1822); *Barnea (Anchomasa) ghanaensis* Huber, 2018; *Talona explanata* (Spengler, 1792); *Martesia striata* (Linnaeus, 1758); *Parapholas branchiata* (Gould, 1845); *Pholadidea loscombiana* Turton, 1819; *Pholadidea eborensis* Cosel & Haga, 2018; *Jouannetia (Pholadopsis) vignoni* P. Fischer, 1862; *Jouannetia (Pholadopsis) uncinata* Cosel, 1995.

Other species reported in the area (3)

Family Pholadidae

Barnea (Barnea) candida (Linnaeus, 1758). Mauritania, Baie de Cansado (Dautzenberg 1910).

Family Xylophagaidae

Xylophaga africana Knudsen, 1961. Off Equatorial Guinea, 2550 m (Knudsen 1961).

Xylophaga guineensis Knudsen, 1961. Off Equatorial Guinea, 2550 m (Knudsen 1961).

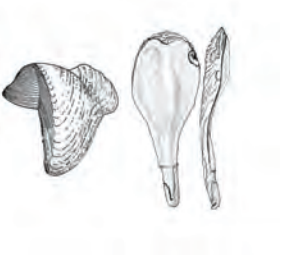
Family TEREDINIDAE

Shells small and reduced, equivalve, brittle, generally about as high as long, anteriorly and posteriorly widely gaping, in form of a curved tongue with a somewhat ear-like projection (the auricle) at the upper part of the posterior margin. Antero-ventral margin with a deep, right-angled notch. Anterior part with dense, regular, commarginal lamellae bearing microscopic denticles, parallel to the notched antero-ventral margin, middle part with broad umbonal-ventral sulcus, posterior part with fine, commarginal lines or with growth lines only. Apophyses

present. The pallets are accessory plates present beside the siphons at the end of the very long, worm-like animal. The teredos are wood-borers and line their bore-holes with a more or less thick layer of calcareous shell material. The siphons are at the small opening of the bore hole into the water, the hole is closed by means of the pallets when the siphons are retracted. The shells of Teredinidae are very variable depending on the ecological conditions and the age, their use for identification is therefore very limited. Conversely, the pallets are essential for species and genus identification. Because of their habitat in all kind of wood and their rapid growth, the shipworms are a big economic problem, especially in the tropics, and in spite of several good publications on them, they are still very little known in many regions. Sixty-six species are considered valid worldwide; many of them live also in brackish water and can tolerate considerably low salinities. From tropical West Africa, 16 taxa are listed by Moll & Roch (1937), 18 by Monod *et al.* (1952) (some of them being synonyms) and 14 by Rancurel (1971, Côte d'Ivoire only). Turner (1966) reported 10 species, but it is not known how many of these are really breeding on the West African coast and how many have been transported there by driftwood only. Four species are present in the Paris Museum, the remaining species could be treated only by using the literature (Turner 1966 and Monod *et al.* 1952) The diagnoses of the genera are largely taken from Turner (1966). The drawings are reproduced from Turner (1966) who, in the early phase of preparation of this book, kindly granted her permission. In some species, the shells remain unknown and only the pallets are figured. For anatomy and ecology of some West African species, see Rancurel (1971); some further comments on their distribution and biology are given by Moll & Roch (1937) and Moll (1939).

Genus *Lyrodus* Gould, 1870. Shells small, as described in the family chapter, with no diagnostic value for the genus. Pallets with calcareous base and pronounced brown to blackish periostracal cap which can readily be separated from the base; calcareous portion narrowly to broadly rounded at the distal end and generally with growth lines. Upper margin of the periostracal cap straight, broadly curved or with lateral horns, cap solid or with bubble-like cavity which usually breaks open and is filled with debris in old specimens.

Genus *Psiloteredo* Bartsch, 1922. Shells with moderate to large, ear-shaped and usually flaring posterior part. Pallets solid, almost entirely calcareous, elongate-oval to broad, on a short stalk. Blade at the base thick, becoming thin at the upper margin, its inner surface slightly concave, outer surface convex. Outer surface with a moderate to deep, thumbnail-like depression or a slight depression with two finger-like projections extending from it in the young stage, the pallets becoming paddle-shaped in the adult.

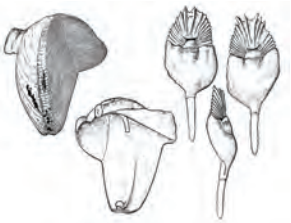


Genus *Teredora* Bartsch, 1921. Shells rather large, high, with small posterior ears which are considerably bent upwards. Pallets solid, almost entirely calcareous, oval to broadly oval, on a short stalk.

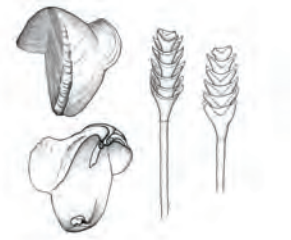
Blade thick at the base, thin at the upper margin, outer surface convex, inner surface concave. Outer surface with a small to large, deep, thumbnail-like depression which is marked with broadly curved, commarginal growth lines. Thickened areas at the base and on the sides of the depression smooth.

Genus *Teredothyra* Bartsch, 1921. Shells very small. Pallet blades composed of two elements: a basal portion forming a broad to elongate cup and a secondary, cone-like inner cup which is divided medially. The stalk of the pallet, which is sheathed by the basal cone, extends into the blade only as far as the base of the inner cup. This arrangement is best seen in young specimens using transmitted light.

Genus *Uperotus* Guettard, 1770. Shells more or less high, with typical or very small, high, posterior "ear". Pallets rather short to elongate, oval to rectangular, on a short, heavy stalk. Basal part of the blade nearly smooth, upper part with typical, pronounced, radiating ribs.



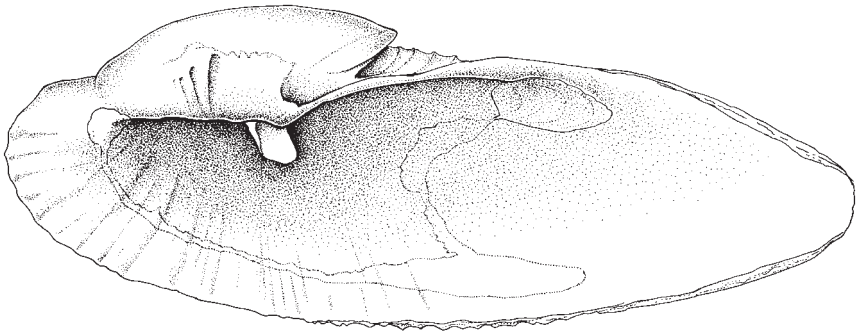
Genus *Bankia* Gray, 1842. Shells variable, as in *Teredo* and other genera, with no characters for generic distinction. Pallets very elongate, blades composed of numerous, cone-like segments built upon central stalk. Base of cones calcareous, with periostracal covering extending as a border which is variable in width, may be smooth, fringed or prolonged laterally. The pallet blade increases in length by addition of new segments at the upper end.



Genus *Nototeredo* Bartsch, 1923. Shells as in *Teredo* and *Bankia*. Pallets elongate-oval to broadly-oval. Blade thin, convex on the outer surface and concave on inner surface, composed of soft, friable, calcareous material laid down in closely packed segments separated by thin layers of periostracum which may extend laterally as small awns. Entire surface of the blade covered with a thin layer of periostracum. Stalk short to very short.

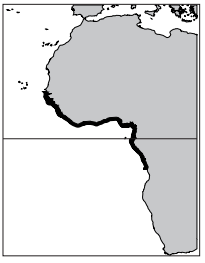
Species treated (10)
Lyrodus pedicellatus (Quatrefages, 1849); *Lyrodus dicroa* (Roch, 1929); *Psiloteredo senegalensis* (Blainville, 1824); *Teredora malleolus* (Turton, 1822); *Teredothyra excavata* (Jeffreys, 1860); *Uperotus lieberkindi* (Roch, 1931); *Bankia carinata* (Gray, 1827); *Bankia anechoensis* Roch, 1929; *Bankia bagidaensis* Roch, 1929; *Nototeredo knoxi* (Bartsch, 1917).

Pholas (*Thovana*) *campechiensis* Gmelin, 1791



19.1. Ngojobil, Senegal (70 mm).

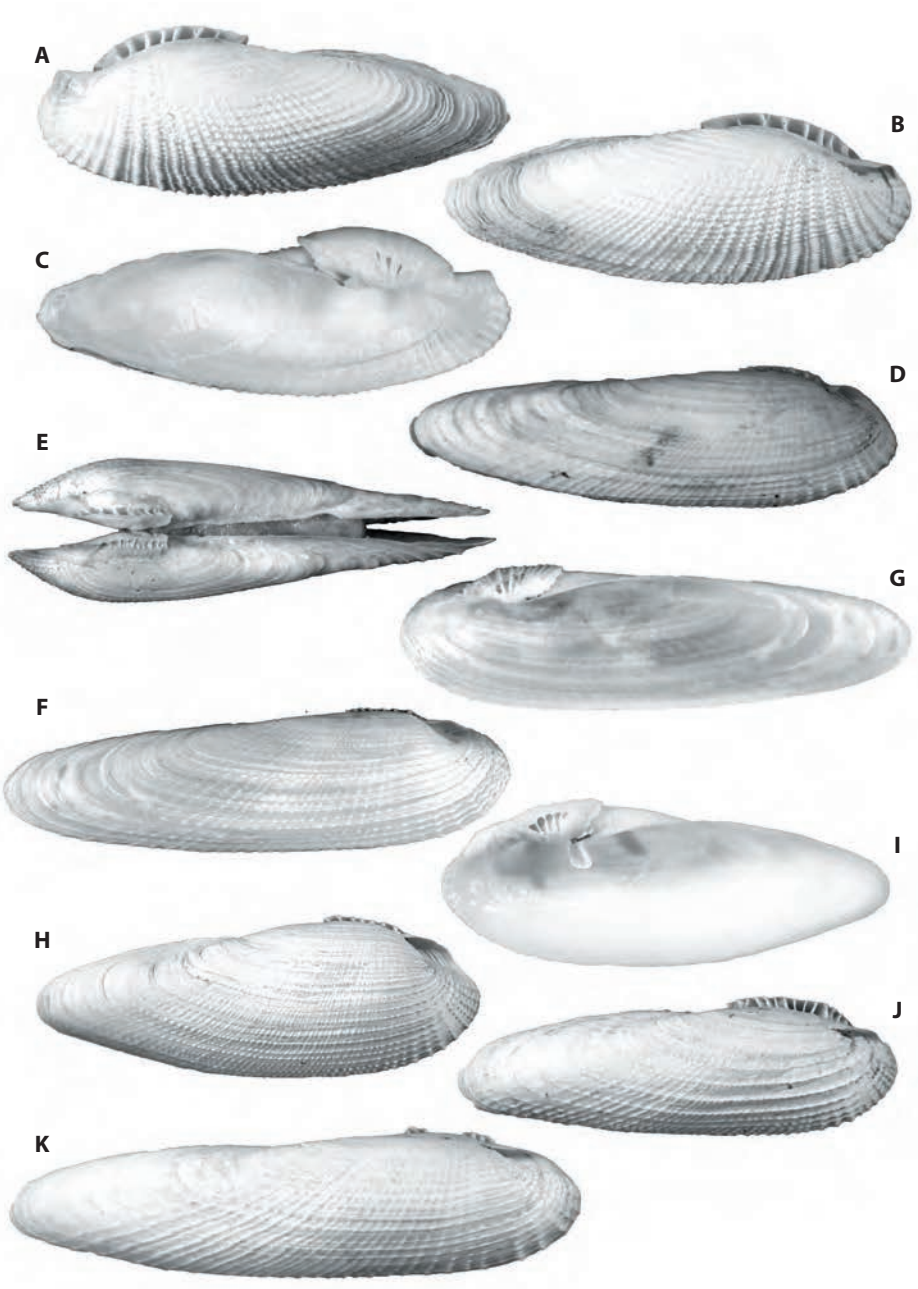
Shell up to 90 mm long (American specimens up to 110 mm), somewhat variable in length/width ratio, very elongate, inflated, thin and fragile, narrowly gaping anteriorly and more widely gaping posteriorly. Anterior margin rounded, posterior part gently tapering, posterior margin narrowly rounded. Umbos at the end of the anterior fourth of the valves. Umbonal reflections double, the inferior one being free on the antero-dorsal margin but firmly adhering to the umbos and the immediate posterior margin, the upper reflection linked to the lower one by about 10-14 septae. Surface with dense, irregular, prominent, commarginal lamellae and irregular, radial ribs. Sculpture present on the whole shell, but most prominent on the anterior half, becoming weaker on the posterior half. Pallial sinus deep and more or less narrowly rounded at its extremity. Apophysis small, short and moderately narrow. Outside and inside dirty white.



Distribution. Eastern Atlantic: Senegal (Petite Côte) to northern Angola (Luanda). Western Atlantic: North Carolina to Florida, Gulf of Mexico, throughout the Caribbean, South America southward to Uruguay.

Biotope. Boring in firm mud, clay, peat, wood, limestone and other soft rock, in shallow water, uncommon. Tolerates salinity reductions in a very limited amount.

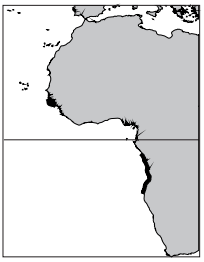
Remarks. Empty valves are occasionally washed ashore on certain beaches, but many of them are broken.



19.2. ***Pholas (Thovana) campechiensis*** **Gmelin, 1791. A-C**, Ngojobil, Sénégal (71.1 mm). **D-E**, Senegal, old coll. MNHN (67.8 mm). **F-G**, Port-Gentil, Gabon, Pointe de Phare, 0°38'S, 8°42.1'E, beach drift (47.0 mm), leg. C. Chevalier, 1980-1989. **H-I**, Pointe-Noire, Congo Brazzaville, Plage Raffinerie (47.5 mm). **J**, same locality (47.1 mm). **K**, Pointe-Noire region, Congo Brazzaville (59.3 mm).

Pholas (*Thovana*) *bissauensis* Cosel & Haga, 2018

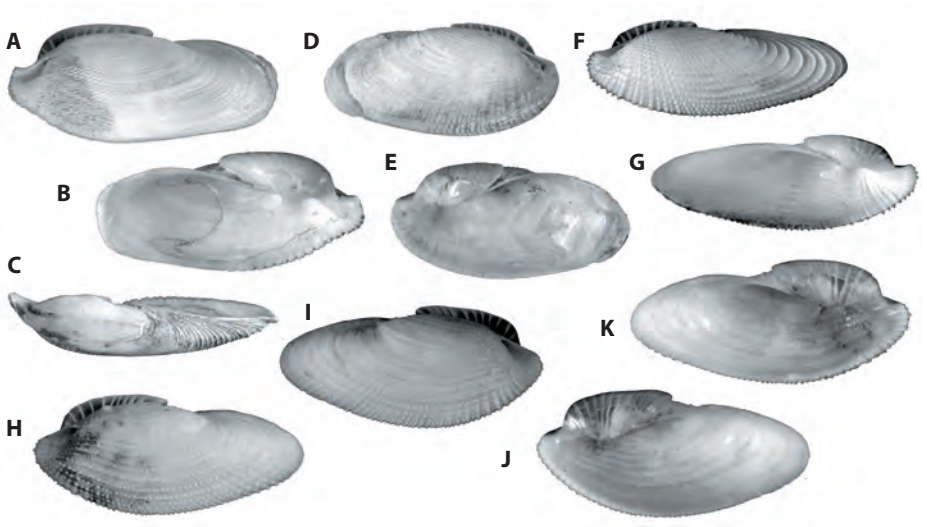
Shell up to 45 mm long, very variable in length/height ratio, rather short to somewhat more elongate, inflated, gaping anteriorly and posteriorly. Anterior margin narrowly rounded, at its upper, antero-dorsal and reflected part more or less sharply bent, posterior part rounded to tapering, posterior margin broadly to more narrowly rounded. Umbos variable, usually at the anterior third of the valves. Umbonal reflections double, the inferior one being free on the antero-dorsal margin but firmly adhering to the umbos and the immediate posterior margin, the upper reflection linked to the lower one by about 10-14 septae. Surface with irregular commarginal lamellae which vary from densely spaced to more distant, and irregular, radial ribs, most prominent on the anterior part. Pallial sinus broad. Apophysis small and rather narrow. Outside and inside white.



Distribution. Yet known from Guinea-Bissau, and from Congo Brazzaville to southern Angola (Porto Alexandre).

Biotope. Known to bore in firm clay and sunken and rotten wood, in shallow water, uncommon. The presence at river mouths and near estuaries indicates a certain tolerance of reduced salinities.

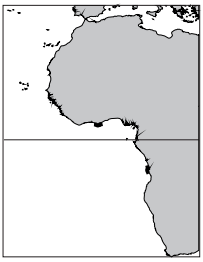
Remarks. This species is distinguished from *Pholas campechiensis* by its smaller size and the shorter and more compact shell, especially by the relation of shell length to length of the upper reflection with the septae, which in *P. bissauensis* is larger and more prominent.



19.3. *Pholas (Thovana) bissauensis* Cosel & Haga, 2018. A-C, W of Ilha de Jeta, Guinea-Bissau, 11°52'N, 18°27'W, 7 m, in firm clay (holotype, 21.2 mm). D-E, same locality (paratype, 19.3 mm). F-G, same locality (paratype, 23.1 mm). H-K, Kouilou River mouth, Congo Brazzaville, 7.5-10 m, mud, in old wood pieces (17.1 mm).

Barnea (*Anchomasa*) *ghanaensis* Huber, 2018

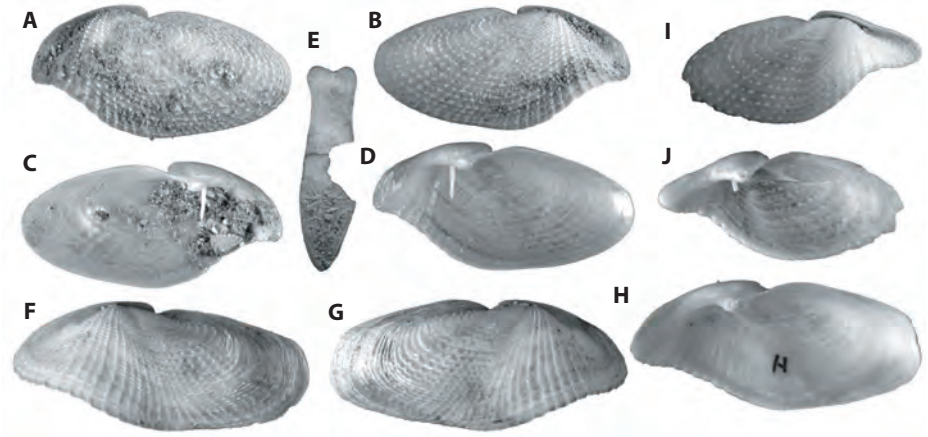
Shell up to 20 mm long, elongate, inflated, very thin and fragile, widely gaping anteriorly and posteriorly. Anterior margin tapering to a narrowly rounded angle, posterior margin evenly rounded, rarely somewhat truncated in the middle. Antero-ventral margin at the gape shallowly indented. Umbos in front of the vertical midline. Umbonal reflections long and simple, in their entire length free, but very close to the umbos. Surface with dense, irregular commarginal lamellae, on the anterior part strong and more lamellose, bearing short spines, on the posterior part gradually becoming somewhat weaker and more densely spaced. There are also radial ribs which cross the commarginal ridges at the spines. Apophysis long, very narrow and delicate. Periostracum not seen. Outside and inside white.



Distribution. Known only from Ghana (western part, NE of Secondi-Takoradi) and a valve from N-Angola (Praia São Tiago, Bengo prov.).

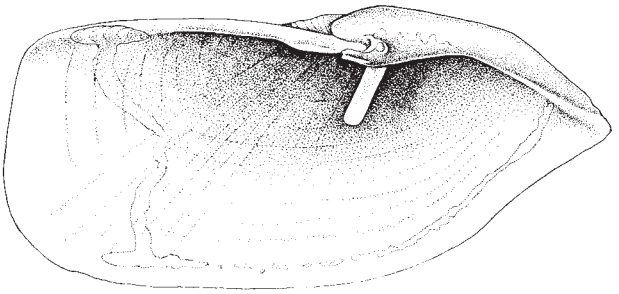
Biotope. Found boring in red sandstone, from 5-10 m, locally common.

Remarks. This is the second known tropical West African *Barnea* (*Anchomasa*). From *B. truncata* it distinguished by its much smaller size, the more elongate shape with rounded and not truncated posterior margin and the fine and narrow apophysis. The umbos are placed less forward, and the anterior part is narrower than in *B. truncata*. In contrast to *B.* (*A.*) *truncata*, *B.* (*A.*) *ghanaensis* lives in hard sandstone; it is yet only known from the two localities Ghana and N-Angola. Another *Barnea* (*Anchomasa*) was recently discovered on the coast of West Sahara (Huber 2010, 2015). Like *B.* (*A.*) *ghanaensis*, it has a rounded posterior margin but is larger and somewhat more elongate. In contrast to *B.* (*A.*) *ghanaensis*, it was found in shallow muddy bottom; it is figured in Ardovini & Cossignani (2004: 292). Because of lack of sufficient material, it will not be named for the moment.



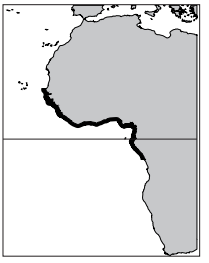
19.4. *Barnea (Anchomasa) ghanaensis* Huber, 2018. **A-D**, Ampenyi, NE of Sekondi-Takoradi, Western Ghana, 5°05'N, 1°25'W, 5-10 m (holotype, 10.5 mm). **E,** protoplax of the holotype (not to scale, 4.8 mm, posterior end upwards). **F-H**, same locality (paratype, 19.2 mm). **I-J**, Praia São Tiago, Bengo prov., N-Angola, sandy bottom, 1-2 m (7.4 mm).

Barnea (*Anchomasa*) *truncata* (Say, 1822)



19.5. Cap Skirring-Diembéring, Casamance, Senegal, on beach (47 mm).

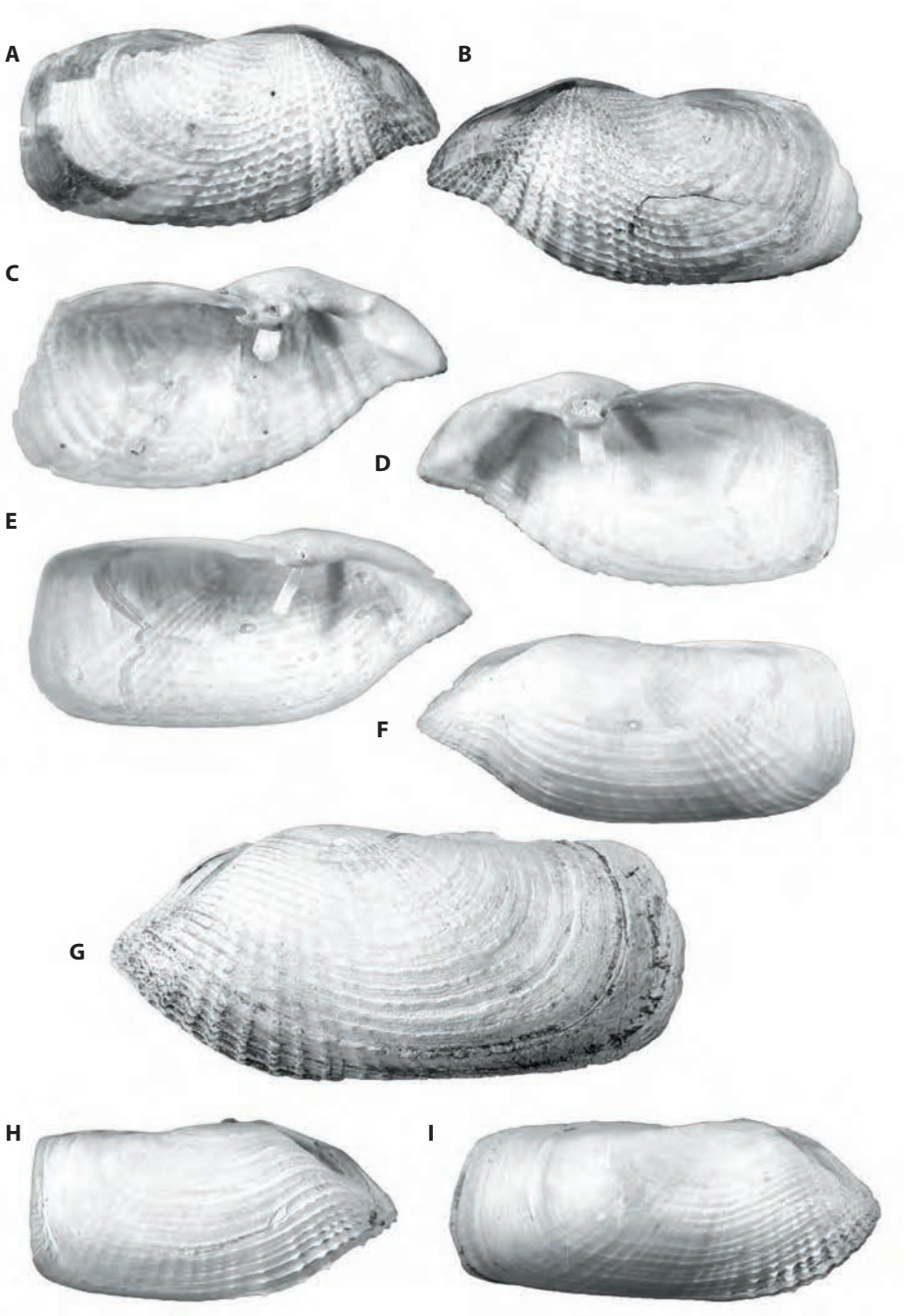
Shell up to 70 mm long, elongate, inflated, thin and fragile, widely gaping anteriorly and posteriorly. Anterior margin tapering to an angle, posterior margin almost vertically truncated, slightly convex to straight. Antero-ventral margin at the gape almost straight, only weakly indented. Ventral margin more or less long, almost straight or slightly convex. Umbos well in front of the vertical midline. Umbonal reflections simple, in their entire length free, but very close to the umbos. Surface with dense, irregular commarginal ridges, on the anterior part strong and lamellose, bearing short spines, on the posterior part gradually becoming weaker and finally obsolete. There are also faint, radial ribs which cross the commarginal ridges at the spines. Periostracum brownish, mostly eroded. Pallial sinus very short and broad. Apophysis variable from rather narrow to broad and spathulate. Outside and inside dirty white.



Distribution. Eastern Atlantic: Senegal (Dakar) to Congo Kinshasa (Banana). Western Atlantic: Massachusetts to Florida, Gulf of Mexico, throughout the Caribbean, South America to Rio de Janeiro and recently also in Argentina (Fiori *et al.* 2012). The species is reported as fossil in South Africa (Kensley & Pether 1986) but not ascertained as living there.

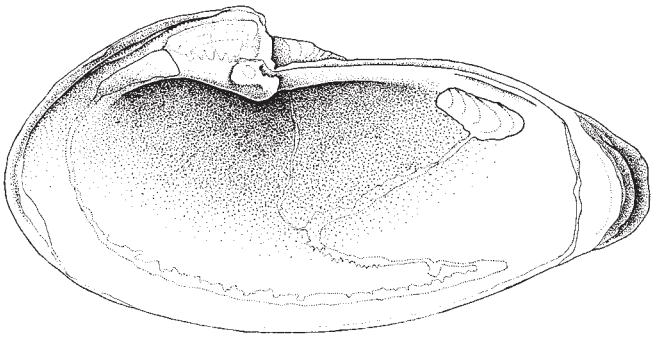
Biotope. Boring in firm mud, clay and peat, rarely in wood, in shallow water, locally not uncommon.

Remarks. Empty valves are occasionally found in the beach drift, but are not common and often broken.



19.6. *Barnea (Anchomasa) truncata* (Say, 1822). **A**-**D**, Bel-Air, Dakar, Senegal (44.5 mm). **E**-**F**, Cap Skirring - Diembéring, S-Casamance, Senegal, beach drift (46.6 mm). **G**, Pointe-Noire, Congo Brazzaville (70.4 mm). **H**, same locality (45.6 mm). **I**, same locality (53.2 mm).

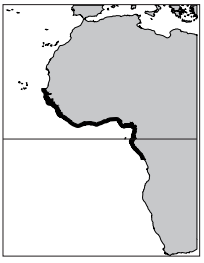
Talona explanata (Spengler, 1792)



19.7. Cacuaco, Bengo, N-Angola, 0-1 m, on beach (50 mm).

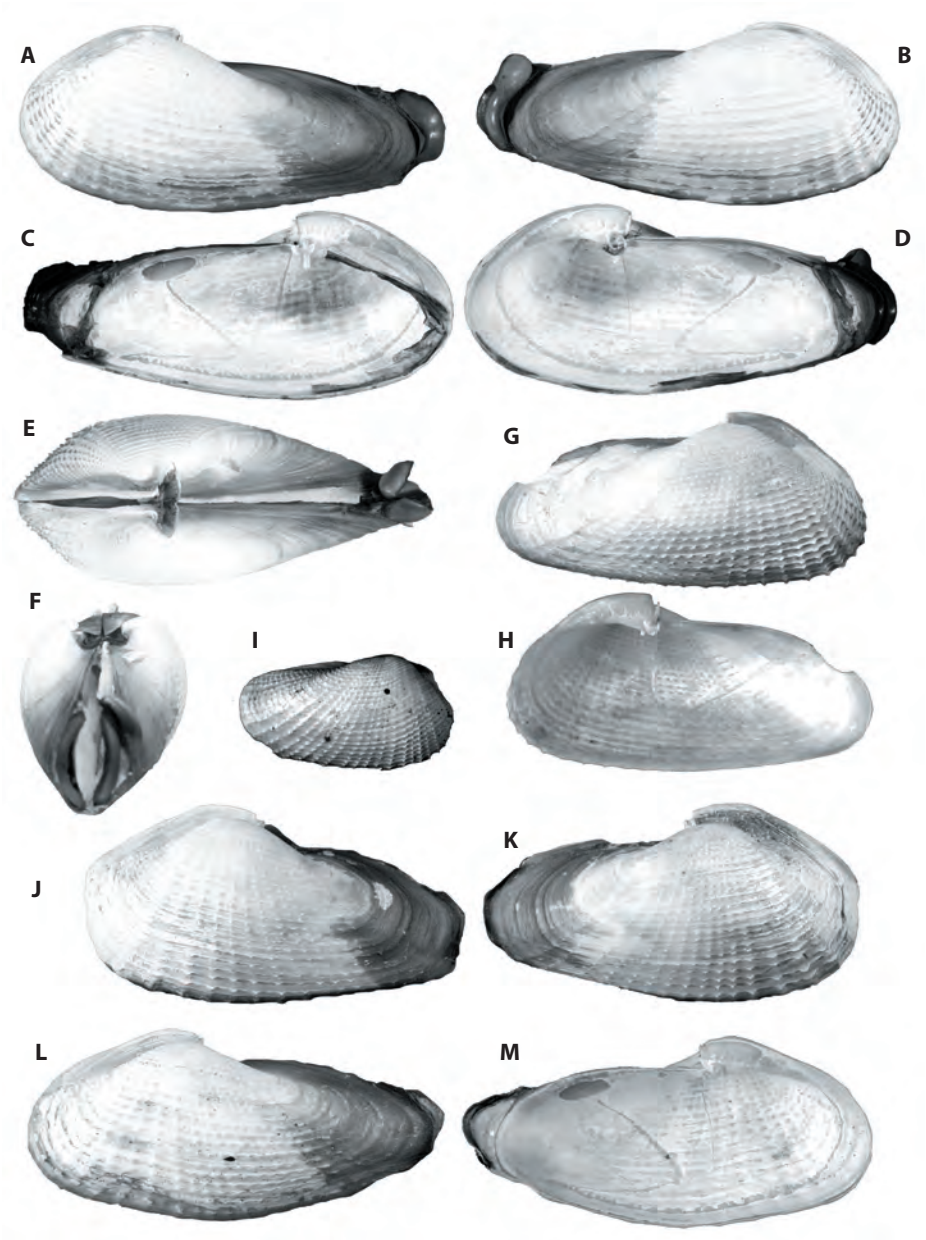
Shell up to 70 mm long (without lobes), slightly variable in outline, elongate, very inflated, thin and brittle, closed anteriorly, only slightly gaping posteriorly. Anterior margin broadly rounded, posterior margin narrowly rounded. Umbos only slightly in front of the vertical midline. Umbonal reflections on the anterior margin erect and on the closing plane of the valves, not folding back over the umbos, abruptly ending just behind the umbonal beaks. Surface with slightly irregular, commarginal lamellae and irregular radial ribs, causing scales where crossing the lamellae. Sculpture absent on the extreme antero-dorsal part and on the postero-dorsal part. Periostracum greenish brown. Outside and inside dirty white.

Distribution. Senegal (Joal, Petite Côte) to northern Angola (Luanda).



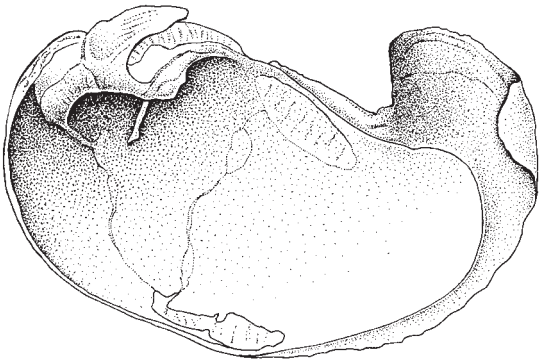
Biotope. Boring in firm, sticky mud and clayey mud, in shallow water (about 1-10 m), common ia areas with this type of substrate. The species may be found together with *Stenocista gambiensis*, *Sinucultellus africanus* and *Rostrimacoma cancellata*.

Remarks. Empty shells are occasionally taken in shrimp trawls and are also cast ashore on some beaches. This is the type species and the only species of the genus *Talona*. *Pholas clausa* Hanley, 1842 is a synonym.



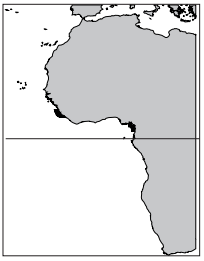
19.8. *Talona explanata* (Spengler, 1792). **A**-**F**, Gambia (65.0 mm). **G**-**H**, Ziguinchor, Casamance River, Senegal, 3-5 m (35.4 mm). **I**, same locality (15.2 mm). **J**-**K**, Grand-Bassam, Côte d'Ivoire, 25 m (48.8 mm). **L**-**M**, Victoria (now Limbe), Cameroon, on beach at Morton Bay (56.1 mm).

Martesia striata (Linnaeus, 1758)



19.9. Freetown, Sierra Leone (12.9 mm).

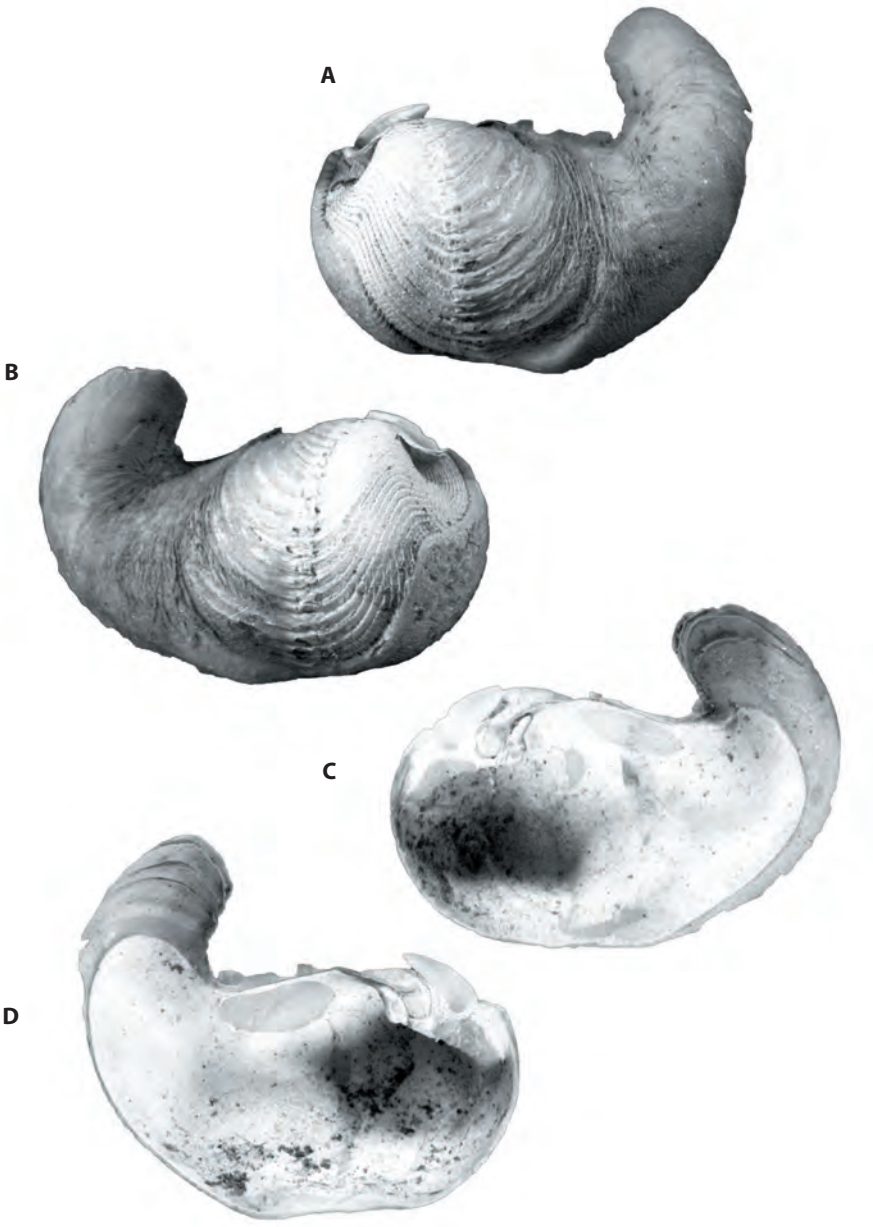
Shell up to 40 mm long (including callum), very variable in shape, short-oval to long and somewhat wedge-shaped, very inflated, thin and fragile, as juveniles widely gaping anteriorly, with narrowly truncated anterior margin; adults closed by a callum; at the posterior margin shells always closed. Umbos placed quite forward, in young specimens near the middle. Umbonal reflection small and adhering the umbos, anteriorly remaining free. A sickle-shaped flange is attached to the anterior part of the reflection and extends around the umbos. Surface with commarginal lamellae, bearing short denticles on the anterior part and separated by an umbonal-ventral sulcus from the posterior part, where the lamellae are smooth. In fast-growing specimens posterior part prolonged, smooth and thin, consisting chiefly of periostracum material. Mesoplax typically irregularly circular. Outside and inside dirty white to cream.



Distribution. Eastern Atlantic: known from Sierra Leone and from Cameroon. Western Atlantic: North Carolina to Florida, Gulf of Mexico, throughout the Caribbean, South America to Rio Grande, Brazil. Eastern Pacific: Lower California to Peru. Also recorded from several localities in the Indo-West Pacific.

Biotope. Boring in driftwood and firm wood, in shallow water.

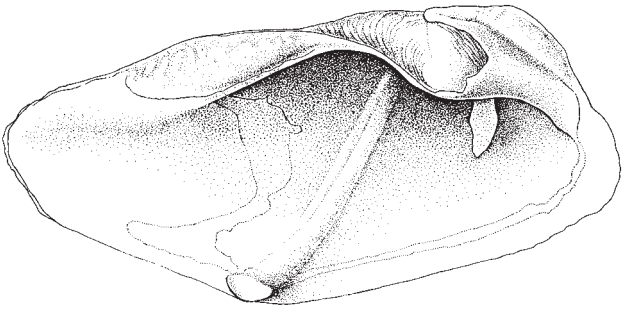
Remarks. Of this widespread tropical species, only one specimen from Freetown, Sierra Leone, is in the collection of the Paris Museum, and another specimen was collected in driftwood on a tidal flat in Victoria (Limbe). Also according to the few literature records, the species seems to be quite rare in the tropical Eastern Atlantic, and specimens recorded from there were most probably collected from driftwood. More species may be present and the mesoplax is a characteristic feature for species delimitation (Holmes *et al.* 2015). *M. striata* has



19.10. *Martesia striata* (Linnaeus, 1758). A-D, off Freetown, Sierra Leone (12.5 mm).

received several synonyms: *Pholas pusillus* Linnaeus, 1758, *P. nanus* Pulteney, 1799, *P. clavata* Lamarck, 1818, *P. tenuistriata* Blainville, 1826, to mention here only a few.

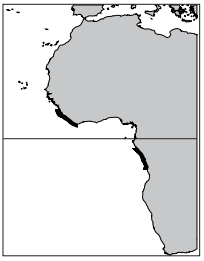
Parapholas branchiata (Gould, 1845)



19.11. Barra do Dande, Bengo, Angola, mud, 0-2 m (juvenile specimen 15.1 mm).

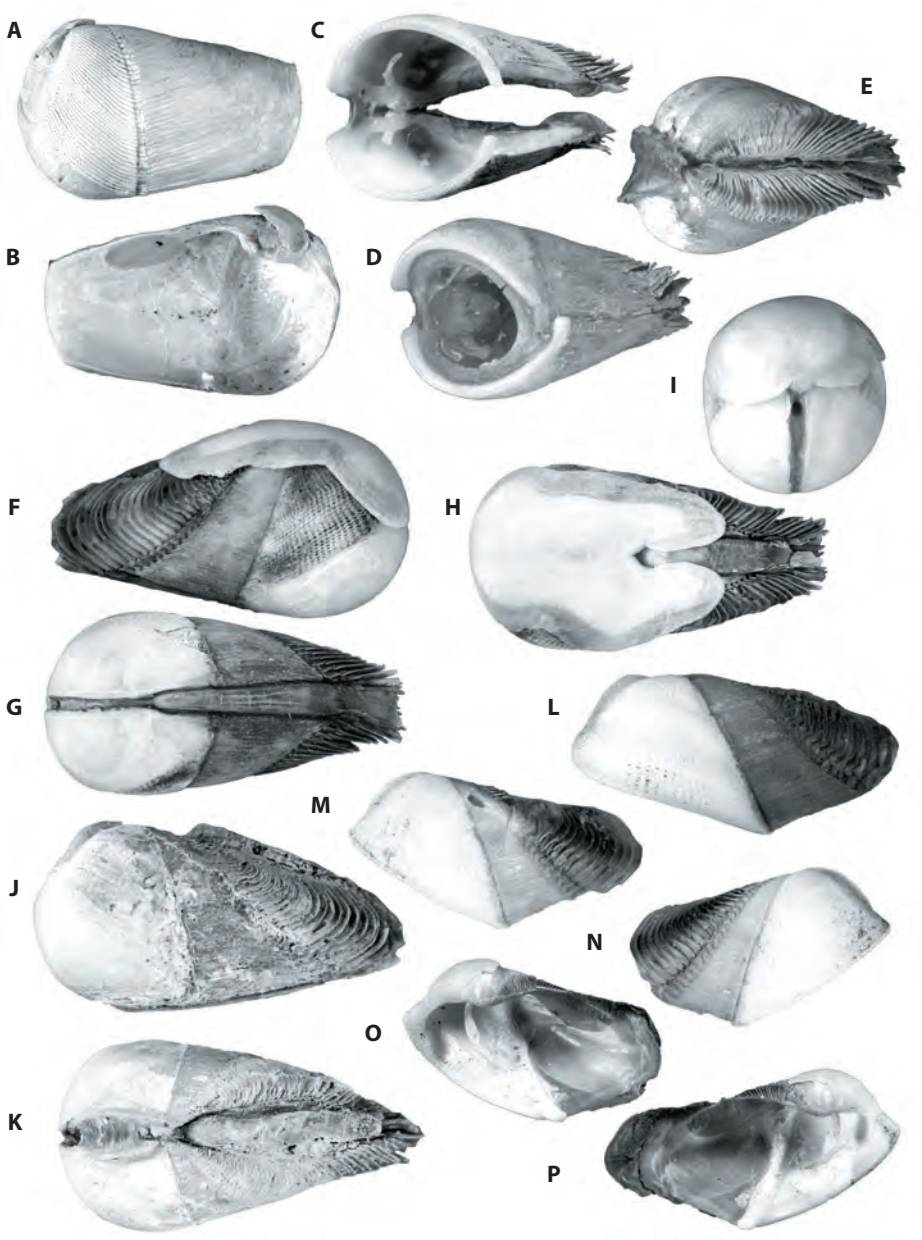
Shell up to 23 mm long (including callum), oblong, somewhat wedge-shaped, rather thin, very inflated, anteriorly widely gaping when young and closed by a callum and broadly rounded when adult. posterior end closed, margin narrowly rounded. Umbos at the end of the anterior fourth of the valves. Umbonal reflection double, the lower part closely adhering to the umbos, the upper part free and serving as support for the rather large anterior adductor. Umbos covered by an extremely large mesoplax which posteriorly ends in two long lobes. Surface on the anterior part with numerous, very dense and close-set, denticulate, commarginal lamellae, which in adult specimens are often partly polished by the contact with the bore hole wall. Middle part with numerous, horizontal, smooth lamellae, and posterior part with many rounded, overlapping plates mainly consisting of periostracum material. Umbonal-ventral sulcus reflected on the interior by a strong and prominent reinforcement. Periostracum greenish brown, on the middle and posterior part of the valves. Pallial sinus broad and deep. Outside and inside white.

Distribution. Only known from Liberia (Nicklès 1953), Gabon (Port-Gentil), Congo Brazzaville and northern Angola.



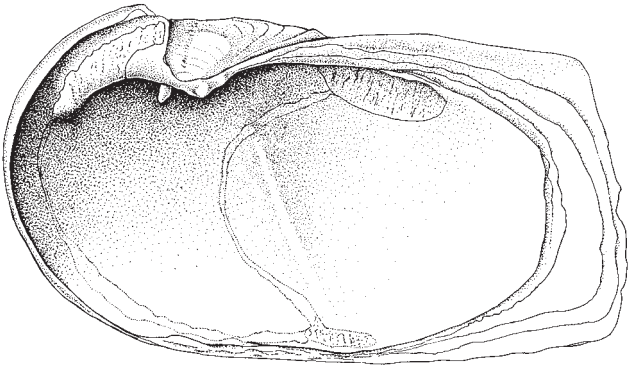
Biotope. Boring in rocks, in shallow water but subtidally, rare.

Remarks. This is the only Eastern Atlantic species of an otherwise Eastern Pacific and Indo-Pacific genus. *Parapholas calva* (G.B. Sowerby I, 1834) from Mexico to Ecuador is very close to the West African species.



19.12. *Parapholas branchiata* (Gould, 1845). **A**-**B**, Baie de Port-Gentil, Gabon, beach drift (26.4 mm). **C**, Congo coast (16.0 mm), MNHN old coll. **D**-**E**, Praia São Tiago, Bengo prov., N-Angola, rocks in shallow water (16.6 mm). **F**-**I**, same locality (21.3 mm). **J**-**K**, same locality (23.2 mm). **L**, Barra do Dande, N-Angola, 0-2 m (15.1 mm). **M**-**P**, same locality (12.6 mm).

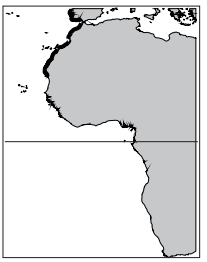
Pholadidea loscombiana Turton, 1819



19.13. Mauritania, 18°19'N, 16°34', 210 m (31.5 mm).

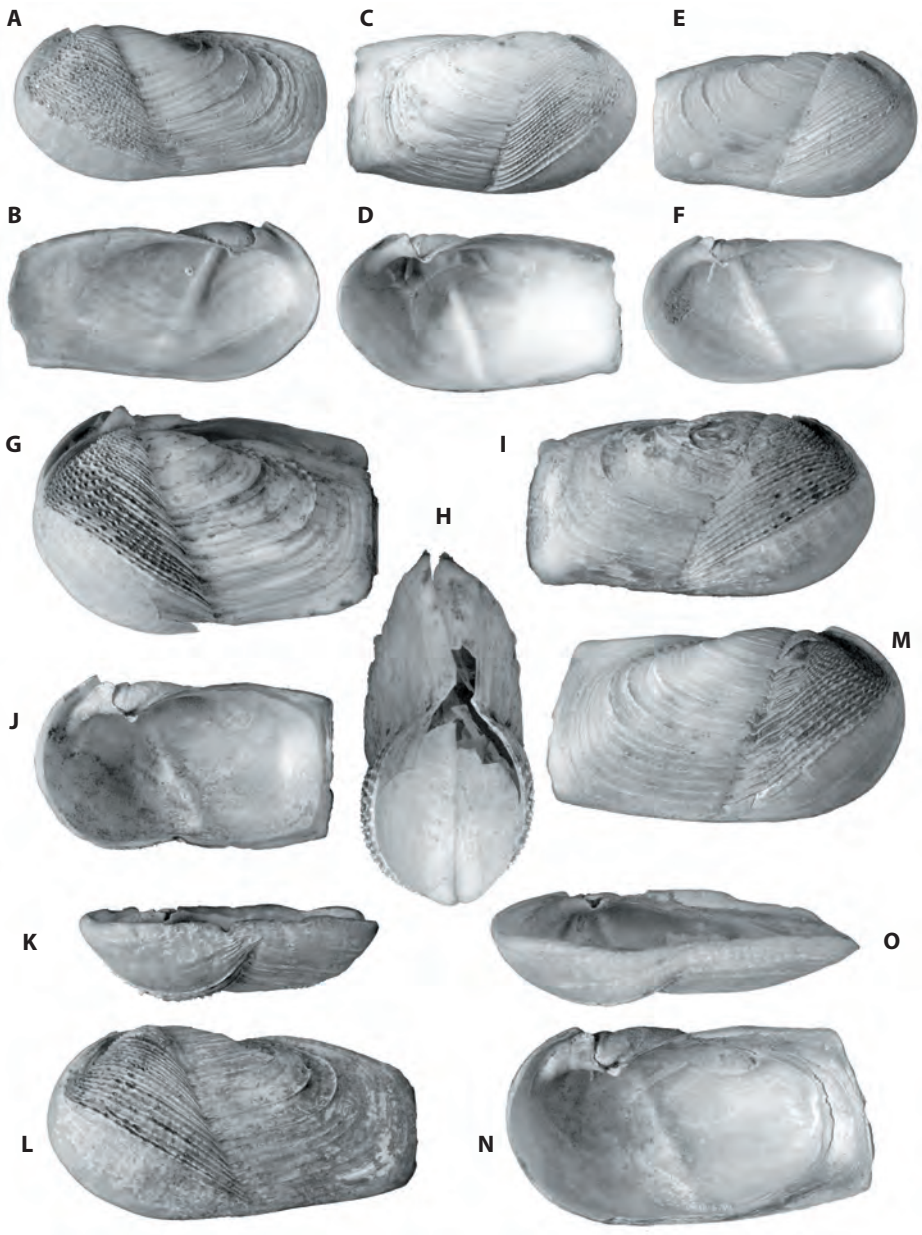
Shell up to 32 mm long (including callum), oblong-rectangular, thin and brittle, well inflated, anteriorly widely gaping when young, closed by callum when adult, with rounded to bluntly truncated posterior margin. Umbos at the beginning of the second fourth of the valves. Umbonal reflection simple, raised, in adult specimens callum growing towards dorsally, attached also to the umbonal reflection and covering the anterior adductor. Surface of the anterior part with numerous, close-set, prominent, commarginal lamellae bearing short spines. posterior part with irregular, smooth lamellae and growth lines. Umbonal-ventral sulcus narrow. Posterior end prolonged by a tube-like siphonoplax which mostly consists of periostracum material. Pallial sinus very broad and deep. Periostracum thin, straw-coloured, mostly eroded. Outside and inside dirty white.

Distribution. Irish Sea to south-western England and southward to Mauritania.



Biotope. Boring in mud, firm clay, peat, on sunken wood and soft sandstone, from low tide level (European specimens only) to offshore from 80 to 300 m, uncommon.

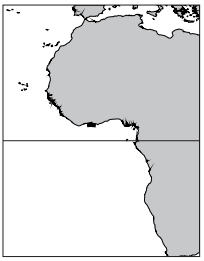
Remarks. This and the following species are the only Eastern Atlantic *Pholadidea*, the other species are eastern Pacific or Indo-Pacific.



19.14. *Pholadidea loscombiana* Turton, 1819. **A**-**B**, off Mauritania, 20°34′N, 17°49′W, 400 m (31.1 mm). **C**-**D**, same locality (30.0 mm). **E**-**F**, same locality (24.6 mm). **G**-**H**, off Mauritania, 18°19′N, 16′34′W, 210 m (29.1 mm). **I**, same locality (31.4 mm). **J**-**K**, same locality (26.5 mm). **L**, same locality (32.0 mm). **M**-**O**, same locality (32.0 mm).

Pholadidea eborensis Cosel & Haga, 2018

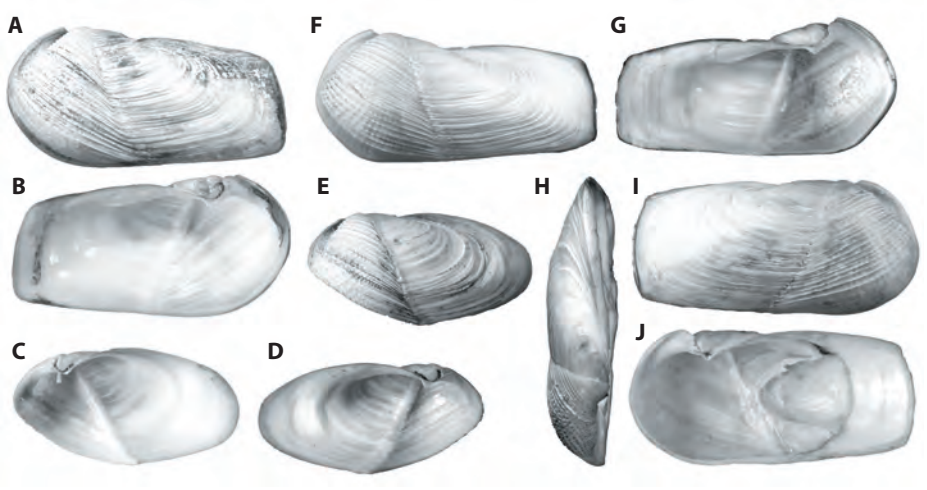
Shell up to 50 mm long (including callum), somewhat variable, elongate-rectangular, thin and brittle, inflated, anteriorly widely gaping when young, closed by callum when adult, posterior margin rounded in juvenile to subadult specimens, bluntly truncated in fully grown specimens. Umbos situated just in front of the second fourth of the valves. Umbonal reflection simple, raised, in adult specimens callum growing towards dorsally, attached also to the umbonal reflection and covering the anterior adductor. Surface of the anterior part with numerous, close-set, prominent, commarginal lamellae bearing short and small spines, posterior part with irregular, smooth lamellae and growth lines. Umbonal-ventral sulcus narrow. Posterior end prolonged by a tube-like siphonoplax. Pallial sinus very broad and deep. Periostracum thin, eroded, persistent very close to the margins. Outside and inside dirty white.



Distribution. Côte d'Ivoire, only known from the so-called "Trou sans Fond" Canyon off Vridi near Abidjan.

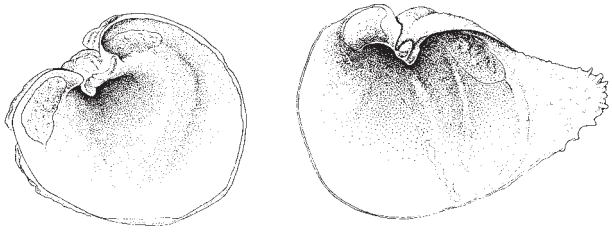
Biotope. Boring in mud and firm clay to 300 m, uncommon.

Remarks. *Pholadidea eborensis* is very close to *P. loscombiana*, but it is easily distinguished by its much larger size and its slightly more elongate shape, the longer and more narrower posterior part which at its posterior half is somewat more tapering. The species has yet been found only in the very sticky mud of the "Trou sans fond", probably in the slopes; other records are not yet known.



19.15. *Pholadidea eborensis* Cosel & Haga, 2018. **A-B**, Trou sans Fond Canyon, off Vridi near Abidjan, Côte d'Ivoire, 100-450 m (lv of holotype, 38.6 mm). **C-E**, same locality (paratype, 26.3 mm). **F-G**, Trou sans Fond Canyon, 100-300 m (49.7 mm). **H-J**, Trou sans Fond Canyon, 80-150 m (44.9 mm).

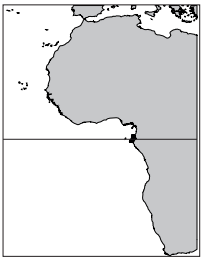
Jouannetia (*Pholadopsis*) *vignoni* P. Fischer, 1862



19.16. Gabon (syntype, lv, 9.5 mm; rv, 7.5 mm).

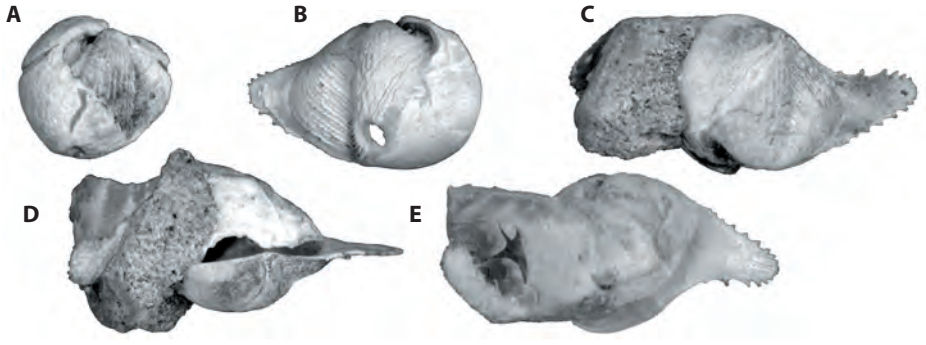
Shell up to 11 mm long (including callum and siphonoplax), very short, rounded-oval, somewhat pear-shaped, anteriorly widely gaping when young, posteriorly closed, posterior margin rounded. Adult specimens with large callum, that of the left valve overlapping that of the right valve. Umbos in young specimens in front of the vertical midline. Umbonal reflection high and free, in adult specimens with the dorsal part of the callum attached to them. Surface with dense, commarginal lamellae bearing short imbrications, which latter on the anterior part are arranged radially, giving the impression of radial waves. Imbrications on the posterior part arranged irregularly. Umbonal-ventral sulcus marked by a constriction of the shell. Siphonoplax blade-like, bearing up to 15 very short spines. Outside and inside dirty white.

Distribution. Known only from Gabon.



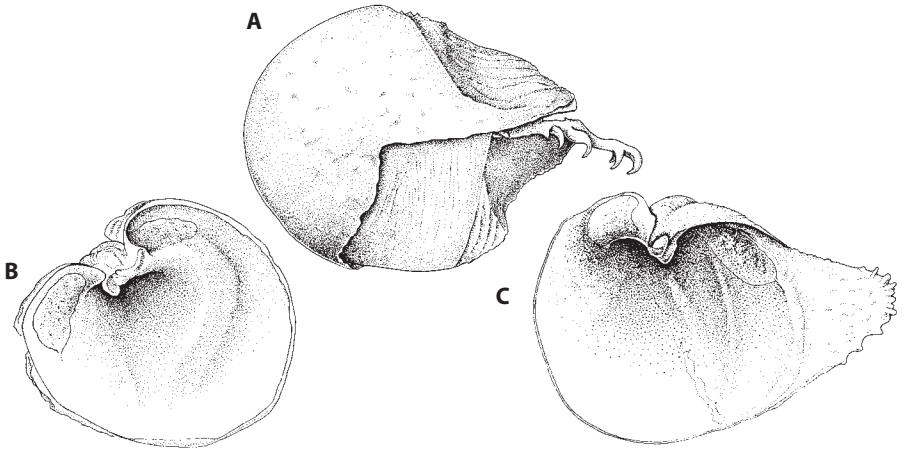
Biotope. Boring in soft rock, most probably in shallow water, very rare.

Remarks. This species is known only from the type lot which consists of two right and two left valves, which apparently are not corresponding, although they were glued together in two pairs, the figured syntype being additionally glued to a small piece of rock, obviously the substrate. They were found "sur la plage du Gabon, après les grands ras de marée du mois de mars", most probably in rock pieces cast ashore.



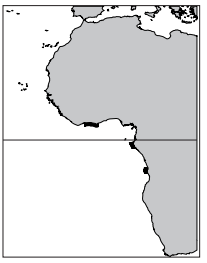
19.17. *Jouannetia (Pholadopsis) vignoni* P. Fischer, 1862. A-B, Gabon "rock borers cast ashore after the peak tides of March" (syntype, 7.1 mm). C-E, same locality (figured syntype, total length of object 13.6 mm).

Jouannetia (*Pholadopsis*) *uncinata* Cosel, 1995



19.18. Abidjan region, Côte d'Ivoire. **A**, ventral view paratype (10.6 mm). **B-C**, paratype (lv, 6.5 mm; rv, 6.9 mm).

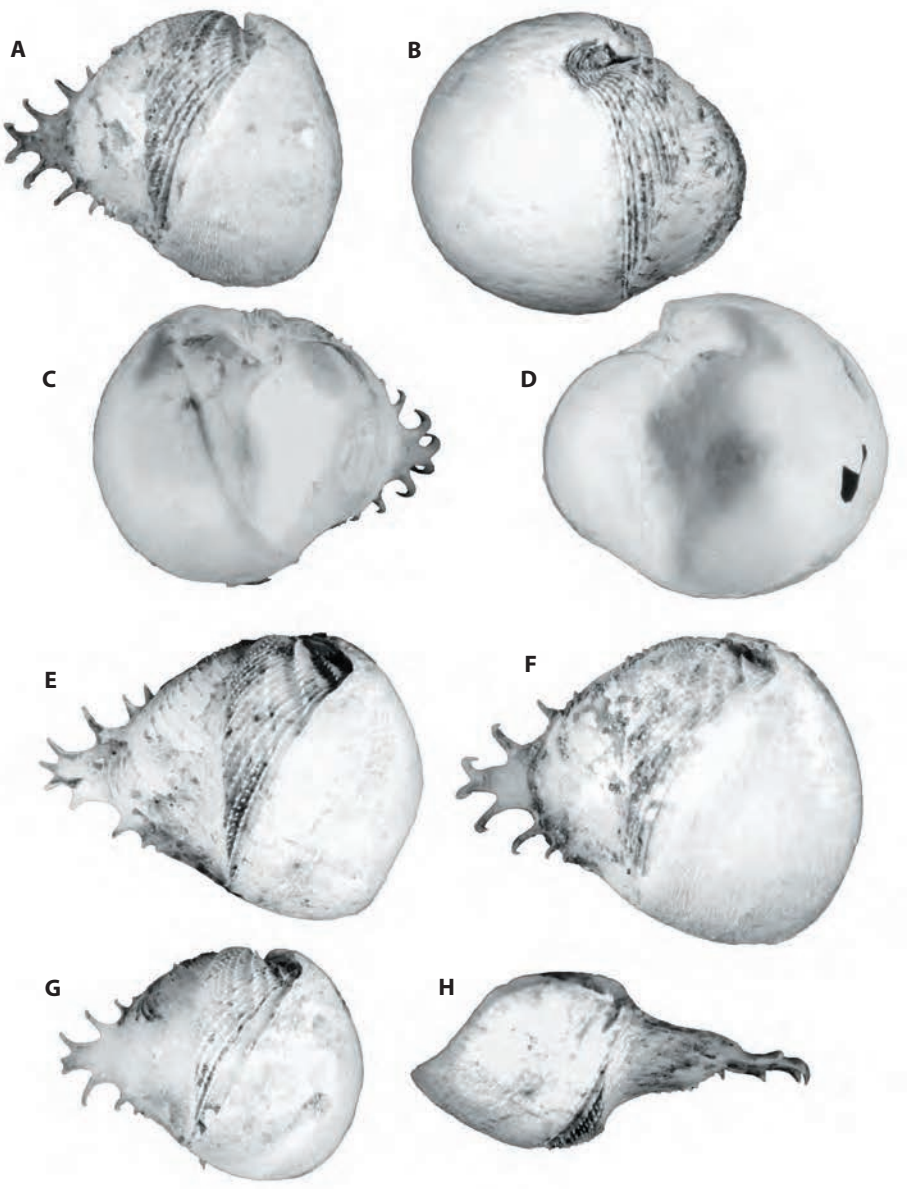
Shell up to 12 mm long (including callum and siphonoplax), globose, already in the juvenile stage slightly inequivalve, with the posterior part of the valves bent to the right. Juveniles anteriorly widely gaping, posteriorly closed; right valve of adults with very large, globular callum which covers about two thirds of the anterior gape and which is connected with the short and broad mesoplax. Left valve with much smaller callum which covers only one third of the gape, ends considerably anterior to the closing plane of the valves and is only slightly or not overlapped by the callum of the right valve. Umbonal reflections rather high and free, dorsal part of the callum attached to them. Surface with dense, commarginal lamellae bearing short imbrications, on the anterior part arranged radially, partly on shallow ribs, on the posterior part sparse and arranged irregularly. Umbonal-ventral sulcus on the left valve marking the change of intensity and direction of the commarginal lamellae, on the right valve rather indistinct. Left valve callum smooth, with faint dents, right valve callum with very fine wrinkles, only visible under a lens (x 5-10). Siphonoplax rather narrow, somewhat triangular, with 6-9 long, thin and delicate claw-shaped spines which are hooked to the right. Outside and inside cream to whitish.



Distribution. Recorded from Côte d'Ivoire and southern Gabon; one single valve from northern Angola (Praia São Tiago).

Biotope. Empty valves were found in boreholes in pieces of solidified sand; obviously it does not live in rock as the other species of the genus. Offshore; very rare.

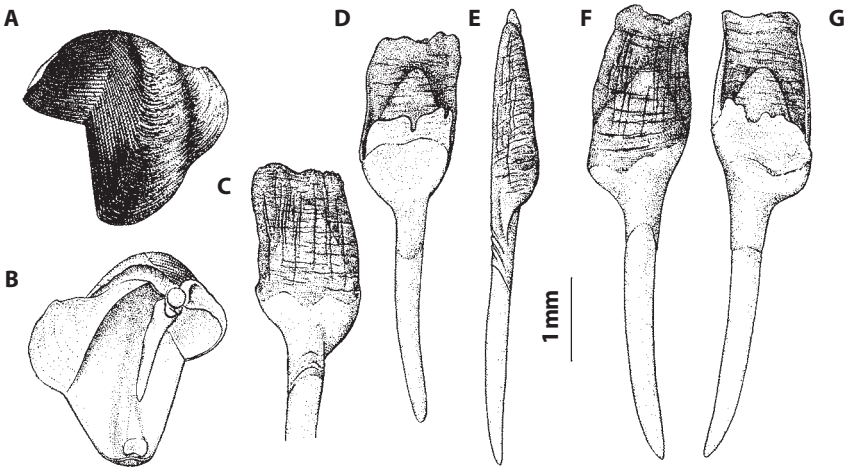
Remarks. This second West African *Jouannetia* is distinguished from *Jouannetia vignoni* and other *Jouannetia* by its peculiar siphonoplax in form of cats' claws with only 6-9 long, thin and curved spines, much longer than in *J. vignoni*. The closest species is the western Pacific *Jouannetia* (*Pholadopsis*) *spinosa* Haga & Kase, 2008



19.19. *Jouannetia (Pholadopsis) uncinata* Cosel, 1995. A-D, Abidjan region, Côte d'Ivoire (holotype, 8.0 mm without siphonoplax). E, same locality (paratype, 10.3 mm without siphonoplax). F, same locality (paratype, 8.6 mm without siphonoplax). G-H, same locality (paratype SMF, 7.2 mm without siphonoplax).

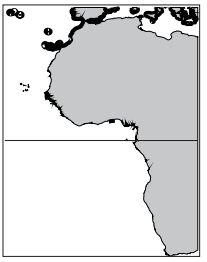
from Japan (Honshu) southward to the northern Philippines (Pacific coast of Aurora, Luzon). It has the same type of claw-like spines on the siphonoplax, however, these are shorter and often more numerous (7–12) than in *J. uncinata*.

Lyrodus pedicellatus (Quatrefages, 1849)



19.20. *Lyrodus pedicellatus* (Quatrefages, 1849). A-B, San Sebastián, Guipúzcoa, Spain, outer and inner views of shell (3.6 mm), coll. Quatrefages, MNHN. C-E, outer, inner and side views of pallet. F-G, outer and inner views of the other pallet. The specimen has a medium to dark golden brown periostracum. This is probably the specimen which Moll (1941) selected as a neotype (reproduced from Turner 1966, pl. 1A).

Shell to about 6 mm high, similar to that of several other *Lyrodus*, *Teredo* and *Bankia*. Pallets very variable in shape, on a cylindric stalk which is as long as the blade, paddle-shaped, with rounded-oval, calcareous blade with convex outer surface and flat inner surface. Periostracal cap with variable height, more or less quadrangular, with blunt or bifurcate upper end, dark brown, with cavity.

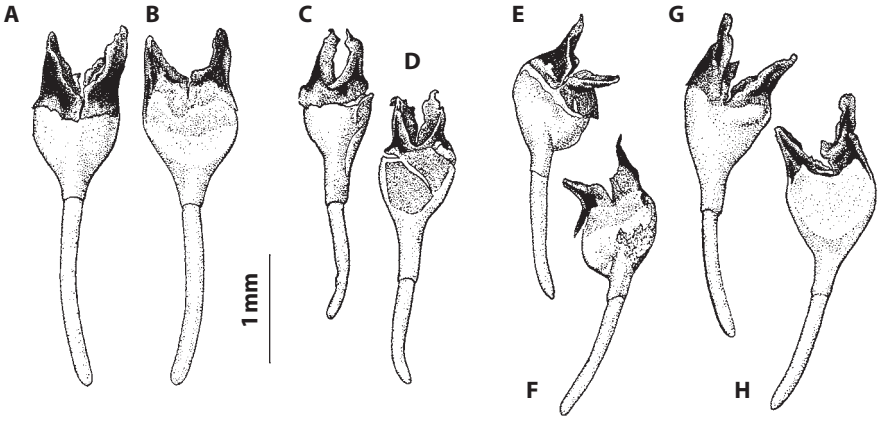


Distribution. Extreme south-western England to West Africa, where it has been collected in Senegal (Dakar, Petite Côte) and Togo. Also known from the Azores, Madeira, Canary Is., the Mediterranean (Borges *et al.* 2014), the tropical western Atlantic, South Africa, some eastern Pacific and several Indo-Pacific localities.

Biotope. In logged wood and driftwood.

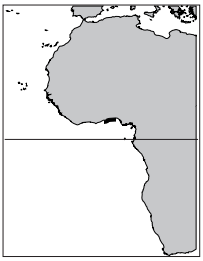
Remarks. This is a widespread species. Synonyms based on eastern Atlantic material are *Teredo lomensis* Roch, 1929, *Teredo togoensis* Roch, 1929, *Teredo lamyi* Roch, 1929, *Teredo franziusi* Roch, 1929, *Teredo dalli* Moll & Roch, 1931.

Lyrodus dicroa (Roch, 1929)



19.21. *Lyrodus dicroa* (Roch, 1929). Togo (no more details) A-B, outer and inner view of pallet (lectotype MZB). C-H, outer and inner views of pallets (paralectotypes MZB). The periostracal cap is dark brown in colour. Pallets dry and deteriorating with the periostracum exfoliating (reproduced from Turner 1966, pl. 7B).

Shell not known. Pallets broadly paddle-shaped, on a stalk which is as long or slightly longer than the blade, this latter rather short and broad. Periostracal cap not very high, with markedly bifurcate upper end, with cavity.

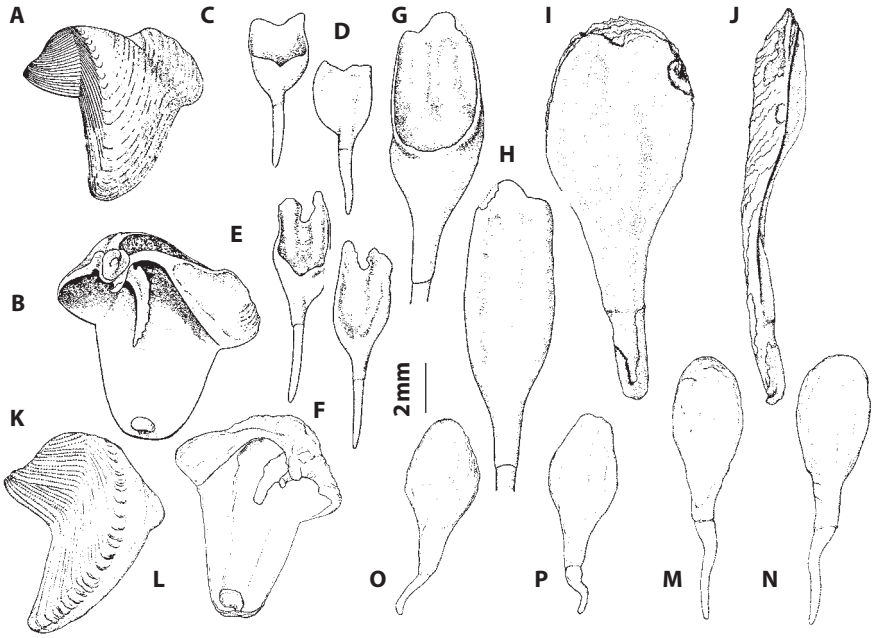


Distribution. Known from Togo.

Biotope. Not cited, but most probably in driftwood.

Remarks. According to Turner (1966) this "is probably *Lyrodus takanoshimensis* (Roch, 1929)" (from Japan). However, as this is not certain, the species remains here under the name given to the West African material.

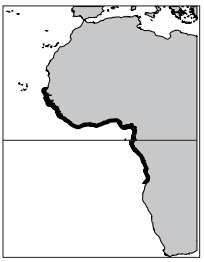
Psiloteredo senegalensis (Blainville, 1824)



19.22. *Psiloteredo senegalensis* (Blainville, 1824). **A**, St. Louis, Senegal, the material used by Monod *et al.* (1952) to demonstrate the change and variation in the pallets of *Teredo senegalensis* Blainville, of which *T. petitii* is a young and ecophenotypic form, outer view of shell (7 mm ht). **B**, same locality, inner view of shell. **C**-**H**, same locality, outer and inner views of pallets of increasing size. **I**-**J**, Senegal (no more details),Adanson collection, MNHN, inner and side view of pallet (holotype, no shell associated). Though the specimens are old, they are in good condition and a dark, straw-brown periostracum is present in patches on the outer face. **K**-**L**, Marigot de Diahakar, Senegal, outer and inner view of shell (holotype of *T. adami* Moll, 1941, IRSNB, 7.9 mm ht). **M**-**N**, outer and inner view of a pallet (holotype of *T. adami,* IRSNB). **O**-**P**, outer and inner views of a pallet (paratype of *T. adami,* IRSNB) (reproduced from Turner 1966, pl. 33C, 32A, 32B).

Shells to about 7 mm high, rather high in relation to length, variable in outline, with not very large ears. Pallets calcareous, very variable in shape, elongate, oval and more or less paddle-shaped or with a depression with two finger-like projections on the upper margin. Stalk short to very short. Periostracum mostly eroded.

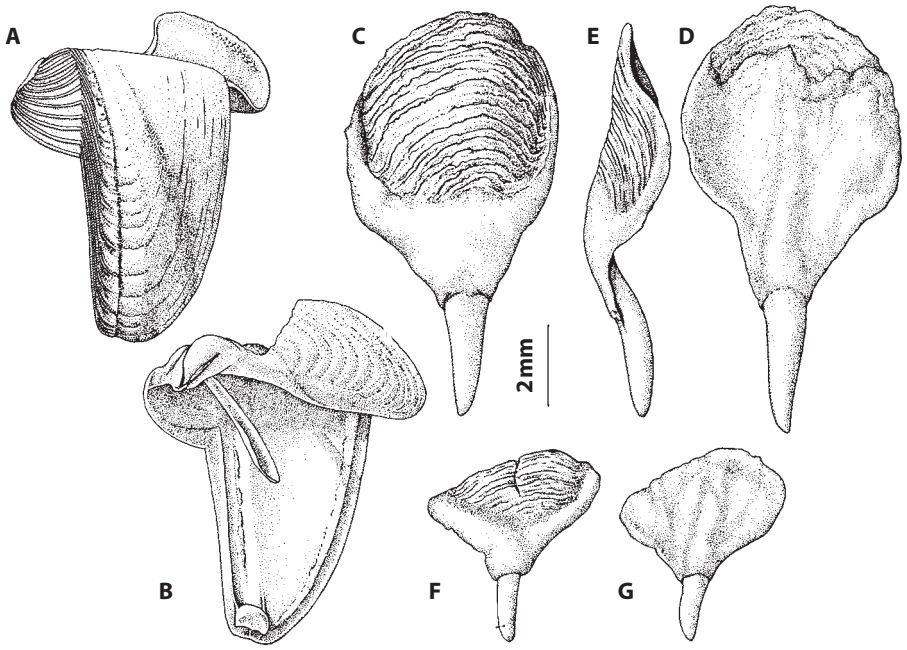
Distribution. West Africa, known from Senegal, Gambia, Côte d'Ivoire, Ghana, Nigeria, Cameroon, Zaïre, Angola.



Biotope. In mangrove roots in lagoons, but also in logged wood and driftwood.

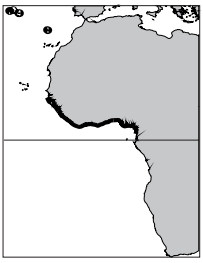
Remarks. This is the most common West African "taret". Synonyms are *Teredo adami* Moll, 1941 and *Teredo petitii* Récluz, 1849, the latter generally being considered the juvenile form of *P. senegalensis* (for details see Monod *et al.* 1952 and Turner 1966).

Teredora malleolus (Turton, 1822)



19.23. *Teredora malleolus* (Turton, 1822). A-B, Torbay, England, outer and inner view of the shell (8.2 mm ht, lectotype USNM 194213, Jeffreys coll. ex Turton). C-D, malformed pallets of the lectotype, which agree with Turton 's figures. E-G, same locality, outer, lateral and inner view of a normal pallet (reproduced from Turner 1966, pl. 20B).

Shell up to 17 mm high, rather narrow, with short anterior part and with the posterior "ear" bent upwards. Pallets oval to nearly round, stalk considerably shorter than the blade. Thickened areas at the base and on the sides of the broad outside depression in adult specimens with sharp margin which narrowly folds over the depression.

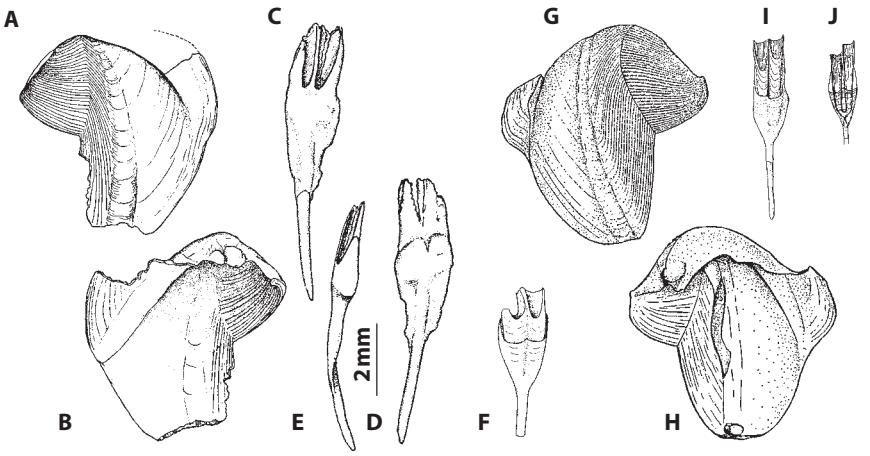


Distribution. Reported from northern Scotland, extreme south-western England, in West Africa from Guinea, Côte d'Ivoire and Cameroon; Madeira. Occurs also in the western Atlantic (East coast of North America). Records from the Mediterranean are not substantiated (Borges *et al.* 2014)

Biotope. In driftwood, perhaps also in logged wood.

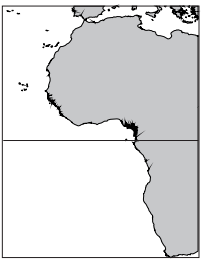
Remarks. In Guinea, this species had been collected in Bassia, near Conakry, by M. Nicklès in 1941 from pine planks cast ashore from a torpedoed ship which was en route from Argentine. The teredos must have infested the ship in the tropical zone, the species has not yet been reported from the colder waters off Argentine.

Teredothyra excavata (Jeffreys, 1860)



19.24. *Teredothyra excavata* (Jeffreys, 1860). **A**-**B**, Guernsey, in driftwood (lectotype USNM 114257, 5.6 mm ht). **C**-**E**, outer, inner and lateral views of a pallet of the lectotype. **F**, Victoria (now Limbe), Cameroon, holotype of *Teredo tritubulata* Moll, 1941, copied from Moll (1941: 221, fig. 4b, no scale given), outer face of pallet. **G**-**H**, Grand-Bassam, Côte d'Ivoire, outer and inner view of shell (2.9 mm), leg. Rancurel 1955. **I**, same locality, outer face of pallet. **J**, pallet as seen with transmitted light (A-F reproduced from Turner 1966, pl. 19; E-F. G-J reproduced from Rancurel 1955).

Shell to 6 mm high, with rather broad middle part and small posterior "ears". Pallets with elongate outer cup and long inner cup which in young specimens are well visible on the outer side and remind organ pipes. Stalk rather long.

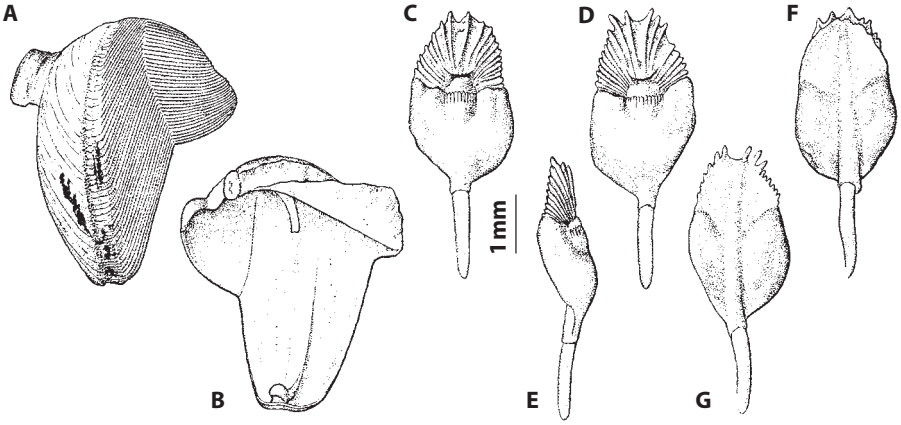


Distribution. Originally described from the Channel Islands, probably from driftwood, in West Africa from Cameroon as *Teredo tritubulata*. Records from the Mediterranean are unsupported (Borges *et al.* 2014).

Biotope. In driftwood, perhaps also in logged wood.

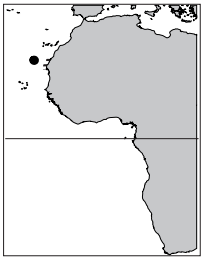
Remarks. The West African material had been published as *Teredo tritubulata* Moll, 1941, which is a synonym.

Uperotus lieberkindi (Roch, 1931)



19.25. *Uperotus lieberkindi* (Roch, 1931). **A-B**, About 356 miles west of Durnford Point, Rio de Oro, Africa, outer and inner view of shell (holotype ZMC, 4.7 mm ht). **C-G**, outer, inner and lateral views of the pallets of the holotype (reproduced from Turner 1966, pl. 23F).

Shell about 4 mm high, with typical anterior margin and rather small, high, posterior "ear". Pallets oval, paddle-shaped, on the outer side with a smooth lower part and prominent ribs on the upper part, radiating from a point in the middle of the limit to the lower part. Inner side smooth, ribs only visible near the upper margin. Stalk with about half the length of the blade.

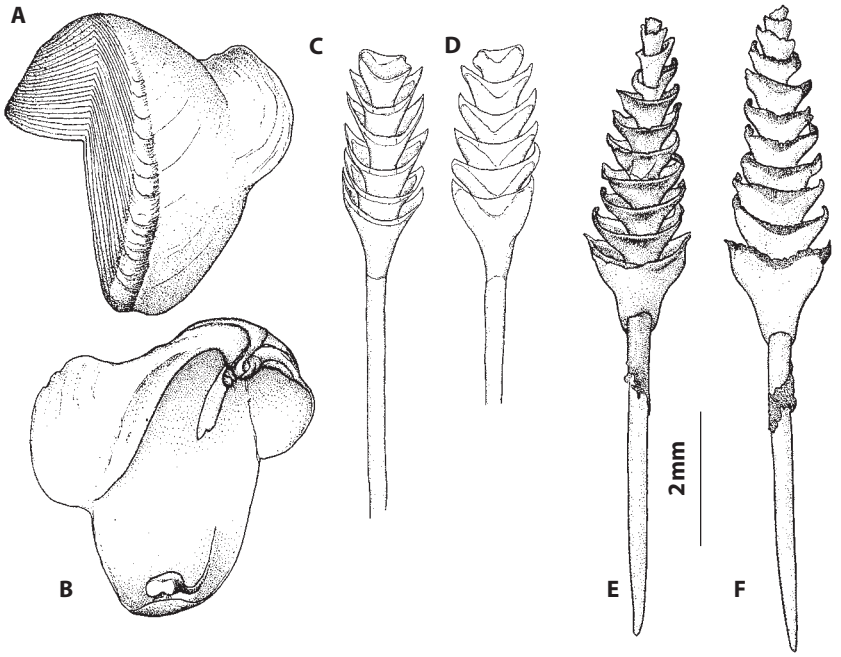


Distribution. Known only from 356 miles W of Durnford Point (24°15'N, 21°24'W), Rio de Oro, West Sahara.

Biotope. In driftwood.

Remarks. According to Turner (1966) this "is probably *Uperotus panamensis* (Bartsch, 1922)" from tropical West America. However, as this is not certain, the name based on West African material is used until more lots become available.

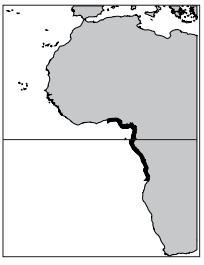
Bankia carinata (Gray, 1827)



19.26. *Bankia carinata* (Gray, 1827). A-B, Cap Lopez, Gabon, outer and inner views of shell (3.6 mm ht), specimen cited by Monod *et al.* (1952) as *Bankia minima* (Blainville). C-D, same locality, outer and inner views of pallet. This is a small form of *carinata* Gray, often with closely packed cones. E-F, Togo (no more details), outer and inner face of pallet (lectotype of *Bankia segaruensis* Roch, 1929, MZB). Shells unknown (reproduced from Turner 1966, pl. 46C and 52B).

Shell up to 5 mm high, with typical outline. Pallets consisting of several, rather densely-set, cone-shaped elements, each with a smooth margin, on the inner side slightly higher than on the outer side. Lateral prolongations of the elements short and broad. Stalk rather long. The periostracal margin of the cones narrow, a medium straw-brown in colour, entire, and with short, blunt awns.

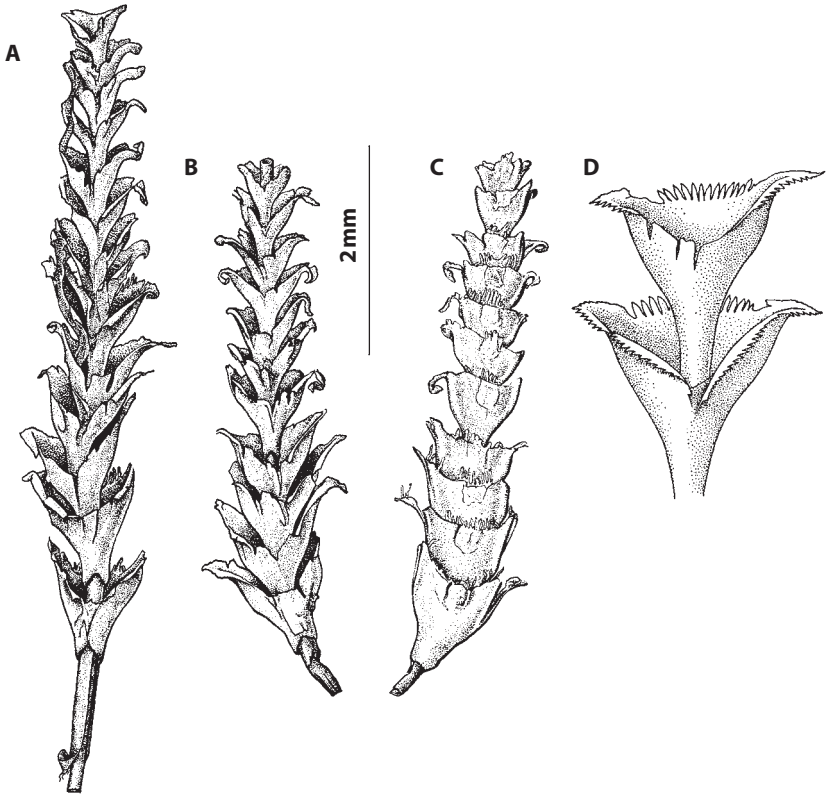
Distribution. West Africa: known from Togo, Nigeria, Gabon and Angola; also reported from the tropical western Atlantic and from several Mediterranean (Borges *et al.* 2014) and Indo-Pacific localities.



Biotope. In drift wood and most probably also logged wood.

Remarks. The West African material of this species is known as *Bankia minima* (Blainville, 1828) and *B. segaruensis* Roch, 1929, which are synonyms.

Bankia anechoensis Roch, 1929



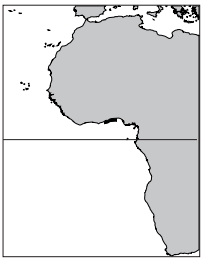
19.27. *Bankia anechoensis* Roch, 1929. **A**, Anecho, Togo, outer view of pallet (lectotype MZB). **B**-**C**, outer and inner views of pallet (paralectotype MZB). **D**, enlargement of the cones (reproduced from Turner 1966, pl. 52D). Specimen dry and badly deteriorated, the detail of the fringe evident on only occasional cones.

Shell unknown. Pallets large, consisting of many well separated, cone-shaped elements, each with a heavy, white, calcareous lower part and densely serrated, periostracal upper margin, which is incised on the outer surface, nearly straight on the inner surface and slightly prolonged at the sides of the pallet. Inner surface of pallets flat, outer surface covered with a straw-coloured periostracum. Stalk long, thin and weak.

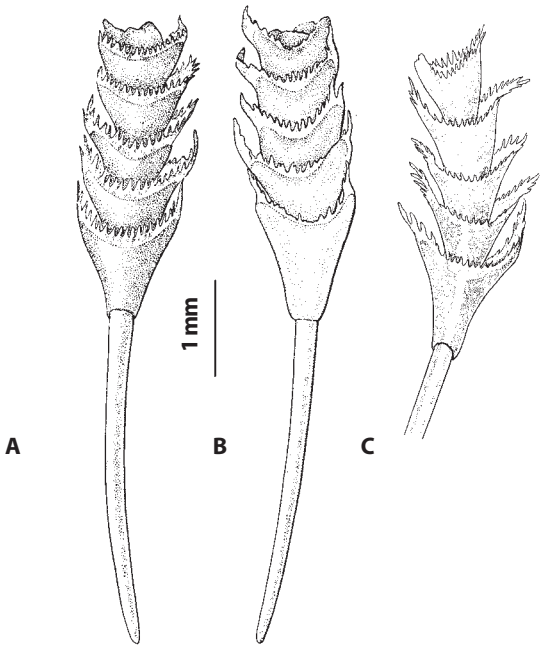
Distribution. Togo.

Biotope. Not known, most probably in mangrove root wood.

Remarks. This species is known only from the type locality Anecho, Togo; nothing is mentioned in the original description on its biology.



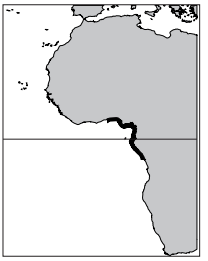
Bankia bagidaensis Roch, 1929



19.28. *Bankia bagidaensis* Roch, 1929. A-B, Bagida, Togo, outer and inner face of pallet (lectotype MZB). C, outer face of pallet soaked in water and mounted in diaphane (paralectotype of *T. congoensis*, MZB) (reproduced from Turner 1966, pl. 51D).

Shell unknown. Pallets consisting of cone-shaped, densely set elements with an evenly serrated, periostracal upper margin, at the inner side slightly sinuous. Margin at the sides of the pallets with digitate prolongations. Stalk very long.

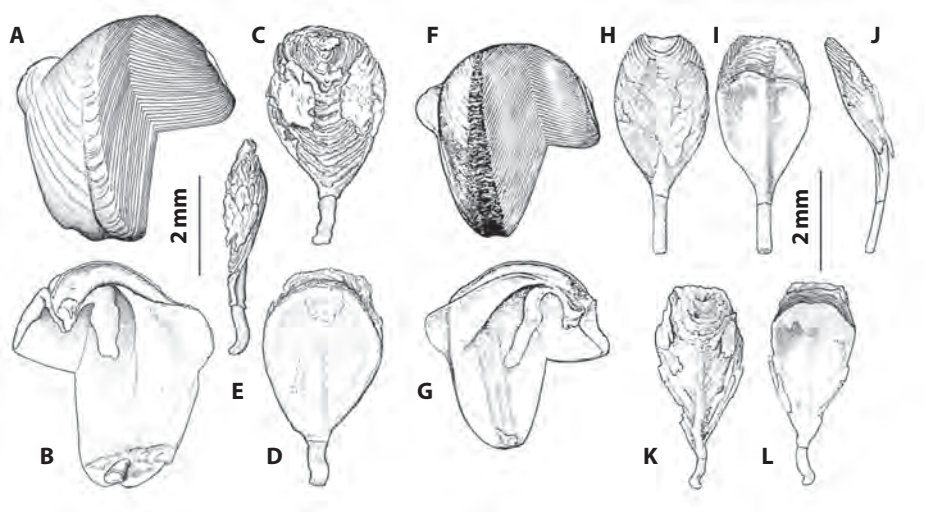
Distribution. Known from Togo, Nigeria, Cameroon and Zaïre.



Biotope. Unknown, most probably in mangrove root wood.

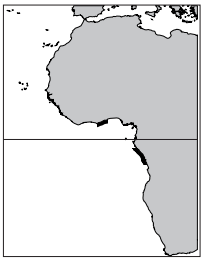
Remarks. According to Turner (1966), this species "is probably young *Bankia bipinnata* (Turton)". As this is still uncertain, the West African specimens are left with their original name until more material becomes available.

Nototeredo knoxi (Bartsch, 1917)



19.29. *Nototeredo knoxi* (Bartsch, 1917). A-B, Guantanamo Bay, Cuba, outer and inner views of shell (holotype USNM 216919, 7.9 mm ht). C-E, outer, inner and lateral views of pallet of the holotype. F-G, Congo Kinshasa, outer and inner views of shell (lectotype of *Teredo congoensis* Roch, 1935, MZB, 6.7 mm ht). H-J, outer, inner and lateral views of pallet of the lectotype. K-L, outer and inner views of pallet (paralectotype of *T. congoensis,* MCZ 170754) (reproduced from Turner, 1966, pl. 30A and 29A).

Shell about 6 mm high, about as long as high, with very small posterior "ear". Pallets oval, paddle-shaped, consisting of numerous, densely packed segments, giving them a foliaceous aspect. Upper margin irregularly truncated. Outer surface of the blade covered with a pale yellow periostracum. Stalk short, flattened and broad.



Distribution. West Africa: known from Ghana and Congo Kinshasa; also in the western Atlantic from North America to Brazil.

Biotope. In driftwood and logged wood.

Remarks. This predominantly western Atlantic species was described from West Africa as *Teredo congoensis* Roch, 1935, which is a synonym. Turner tentatively placed also *Teredo digitalis* Roch, 1935, from Congo Kinshasa, as "probably young *congoensis* Roch" in the synonymy of *N. knoxi*, however, the type specimens (pallets only) could not be examined by her.

Superfamily **THRACIOIDEA**

Family **THRACIIDAE**
Genus ***Thracia*** Blainville, 1824 – 5 species in 4 subgenera
Genus ***Cyathodonta*** Conrad, 1849 – 1 species

Family **PERIPLOMATIDAE**
Genus ***Periploma*** Schumacher, 1817 – 1 species

Superfamily **CLAVAGELLOIDEA**

Family **CLAVAGELLIDAE**
Genus ***Clavagella*** Lamarck, 1818
Subgenus ***Bryopa*** Gray, 1847 – 1 species

Superfamily **PANDOROIDEA**

Family **PANDORIDAE**
Genus ***Pandora*** Bruguière, 1797 – 1 species

Superfamily **POROMYOIDEA**

Family **POROMYIDAE**
Genus ***Poromya*** Forbes, 1844 – 1 species
Genus *Cetomya* Dall, 1889 – 1 species (not treated)

Family CETOCONCHIDAE
Genus *Cetoconcha* Dall, 1886 – 1 species (not treated)

Superfamily **VERTICORDIOIDEA**

Family **VERTICORDIIDAE**
Genus ***Haliris*** Dall, 1886 – 1 species
Genus *Verticordia* J. de C. Sowerby, 1844 – 2 species (not treated)
Genus *Vertambitus* Iredale, 1930 – 1 species (not treated)
Genus *Halicardia* Dall, 1895 – 1 species (not treated)

Family **LYONSIELLIDAE**
Genus *Allogramma* Dall, 1903 – 1 species (not treated)
Genus *Policordia* Dall, Bartsch & Rehder, 1938 – 2 species (not treated)

Superfamily **CUSPIDARIOIDEA**

Family **CUSPIDARIIDAE**
Genus ***Cuspidaria*** Nardo, 1840 – 8 species (2 treated)
Genus ***Cardiomya*** A.Adams, 1864 – 1 species
Genus ***Tropidomya*** Dall, 1886 – 1 species
Genus *Rhinoclama* Dall & Smith, 1886 – 3 species (not treated)
Genus *Myonera* Dall & Smith, 1886– 1 species (not treated)
Genus *Luzonia* Dall & Smith in Dall, 1890– 1 species (not treated)
Genus *Halonympha* Dall & Smith, 1886 – 1 species (not treated)
Genus *Protocuspidaria* Allen & Morgan, 1981– 2 species (not treated)

Family **SPHENIOPSIDAE**
Genus ***Spheniopsis*** Sandberger, 1861

Superfamily PHOLADOMYOIDEA

Family PARILIMYIDAE
Genus *Parilimya* Melvill & Standen, 1899 – 2 species (not treated)

The Anomalodesmatan families

The Anomalodesmata (whose name means "with an unusual ligament") is a well-supported group of bivalves, which have long been ranked as a separate subclass but are now considered as members of the subclass Euheterodonta. They comprise a quite large array of families with an extraordinary diversity in morphology, habitat and life habits, many of them highly successful in the deep sea. Key characters include a hinge margin without true teeth, in some groups with small secondary teeth, and a ligament mostly internal, often reinforced by a calcareous plate, the lithodesma. Several families retain a prismatic nacreous layer inside the shell, a character also seen in some protobranchs (Nuculidae) and in some pteriomorphs (*e.g.* Pteriidae) but completely lost in the rest of Euheterodonta. Most species live buried in soft bottom, a few, however, are hard substrate dwellers. An overview of the group was provided by Morton (1981a) and Harper *et al.* (2006), the latter largely followed here for the systematic arrangement.

Superfamily THRACIOIDEA
Family THRACIIDAE

Shells small to medium-sized, mostly more or less oblong, inequivalve, with larger right valve, subrectangular, subtrigonal or somewhat oval, very thin, not nacreous. Surface with growth lines or commarginal sculpture, often with tiny granules. No transverse crack on the umbos. Hinge without teeth, ligament both external and internal, partly with calcareous reinforcement (lithodesma). Pallial sinus well-marked. The species number is estimated at 92, among them 6 West African species, and worldwide revision is long overdue.

Genus *Thracia* Blainville, 1824. Shells small to medium-sized, oblong to suboval, slightly to markedly inequivalve, thin and fragile to rather solid, quite inflated, posteriorly broadly truncate, with a more or less marked posterior angle. Surface with growth lines, growth waves and often fine granules. Ligament both internal and external. Chondrophore rather small, of variable shape. *Osteodesma* Blainville, 1827 is a synonym.

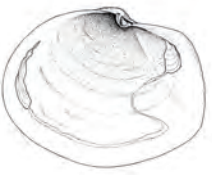
Subgenus *Thracia* Blainville, 1824. Shells elongate, thin, mostly with truncated posterior margin, granulate, with growth striae. Hinge line with small chondrophore, lithodesma present but rather small and often lost. Ligament shallow.

Subgenus *Odoncineta* O.G. Costa, 1830. Shells elongate, very thin, with truncated posterior margin. Surface with very fine granules. Ligament mostly external, chondrophore small and narrow; lithodesma very small to well-developed. Pallial sinus deep, reaching beyond the level of the beaks.

Subgenus *Homoeodesma* P.Fischer, 1887. Shells rather large, thin but solid, markedly inflated, often somewhat irregular, with strongly convex middle part of the ventral margin and a finely granulate surface. Chondrophore small and narrow; ligament broad and not very deep.

Subgenus *Ixartia* Leach, 1852. Shells small to medium-sized, irregularly oval, thin but solid, with well marked, irregular growth lines and granulate surface. Chondrophore small but projecting. The species are nestlers, they live mostly in crevices and empty bore holes on hard substrate but are also found free-living.

Genus *Cyathodonta* Conrad, 1849. Shells medium-sized, elongate, subrectangular to suboval, inequivalve, thin and fragile, more or less inflated, posteriorly broadly truncate, with more of less marked posterior angle. Surface always with strong undulations which vary between very oblique and nearly parallel to the margins. Umbos of the right valve very slightly or not perforated by the left valve beaks. Ligament both internal and external, in a small, more or less prominent chondrophore; lithodesma small, in front of the resilium.



Species treated (6)
Thracia (Thracia) pubescens (Pulteney, 1799); *Thracia (Odoncineta) phaseolina* (Lamarck, 1818); *Thracia (Odoncineta) roumei* Cosel, 1995; *Thracia (Homoeodesma)* cf. *corbuloidea* Blainville, 1827; *Thracia (Ixartia) distorta* (Montagu, 1803); *Cyathodonta plicata* (Deshayes, 1832).

Family PERIPLOMATIDAE

Shells mostly medium-sized, subcircular or suboval to subrectangular, inequivalve, with more inflated right valve, thin and fragile, nacreous. Surface with growth lines only or with irregular, commarginal sculpture. Umbos with a typical, transverse crack. Ligament internal, resilifer in protruding, spoon-shaped chondrophore, lithodesma present in some species. Pallial sinus short. There are 43 species known worldwide, one only from West Africa.

Genus *Periploma* Schumacher, 1817. Shells medium-sized, subcircular, short-oval or subrectangular, thin, nacreous, inequivalve, left valve less convex than right valve or flat. Surface with growth lines, under a lens appearing granular.

Subgenus *Cricoploma* F. Bernard, 1989. Shells subcircular, circular or short-oval, thin and fragile, inequivalve with right valve more tumid than left valve, posterior end more or less truncated. Chondrophore projecting towards an antero-ventral direction,

without (contrary to *Periploma s. str.*) a buttress reaching from there to the posterior adductor scar.

Species treated (1)
Periploma (Cricoploma) camerunense Cosel, 1995.

Superfamily CLAVAGELLOIDEA
Family CLAVAGELLIDAE

Shells regular and free-living in juvenile stage, then forming a secondary or adventitious shell in form of a tube, to which one or both valves are partly or completely fused. In some groups (genus *Penicillus* Bruguière, 1789, not in the region) this tube is closed at the bottom (foot end) by a perforated plate resembling a watering pot. In most *Clavagella,* tube irregular, frequently imbedded in rock, shorter and ending in an often somewhat flask-like cavity. Valves nacreous, with no hinge plate. Ligament external. Adductor muscles reduced or missing. The species live buried in soft bottom or bore in hard substrate, with the siphonal end of the adventitious shell tube often sticking out into the free water. The worldwide species number is estimated at 10-15, one species is found in West Africa.

Genus *Clavagella* Lamarck, 1818. Shells irregular, with one valve fused with the adventitious shell tube in the terminal cavity of the tube and one valve always free. Both adductors still present in adult specimens. Free part of the tube simple or with irregular, transverse lamellae.

Subgenus *Bryopa* Gray, 1847. Free part of the adventitious shell tube with irregular, transverse, foliate lamellae caused by the periodically expanded end of the tube. Species living in calcareous hard substrate. Morton (2007) treated *Bryopa* as full genus but this was not followed by Huber (2010).

Species treated (1)
Clavagella (Bryopa) aperta G.B. Sowerby I, 1823.

Superfamily PANDOROIDEA
Family PANDORIDAE

Shells small to medium-sized, more or less oblong to elongate, strongly inequivalve, with left valve larger and inflated and right valve flat or slightly concave and overlapped by the left valve, thin but quite solid, nacreous. Surface with growth lines only. Internal ligament present, no external ligament, lithodesma present in some groups. No hinge teeth, but laminar reinforcements besides the resilifer. Pallial sinus missing. There are 46 species known worldwide, among them two, perhaps three, from West Africa.

Genus *Pandora* Bruguière, 1797. Shells very small to medium-sized, more or less elongate, inequivalve, nacreous, thin, compressed with flat right valve, with rounded anterior margin and rostrate posterior end. Surface with commarginal growth lines. Ligament internal, no lithodesma.

Species treated (1)
Pandora oblonga G.B. Sowerby I, 1830.

Other species reported in the area (1)
Pandora gorii Rolán & Hernández, 2007. Casamance, Senegal (Rolán & Hernández 2007).

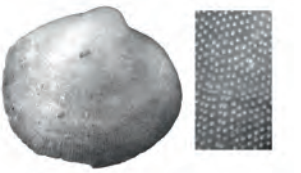
Superfamily POROMYOIDEA

This and the following superfamilies form a highly specialized group, very successful in the deep sea and usually rare in the nearshore habitats. They have a modified pallial cavity with a muscular septum (hence their name of "septibranchs") instead of the lamellibranch gill, and use this structure to pump small prey into the open siphons.

Family POROMYIDAE

Shells small to medium-sized, mostly oval to subcircular, with rather prominent umbos, generally equivalve and nearly equilateral, inflated, thin and fragile, with more or less nacreous interior. Surface with granules which are often arranged radially, with radial or occasionally commarginal sculpture. Ligament external, no lithodesma. Hinge line with one cardinal in the right valve or in both valves, which may be obsolete. Pallial sinus shallow. The poromyids live in soft bottom, mostly in deep-water. They are carnivorous and suck in tiny crustaceans. About 100 species are known worldwide, one only from West Africa.The Atlantic species were reviewed by Allen & Morgan (1981) and the predatory behaviour vas described by Morton (1981b).

Genus *Poromya* Forbes, 1844. Shells small, suboval, equivalve, inflated, thin and rather fragile, nacreous. Surface with granules. Hinge with one cardinal in the right valve and a corresponding socket in the left valve, also with a posterior ridge.



Species treated (1)
Poromya granulata (Nyst & Westendorp, 1839).

Other species reported in the area (2)
Family Poromyidae
Cetomya tornata (Jeffreys, 1876). Gulf of Guinea 4088-4279 m (Allen & Morgan 1981).

Family Cetoconchidae
Cetoconcha angolensis Allen & Morgan, 1981. Off Angola 5124 m.

Superfamily VERTICORDIOIDEA
Family VERTICORDIIDAE

Shells mostly small, a few medium-sized, rounded, oval, subquadrangular, trapezoidal, rostrate or irregular, equivalve to slightly inequivalve, mostly inflated to very inflated, thin and fragile to rather solid, with nacreous interior. Beaks mostly prominent and pointing forward. Surface in most species with fine to coarse and prominent radial sculpture, occasionally irregular radial waves and often also with granules. Ligament appearing internal but in fact a more or less sunken external ligament; lithodesma present. Hinge line either without teeth or with a weak cardinal in the right valve in front of the ligament. Pallial sinus very faint or missing. The deep-water species of the Atlantic were revised by Allen & Turner (1974). The verticordiids inhabit soft bottom, mostly mud and produce fine, at the end tufted byssus threads which are not attached to substrate. Most species live in abyssal depths or on the continental slope, they feed on very small crustaceans (*e.g.* copepods) and small radiolaria. The worldwide species number is 58, five of them known from West Africa. The related family Lyonsiellidae is exclusively found in the deep sea.

Genus *Haliris* Dall, 1886. Shells small, quadrangular to subtrapezoidal or globose, with rather shallow, close-set, radial ribs and not very much marked lunule. Hinge with a cardinal and two posterior lateral ridges in the right valve and a socket for the cardinal and a short posterior lateral in the left valve.

Species treated (1)

Haliris lamothei (Dautzenberg & Fischer, 1897).

Other species reported in the area (8)

Family Verticordiidae

Verticordia quadrata E. A. Smith, 1885. Off Guinea-Bissau 2357-3861 m (Allen & Turner 1974).

Verticordia guineensis Thiele, 1931. Golfe de Guinée, 2278 m (Thiele & Jaeckel 1931).

Vertambitus triangularis (Locard, 1898). Off Guinea-Bissau, 1796 m (Allen 2008); off Angola 2644-2675 m (Allen & Turner 1974).

Halicardia flexuosa (Verrill & Smith, 1881). Off Namibia, 812-823 m (Altaba & Travesset 1985, fig. 5).

Family Lyonsiellidae

Allogramma formosa (Jeffreys, 1882). Off Guinea-Bissau 1796 m (Allen 2008).

Policordia densicostata (Locard, 1898). Cape Verde basin, 2300-2500 m (Locard 1898), off Namibia 1007-1559 m (Allen & Turner 1974).

Policordia lisbetae Knudsen, 1970. Off Angola, 2690 m.

Policordia atlantica Allen & Turner, 1974. Off Guinea-Bissau, 1624-2185 m (Allen & Turner 1974).

Superfamily CUSPIDARIOIDEA
Family CUSPIDARIIDAE

Shells small to medium-sized, equivalve to slightly inequivalve, oval and generally more or less markedly rostrate, occasionally with a very long, tubeshaped rostrum, some species more triangular, anterior and middle part mostly inflated to very inflated, thin and fragile, not nacreous. Beaks more or less prominent. Surface smooth, with radial or with commarginal sculpture.

Ligament external but sunken, in small chondrophore; lithodesma present. Hinge line with or without teeth. Pallial sinus small. The Atlantic species, mostly from deep water, were reviewed by Allen & Morgan (1981). The species live in soft bottom from shallow water to abyssal depths and feed on small crustaceans and worms. There are 258 species worldwide, 19 of which species are reported from West Africa, mostly from deep water.

Genus *Cuspidaria* Nardo, 1840. Shells small, oval and markedly rostrate, inequivalve with more tumid left valve, thin and fragile, inflated. Surface with more or less coarse growth lines or commarginal sculpture. Ligament sunken, in a small resilifer. Hinge line with one or more teeth.

Genus *Cardiomya* A.Adams, 1864. Shells small, thin, oval, with rather long rostrum and strong, radial ribs. Ligament small and internal, with lithodesma, in deep sunken chondrophore. Posterior lateral in the right valve, no cardinals.

Genus *Tropidomya* Dall, 1886. Shells small, very thin, with short, ill-defined rostrum, commarginal sculpture and a ridge from the beaks to the postero-ventral margin. Ligament sunken, oblique and narrow, hinge line with a small cardinal in each valve, no laterals.

Species treated (4)

Cuspidaria cuspidata (Olivi, 1792); *Cuspidaria rostrata* (Spengler, 1793); *Cardiomya costellata* (Deshayes, 1835); *Tropidomya abbreviata* (Forbes, 1843).

Other species reported in the area (15)

Cuspidaria parva Verrill & Bush, 1898. Off Guinea Bissau, 1624-2185 m (Allen & Morgan 1981); off Angola 2031 m (Allen 2008).

Cuspidaria guineensis Knudsen, 1970. Off Equatorial Guinea, 2550 m.

Cuspidaria jeffreysi (Dall, 1881). Angola Basin, 1432 m (Allen & Morgan 1981).

Cuspidaria atlantica Allen & Morgan, 1981. Angola Basin 1432 m (Allen & Morgan 1981).

Cuspidaria barnardi Knudsen, 1970. Off Guinea Bissau 3814-3828 m (Allen & Morgan, 1981).

Cuspidaria ventricosa Verrill & Bush, 1898. Angola Basin, 2044 m (Allen & Morgan 1981).

Rhinoclama notabilis (Jeffreys, 1876) (= *C. filocarinata* (E.A. Smith, 1885) = *C. testai* Knudsen, 1970). Off Sierra Leone, 1100-4734 m (Allen & Morgan 1981), also W. European basin and Canaries.

Rhinoclama abrupta (Allen & Morgan, 1981). Off Namibia, 619-1014 m (Allen & Morgan 1981).

Rhinoclama halimera (Dall, 1886). Off Guinea Bissau, 2934 m (Allen & Morgan 1981).

Myonera tillamookensis Dall, 1916. Off Namibia, 617-2154 m (Allen & Morgan 1981).

Myonera acutecarinata (Dautzenberg & Fischer, 1906). Cape Verde Islands, 628 m (Dautzenberg & Fischer 1906).

Luzonia simplex Allen & Morgan, 1981. Off Guinea Bissau, 1624-2357 m; off Namibia, 439-619 m (Allen & Morgan 1981); off Angola 542 m (Allen 2008).

Halonympha atlanta Allen & Morgan, 1981. Off Côte d'Ivoire 3025-3138 m; off Angola, 2644-2754 m; off Namibia, 439-619 m.

Protocuspidaria (Edentaria) simplis Allen & Morgan, 1981. Off Guinea-Bissau 1624-1796 m (Allen & Morgan 1981).

Protocuspidaria verityi Allen & Morgan, 1981. Off Guinea-Bissau 2357 m (Allen 2008).

Family SPHENIOPSIDAE

Shells very small to minute, triangular-oval to posteriorly rostrate, Surface smooth or with commarginal sculpture. Protoconch fairly large and well set-off from the postlarval part of the valve, indicating possible brooding of the young (positively known so far in one species only). Right valve with an anterior cardinal and a posterior cardinal which may be prolonged to a ridge or lamella parallel to the postero-dorsal margin. Left valve without hinge teeth. Ligament internal, in a small, deep sunken resilifer. Pallial sinus small and rounded. Only 16 species are known worldwide, one from West Africa. Marshall (2002) transferred this family from order Myoidea to the Anomalodesmata, and Morton *et al.* (2016) described in detail the anatomy of a Western Atlantic species.

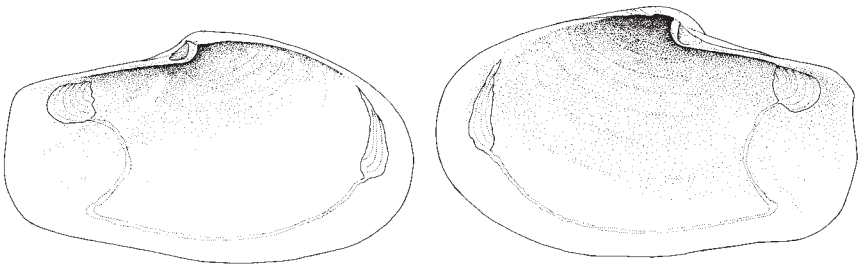
Genus *Spheniopsis* Sandberger, 1861. Shells minute, subtriangular, with more or less tapering posterior rostrum which is not spectacularly set-off from the rest of the valve. Surface smooth or commarginally sculptured with fine ribs or coarse cords or lamellae. Right valve with anterior tooth and more or less lamellar posterior tooth, left valve toothless. Small lithodesma directly under the beaks.

Species treated (1)
Spheniopsis senegalensis Cosel, 1995.

Superfamily PHOLADOMYOIDEA
Family PARILIMYIDAE

Species reported in the area (2)
Panacca africana (P. Fischer *in* Locard, 1898). Off Morocco (Cap Ghir) and off Western Sahara (Cap Mérik), 2210-2600 m (Locard 1898).
Panacca locardi (Dall, 1903) (= *Pholadomya arata* Locard, 1898). Off Western Sahara, 1130 m (Locard 1898).

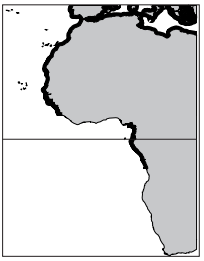
Thracia (*Thracia*) *pubescens* (Pulteney, 1799)



20.1. M'Bour, Petite Côte, Senegal, 40-50 m (lv, 40 mm; rv, 41.2 mm).

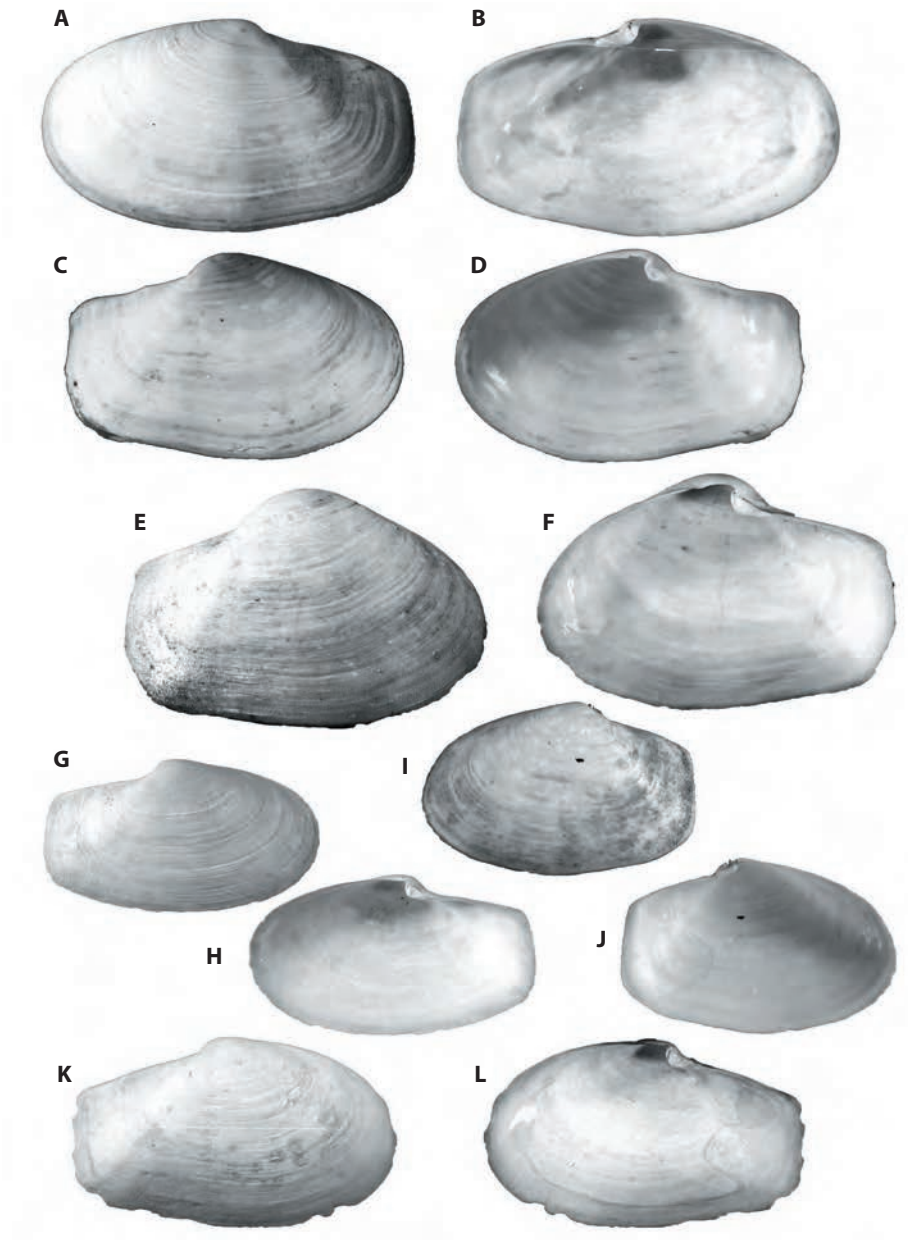
Shell up to 90 mm long (largest West African specimen seen 58 mm), oblong-suboval, inequivalve, thin and fragile, somewhat inflated, right valve more than left valve. Beaks just behind the vertical midline. Antero-dorsal margin more or less sloping, slightly convex and gradually passing into the well rounded anterior margin. Ventral margin convex, posterior margin more or less vertically truncated, postero-dorsal margin straight or nearly straight. Umbos of the slightly narrower left valve lodging in a shallow secondary indentation in the base of the right valve umbo. Surface with irregular growth lines and small, shallow, irregular, commarginal waves. There are also fine granulations over the whole surface which are strongest on the posterior and marginal part of the valve and which are visible only under a lens (x 10-20). Posterior angle rounded, more pronounced on the right than on the left valve. Periostracum thin, pale straw-coloured to nearly colourless. Ligament both external and internal, in a small, triangular resilifer behind the beaks. Pallial sinus broad but shallow. Valves entirely white to cream.

Distribution. West coast of Ireland, Irish Sea, Southwest England southward to Senegal to Guinea, Cameroon, northern Angola; throughout the Mediterranean, rare.



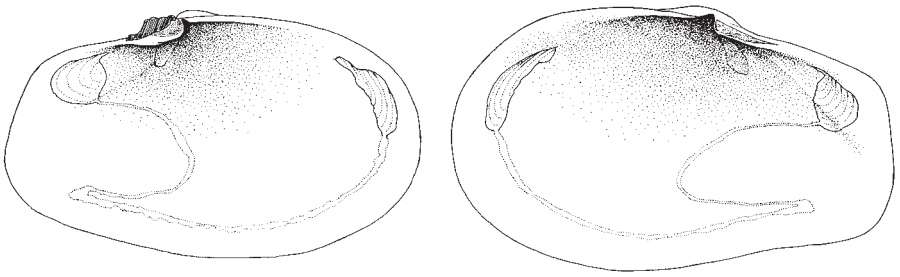
Biotope. In muddy sand and fine sand, also with shell debris, from about 10 to 60 m and deeper, not common.

Remarks. Empty valves are occasionally taken in shrimp trawls but are not found on the beach. This is the type species of the genus *Thracia*.



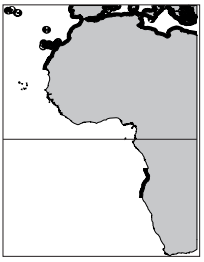
20.2. *Thracia (Thracia) pubescens* (Pulteney, 1799). **A**-**B**, Ensenada de la Almadraba, Ceuta, Spanish Morocco (54.5 mm). **C**-**D**, M'Bour, Senegal, 40-45 m (43.0 mm). **E**-**F**, Casamance (58.0 mm). **G**-**H**, W of Kaporo, Guinea, 9°36'N, 15°51'W, 50 m (40.6 mm). **I**-**J**, Ilha de Luanda, Luanda prov., N-Angola, 40-60 m (23.7 mm). **K**-**L**, Baia da Corimba, N-Angola, 10-20 m (48.0 mm).

Thracia (*Odoncineta*) *phaseolina* (Lamarck, 1818)



20.3. Port Etienne (now Nouadhibou), Mauritania (two specimens, lv, 20.1 mm; rv, 30.3 mm).

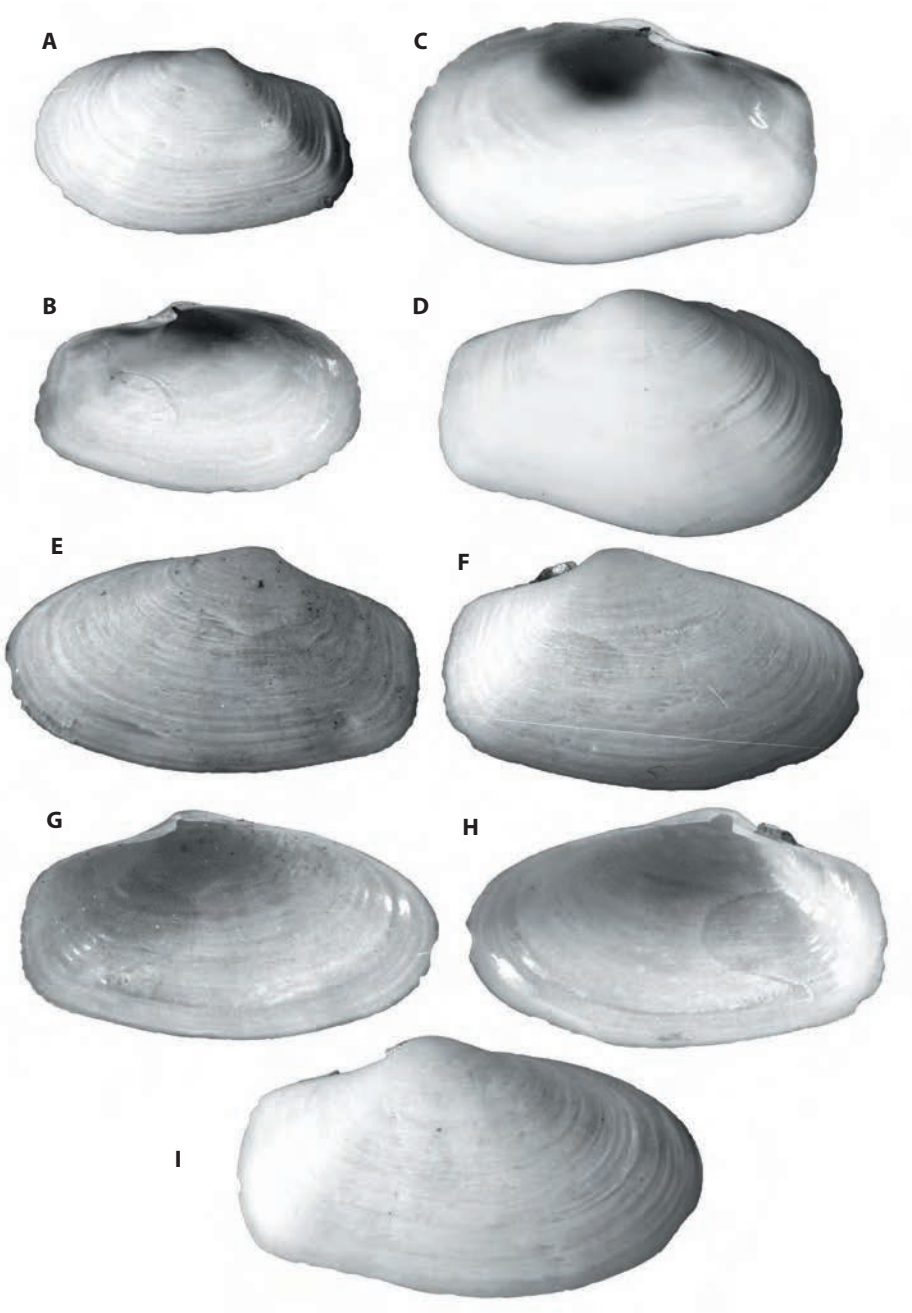
Shell up to 38 mm long, slightly variable in outline, oblong-suboval, inequivalve, thin and fragile, somewhat inflated, right valve larger and more convex than left valve. Beaks just behind the vertical midline. Antero-dorsal margin slightly convex and gradually passing into the well rounded anterior margin. Ventral margin in its anterior part convex, posteriorly nearly straight or occasionally even slightly concave. Posterior margin vertically truncated, postero-dorsal margin straight to slightly concave. Surface with irregular growth lines and extremely fine granules which are visible under a rather strong lens (x 40-50) only. Posterior angle rounded. Periostracum dull, brownish, pale yellowish or nearly colourless. Ligament both internal and external, in a small, narrow, triangular resilifer situated behind the beaks. Pallial sinus deep, ending slightly beyond the level of the beaks. Valves entirely white to cream.



Distribution. Norway (68°N); Iceland, Faroe, British Isles southward to Mauritania (Cap Blanc); Ghana?; northern Angola (Luanda) to southern Angola (Baia dos Tigres); Azores, Madeira, Canary Islands; throughout the Mediterranean.

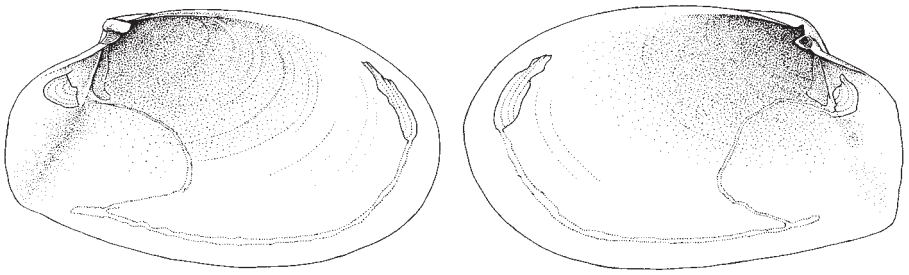
Biotope. In muddy sand, fine sand, mixed sand and coarse sand, from low tide level to about 50 m, not common anywhere in West Africa.

Remarks. *Thracia phaseolina* has a pronounced disjunct distribution which, in West Africa, largely coincides with the zone of permanent or nearly permanent upwelling. Its presence in the zone of intermittent upwelling in the Gulf of Guinea is possible: although it is not recorded yet from Côte d'Ivoire, two specimens from Ghana (Takoradi area) seem to belong to this species. Empty valves are occasionally cast up on beaches. This species has been known for a long time as *T. papyracea* (Poli, 1791), however, *Tellina papyracea* Poli, 1791 is a primary homonym of *Tellina papyracea* Gmelin, 1791 and is therefore not the valid name for this species.



20.4. ***Thracia (Odoncineta) phaseolina*** **(Lamarck, 1818).** **A-B**, Port-Etienne (now Nouadhibou), in the bay (20.0 mm). **C-D**, same locality (30.2 mm). **E-H**, Mia Mia Bay, Ghana, 10 m (16.6 mm). **I**, Ponta do Mussulo, Luanda prov., N-Angola (16.5 mm).

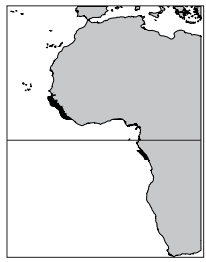
Thracia (*Odoncineta*) *roumei* Cosel, 1995



20.5. Roume, Iles de Los, Guinea, north side, fine muddy sand, 1.5-2 m (holotype, 10 mm).

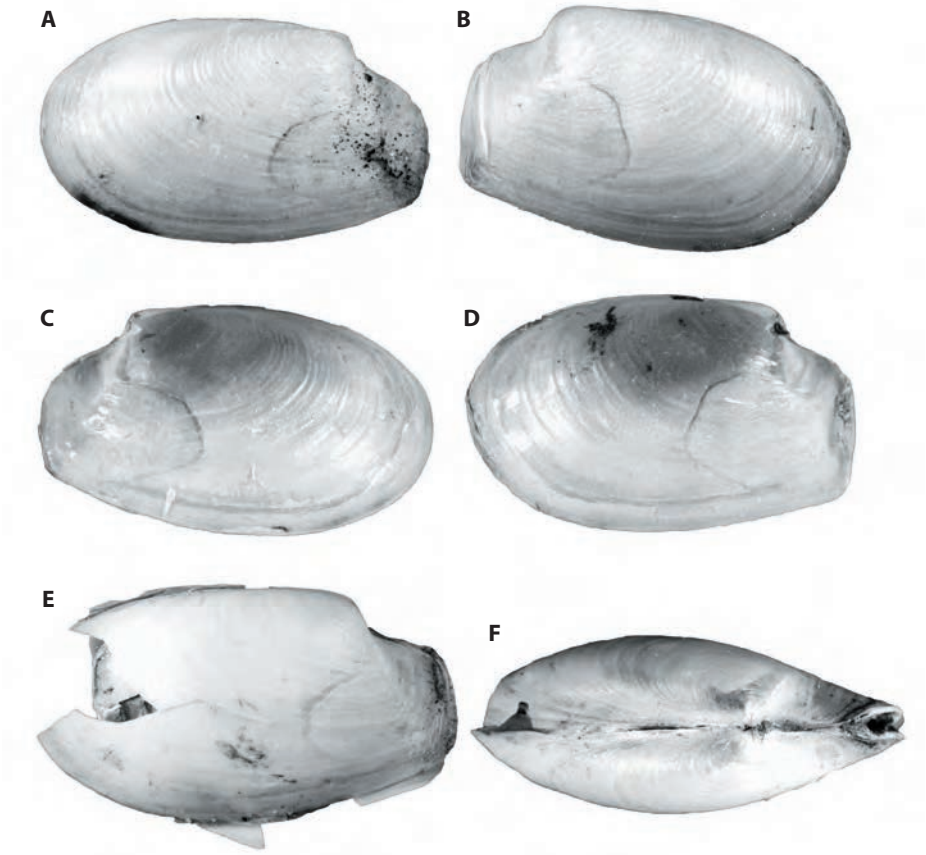
Shell small, up to 12 mm long, somewhat variable in shape, oblong-suboval, slightly inequivalve, very thin and fragile, rather inflated, right valve slightly overlapping the left valve but of nearly equal convexity. Beaks well behind the vertical midline, at the beginning of the posterior fourth of the valve. Antero-dorsal margin gently convex, anterior margin well rounded, ventral margin in its anterior part strongly convex, towards posterior only slightly convex. Posterior margin vertically rounded-truncated, postero-dorsal margin short and nearly straight. Surface with extremely fine granules, visible only under a lens (x 30-50), irregular growth lines and faint irregular commarginal waves. Posterior angle often sharp near the umbos, towards the margins becoming rounded and rather ill-defined. Periostracum thin, light yellowish brown, persistent mostly near the margins and on the posterior part. Small external ligament and internal resilium in a small triangular chondrophore. Lithodesma well developed. Valves entirely white, with a slightly nacreous aspect.

Distribution. Senegal (Saloum, Petite Côte) southward to Sierra Leone (Banana Grounds); Congo Brazzaville (Pointe-Noire).



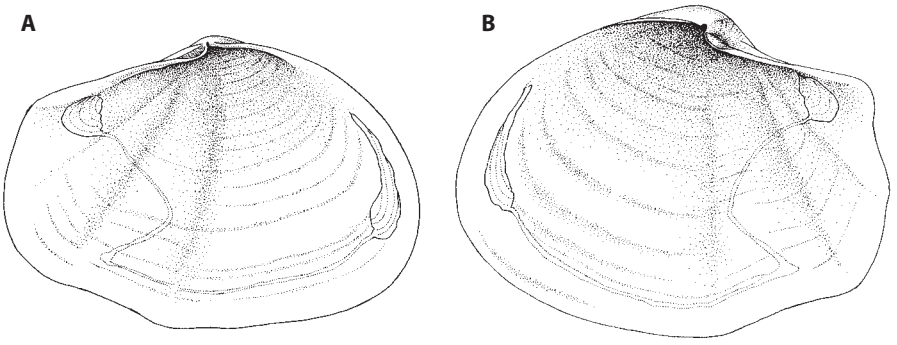
Biotope. In fine muddy sand in calm bays, inlets and other sheltered areas, also near mangroves, in shallow water from 1 to about 7 m, rare.

Remarks. This species is distinguished from *T. phaseolina* by its smaller size, the more oval shape and the more posteriorly situated beaks. Its distribution is still very imperfectly known.



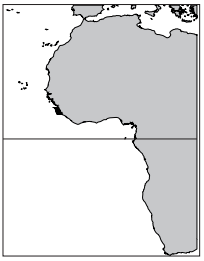
20.6. ***Thracia (Odoncineta) roumei*** **Cosel, 1995. A-D**, N-side of Roume Island, Iles de Los, Guinée, 1.5-2 m (holotype, 10.0 mm). **E-F**, Baie de Pointe-Noire, Congo Brazzaville, 5-7 m (13.0 mm).

Thracia (*Homoeodesma*) cf. *corbuloidea* Blainville, 1827



20.7. A, Guinea, 9°18'N, 13°41.5'W, 20 m (lv, 34.3 mm). B, W of Kaporo, Guinea, 9°36'N, 14°12'W, 34 m (rv, 22.5 mm).

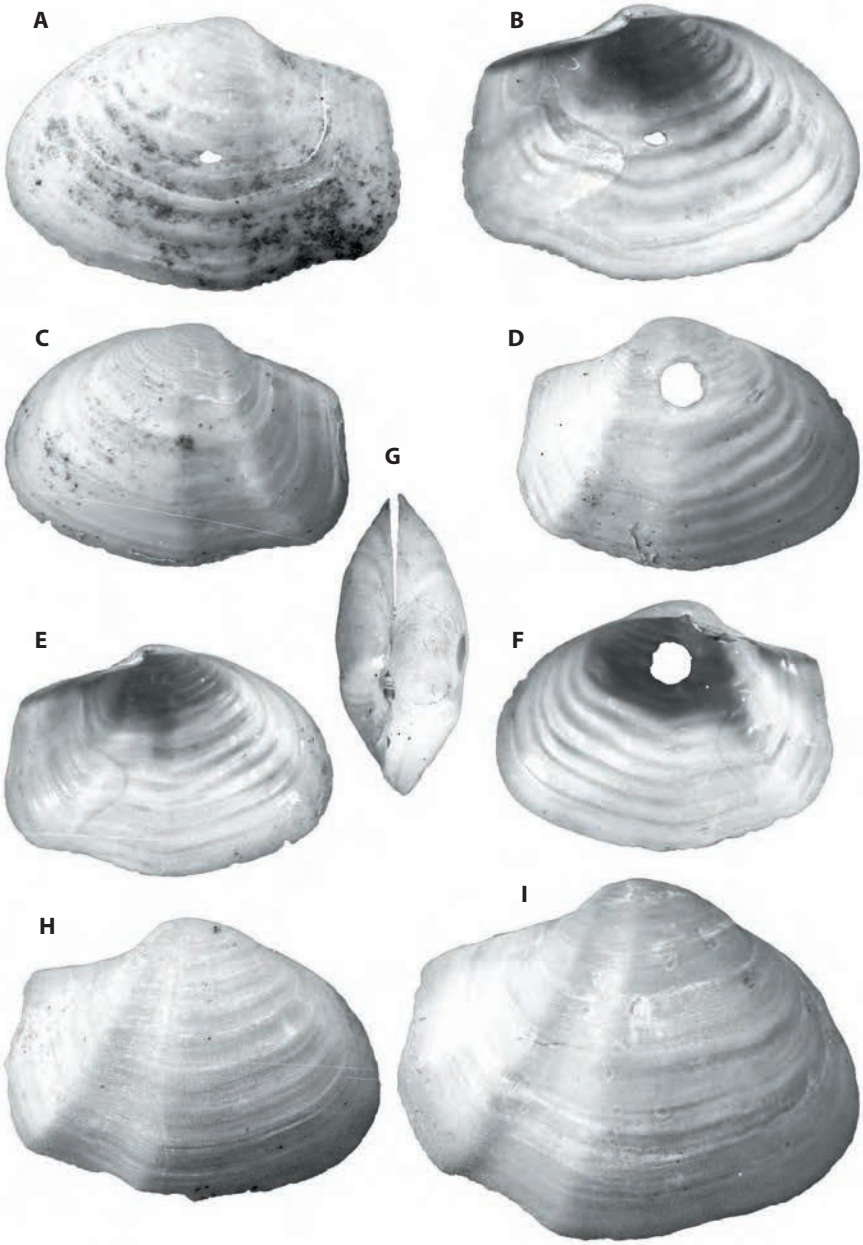
Shell up to 34 mm long, somewhat variable in outline, suboval-subrectangular, thin and fragile, inflated, right valve more so than left valve. Beaks slightly behind the vertical midline. Antero-dorsal margin convex, passing gradually into the rounded anterior margin. Ventral margin anteriorly very weakly convex to straight, in the middle markedly convex, posteriorly slightly concave. Posterior margin truncated, postero-ventral corner rounded. Surface with irregular, broad, almost commarginal undulations, most developed on the anterior part of the valves and well reflected on the interior. A broad, radial depression goes from the beaks to the postero-ventral margin just anterior to the rounded posterior angle. There are also fine, strong and dense granules over the whole surface, which are most developed on the marginal and posterior part and which are only visible under a lens (x 5-10). Periostracum very thin and nearly colourless. Ligament both internal and external, in a small, narrow and nearly horizontal, not prominent chondrophore. Pallial sinus short, broad, somewhat triangular, not reaching the level of the beaks. Valves entirely whitish to cream.



Distribution. Only known so far from three stations on the continental shelf off Guinea (9°18'N and 9°36'N).

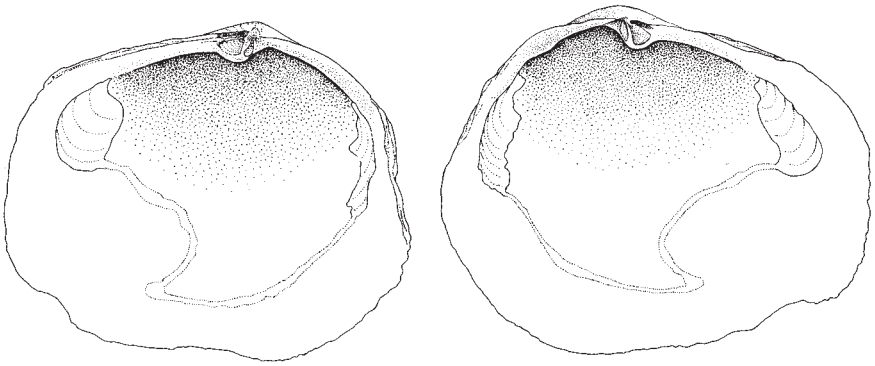
Biotope. Most probably in fine sand with shells and shell debris, 20-35 m, rare.

Remarks. This form is close to the Mediterranean *T. corbuloidea*, which is also found in the Canary Is. (Hernández *et al.* 2011) but the latter lacks the commarginal undulations and has a more solid shell. This is probably a distinct, undescribed species. It resembles somewhat *Cyathodonta plicata*, although the chondrophore is much narrower and not as prominent as in *C. plicata*. In the latter the commarginal waves are often less developed than in this species.



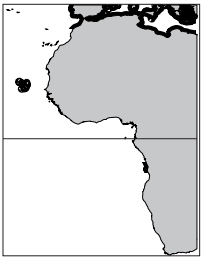
20.8. ***Thracia (Homoeodesma)*** **cf.** ***corbuloidea*** **Blainville, 1827. A**-**B**, W of Conakry, Guinea, 9°30'N, 14°02'W, 25 m 24.5 mm). **C**-**G**, W of Ile Tannah, Guinea, 9°11.5'N, 14°46.5'W, 50 m (21.7 mm). **H**, W of Kaporo, Guinea, 9°36'N, 14°12'W, 34 m (22.4 mm). **I**, W of Ile Kabak, Guinea, 9°18'N, 13°45'W, 20 m (33.8 mm).

Thracia (*Ixartia*) *distorta* (Montagu, 1803)



20.9. Cabo Ledo, Bengo, N-Angola, 10-40 m (lv, 7.3 mm; rv, 7.7 mm).

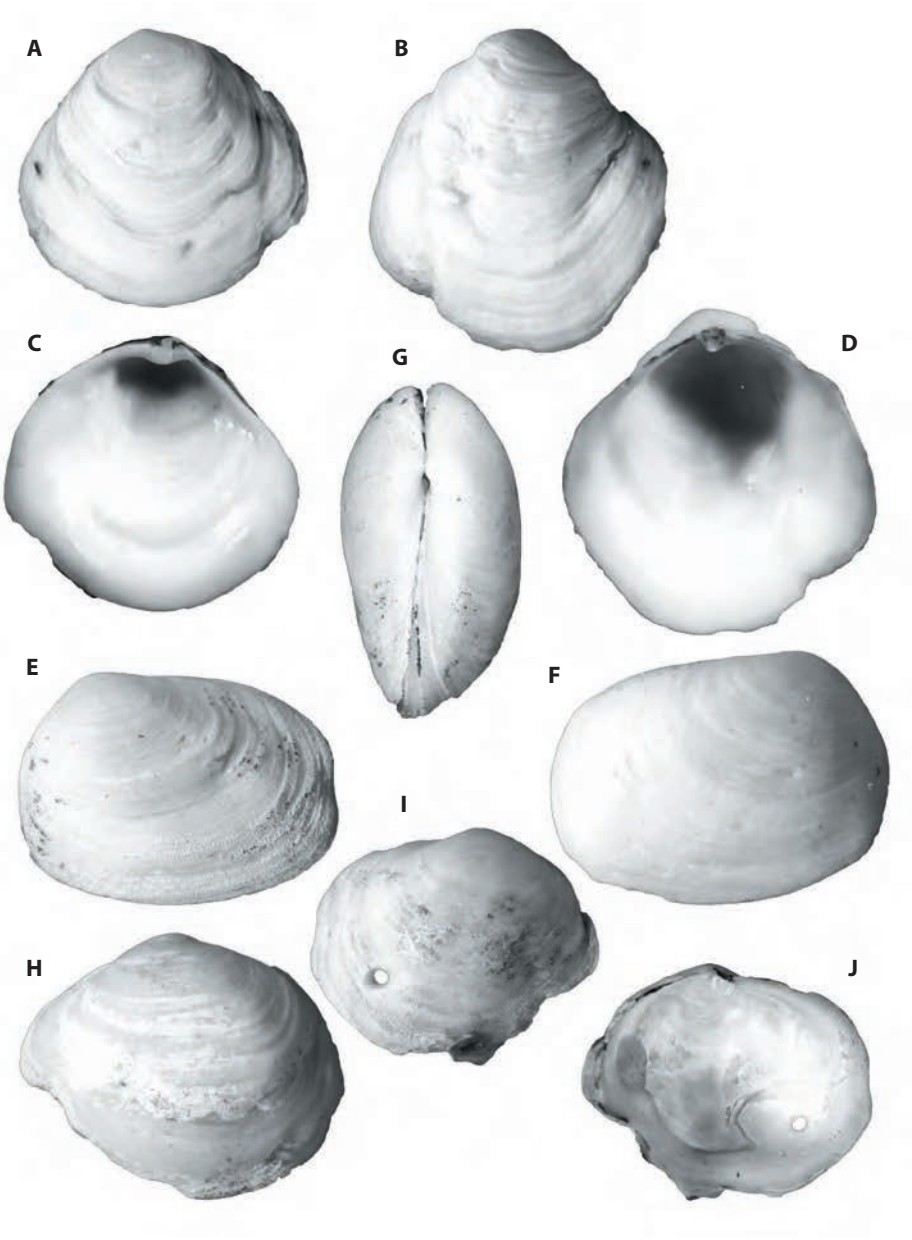
Shell up to 20 mm long, occasionally larger, very variable in outline, mostly irregularly suboval, inequivalve, thin but rather solid, with very inflated right valve and less inflated and slightly smaller left valve. Beaks mostly well in front of the vertical midline. Anterior and posterior margin broadly rounded, ventral margin slightly convex or irregular with one to several sinuosities or dents. Beaks of the left valve puncturing the umbos of the right valve. Surface with strong growth lines and growth waves and fine, dense granules, visible only under a lens (x 5-10). No posterior angle. Periostracum thin, greyish brown to nearly colourless. Ligament both internal and external, in a short but prominent, triangular chondrophore situated behind the beaks. Small lithodesma just anterior to the ligament. Pallial sinus broad but not very deep. Valves entirely whitish to cream.



Distribution. Eastern Atlantic: Norway (69°N), Shetlands, British Isles southward to Morocco (33°N); Northern Angola (Cabo Ledo, Luanda); Cape Verde Islands; Mediterranean. Western Atlantic: Gulf of Mexico southward to Colombia.

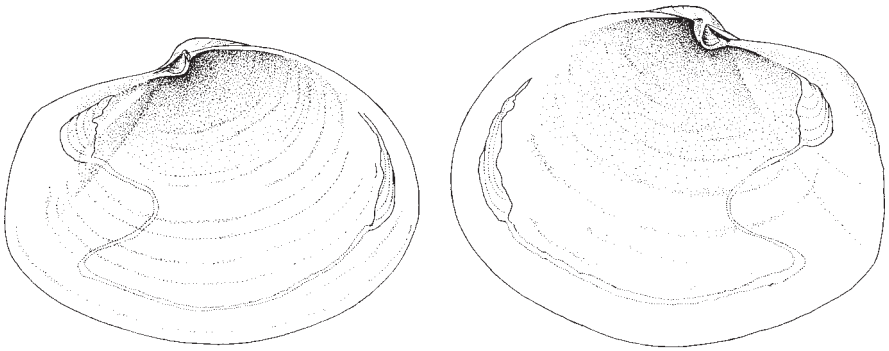
Biotope. On rocky bottom and other hard substrate, in crevices and empty bore holes, from shallow water to about 40 m, occasionally deeper, not common.

Remarks. This rarely collected species shows a pronounced disjunct distribution which leaves out nearly the entire tropical part of the West African shore.



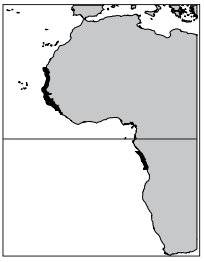
20.10. *Thracia (Ixartia) distorta* (Montagu, 1803). **A-D**, Baia Matiota, São Vicente, Cape Verde Islands (14.9 mm). **E-G**, Cabo Ledo, Luanda prov., N-Angola, 10-40 m (15.1 mm). **H**, same locality (9.2 mm). **I-J**, same locality (8.1 mm).

Cyathodonta plicata (Deshayes, 1832)



20.11. Ponta das Lagostas, Luanda, N-Angola, 30-50 m (lv, 32.5 mm; rv, 33.8 mm).

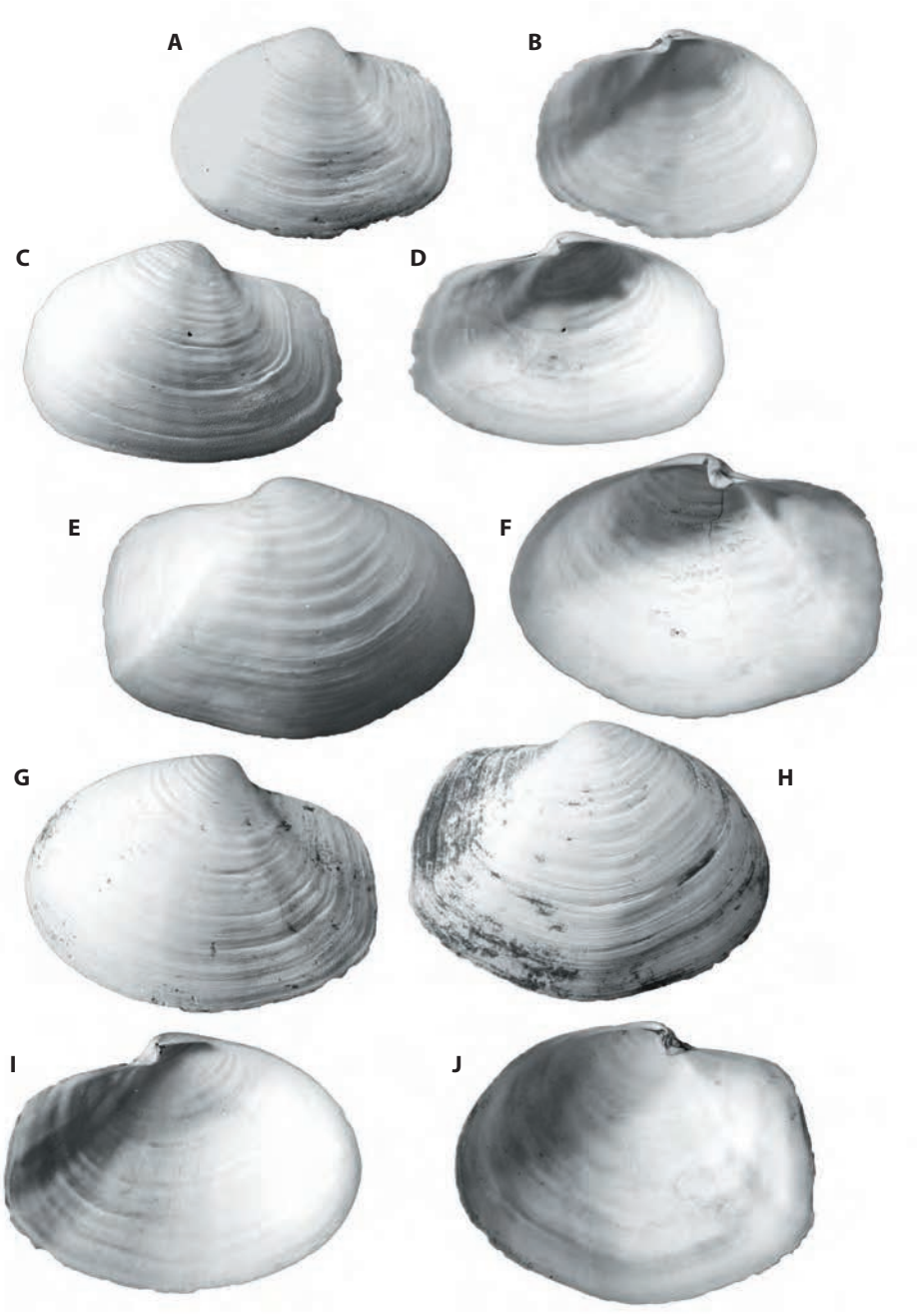
Shell up to 35 mm long, variable in outline, somewhat suboval, thin and fragile, inflated, right valve more so than left valve. Beaks slightly behind the vertical midline. Antero-dorsal margin convex, passing into the well and evenly rounded anterior margin. Ventral margin in the middle more convex than anteriorly and posteriorly. Posterior margin truncated, slightly convex, with rounded corners. Umbos of the right valve with a very small hole perforated by the left valve beaks. Surface with rather broad, irregular, more or less marked undulations, which are parallel to the growth lines and which mostly become obsolete on the marginal part of the valves. There are also fine, strong and very dense granules, visible only under a lens (x 10-20). Posterior angle rounded. Periostracum thin and greyish brown, on empty shells often peeled off. Ligament both internal and external, in a small but prominent, triangular chondrophore situated behind the beaks. Pallial sinus broad and rather short, not reaching the level of the beaks. Valves entirely whitish to cream.



Distribution. Mauritania (Cap Blanc) to Guinea (9°30'N); Congo Brazzaville (Pointe-Noire) to northern Angola (Luanda).

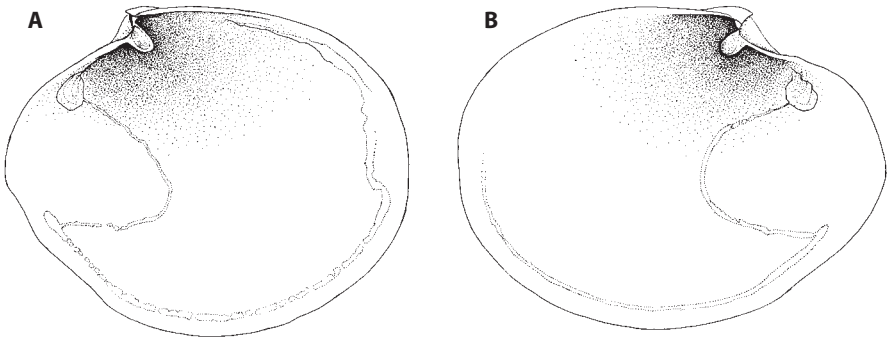
Biotope. In fine, muddy sand and fine sand, mostly with shells and shell debris, but also with gravel, from shallow water (*ca.* 5 m) to about 50 m, rare.

Remarks. This species is distinguished from most other *Cyathodonta* by the nearly commarginal undulations. A very close Panamic-Pacific species is *C. dubiosa* Dall, 1915, a comparable Caribbean species *C. cruziana* Dall, 1915. Although the locality "probably Senegal" had been given only later (Deshayes & Milne-Edwards 1835), the species was never mentioned in the "modern" molluscan literature concerning West Africa. The species seems to be restricted to the Northern and Southern Alternant Regions. Empty valves or fragments may rarely be found on some beaches.



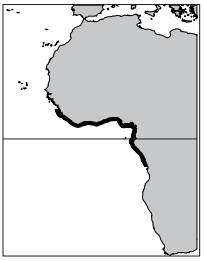
20.12. ***Cyathodonta plicata*** **(Deshayes, 1832). A-B**, Between Gorée and Thiaroye, Senegal, 17-19 m (27.0 mm). **C-D**, W of Kaporo, Guinea, 9°36'N, 13°57'W, 21 m (28.8 mm). **E-F**, Pointe-Noire, Congo Brazzaville, Plage Mondaine, beach drift (rv, 33.2 mm). **G-J**, off Ponta das Lagostas, Luanda prov., N-Angola (34.7 mm).

Periploma (*Cricoploma*) *camerunense* Cosel, 1995



20.13. **A**, Victoria (Limbe), Cameroon, 3°58'N, 9°05'E, 38 m (lv, 27.1 mm). **B**, W of Rio Morébaya, Guinea, 9°24'N, 13°48'W, 13 m (rv, 16.6 mm).

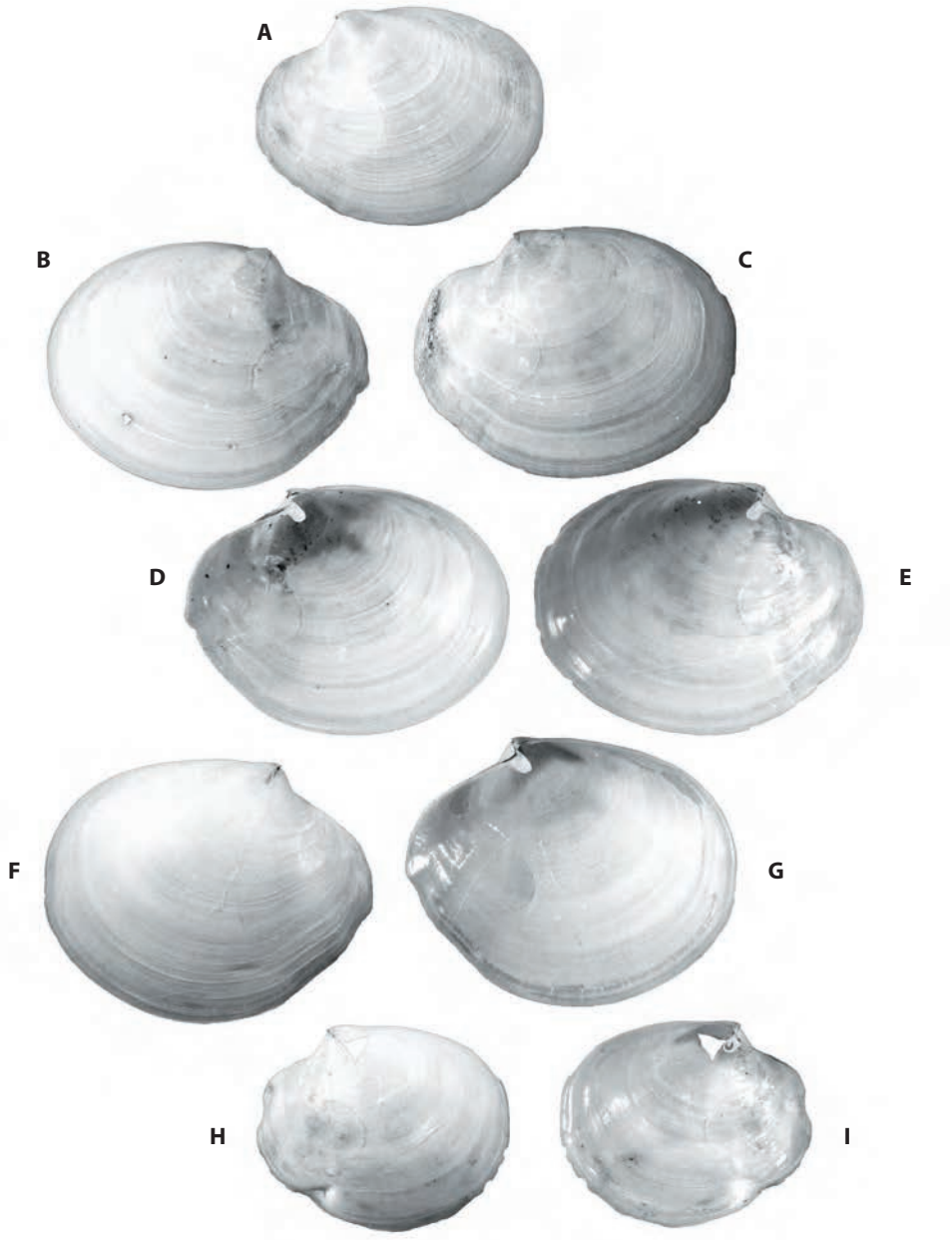
Shell up to 27 mm long, subcircular-suboval, very thin and fragile, rather compressed, with right valve slightly more inflated than left valve. Umbos well behind the vertical midline, with typical, transverse crack. Anterior margin well rounded, passing into the convex ventral margin. Posterior margin narrowly rounded. Surface with irregular growth lines and growth waves and with extremely fine, irregular, dense striae which are not entirely parallel to the growth lines and which transform to somewhat coarser granules near the posterior margin. They are visible only under a lens (x 10-20). Periostracum very thin, pale yellowish grey to nearly colourless. Ligament internal, in strong, conspicuous, spoon-shaped chondrophore which points towards the antero-ventral margin; no lithodesma. Hinge without any teeth. Pallial sinus broad and rather short. Valves nacreous white.



Distribution. Guinea (9°24'N) to Angola (7°55'S). The other known records are Liberia (off Marshall, 6°N), Ghana (0°35'E), Nigeria (3°27'E) and Cameroon (Victoria/Limbe area).

Biotope. In fine, muddy sand, from shallow water (13 m) to well offshore (150-400 m), rare.

Remarks. This species has been cited by Nicklès (1955) as "*Periploma discus* Stearns, 1890", a species from California which is more circular than the west African species. This is the only *Periploma* known from West African waters.

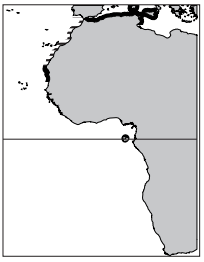


20.14. *Periploma camerunense* Cosel, 1995. **A**, W of Rio Morébaya, Guinea, 9°24'N, 13°48'W, 13 m (16.6 mm). **B-E**, W of mouth of Sanaga River, Cameroon, 3°31'N, 9°24.4'E, 30 m (holotype, 19.2 mm). **F-G**, Cameroon, 3°34.3'N, 9°22.3'E, 29 m (paratype, 27.1 mm). **H-I**, Victoria (now Limbe), Cameroon, 3°58'N, 9°05'E, 38 m (21.1 mm).

Clavagella (*Bryopa*) *aperta* G.B. Sowerby I, 1823

20.15. Pointe de Cansado, low tide (tube 47 mm; rv, 28.4 mm).

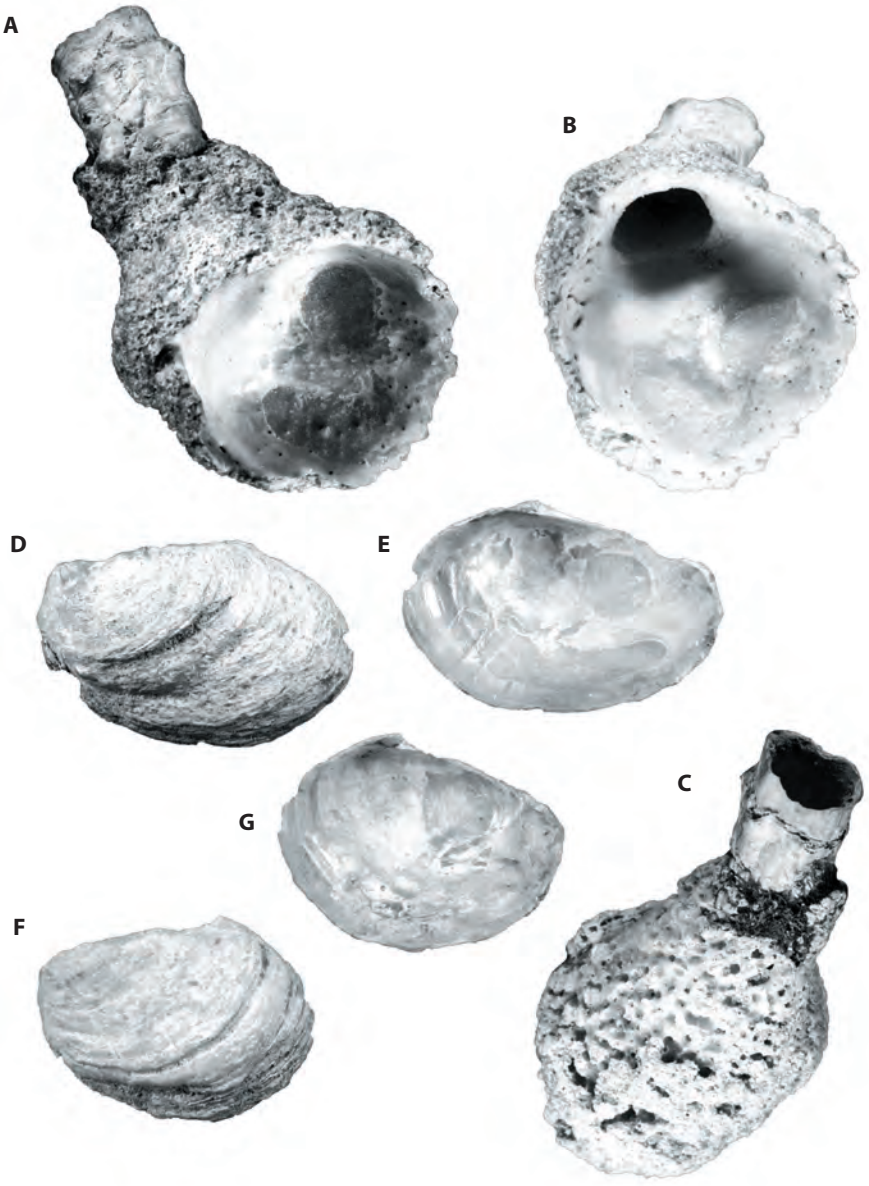
Shell irregular, free valve up to 28 mm long, the compound of valves and adventitious shell tube up to 60 mm, extremely variable, irregular and distorted. Right, free valve irregularly oval, rather solid, not very much inflated. Beaks in front of the vertical midline. Postero-dorsal margin eroded during growth. Surface with very strong, irregular growth lines, growth stages and growth waves. Left valve entirely fused with the secondary shell tube. Ligament external. Hinge line without any teeth. Pallial sinus deep, irregular. Adventitious shell tube on the ventral end anterior side of the shell irregularly perforated with small holes. Siphonal tube hexagonal-oval in cross-section, short, with flaring siphonal margin and transverse lamellae originating from anterior, earlier margins. Valves creamy white to cream, interior nacreous.



Distribution. Southwestern Mediterranean (Sicily, Malta, Tunisia, Algeria). West African records only from Mauritania and from Ilha do Principe (one valve only).

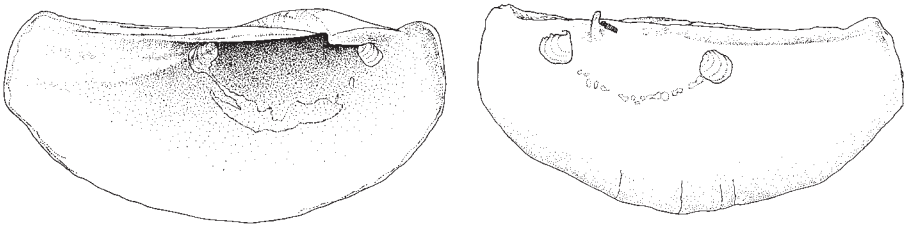
Biotope. In beachrock, limestone and other soft, predominantly calcareous rock, from extreme low tide to about 15 m, rare.

Remarks. The West African occurrence of this species was unknown until 1977 when Marche-Marchad collected three specimens in Pte de Cansado, Mauritania (Marche-Marchad 1978).



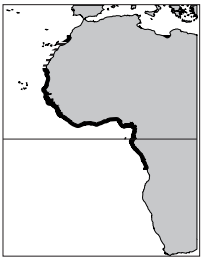
20.16. *Clavagella (Bryopa) aperta* G.B. Sowerby I, 1823. A-C, Pointe de Cansado, Mauritania, 48.1 mm (different views of the tube). D-G, same specimen, valves.

Pandora oblonga G.B. Sowerby I, 1830



20.17. Pointe-Noire, Congo, off Orstom beach, 3-5 m (lv, 10.7 mm; rv, 10.5 mm).

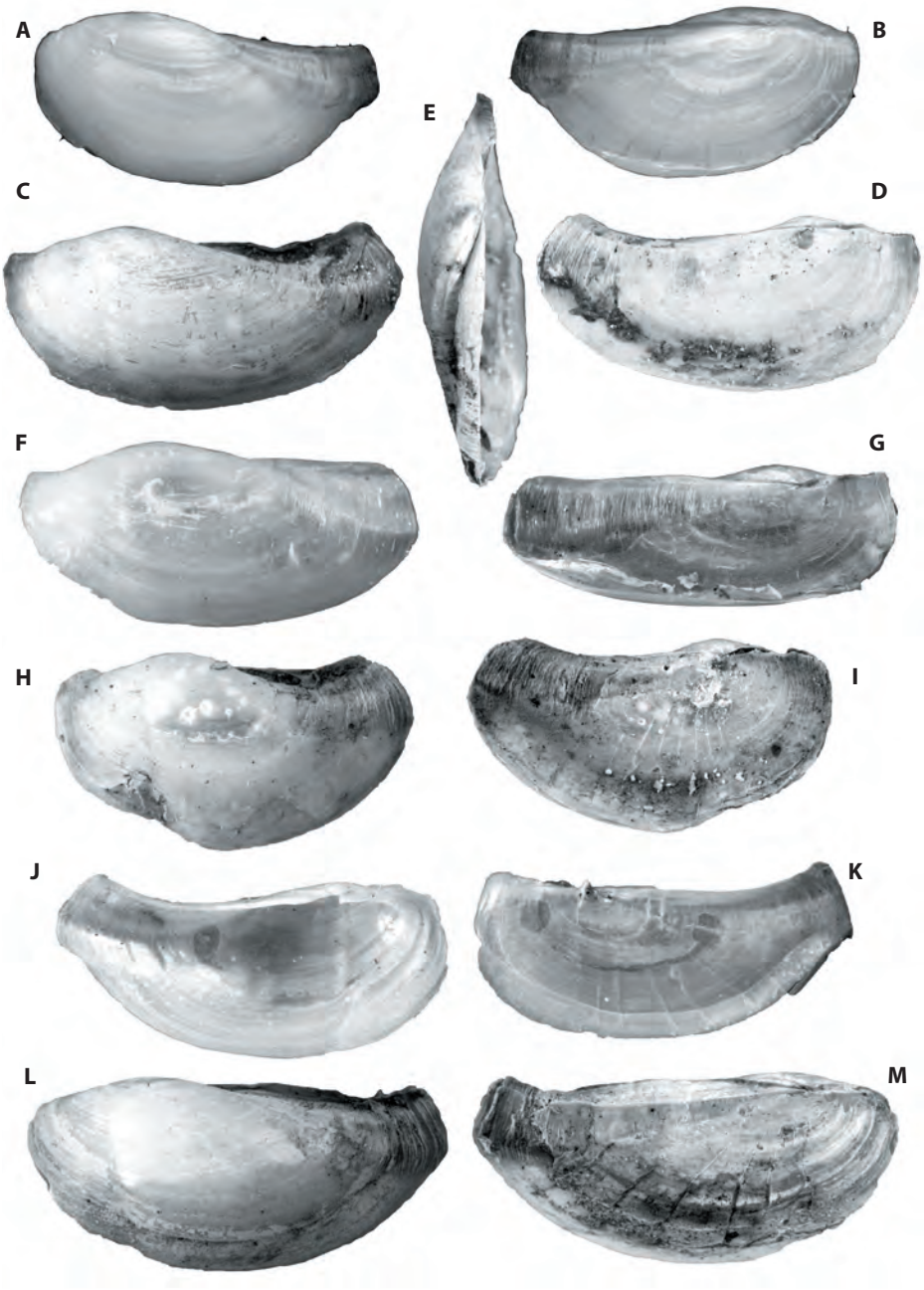
Shell up to 15 mm long, quite variable in outline, oblong, somewhat crescent-shaped, thin and brittle, with convex left valve and flat, smaller right valve which lodges within the larger left valve. Beaks at the end or just behind the anterior fourth of the valves. Antero-dorsal margin nearly straight, postero-dorsal margin straight to markedly concave, ventral margin strongly convex, posterior margin rostrate. Sharp angle between anterior and antero-dorsal margin. Surface smooth, with growth lines only, posterior area on the left valve separated from the rest of the valve by a rounded keel, on the right valve narrow, with a sharp keel. Periostracum thin, pale straw-coloured, on the umbonal area mostly eroded. Ligament internal, in a long, narrow resilifer which is oblique towards posterior. Hinge in the right valve with a narrow, protruding, somewhat hooked tooth-like structure anterior to the resilifer, which fits into a narrow space of the left valve between the resilifer and a horizontal, laminar, inner reinforcement of the antero-dorsal margin. No pallial sinus. Valves translucent white, entirely nacreous.



Distribution. Morocco (Agadir (Moukrim *et al.* 2010)), Mauritania (Cap Blanc) to southern Angola (Moçâmedes, Namibe Province)).

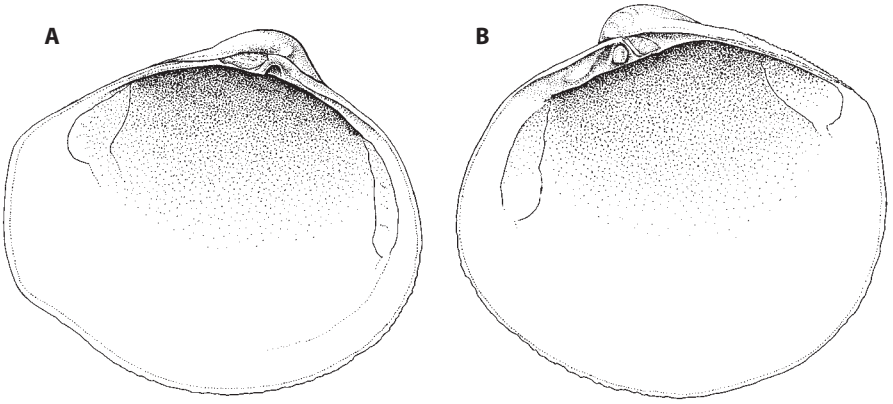
Biotope. In fine, muddy sand and fine sand, from about 2 to 30 m, locally common.

Remarks. This species shows a considerable variability in length/height ratio and situation of the beaks, especially specimens from Cameroon are short with well rounded ventral margin. Intermediate forms exist, which for the moment are all considered conspecific. A few specimens collected in Ghana (near Takoradi) are short with markedly concave dorsal margin, these might represent a separate species. In Agadir, *Pandora oblonga* was found together with the European *P. inaequivalvis* (Linnaeus, 1758) which has there its southernmost record. A second species, *Pandora gorii* Rolán & Hernández, 2007, was recently described from Casamance (Senegal) and is only known from one locality ("estuary of Ziguinchor, Casamance, 30 m", Rolán & Hernández 2007: 12). From *P. oblonga* it is distinguished by its extremely small size of only 5 mm, a very short and concave anterior margin and a straight posterior margin.



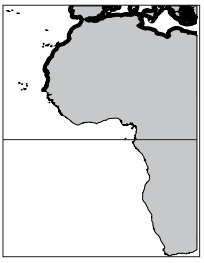
20.18. ***Pandora oblonga*** **G.B. Sowerby I, 1830. A-B**, Agadir, Morocco, beach, 6 m (14.0 mm). **C-E**, Essoukoudiak Bôlon, Casamance, Senegal, 4-6 m (12.6 mm). **F-G**, Abidjan, Côte d'Ivoire, 20 m (15.5 mm). **H-I**, Victoria (now Limbe)–Bota, Cameroon, 8-10 m (12.6 mm). **J-K**, Cacuaco, Bengo prov., N-Angola, shallow water (13.7 mm). **L-M**, Baia de Moçâmedes, Namibe prov., S-Angola, 5-10 m (13.4 mm).

Poromya granulata (Nyst & Westendorp, 1839)



20.19. **A**, Baie de Gorée, Senegal, 170-200 m (lv, 7.2 mm). **B**, off the Cap Vert Peninsula, 150-200 m (rv, pallial line not visible, 5.2 mm).

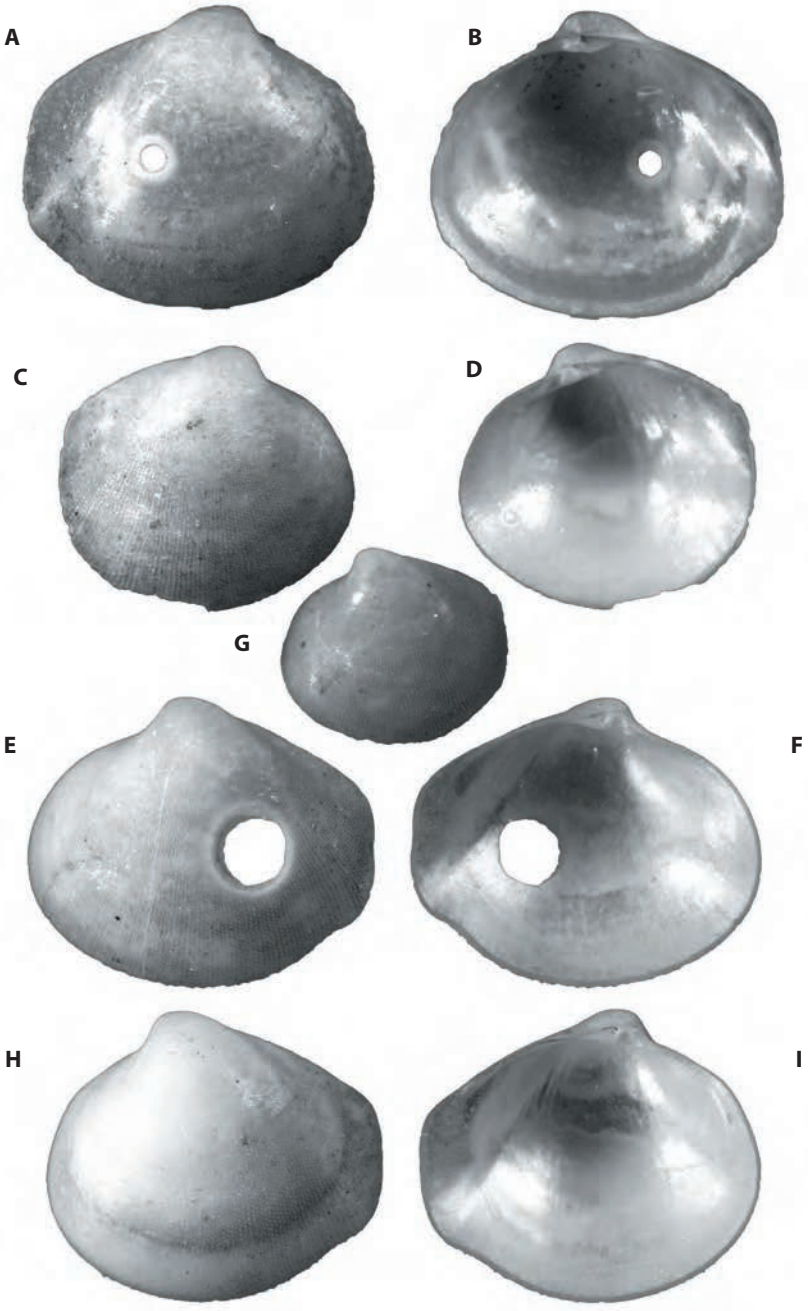
Shell up to 12 mm long (West African specimens to 8 mm), variable in outline and sculpture, equivalve, suboval-subcircular, thin and fragile, inflated. Beaks just in front of the vertical midline and pointing forward. Anterior margin evenly rounded, passing gradually into the antero-dorsal and ventral margin. Posterior margin truncated, with rounded corners, postero-dorsal margin slightly convex, postero-ventral margin with a weak sinuosity just anterior to the postero-ventral corner. Surface with fine, conspicuous granules, densely arranged in radial rows and best visible under a lens (x 10-20). There are also faint, irregular growth lines and growth waves, more or less marked and occasionally obsolete. Posterior angle rounded and not prominent. Periostracum thin, brown to nearly colourless. Ligament both internal and external, resilifer small, short and triangular, not prominent and situated behind the beaks. Hinge line with one prominent cardinal in the right valve and a socket in the left valve. Pallial sinus short and broad. Valves whitish to cream, interior nacreous.



Distribution. Eastern Atlantic: Iceland, Norway (70.5°N), Faroe, British Islands southward to Senegal (Dakar); throughout the Mediterranean. Western Atlantic: Arctic region and SW-Greenland southward to Brazil (São Paulo State); throughout the Caribbean.

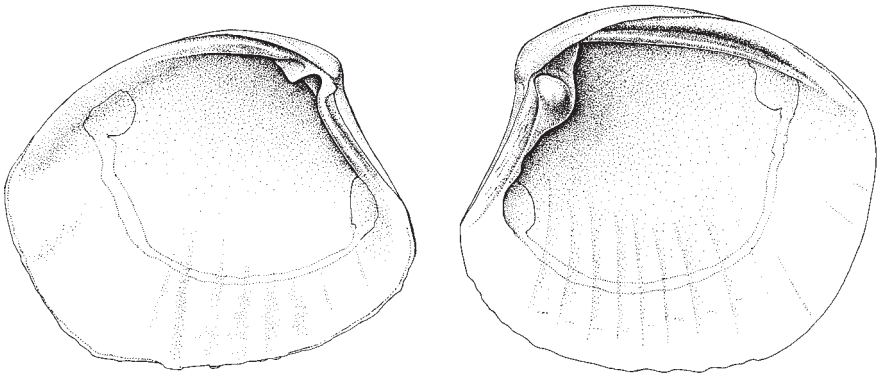
Biotope. In muddy bottom, offshore from 30 to 600 m and deeper, not common. Samples from Atlantic Morocco and Senegal have been taken between 110 and 250 m.

Remarks. The West African specimens fall well within the variability of this widespread species. The predatory behaviour was described by Morton (1981b).This is the type species of the genus *Poromya*.



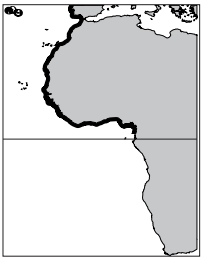
20.20. *Poromya granulata* (Nyst & Westendorp, 1839). **A-B**, Atlantic coast of Morocco, 34°08'N, 7°30'W, 170 m (9.3 mm). **C-D**, off Cap-Vert Peninsula, Senegal, 150-250 m (5.1 mm). **E-F**, Baie de Gorée, Senegal, 14°27'N, 17°33'W, 170-200 m (7.1 mm). **G**, same locality (5.5 mm). **H-I**, same locality (6.8 mm).

Haliris lamothei (Dautzenberg & Fischer, 1897)



20.21. Abidjan region, Côte d'Ivoire (2.7 mm).

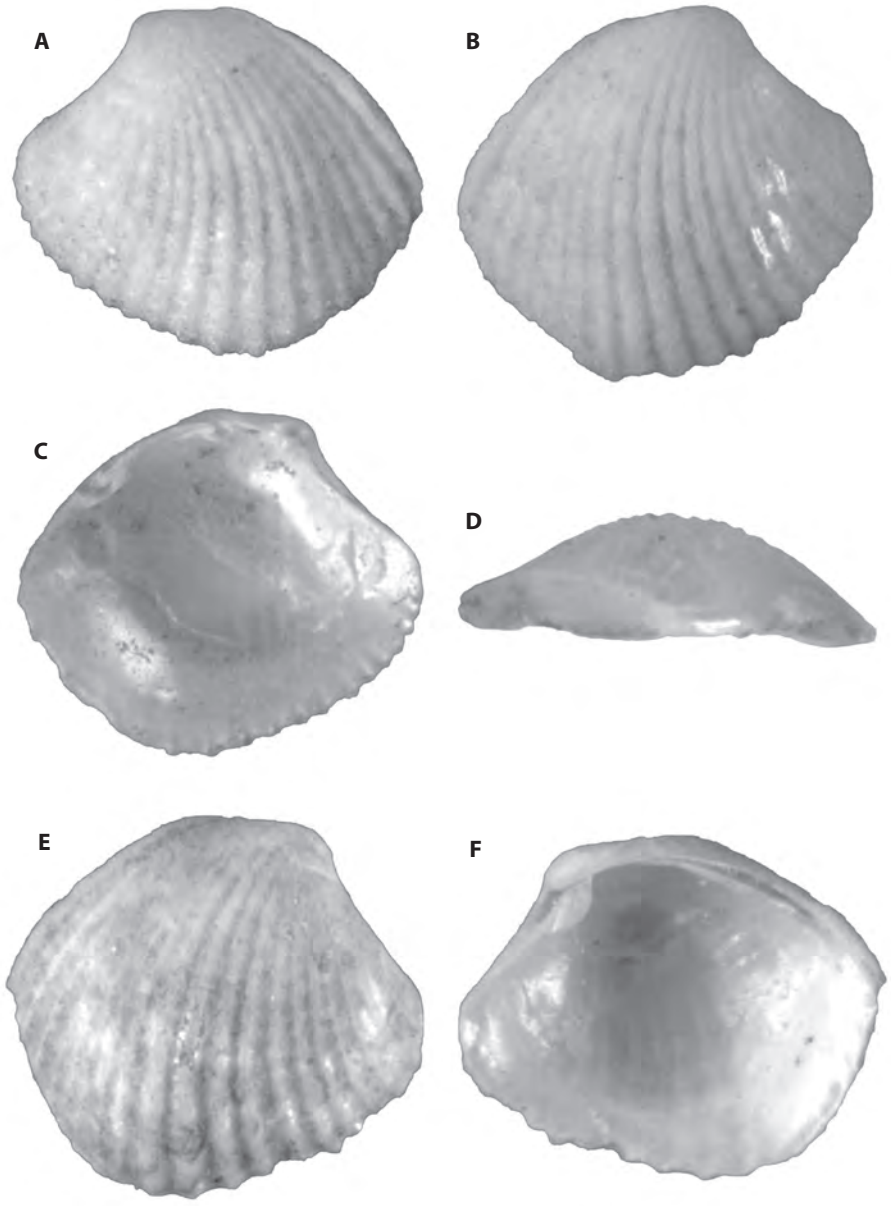
Shell up to 10 mm long (West African specimens only 3-4 mm), variable in outline, somewhat trapezoidal, inequivalve, with right valve slightly larger and dorsally and ventrally overlapping the left valve, rather solid, not very inflated. Beaks at the end of the anterior fourth of the valves. Surface with 17-21 low, radial ribs and extremely fine, dense granules, arranged radially and visible under a strong lens (x 25-50) only. Lunule and escutcheon well separated. Periostracum very thin and nearly colourless. Ligament short, sunken. Hinge line in the right valve with a more or less strong and prominent, rounded cardinal and two narrow posterior lateral ridges, left valve with a well marked socket for the cardinal and a protruding dorsal margin which fits between the two ridges on the right valve. Pallial sinus very shallow and ill-defined. Outside greyish white, inside white and nacreous.



Distribution. N-Spain southward to Cameroon and Congo Brazzaville, perhaps further southward to South Africa; Azores (type locality).

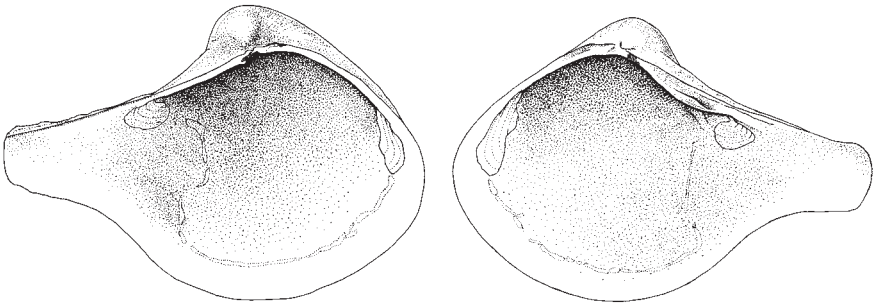
Biotope. In muddy bottom, on the shelf slope, from 150 m to about 600 m, rare.

Remarks. The West African specimens are somewhat different from the specimens from the Azores, the type locality of the species. They are less tumid and have less ribs (17-21 instead of 22-23), but here still considered as being conspecific with the North Atlantic specimens. Allen & Turner (1974) consider that *Haliris* is not a clearly defined taxon and leave the species and leave the species in its original combination under *Verticordia*. *Haliris granulata* (Seguenza, 1860) is a similar Mediterranean species, and the species-level taxonomy of this group is badly in need of revision.



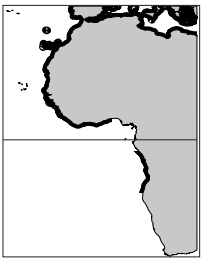
20.22. *Haliris lamothei* (Dautzenberg & Fischer, 1897). **A**-**B**, off Gorée, Dakar, Senegal, 145-170 m (3.3 mm). **C**-**D**, same locality (3.3 mm). **E**-**F**, Cameroon, 33°33.4'N, 9°17.3'E, 41 m (3.8 mm).

Cuspidaria cuspidata (Olivi, 1792)



20.23. Abidjan region, Côte d'Ivoire, 70 m (10.7 mm).

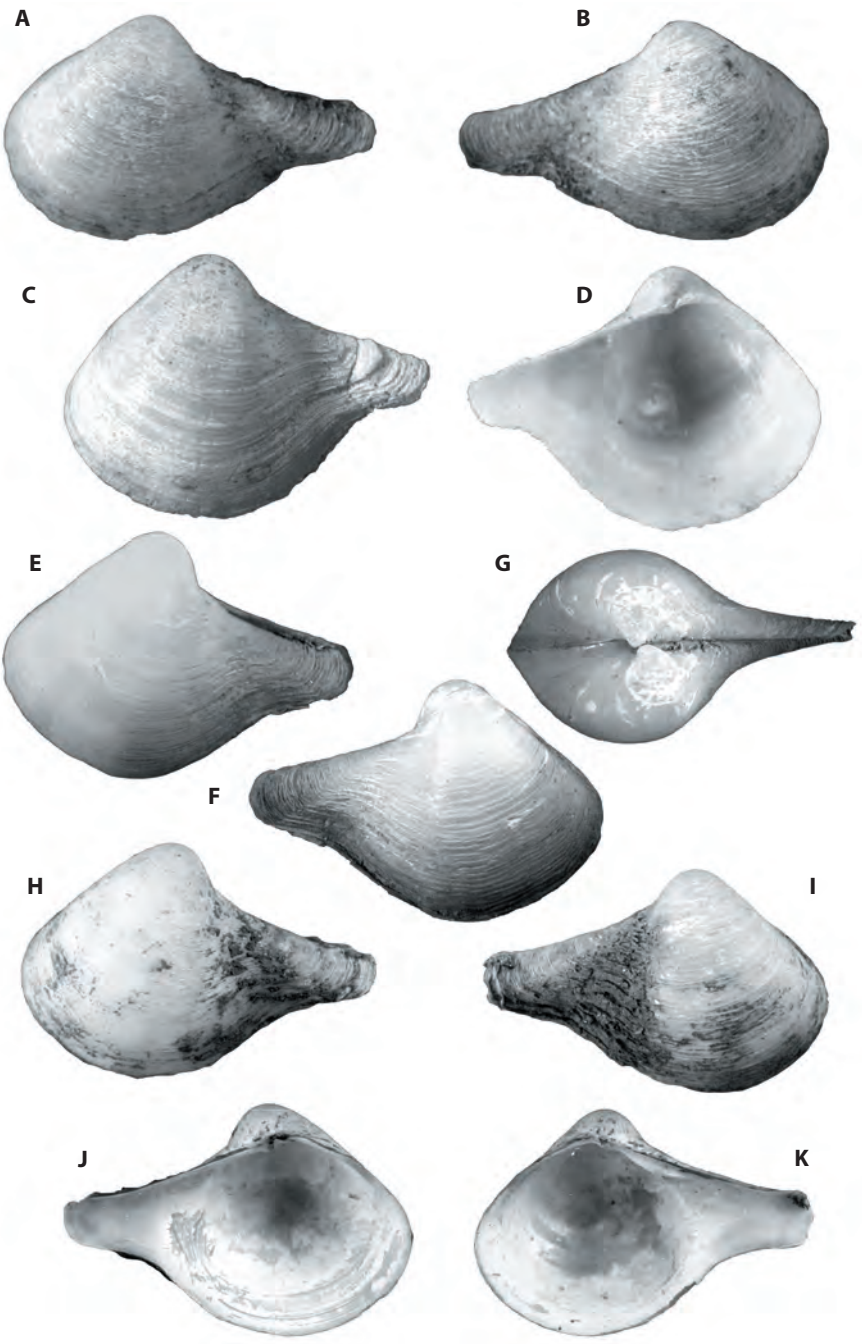
Shell up to 19 mm long (West African specimens up to 12 mm), variable in outline, short-oval with rather long posterior rostrum, inequivalve, with left valve slightly more tumid than right valve, anteriorly very inflated, rostrum compressed and gaping posteriorly. Beaks more or less median or slightly in front of the vertical midline; beak of the left valve situated immediately behind the beak of the right valve. Surface with numerous, fine, irregular, commarginal striae, on the umbonal part obsolete. Periostracum thin, pale greyish brown, most developed on the rostrum and there often encrusted with sediment. Ligament very small, in a triangular chondrophore about under the beaks. Hinge line with a strong, lamellate posterior lateral in the right valve. Postero-dorsal margin of the left valve protruding and fitting between this tooth and the postero-dorsal margin of the right valve. Cardinal teeth absent. Pallial sinus shallow. Valves entirely whitish to cream.



Distribution. Norway (70°N), British Isles southward to Bénin; Congo Brazzaville to southern Angola (Luanda to Moçâmedes, Namibe province); Madeira, Canary Islands; rare in the Mediterranean.

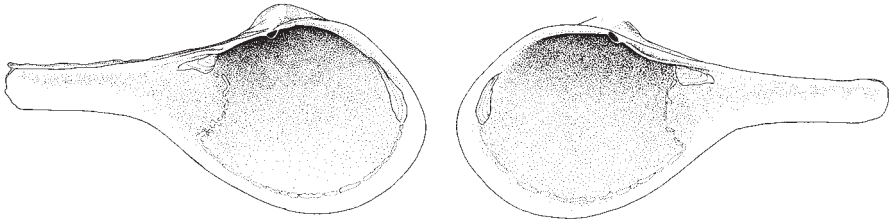
Biotope. In sandy mud and muddy sand, also with gravel and shell debris, from 20 to 250 m and deeper, to 1850 m. West African specimens found from 40 to 250 m, uncommon.

Remarks. The known distribution pattern shows a gap in the eastern (southern) typical tropical region; this can also be due to insufficient samplings. This is the type species of the genus *Cuspidaria*.



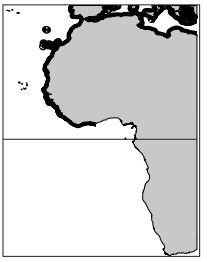
20.24. ***Cuspidaria cuspidata*** **(Olivi, 1792).** **A**-**B**, Dakar, Senegal, 14°23.1'N, 17°24.1'W 65-70 m (7.8 mm). **C**-**D**, Libéria, 6°40'N, 11°23'W, 51 m (7.7 mm). **E**-**G**, Grand Bassam, Côte d'Ivoire, 70 m (9.3 mm). **H**-**K**, Ilha de Luanda, Luanda prov., Angola, 120 m (12.2 mm).

Cuspidaria rostrata (Spengler, 1793)



20.25. Off M'Bour, Petite Côte, Senegal, 246 m (14.0 mm).

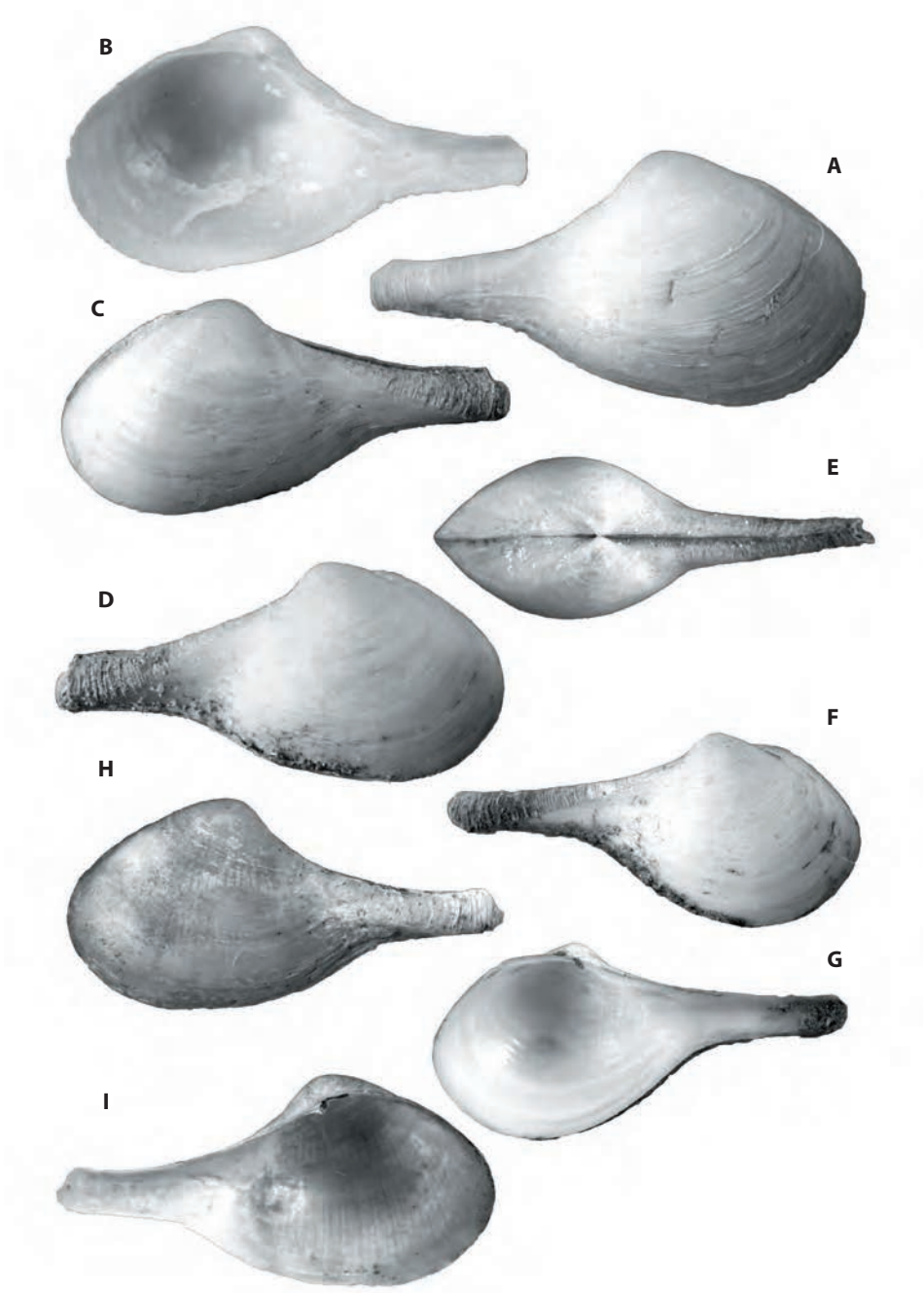
Shell up to 25 mm long (West African specimens up to 17 mm), somewhat variable in outline, oval with very long rostrum, nearly equivalve, with the left valve only slightly more tumid than the right valve, anteriorly very inflated, rostrum not very much compressed, nearly tubular, gaping at the end. Beaks well in front of the vertical midline, facing each other and not offset. Surface with numerous, fine, dense, irregular growth lines. A ridge running from the beaks to the postero-ventral corner of the rostrum divides the surface of the rostrum in an antero-ventral part with horizontal lines and a postero-dorsal part with vertical and coarser growth lines in the manner of a *Solen*. Periostracum thin, pale yellowish brown to nearly colourless, stronger on the rostrum. Ligament sunken, in a very small, but prominent, triangular chondrophore situated under the beaks. Hinge line with a strong, laminar, posterior lateral in the right valve, no cardinals. Pallial sinus shallow. Valves entirely white.



Distribution. Eastern Atlantic: Norway (70.5°N), Faroe, British Isles southward to Côte d'Ivoire; Azores, Madeira, Canary Islands; throughout the Mediterranean. Western Atlantic: Arctic region to the Caribbean.

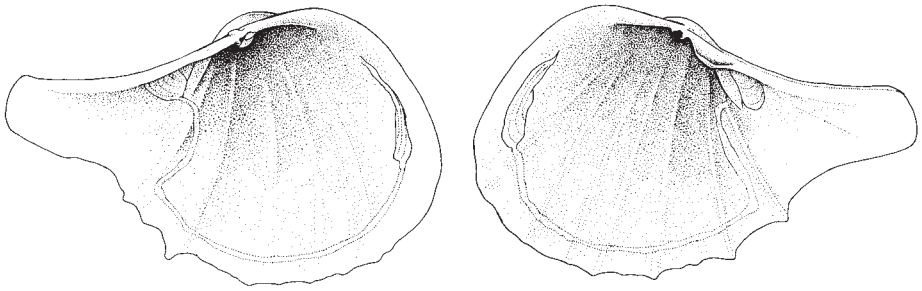
Biotope. In muddy bottom, from about 70 m to 270 m and deeper (1850 m), rare.

Remarks. Synonyms are *C. attenuata* (Forbes, 1844) and *C. renovata* (Tiberi, 1855). There is no doubt that the West African specimens fall into the variability of *C. rostrata*.



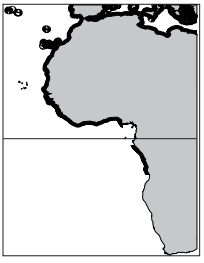
20.26. ***Cuspidaria rostrata*** **(Spengler, 1793).** **A**-**B**, Mauritania, 18°36'N, 16°31'W, 135 m (20.5 mm). **C**-**E**, Dakar region, Senegal, 14°34'N, 17°35'W, 120 m (14.6 mm). **F**-**G**, M'Boro, Sénégal, 246 m (14.1 mm). **H**-**I**, W of Rio Morébaya, Guinea, 9°24.8'N, 15°54'W, 130 m (15.7 mm).

Cardiomya costellata (Deshayes, 1835)



20.27. Senegal, 14°53.5'N, 17°30.5'W, 205-230 m (6.3 mm).

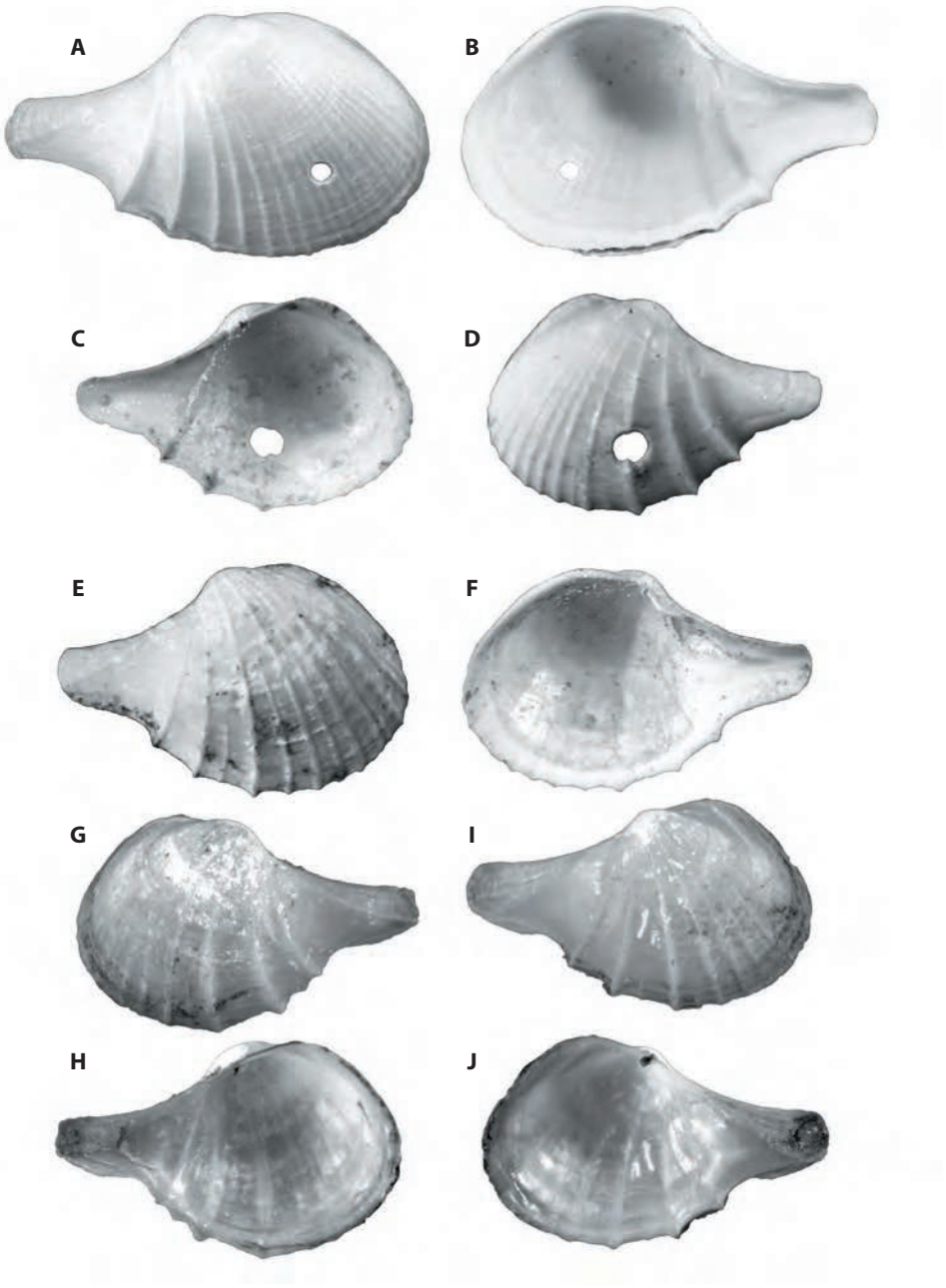
Shell up to 9 mm long, somewhat variable in outline, short-oval, with very broad anterior part, tapering posterior part and well developed, set-off rostrum, slightly inequivalve, with left valve somewhat more tumid than right valve. Valves anteriorly very inflated, rostrum compressed and gaping posteriorly. Beaks somewhat behind the vertical midline. Surface with numerous, strong, radial ribs, irregularly spaced and the posterior ribs often stronger than the anterior ribs. Rostrum with two faint ridges running to the postero-ventral corner. Periostracum very thin. Ligament very small, in a deeply sunken, triangular chondrophore under the beaks. Hinge with a lamellar posterior lateral in the right valve. No cardinal teeth. Short reinforcement on the inside from the beaks towards postero-ventrally. Muscle impressions mostly not seen. Valves entirely white, the periostracum nearly colourless to light brownish.



Distribution. Norway (Trondheimsfjord), Northern North Sea, British Isles southward to Nigeria; Gabon (2°S) to northern Angola (Mussulo, 90-100 m); Azores, Madeira, Canary Islands; throughout the Mediterranean. Also known from the Quaternary of Gabon (Port-Gentil).

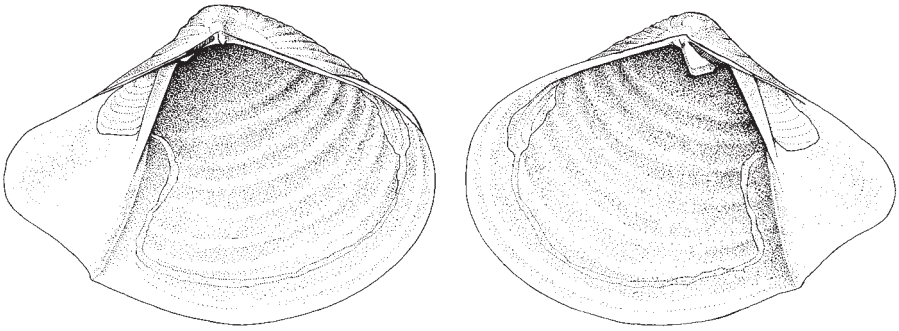
Biotope. In muddy sand and fine sand, offshore from about 40 m to 250 m, uncommon.

Remarks. none.



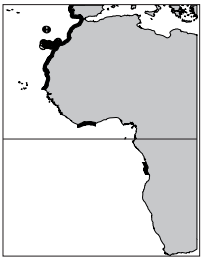
20.28. ***Cardiomya costellata*** **(Deshayes, 1835).** **A-B**, off Mauritania, 18°36'N, 16°37'W, 210 m (10.2 mm). **C-D**, Dakar region, Senegal, 14°53.1'N, 17°30.1'W, 205-230 m (6.1 mm). **E-F**, same locality (6.3 mm). **G-H**, same locality (6.1 mm). **I-J**, same locality (6.1 mm).

Tropidomya abbreviata (Forbes, 1843)



20.29. Off Abidjan, Côte d'Ivoire, 5°02.5'N, 4°15'W, 200 m (7.1 mm).

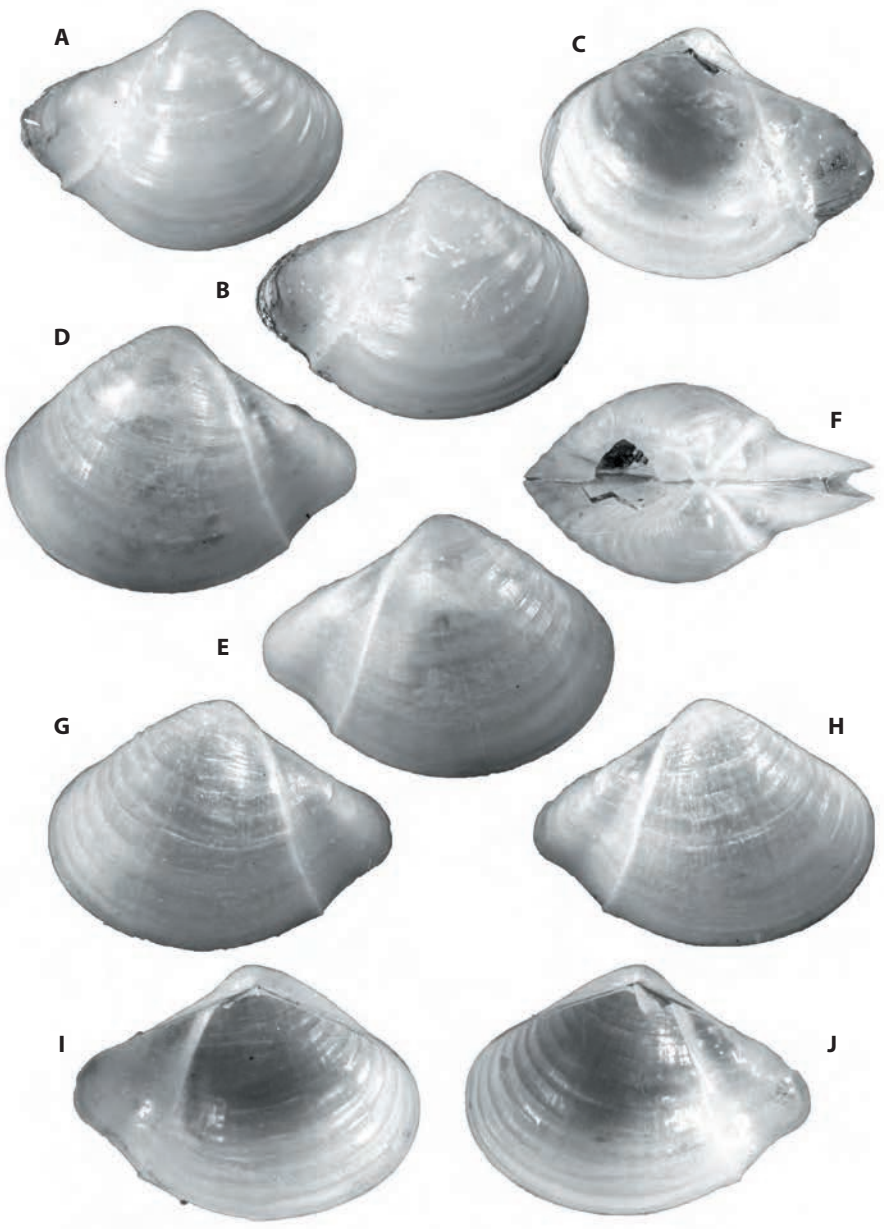
Shell up to 9 mm long, somewhat variable in outline, short-oval, with well rounded anterior margin and short, tapering rostrum, nearly equivalve, very inflated, thin and fragile, gaping posteriorly. Beaks close to the vertical midline, opposite and not offset. Surface with somewhat irregular, shallow, more or less broad, commarginal waves and fine, irregular growth lines. A conspicuous ridge runs from the beaks to the postero-ventral margin. Periostracum very thin and nearly colourless, on the rostrum near the posterior margin thicker, often light brownish and folding over the posterior margin. Ligament narrow, in a chondrophore behind the beaks, lithodesma laminar. Hinge plate with a small, knoblike cardinal in the right valve and a very small knob in the left valve. Muscle impressions ill-defined. Valves entirely white.



Distribution. Norway (68°N), Shetlands, West coast of the British Isles southward to Senegal (Dakar area); Côte d'Ivoire, northern Angola (Luanda); Madeira, Canary Islands.

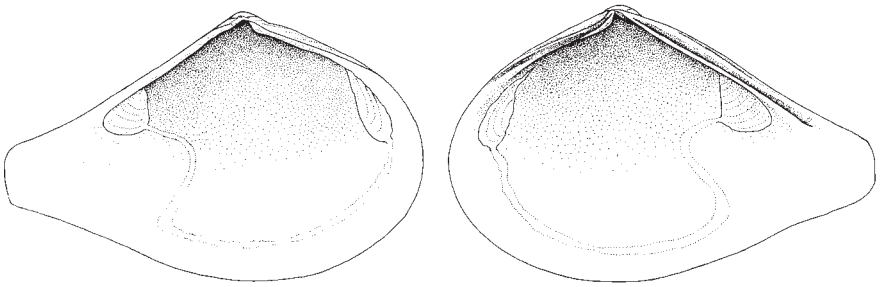
Biotope. In muddy bottom, offshore from 90 to 200 m and on the slope down to about 500 m, rare.

Remarks. Distribution gaps in the two typical tropical regions are probable; to prove it definitively, more sampling is necessary. This is the type species of the genus *Tropidomya*.



20.30. ***Tropidomya abbreviata*** **(Forbes, 1843).** **A**, off Mauritania, 18°30'N, 16°43'W, 520 m (9.4 mm). **B**-**C**, same locality (10.0 mm). **D**-**F**, off Côte d'Ivoire, 5°01.5'N, 4°20'W, 200 m (6.8 mm). **G**-**J**, off Abidjan, Côte d'Ivoire, 5°02.5'N, 4°15'W, 200 m (7.0 mm).

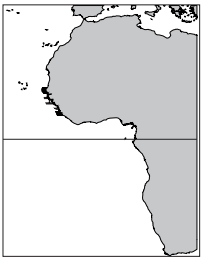
Spheniopsis senegalensis Cosel, 1995



20.31. Off Cape Verde Peninsula, 170-200 m (paratype, 2.7 mm).

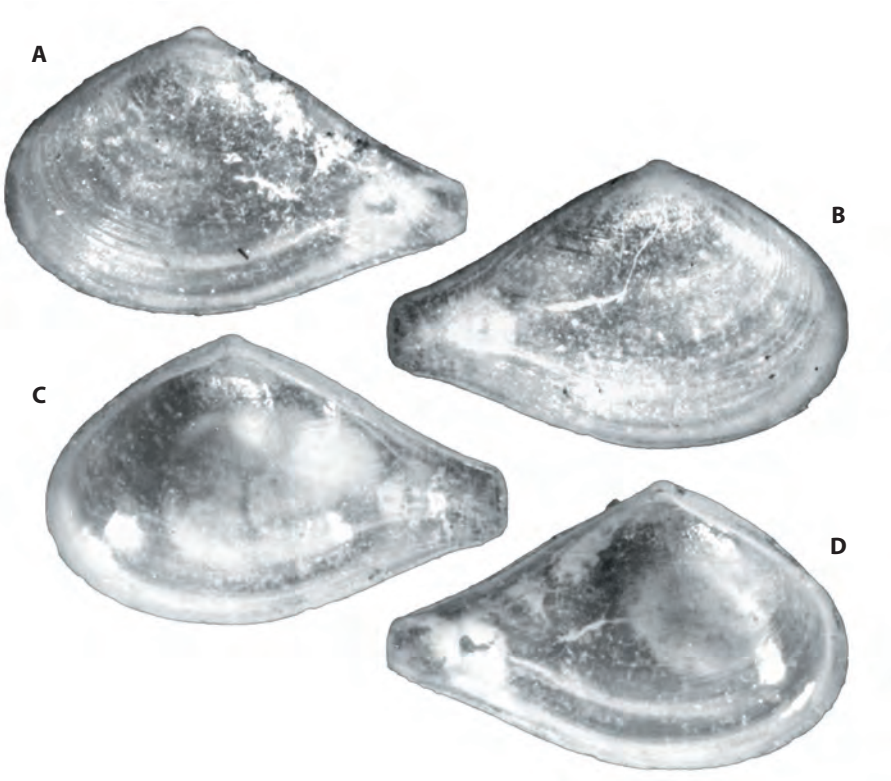
Shell very small, 2.0-3.4 mm long, slightly variable in outline, oval-triangular, not very much inflated, almost equivalve, right valve only slightly overlapping the left valve along the postero-dorsal margin. Anterior margin well rounded, posterior part tapering with rostrum marked by a weak postero-ventral sinuosity in the otherwise evenly convex ventral margin. Rostrum with truncated posterior margin, very compressed and not gaping. Beaks just in front of the vertical midline. Surface smooth, with faint irregular growth lines. Weak ridge running from the beaks to the postero-ventral corner. Periostracum very thin and colourless. Resilifer very small, under the beaks, directed posteriorly. Hinge line in the right valve with an anterior cardinal and a posterior cardial as a strong laminar ridge parallel to the postero-dorsal margin, no teeth in the left valve. Protoconch small but well visible. Valves entirely white.

Distribution. Known from Senegal (Dakar region) and from Guinea (9°54'N).



Biotope. Apparently in fine muddy sand or mud, from 150 to 250 m, rare.

Remarks. This is the only record of the family Spheniopsidae in the eastern Atlantic. The family was yet recorded only from America (both coasts) and New Zealand, fossil records in Europe are known from the limit between Middle and Upper Eocene (Wemmel Sands, Belgium) and the Middle Oligocene (Mainz Basin, Germany) (for details, see Cosel 1995). *S. senegalensis* seems to have a limited distribution on the Senegalese coast and southwards.



20.32. ***Spheniopsis senegalensis*** **Cosel, 1995. A-D**, off Cap Vert Peninsula, Senegal, 170-200 m (holotype, 2.9 mm).

List of species excluded

This list includes species which are not included in this book and have been reported, in our opinion erroneously, from West Africa. Misidentifications of species treated in this book have been reported in the main text and are not repeated here.

Family Arcidae

Arca imbricata Bruguière, 1789. Recorded from Cape Verde Islands by Locard (1898). Is a Caribbean species.

Acar nodulosa (O.F. Müller, 1776). Recorded from Cape Verde Islands by Dautzenberg & Fischer (1906) and stated to range from Northern Spain to Angola by Poppe & Goto (1993). Most probably a confusion with *Acar olivercoseli*.

Bathyarca glacialis (Gray, 1824). A northern species recorded from Cape Verde Islands by Dautzenberg & Fischer (1906). The record remains doubtful.

Family Mytilidae

Mytilaster lineatus (Gmelin, 1791), Cape Verde Islands. Recorded by Saunders (1977), but not found by other expeditions and collectors. The record remains doubtful.

Family Pectinidae

Chlamys flexuosus (Poli, 1795). Recorded from Cape Verde Islands by Locard (1898), most probably based on *Nodipecten corallinoides* (see also Poppe & Goto 1993).

Pecten jacobaeus (Linnaeus, 1758). All West African records refer to *P. keppelianus*.

Family Astartidae

Goodallia triangularis (Montagu, 1803). Recorded by Rosso & Saubade (1981 [sta. 547, 103 m]) from North Senegal, but that needs confirmation; confusion with *"Crassatina" dakarensis* or *"C." marchadi* is likely.

Family Crassatellidae

Crassinella cf. *martinicensis* (d'Orbigny, 1846). Recorded by Rosso & Saubade (1981) from northern Senegal. It is most probably one of the two small Crassatellidae described by Cosel (1995).

Family Cardiidae

Laevicardium couvrili Fischer-Piette, 1977, described from Gabon. A synonym of *Acrosterigma impolitum* (G. B. Sowerby II 1834), an Indo-Pacific species, The type specimen was most probably mixed up with West African material prior to description.

Laevicardium rudentis Fischer-Piette, 1977, described from Mauritania. A fossil species [of the genus *Europicardium*].

Family Mactridae

Mactra stultorum (Linnaeus, 1758). Stated by Poppe & Goto (1993) as living in Senegal; is either unsubstantiated or based on *M. glabrata*.

Lutraria angustior Philippi, 1844. Stated as living in West Africa south to Guinea by Poppe & Goto (1993) and cited from Cape Verde Islands by Guerreiro & Reiner (2000), however, the West African records refer to *L. senegalensis*.

Lutraria costata Tryon, 1870. Described from "Senegal - Dr. R.E. Griffith". According to the figure (Tryon 1870: pl. 16, fig. 6), is the Indo-Pacific *Lutraria complanata* (Gmelin, 1791) according to Huber (2010).

Lutraria oblonga (Gmelin, 1791). Stated as living in Senegal by Poppe & Goto (1993), but never seen there.

Family Tellinidae

Tellina (Tellina) radiata Linnaeus, 1758. An exclusively Caribbean species which, however, was cited by Dunker (1853) and Bertin also for "Guinée" and Angola.

Tellina (Megangulus) ascensionis G.B. Sowerby II, 1905. The holotype, originating from the Keppel collection (in BMNH), and a paratype in ZMB (*fide* Huber pers. comm. 2012) could be examined, there is no record of this species from Ascension. Synonym of *Megangulus luteus* (W. Wood, 1828) *fide* Huber *et al.* (2015), a species living in the N. Pacific and the Arctic.

Austromacoma laevigata (Lamarck, 1818), treated by Huber *et al.* (2015) as a valid West African species, was only represented by one syntype of unknown locality in the MNHN material. Two valves from São Tiago (Cape Verde Islands) approach this species in having the pallial sinus touching the anterior scar, but further material would be needed before this is claimed as a second West African species.

Tellina plebeia Hanley, 1846. A non-West African species from the Panamic province which was cited in part from West Africa. Bertin (1878) gave a new name to West African material present in the Paris Museum under the name "plebeia" (*Macoma senegalensis* Bertin = *Macomopsis cumana* (O.G. Costa, 1830)).

Tellina psammotella Lamarck, 1818. Material under this name in Paris Museum might be an extreme form of *Macomopsis cumana* (O.G. Costa, 1830)

Tellina irus Hanley, 1845. A non-West African species cited by Bertin (1878) erroneously for Guinea; a valid Indo-Pacific species of the genus *Heteromacoma* according to Huber *et al.* (2015)

Psammotaea candida Lamarck, 1818. A *Macoma* species from the Indo-Pacific erroneously cited from West Africa, *e.g.* by Nicklès (1955) based on misidentified *Psammacoma pseudofallax* Cosel, 1995.

Arcopagia crassa (Pennant, 1777). Stated as ranging to Senegal by Poppe & Goto (1993). These refer most probably to *A. richardi*.

Family Donacidae

Donax deshayesii Dunker, 1853. Described from Angola (Luanda). An Indo-Pacific species, synonym of *D. cuneatus*, in subgenus *Latona* according to Huber (2010).

Donax trunculus Linnaeus, 1758. Stated as ranging to Senegal by Poppe & Goto (1993) but not occurring there, southern limit is Morocco.

Family Semelidae

Scrobicularia plana (da Costa, 1778). Stated as ranging to Senegal by Poppe & Goto (1993) but not occurring there, southern limit is Morocco.

Family Pharidae

Pharus legumen (Linnaeus, 1758). Stated to be found in Senegal by Poppe & Goto (1993), but this is either unsubstantiated or based on *Pharus chenui*. Southernmost record of *P. legumen* is Agadir, Morocco, where both species co-occur.

Family Veneridae

Venus nux Gmelin, 1791. Recorded from Cape Verde Islands by Locard (1898) and cited from Senegal by Poppe & Goto (1993). Southern limit is Morocco, the west African records refer to *V. chevreuxi*.

Venus (Chione) keppeliana G.B. Sowerby III, 1905, described from Sierra Leone. Is *Protothaca (Leukoma) mcgintyi* Olsson, 1961 (which thus falls into synonymy) from the Panamic-Pacific faunal province; the locality "Sierra Leone" is erroneous like most of those stated in that paper.

Lajonkairia cancellata (Gmelin, 1791). Cape Verde Islands. Recorded by Marche-Marchad (1956), is most likely *L. substriata*.

Family Teredinidae

Lyrodus massa (Lamy, 1923). This Indo-Pacific species was recorded by P. Rancurel from Gorée, Senegal (Monod & Nicklès 1952: 68) but could not be verified.

List of stations

Coordinates of some of the collecting localities most frequently cited in this book. *Italics: site no longer exists.*

Mauritanie	
Baie de l'Etoile, intertidal	21°00.5'N, 17°00.8'W
Baie de l'Etoile, La Rivière	21°01.8'N, 17°01.2'W
Pointe des Maures	20°58.0'N, 17°00.3'W
Baie de Cansado	20°53.0'N, 17°03.0'W
Cap Blanc	20°47.0'N, 17°02.4'W
Cape Verde Islands	
Baia Matiota, São Vicente	16°53.7'N, 24°59.7'W
Baia de Calhau, São Vicente	16°51.0'N, 24°51.9'W
Salamanza, São Vicente	16°54.6'N, 24°56.8'W
Mindelo, São Vicente	16°53.0'N, 25°00.0'W
Mordeira, Sal	16°40.8'N, 22°56.5'W
Palmeira, Sal	16°45.0'N, 22°59.0'W
Rigona, Sal	16°46.2'N, 22°59.4'W
Tarrafal, Santiago	15°16.9'N, 23°45.3'W
Sal Rei, Boavista	16°10.3'N, 22°55.2'W
Senegal	
M'Bour	14º24'N, 16º58'W
Joal	14º09'N, 16º49.5'W
Ouaran	14º22'N, 16º56.7'W
Baie de Hann	14º43'N, 17º25'W
Banc du Séminole	14º34'N, 17º27'W
Casamance	
Cap Skirring, beach	12°22.8'N, 16°44.3'W
Cap Skirring, 3-5 m	12°22.6'N, 16°44.5'W
S of Cap Skirring	12°21.4'N, 16°43.8'W
Ziguinchor	12°35.3'N, 16°15.5'W
Essoukoudiak Bôlon	12°22.3'N, 16°39.5'W
Karabane Bolon	12°32.9'N, 16°41.8'W
Elinkine	12°30.6'N, 16°40.4'W
Ourong Bolon	12°28.0'N, 16°41.0'W
Katakalous Bôlon	12°25.8'N, 16°40.0'W
Kafountine	12°57'N, 16°45'W
Abéné – Kafountine	12°58', 16°44.7'W
Guinée	
Kaporo port	09°37.0'N, 13°38.7'W
Dixinn port	09°33.3'N, 13°40.3'W
Conakry, Palais du Peuple	09°31.1'N, 13°41.5'W
Banc Crawford	09°28.6'N, 13°47.1'W
Roume, îles de Los	09°28.0'N, 13°47.5'W
São Tomé	
Praia Mouro Peixe	00°24.5'N, 06°38'E
Esprainha	00°19.9'N, 06°31.2'E
Praia Emilia	00°21.6'N, 06°43'E
Baia de Ana Chaves	00°20.5'N, 06°43.5'E
Praia das Conchas	00°24.4'N, 06°37.2'E
Cameroun	
Morton Bay	04°00.0'N, 09°12.6'E
Ambas Island	03°58.6'N, 09°10.1'E
Mondoleh Island	03°58.8'N, 09°11.5'E
Man o'War Bay	03°57.3'N, 09°13.5'E
Kribi	02°56.6'N, 09°54.3'E
Congo	
Pointe-Noire, Plage Raffinerie	04°44.4'S, 11°50.6' E
Pointe-Noire, Plage Orstom	04°46.4'S, 11°51.1'E
Pointe-Noire, Plage Mondaine	04°47.4'S, 11°50.8'E
Pointe-Noire, Plage Sauvage	04°48.2'S, 11°50.2'E
Songolo	04°45.5 S, 11°51.1 E
Gabon	
Cap Esterias, Gabon	00°37.2'N, 09°19.4'E
Cap Esterias - Pointe Idolo	00°37.5'N, 09°22'E
Mondah, baie de Corisco	00°40'N, 09°33'E
Plage de la Sogara	00°40.6'S, 08°45.8'E
Angola	
Ambrizete, below lighthouse	07°17.8 S, 13°53.1'E
Barra do Dande	08°28.1'S, 13°21.6'E
Praia São Tiago	08°38'S, 13°24.6'E
Cacuaco, Foz do Bengo	08°45'S, 13°23.5'E
Cacuaco	08°46'S, 13°21'E
Ilha de Luanda, 40-60 m	08°44'S, 13°12'E

Ponta do Mussulo	08°52.0′S, 13°9.9′E
off Mussulo, 90 m	08°50′S, 13°05′E
Corimba, 10-20 m on sand bar	08°51.0′S, 13°10.5′E
Corimba, rocky shore	08°52.9′S, 13°10.5′E
Corimba, Praia Etambar	08°53.4′S, 13°10.0′E
Futungo–Ilha do Desterro	08°54.0′S, 13°9.2′E
Barra do Cuanza	09°20.4′S. 13°09.0′E
Palmeirinhas (Buraco)	09°01.4 S, 13°00.5 E
Palmeirinhas, beach	09°01.7 S, 13°00.5 E
Cabo Ledo 40 m (approx.)	09°36′S, 13°06′E
Caotinha	12°35.0′S, 13°15.8′E
Santo Antonio	12°36.8′S, 13°20.0′E
Baia dos Limagens	13°17.7′S, 12°39.3′E
Baia de Santa Maria	13°25.3′S, 12°32.5′E
Lucira – Praia do Cesar	13°52.9′S, 12°30.6′E
Lucira – Doca	13°52.7′S, 12°29.4′E
Lucira – Bissonga	13°50.9′S, 12°31.5′E
Chapeu Armado	14°26.9′S, 12°20.5 E
Baia das Pipas	14°56.5′S, 12°11.7′E
Praia Amelia	15°12.2′S, 12°06.0′E
Baia dos Tigres	16°35.6′S, 11°43.4′E

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Illustration Credits

Photography

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Drawings

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C. Vachelot (262 species): Solemyidae (p. 70), Carditidae (p. 328, 330, 334, 336, 342, 344, 346, 350, 352, 354), Condylocardiidae (p. 358, 359, 360, 362, 364, 365, 366, 368, 370), Astartidae and Crassatellidae (p. 372, 374, 376, 378, 382, 384, 386, 388, 390), Lucinidae and Thyasiridae (p. 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 434, 436, 438, 440, 444, 446, 450, 451, 454, 456, 462, 464), Lasaeidae (p. 478, 480, 484, 487, 488, 492, 494, 496, 498), Cardiidae (p. 516, 518, 520, 522, 526, 528, 530, 532, 534, 536, 540, 542), Tellinidae (p. 560, 562, 564, 566, 568, 570, 572, 576, 578, 580, 582, 584, 586, 590, 592, 594, 596, 598, 600, 602, 604, 610, 612, 614, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638), Donacidae (p. 640, 642, 644, 648, 650, 652, 658, 660, 662, 666, 668, 670, 672), Semelidae (p. 674, 676, 678, 679, 680, 682, 684, 685, 686, 687, 688, 689), Psammobiidae and Solecurtidae (p. 690, 694, 698, 702, 704, 706, 710, 712, 714, 716), Solenidae and Pharidae (p. 724, 726, 728, 730, 732, 734, 736, 738, 740, 742, 744, 746), Hiatellidae (p. 748, 750), Gastrochaenidae (p. 752), Mactridae and Cardiliidae (p. 759, 762, 770, 774, 778, 784, 786, 788, 790, 792, 794, 796), Chamidae (p. 806, 808, 810, 812), Ungulinidae (p. 814, 816, 818, 820, 822, 826, 828, 830, 832, 834, 836), Cyrenoididae (p. 838, 839), Trapeziidae (p. 840), Veneridae (p. 850, 868, 874, 876, 878, 882, 884, 886, 888, 890, 892, 894, 898, 900, 902, 904, 906, 908, 910, 914, 916, 918, 920, 922, 924, 926, 928, 930, 932, 934, 936, 938, 940, 942), Myidae (p. 948, 950), Corbulidae (p. 952, 954, 956, 960, 962, 964, 966, 968), Dreissenidae (p. 970), Pholadidae (p. 978, 982, 984, 986, 988, 990, 993, 994) and Anomalodesmatan families (p. 1014, 1016, 1018, 1020, 1022, 1024, 1026, 1028, 1030, 1032, 1034, 1036, 1038, 1040, 1042, 1044).

F. Thouin (35 species): Glycymerididae (p. 156, 158, 162, 166), Carditidae (p. 332, 338, 340, 348, 356), Cardiidae (p. 512, 538), Tellinidae (p. 558, 588, 608), Donacidae (p. 664), Psammobiidae (p. 692, 696, 700, 708), Mactridae (p. 764, 766, 768, 772, 780, 782), Veneridae (p. 852, 854, 856, 858, 860, 862, 864, 866, 870, 872).

R. von Cosel (29 species): Mytilidae (p. 176, 178, 180, 182, 184, 188, 190, 191, 192, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218), Lucinidae (p. 432, 442, 448, 452, 458, 460, reproduced from Cosel 2006 or from Taylor & Glover 2005), Tellinidae (p. 606), Vesicomyidae (p. 841, from Cosel & Salas 2001).

S. Gofas (27 species): Nuculidae (p. 74, 75), Glycymerididae (p. 160, 164), Pinnidae (p. 224, 226, 228), Pteriidae (p. 230, 232), Anomiidae (p. 276, 278, 280), Crassatellidae (p. 380, 392), Galeommatidae (p. 474, 476, reproduced from Gofas 1991), Lasaeidae (p. 502, reproduced from Cosel & Gofas 2018), Cardiidae (p. 514, 524), Tellinidae (p. 574, 616), Donacidae (p. 646, 654), Mactridae (p. 776), Ungulinidae (p. 824), Veneridae (p. 896, 912).

C. Meechan (24 species): Arcidae (p. 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142; reproduced from Oliver & Cosel 1993a), Noetiidae (p. 144, 146, 148, 150, 152, 154; reproduced from Oliver & Cosel 1993b).

N. Yonow/P.J. Hayward (16 species): Nuculidae and Nuculanidae (p. 72, 73, 76, 78, 79, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 99)

R. Turner (10 species): Teredinidae (p. 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005; reproduced from Turner 1966).

Glossary

In the selection of terms and current abbreviations, this glossary is based mainly on Arnold (1965, also a source for the etymology of many terms) and similar glossaries in other identification books (*e.g.* Kilburn & Rippey 1982; Mikkelsen & Bieler 2007 *etc.*). Specific gastropod terms are omitted here and can be looked up in the cited works. This glossary does not comprise only bivalve terms but also some oceanography, ecology, taxonomy etc. which the reader of this book comes across. Words of the common language (*e.g.* tapering, inflated) used in descriptions are omitted and can be found in standard dictionaries. For special anatomical terms in bivalves, see *e.g.* Mikkelsen & Bieler (2007) A much more extensive glossary was recently provided by Carter *et al.* (2012). Cross-references are denoted by #.

A

abyssal: the sea floor below the continental slope, without the influence of light.

adductor muscle(s): the muscles that are responsible for closing the valves and are attached to their interior.

adductor scars: the impression(s) (attachment areas) of the adductor muscle(s) in the inside of a valve, mostly seen as slight depressions.

«aff.»: =affinis, allied to.

allopatric species: species with entirely separate distribution areas.

amphiatlantic: living on both sides of the Atlantic

amphidetic ligament: ligament extending on both sides (anterior and posterior) of the beaks.

angle: a sharp to blunt edge where two surfaces meet at an angle (see also: posterior angle)

anisomyarian: bivalves with two, but very unequal adductor muscles or one muscle only, the other being absent (see also: heteromyarian).

anterior end: front end of a bivalve, the end nearest to the mouth.

anterior part: the part of the valve between the anterior margin and the vertical line drawn through the beaks of the valve.

apophysis: a shelly, often finger-like projection on the inside under the beaks of Pholadidae, Teredinidae and others, which serves as an attachment for the pedal muscle.

associated specimen: a specimen from the original type lot but explicitly not declared holotype or paratype by the author.

atypical tropical region: on the West African coast the section comprising Côte d'Ivoire and Ghana, where during the winter season rather cold upwelling occurs, that means the conditions are not entirely tropical.

auct.: = *auctorum*, of previous authors, generally used to denote wrong usage.

auricle: the «ears» on both sides of the beaks of Pectinidae; also, the posterior part of the valves of Teredinidae.

auriculate: a valve having «ears»

available name: a name which has been published according to ICZN rules; the earliest available name is the valid name unless it is a preoccupied name.

B

bathyal: the deeper shelf and continental slope from 200 to ca. 2000 m.

beak: the tip of the #umbo, bearing the embryonic shell. It marks the point where growth of shell starts.

beam trawl: a fishing trawl which is kept open by a wooden or iron bar or beam instead of otter boards and which glides on iron runners situated at both ends of this bar. It is used for catching shrimps or flatfish in certain regions, mostly the North Sea (*e.g.* the Netherlands, Germany, Belgium and the French Channel coast) and also for scientific trawling (see also trawl, shrimptrawl).The beam trawl is towed by means of one cable and is connected to it by two short bridles of chain or cable shackled to the runners. The commercial fishing boats use these trawls in pairs, one on starboard, one on portside. The large and very heavy flatfish version with often more than ten tickler chains (see «shrimp trawl») used by Dutch trawlers in the North Sea is responsible for considerable destruction of the benthic communities. French research vessels frequently use the 'Honfleur' type, also in depths of more than 1000 m. A smaller and lighter modified version employed on research vessels is the «Agassiz trawl» or «Blake trawl».

benthos: the totality of the animals and plants living on the sea floor.

bicuspidate: ending in two points (*e.g.* some nuculanids).

bifid: divided by a groove or an incision separating two divergent parts (mostly used for hinge teeth).

bifurcate sculpture: elements of radial sculpture which split in two parts at some stage.

binominal: the scientific name of an animal or plant consisting of two Latin or Greek words: the first denoting the genus, the second the species. A subspecies is denoted by a third word, the name is then trinominal.

biocenosis: organisms occurring permanently together in a biotope under the same conditions and being in a natural equilibrium to each other.

biogeography: the science of the distribution of species.

biotope: the characteristic environment of a species with optimal conditions of life (the natural «home» of the species)(= habitat).

bôlon: In West Africa the secondary creeks flowing into or connecting to the principal river or «ria», often within a complex delta, *e.g.* the Casamance River or the Sine-Saloum system.

boreal species: species occurring in the cold northern waters.

borer: an organism excavating in wood, stone, clay, coral, firm mud etc.

bottom grab: a tool for taking quantitative samples of the bottom of the sea or a freshwater body. It is operated from the main winch or an auxiliary winch of a research vessel which has to stop for the operation. Several different systems exist (Petersen, Van Veen, Smith-Macintyre, Ekman-Birge etc.) and sizes, but in principle a bottom grab consists of a two-shell grab covering a defined surface and a device for closing the grab once it arrives on the sea floor.

box corer: a special version of a bottom grab by means of which a bottom sample is taken without any disturbance of the sequence of sediment layers and the position of the infaunal animals.

buttress: a ridge on the inside of a valve radiating from the hinge and serving as a reinforcement.

byssal gape: opening between the margins of the valve through which the byssus passes to the exterior.

byssal notch: ventral indentation of the anterior ear of the right valve in Pectinidae through which the byssus passes to the exterior; also used for a small byssal gape (Arcoidea).

byssus: proteinaceous threads, often in bundles, with which some bivalves (Arcoidea, Mytilidae, Pteriidae, Pinnidae etc.) attach themselves to a hard substrate, mostly to withstand wave force in the intertidal zone and shallow water. They are secreted by the byssus gland of the foot.

C

callum: the shell layer which covers the pedal gape between the valves of certain Pholadidae in adult specimens.

cancellate sculpture: radial and concentric ridges of more or less the same intensity crossing each other.

cardinal area: the dorsal surface, partly or wholly occupied by the external ligament, between the hinge margin and the umbos, in family Arcidae.

cardinal crura: symmetrically arranged ridges bordering the resilifer, in some Pectinidae.

cardinal teeth: all hinge teeth situated beneath the umbos or radiating from below the beaks.

carina: #keel

Cenozoic Era (= Tertiary and Quaternary): the third large geologic era (66 mill. years to present), with abundance of gastropods and bivalves.

cf.: = confer, to be compared with.

chomata: in oysters, the small tubercles and corresponding pits in the opposite valve along the margins at both sides of the hinge. The tubercles are called anachomata and the pits catachomata.

chondrophore: a #resilifer which projects ventrally like a spoon from the hinge margin, found mostly in Mactridae and Myidae.

chresonymy: list of secondary citations (subsequent use of synonyms) for a taxonomic entity in a scientific paper (see also: synonymy).

cilia: microscopic hair-like filaments *e.g.* on the gills, developed from cell membranes, their rhythmic beating causes movement of water and small particles.

ciliary feeder: a mollusc feeding on small particles suspended in the water which are moved by cilia to the mouth.

circalittoral: the outer shelf. The notion is based on faunal assemblages rather than strict depths. The upper depth is variable according to the influence of light, normally at about 50 m, the lower limit is the maximum depth where algae still can live fixed to the sea floor, often at about 200 m, the edge of the shelf.

circumboreal: distributed in the whole cold northern part of the world.

clade: a group of organisms which share a unique common ancestor, therefore are monophyletic. A #phylogenetic classification requires that all taxa should be clades.

clam: in Britain and Europe, this term is used mostly for venerids and venerid-like bivalves, in America for all bivalves except mytilids («mussels»), ostreids («oysters»), pectinids («scallops»), cardiids («cockles») and many unionids («freshwater mussels»). Originally the term was applied to sand- and mud-burrowing bivalves.

classification: the action of defining groups of objects based on some of their shared attributes. Regarding living organisms, the groups are called #taxa and the dominant view is that the shared attributes must be the possession of a unique shared ancestor, and/or the characters which provide evidence for this (see also phylogenetic systematics).

clinal variation: a gradual and more-or-less continuous change in characters from one extremity of a species' range to the other.

cockle: vernacular name for bivalves of the family Cardiidae.

«coll.» (on specimen labels): from the collection of. Indicates the particular collection (usually identified by its owner's name) in which the specimen was incorporated when it entered the collection of a museum or other institution.

commarginal sculpture: sculpture parallel to the valve margin and the growth lines (the preferable term for what has long been called «concentric» sculpture).

commensal: species living together without being parasite and host, e.g; some leptonacean bivalves with irregular sea-urchins.

compressed: relatively flattened laterally, *e.g.* many tellinids.

concentric sculpture: an outdated term for commarginal.

conchiolin: organic component of the molluscan shell, (#periostracum, #ligament, organic matrix of calcareous parts) consisting of a diverse array of proteins.

conchology: the study of mollusks based on the shell only. Today obsolete (see also: malacology).

coralligenous (coralligène): a special term for bioclastic gravel bottoms encrusted with calcareous red algae, in the Mediterranean Sea and elsewhere; has nothing to do with coral.

crenulate: regularly and finely notched (internal margin of *e.g.* some Veneridae, Astartidae, Crassatellidae).

cruciform muscle: in the Tellinoidea two small, crossed muscle bundles situated below the pallial sinus, serving to anchor the siphons to the shell.

cruciform muscle scars: two small scars under the pallial sinus, often only hardly visible or not at all.

ctenidium: the respiratory organ of aquatic molluscs. Filter-and suspension feeders (among them most bivalves) use it also for feeding. Also known as a gill.

ctenolium: a row of denticles lining the #byssal notch of some Pectinidae.

cuneiform: wedge-shaped.

D

demersal: animals and plants living on or very close to (*e.g.* fishes) the sea bottom.

dentate: toothed.

denticulate: with small teeth.

dentition: the ensemble of hinge teeth and sockets.

ded. (on specimen labels): = dedit, given by. Indicates the person who donated the specimen to the museum or institution.

deposit feeder: a mollusc that passes sediment through its alimentary tract and digests the organic material in it (*e.g.* among the bivalves: Semelidae).

det. (on specimen labels): = determinavit, identified by. Indicates the person who determined the specimen (*e.g.* the museum curator or a visiting scientist).

detritus: decaying organic matter such as small parts of plants, dead planktonic organisms etc. finely suspended in the water or deposited on the sea floor.

dimyarian: bivalves with two equal adductor muscles.

direct development: development without a pelagic larval stage. In bivalves, the eggs usually have a diameter of more than 150 microns, many of these species brood their young within the mantle cavity.

disc: in Pectinidae the valve except the ears or auricles.

discordant margins: margins of the closed valves are not in exact juxtaposition but one is overlapping the other (*e.g.* some Anadarinae, Pectinidae, Corbulidae).

disjunct distribution: geographical distribution of a species with a distribution discontinuity (distribution gap) between two parts.

dispersalist theory: in biogeography, a theory stating that organisms may reach new areas through dispersal processes (see also vicarianist theory)

dissoconch: the part of the bivalve shell which is added to the larval shell after settling of the larva (postlarval shell). Corresponds to the teleoconch of the gastropods and is often called so, also herein.

distal: situated far away (or further away) from the basal part of a structure (contrary proximal).

dorsal side: in a bivalve the side where the hinge and umbos are situated. Normally the physiological back; a well-known exception is the tridacnids (giant clams) where the ventral part faces upwards.

dredge: implement for catching bottom-dwelling animals. It consists of a usually rectangular or triangular, occasionally circular metal frame to which a strong fine-mesh net or wire screen box is attached. It is connected with bridles or iron bars to a towing rope or cable and is hauled by a boat or ship. Width of the frame 0,3 to 3 m, frequently used net mesh 5.0-10.0 mm, larger dredges may have wider mesh. Several different types of dredges are in use according to the aim of the operation. Commercially, dredges are employed for catching oysters, mussels, scallops or clams. These dredges are mostly larger and stronger, often of special design, and the bag may be made of chain or very strong rope net.

E

ecology: the study of the relationship between animals and plants and their environment.

ecological niche: a special position filled by an animal in a biocenosis.

ecological variant: distinct form of a species living in a particular biotope with specific ecological conditions; also called ecophenotype.

edentulous: toothless, no hinge teeth present.

elongate: a bivalve shell with length/height ratio more than 2 : 1.

embryonic shell: the larval shell formed before hatching, it is the earliest part (and sole part in species with direct development) of the #protoconch or prodissoconch.

endemic species: a species whose distribution is restricted to a particular geographic area is said to be endemic to this area.

entire (pallial line): without a pallial sinus.

Eocene: The second early Tertiary geological period, dating back 34-56 mill. years.

epidermis: the outer layer of the skin of an animal; sometimes used inaccurately for the periostracum, an usage which should be avoided.

epifauna: animals living on the surface of soft or hard bottom (contr. infauna).

equilateral: with beaks about in the middle of the valve.

equivalve: valves similar in size, shape, tumidity and sculpture.

escutcheon: a more or less elongated depression on the dorsal side of a bivalve behind the beaks, often delimited clearly from the rest of the surface by a more-or-less pronounced ridge.

estuary: the part of a river mouth into the sea where sea water and fresh water are mixed and the salinity is reduced (brackish water). The mouth of the river can be funnel- or delta-shaped.

estuarine: denotes the conditions found in estuaries, lagoons, inlets, mangrove areas etc; where sea water and fresh water are mixed and the salinity is variable (brackish water).

euryhaline: animals and plants that can withstand drastically changing salinity, *e.g.* in estuaries and lagoons etc.

eurythermal: animals and plants that can withstand drastic changes of water temperature.

exhalant siphon: the #siphon through which the water is expelled from the mantle cavity. Also called excurrent siphon.

F

fathom (abbreviation fm, fms): nautical measuring unit for ocean depths, equivalent to 1.83 m, now more and more replaced by metre, but soundings on sea charts are often still in fathoms as well as depth ranges in older English language shell books.

fide: on the authority of.

filter feeder: a mollusc feeding on plankton and detritus suspended in the water, the food is filtered by the gills.

flexure: a more-or-less shallow bending of the margin.

fold: a more-or-less broad radial or commarginal undulation of the surface of the valves.

foot: a large muscular structure of the bivalve animal that normally extends anteroventrally from about the mid-line of the body. Its form is very variable throughout the bivalve class and is an important systematic character. The foot is protruded between the opened valves and serves chiefly for burrowing and moving around.

fossil species: species only known from remains preserved in geological strata.

G

gape: the space left between the valve margins (mostly anteriorly or posteriorly, less commonly ventrally) when the valves are closed.

gerontic specimen: a very old specimen.

gills: #ctenidia.

globose: a more-or-less spherical shape.

growth lines: fine, mostly irregular commarginal lines on the surface indicating the former position of the margin at former stages of growth.

growth stages: coarse commarginal lines or steps indicating a more or less long interruption of the growth.

H

habitat: the place where a species is normally living and which is typical for it (see also biotope).

hadal: the deep sea trenches below 6000 m.

hand dredge: a special #dredge consisting of a small-mesh wire or plastic net on a frame attached to a long stick or a short handle. It is operated while wading in knee- to waist-deep water or shallow diving. Excellent for catching small intertidal and shallow lagoonal soft-bottom and seagrass-dwelling animals but also for use in the surf zone. Larger and more sophisticated models are used for professional fishing of Donacidae in certain regions, chiefly in the Mediterranean.

height: the distance between the uppermost point of the umbo and the ventral margin below (abbreviated ht in figure captions).

hermaphrodite: with both sexes in the same individual. The best-known examples in bivalves are oysters.

heterodont hinge: #hinge with differentiated teeth with cardinal and lateral teeth.

heteromyarian: bivalves with anterior and posterior adductor muscles well developed but of different size, *e.g.* Mytilidae.

hinge: the dorsal structures (teeth and sockets) of the valves, which function during their opening and closing.

hinge line: the dorsal margin with the hinge, often used in the sense of hinge axis.

hinge plate, hinge margin: the inner part of the dorsal margin of a valve, often more-or-less broadened, which bears the hinge teeth.

hinge teeth: the protruding structures on the #hinge

plate, which insert in sockets between teeth in the opposite valve and which hold the closed valves in position. In some cases (*e.g.* Solecurtidae) the teeth still allow a slight rocking of the valves against each other.

Holocene: the geological period in which we are living at present (second period of the Quaternary), comprises the last 11700 years BP, after the last glaciation.

holotype: a single specimen on which a species is based and which is designated as the holotype or «type» by the author; the name-bearing specimen.

homomyarian: the two adductor muscles have more or less the same size.

homonym: the same name given independently to different taxa of the same rank (species, genera or higher taxa).

hypoplax: an accessory plate in Pholadidae, situated across the ventral gape between the valves in the posterior half.

hypotype: a listed or figured specimen which has been used as an example of the species but does not belong to the primary type material. Term mostly used in 20th Century American literature, should be avoided.

I

ICZN: International Code of Zoological Nomenclature.

inequilateral: umbos not on the vertical midline but in front of it or behind it.

inequivalve: valve not equal in size, sculpture, tumidity etc.

infauna: animals burrowing in the sediment (contr. epifauna).

inflation: the «thickness» or the distance between the outermost points of the two valves, that means, the greatest dimension through both valves; also called tumidity.

infralittoral: zone below low tide but within influence of light, the lower limit is variable: it is the maximum depth for photophilous algae and seagrasses and is generally shallower than 40 m.

inhalant siphon: the siphon through which the bivalve draws the water with the nutrition into the mantle cavity and onto the gills. Also called incurrent siphon.

in litt.: = *in litteris*, in correspondence, in a letter.

in sched.: = *in schedis*, on labels (*e.g.* label with manuscript name, not validly published).

interspace: the space or interval between sculpture elements (ribs, ridges, cords etc.).

intertidal area: the zone between high spring tide and low spring tide. It varies between 0.5 and 15 m, in West Africa not more than about 4 m.

isodont hinge: hinge with a few symmetrical hinge teeth (***e.g.*** Spondylidae, Plicatulidae).

isomyarian: bivalve with two equal adductors; also called homomyarian.

J

juvenile: immature, not fully grown.

K

keel: a prominent angular ridge; also called carina.

kitchen middens: from Danish: kjøkkenmoddinger, concentrates of bivalve and gastropod shells (shell mounds), mostly in prehistoric cooking places.

L

labial palps: four leaf- or tentacle-shaped extensions of the lips, situated in front of the gills on both sides of the mouth and serving for sorting the food.

lamellate: with lamellae, blade-like.

Lamellibranchia: another (old) name for Bivalvia.

laminarian zone: an outdated (mostly used in the 19th century) name for the zone between about 2 to 30 m depth where laminarian seaweeds live; equivalent to #infralittoral.

larva: the first stage of a mollusc before metamorphosis.

lateral: on the side.

lateral teeth: the hinge teeth situated at one or both sides of the hinge plate at some distance from the beaks and not ending under the beaks.

lecithotrophic larva: a molluscan larva which develops within the egg capsule, feeding on the nutrient matter of the egg or nurse eggs. In bivalves, the eggs have a diameter of 90-140 microns, and there is a very short nonfeeding planktonic stage.

lectotype: a single specimen selected subsequently from a lot of syntypes and officially designated by the same or another author. Like a holotype, it is the sole name-bearing type.

leg. (on specimen labels): = *legit*, collected by. Indicates the person who sampled the specimen in the field - In French speaking countries, this abbreviation («lég.») is sometimes used for «légué par», (bequeathed by); in this case the abbreviation «réc» (= récolté par) is employed to indicate the field collector.

length: distance between anterior and posterior end (margin) of the shell. Usually the largest dimension, but sometimes the largest can be the height (***e.g.*** in some Cardiidae).

ligament: an elastic structure or band which joins the two valves at their dorsal margins, mostly behind the umbos, sometimes below the umbos. Antagonist to the adductor muscles, opens the valves when the adductors relax or when the animal is dead.

ligament pit: #resilifer.

lithodesma: a calcareous overlay strengthening the inner

ligament (resilium) in certain bivalve groups (*Pandora*, *Thracia*, *Periploma etc.*).

littoral: the intertidal zone and the subtidal zone down to about 10 m. For several authors, however, «littoral» is the whole continental shelf, for others the intertidal zone only.

lot: all specimens of the same species collected at one locality by the same collector at the same time.

lunule: a depressed or delimited, often heart-shaped area just in front of the umbos, well marked *e.g.* in venerids.

M

maërl: a bottom consisting of biogenic carbonate deposits formed by free calcareous algae. Biotope for a lot of molluscs.

malacology: the study of molluscs based on both the soft parts and the shell, including the application of modern techniques such as DNA sequencing.

mangrove zone: in the tropics and subtropics a special form of the shore confined to calm water with more-or-less soft mud or fine sandy bottom, dense vegetation of mangrove trees and a special molluscan assemblage, often with weak to strong influence of brackish water.

mantle: an integument which forms the outermost layer of the soft animal, surrounds the vital organs and secretes the shell at its margin. Ventrally the mantle edges may be fused (leaving openings for foot and siphons only) or partly to totally separate.

mantle cavity: in a bivalve, the space between the mantle lobes and the body, where the gills are situated.

manuscript name: a name which was never published but which may appear *e.g.* on museum labels.

margin: the edge of a shell or valve which may be smooth, crenulated or undulated.

margino-littoral species: species living in estuaries, lagoons, creeks and mangrove areas with periodically or always reduced salinity. The term margino-littoral comes from paleoecology and is mostly used by French researchers.

marine phanerogams: plants living on the sea bottom with roots and flowers or fruits (in contrast to algae). They belong to the families Zosteracea (*Zostera*, *Posidonia* etc.) and Hydrocharitacea (*Halophila*, *Thalassia* etc.) and form the biotope of many gastropods and bivalves.

mediolittoral: the intertidal zone from upper mean tide to lower mean tide.

mesoplax: an accessory plate in Pholadidae, situated dorsally above the umbonal region.

Mesozoic: the second of the four major geologic eras (66-252 million years ago).

metamorphosis: the transition from the larval phase to the postlarval juvenile animal.

metaplax: another accessory plate in Pholadidae, situated dorsally behind the umbos, on the postero-dorsal gape.

mineral sand: sediment of different grain size consisting of quartz and other silicates. Biotope of many molluscs.

Miocene: the middle of the Tertiary, dating back 5.33 - 23 mill. years.

monomyarian: bivalve with one adductor muscle only.

monotypic: a supraspecific systematic entity with one single representative.

ms: manuscript, not published, *e.g.* a #manuscript name.

multivincular ligament: ligament divided into several discrete bands or blocks, each attached to the hinge plate in a transverse groove (*e.g. Isognomon* in the Pteriidae).

muscle scar: a mark, often a shallow depression on the inside of the valves, where a muscle is attached.

mussel: a mytilid or unionid bivalve.

myophore: #apophysis.

N

nacreous: pearly, iridescent; the inner valve surface of several groups (Nuculidae, Pteriidae, Isognomonidae *etc.*), consisting of aragonite.

Neogene Period: the latest period of the #Tertiary, includes Pliocene and Miocene.

neotype: a specimen designated as the new type when the holotype or the syntypes have been lost or destroyed.

nepionic shell: the earliest postlarval shell.

nestlers: bivalves seeking shelter and living in holes, cavities, empty barnacles, among shell concentrates etc., their valves are formed according to the cavity and may be distorted. Examples are among the Petricolidnae and Saxicavidae.

nomenclature: the application of scientific names to animal species and higher categories. The rules of application are laid down in the ICZN.

nom. dub.: = *nomen dubium* (doubtful name), a name of which the application is not certain or indeterminate.

nom. nov.: = *nomen novum* (new name), a name given as a replacement name *e.g.* for a species with a preoccupied name. Under ICZN rules, it conserves the same types as the replaced name (= is an "objective" synonym).

nom. nud.: = *nomen nudum* («naked» name), a name given in an invalid manner, *e.g.* not accompanied by any description or figure.

nom. null.: = *nomen nullum* (null name), an unavailable name formed by an unintentional emendation (better called "incorrect subsequent spelling").

nomen oblitum (forgotten name): a name not used in the

scientific literature after 1899 and rejected under the provisions of Art. 29.3 of ICZN. This usually accompanies declaration as "nomen protectum" of an alternative name which has been used in at least 25 different instances over the last 50 years.

nom. van.: = *nomen vanum* (vain name), an available name formed by an intentional unjustified emendation of an already existing name of which it becomes a synonym (better called "unjustified emendation").

***non*:** not (as [Species name] Author1 (non Author2)); an ambiguous notation which sometimes (herein, always) denotes that [Species name] Author1 is a homonym of [Species name] Author2, and sometimes that the specimens were misidentified by Author1 and do not belong to the species as established by Author2).

non-binominal: a scientific species name consisting of more than two (in case of subspecies more than three) words, not conforming Linnaeus' binomial system and therefore invalid.

Nouakchottian: the last transgression of the sea which during the Quaternary (about 5000 years ago) covered the Mauritanian and Senegal basin. The shells of several molluscan species are found in these outcrops (see Rosso 1975).

nymph: a narrow platform on the hinge line above the teeth and behind the umbos to which the external ligament is attached.

O

oblique: is said of a shell where the largest extension of the valve not towards below the umbo, but towards an anterior or posterior direction.

oblong: a bivalve shell with a length/height ratio of about 1,5-2 : 1.

obsolete: not very distinct, weak to becoming almost absent.

oceanic islands: islands beyond the continental shelf, which have originated trough volcanism in the oceanic crust.

O.D. (of a type species): original designation (in the publication where the name is introduced).

Oligocene: Tertiary period between #Eocene and #Miocene, dating back 23-34 mill. years. Latest period in the #Paleogene.

opisthodetic ligament: ligament situated behind the beaks.

opisthogyrate (or opisthogyrous) umbos: umbos pointing towards the posterior (a rare condition in bivalves, *e.g.* in Nuculidae and certain Glycymerididae).

orthogyrate (or orthogyrous) umbos: umbos pointing towards each other (*e.g.* in many Cardiidae).

P

Paleocene: the earliest Tertiary period, dating back 56-66 mill. years.

Paleogene Period: the earliest period of the #Tertiary (Cenozoic Era), includes Paleocene, Eocene and Oligocene.

Paleozoic: the first of the four major geologic eras (252-541 mill. years ago).

pallets: a pair of calcareous structures in the form of a spade or a feather at the posterior end of the teredinid animal. It serves for closing the open end of their bore hole in the wood when the siphons are retracted.

pallial line: the mark of attachment of the mantle lobes on the inside of the valves in the form of a line more or less parallel to the ventral inner margin.

pallial sinus: a more or less deep indentation of the pallial line in the posterior part of the valve marking the attachment of the siphon retractor muscle.

paralectotype(s): specimen(s) from the type lot other than the #lectotype, which are mentioned in the publication where the lectotype is designated.

paratype(s): specimen(s) from the type lot other than the holotype, which are mentioned in the original description.

pedal gape: 1) the gape between ventral margins in some species; 2) in species with a fused mantle, the anterior mantle aperture for the foot.

pedal retractor muscle: the muscle which serves to draw in the foot.

pelagic molluscs: mollusks not living on the sea floor but drifting in the water, often far from the coast; active movement is limited.

Pelecypoda: «old» name for the Bivalvia, means «with axe-shaped foot». It should not be used because not all bivalves have an axe-shaped foot.

periostracum: the outermost uncalcified layer of a molluscan shell, composed of quinone-tanned proteins, mucopolysaccharides, more rarely with a limited amount of chitin. It provides the organic basis for initial mineral deposition at the edge of the shell and works as a waterproof layer that protects the shell from acids in the environment

phylogeny: the evolutionary history and relationships among taxa (*e.g.* species, or higher categories).

phylogenetic classification: a classification using exclusively groups (#clades) inferred from common ancestry of their components, not on overall similrity of those.

piddock: an edible pholadid bivalve (*Pholas*, *Barnea etc.*).

plankton: organisms living in the free water and not or very little capable of moving actively. They float, and drift in the currents.

planktotrophic larva: a molluscan larva with a more-or-less long free-swimming phase during which it feeds on plankton. In bivalves the eggs which hatch into this type of larva are smaller than 85 microns.

Pleistocene: the period between the Tertiary and the present (first period of the Quaternary), dating back

2.58 mill. years to 11700 years B.P. (including several Ice Ages).

Pliocene: the latest Tertiary period, dating back 2.58-5.33 mill. years.

posterior angle '(also posterior ridge): a keel, ridge or more-or-less rounded angle radiating from the umbo to the postero-ventral margin or corner.

posterior area: the part of the valve surface that is situated behind the posterior angle.

posterior part: the part of the valve between the posterior margin and the vertical line drawn through the beaks of the valve.

posterior ridge: #posterior angle.

prodissoconch: the embryonic shell of a bivalve or a scaphopod, secreted during the larval stage. The prodissoconch I is the earliest-formed part, secreted by the shell gland of the early veliger, the prodissoconch II is the part secreted by the mantle edge, during the later larval stage. The term is now frequently replaced by #protoconch.

prosodetic ligament: ligament situated in front of the umbos.

prosogyrate (or prosogyrous) umbos: umbos pointing or enrolled towards the anterior (*e.g.* in most Veneridae and in Glossidae).

protoconch: the larval shell of a gastropod, but now often also used for bivalves, also herein, because of homology of both structures.

protoplax: an acessory plate in the Pholadidae, situated dorsally in front of the umbos.

provinculum: the central part of the hinge of the #prodissoconch, which generally bears small denticles.

proximal: situated near (or closer to) the centre of the body or to the point of origin of a structure.

Q

Quaternary: the most recent of the four major geological eras (present to 2.58 mill. years ago) with well preserved subfossil and fossil records, the others being #Paleozoic, #Mesozoic and #Cenozoic (= Tertiary).

R

radial sculpture: surface sculpture originating on the beaks and extending towards the opposite margin.

rank: a hierarchical level in the classification of living organisms (from lowest to highest: subspecies, species, subgenus, genus, family, order, class, phylum, kingdom).

Recent species: a species living now, at present (contr. fossil).

regression: in geological time-scale, an episode where the sea-level becomes lower, and part of the continental shelf becomes land.

resilifer: the part of the hinge plate to which the internal ligament of resilium is attached, also called a ligament pit (see also chondrophore).

resilium: the internal ligament, a normally triangular, tough, elastic, horny structure which is compressed when the valves are closed and drives the valves apart upon relaxing of the adductor muscles.

rostrate: beak-like (anterior or posterior end of the valve).

S

salinity: the saltiness of the sea water, measured in ‰. ("parts per thousand") or PSU ("practical salinity units") Normal seawater has about 35 ‰ salt.

scallop: the vernacular name of a pectinid bivalve.

sculpture: form and ornamentation of the external surface of a shell.

sediment: material of the sea bottom formed by non-consolidated particles of different grain size (mud, fine sandy mud, fine muddy sand, fine sand, medium sand, mixed sand, coarse sand, gravel, bioclasts).

seston: all particles, live or dead, suspended in the sea water, food for most bivalves.

shipworm: a teredinid bivalve.

shrimptrawl: a special otter trawl used for catching shrimps (or prawns, mostly families Penaeidae and Caridae), which is also quite effective for molluscs. It has a semiballoon form and a rather small mesh, and the otterboards are directly attached to the net wings without intercalated wires. The footrope is weighted with chains for digging into the sediment (instead of rubber bobbins or steel rollers as usually used on fish trawls), often an additional so-called tickler chain is placed a few metres ahead of the footrope to rouse up the shrimps. The trawl is used in this form usually in depths between about 7 and 80 m. Two trawls (one on each side) are operated at the same time from a shrimp boat, which is equipped with an outrigger for each net. The larger deep-water shrimp trawls, for depths between 100 - 1000 m, however, are rigged up like fish trawls, except for the footrope with the chain and the smaller mesh size, and are worked in a conventional manner by a side- or stern trawler. Most «trawled» tropical molluscs come from shrimptrawlers (see also beam trawl, trawl, trawler, try-net).

sibling species: species which are nearly or totally identical in morphology but which do not interbreed and which differ biologically.

siphon: an opening or tubular prolongation of the posterior mantle through which the water is taken into the mantle cavity or pumped out.

siphonoplax: an accessory calcareous structure in the Pholadidae which closes the posterior gape and protects the siphons.

***s.l.*:** = *sensu lato*, in the broad sense.

socket: a cavity in the hinge line in which a tooth of the opposite valve fits.

***s.s.*, *s. str.*:** = *sensu stricto,* in the strict sense.

stenohaline: animals and plants which cannot withstand drastic salinity changes, *e.g.* fully marine species.

subfossil: this term is often used for shells originating from the late Pleistocene (last interglacial or last glaciation) and early Holocene (some 5000-10 000 years ago) and are found in unconsolidated sediment.

sublittoral: zone from below low tide mark to the outer edge of the continental shelf (200 m); a term used prevalently in the English-speaking literature, as an alternative to "infralittoral" and "circalittoral" used mostly by French authors.

subspecies: a subset of populations of a species living in a distinct geographical area and showing constant differences from other such subsets. Fertile interbreeding, however, would take place if these populations could meet.

substratum (or substrate): the bottom surface on which a benthic animal lives. It can be hard such as rocks (primary hard substrate), ship's hulls or objects on a soft bottom (secondary hard substrate) or soft (sand, gravel, mud, silt etc.).

subtidal: the zone just below spring tide low water to a few metres.

subtropical zone: the regions immediately north and south of the tropical zone, to about 30-35° N or S.

subumbonal pit: an excavation on the hinge line under the anterior part of the ligament and above the posterior cardinal in certain Vesicomyidae.

supratidal: the splash zone above high tide, also: supralittoral.

suspension feeder: a mollusc that feeds on plankton and detritus suspended in the water. The food is sucked in via the inhalant siphon and sorted on the gills.

sympatric species: species occurring together in the same geographic area.

synonym: one of two or more names given to the same species or higher taxonomic entity; the first given name is the senior synonym and the valid name if it is not preoccupied or a #nomen oblitum, the second and later names are junior synonyms.

synonymy: list of primary citations of synonyms of a taxonomic entity in a scientific paper (see also: chresonymy).

syntype: any specimen of a type lot for which neither a holotype nor a lectotype is designated.

systematics: the branch of biology which deals with the diversity of organisms and their classification; some authors distinguish systematics (the understanding of evolutionary relationships among organisms) from taxonomy (the inventory, naming and description of these organisms) but this is not justified since the word "taxonomy" (which in Greek means "dealing with order") was first defined as "the theory of classifications".

T

taret: french word for shipworm.

tautonymy: The species name is the same as the genus name (*e.g. Ensis ensis*).

taxon (plur. taxa): any unit in the classification of living organisms, at whatever rank (subspecies, species, genus, family, order etc.) (plural: taxa).

taxonomy: the branch of biology which deals with classification of species and higher categories (see also systematics).

taxodont hinge: a hinge plate bearing numerous similar teeth of equal size in a row.

teleoconch: the shell except the #protoconch (larval shell); the term is generally used for gastropods but can also be employed for bivalves.

Tertiary: the third of the four major geological eras (2,58 mill. to 66 mill. years ago); abandoned today in the formal stratigraphic classification.

testaceous: shell-bearing.

topotype: a specimen collected subsequently at the type locality and not belonging to the type lot.

trawl: a normally large to very large fishing net in the form of a bag tapering towards the end, which is towed by a ship over the seabed at a speed of about 3-4 knots by means of two strong cables or warps. It is usually kept open by two so-called otter boards (functioning in the manner of a kite), one on each side, to which the correspondent warp is shackled. Between the otter boards and the trawl itself, more or less long cables or bridles are intercalated (see also shrimptrawl, beam trawl, try net).

trawler: a fishing vessel using trawls and for that purpose equipped with a powerful two-drum winch. The «classic» side-trawler of the hundred years before the 1980s has now almost entirely disappeared and been replaced by the stern-trawler. Also most research vessels have trawling facilities.

transgression: in geological time-scale, a rise of the sea-level resulting in the inundation of a region of land which becomes sea bottom (contr. regression).

trochophore: the early planktonic stage of a molluscan larva.

tropical zone: the zone between the Tropics of Cancer in the north and Capricorn in the south.

truncated: ending abruptly

try-net: a miniature #shrimp trawl with a footrope length of about 2-4 m which normally is used to test the presence of shrimp on a fishing ground. Moreover, after slight modification it is very effective for benthos sampling and may be used instead of a #beam trawl, mostly in shallower water (10-200 m).

tumidity: #inflation.

type(s): the specimen or specimens on which the original species description is based.

type locality (locus typicus): the locality where the type specimen(s) have been collected.

type lot: all specimens that were used or cited as such in an original species description.

type species: the species on which the description of a genus-group taxon (subgenus or genus) is based.

typical tropical region: on the West African coast the area comprised between southern extremity of Guinea and the eastern border of Liberia and between the coast of Nigeria and Cameroon or Gabon, with entirely tropical conditions throughout the year.

Tyrrhenian: subdivision of the Mediterranean late Quaternary (130 000 to 80 000 years B.P., coincident with "marine isotope stage 5"), a warmer period during which subtropical species (*e.g. Tugonia anatina*), today only living in tropical West Africa, advanced northward into the Mediterranean Sea; today abandoned as a formal stratigraphic subdivision.

U

ubiquitous species: species capable of living in many different biotopes, depths or under various ecological conditions.

umbo: the early upper dorsal part of a valve. It can be more or less straight (*e.g.* many Mactridae, *Tivela*, Pectinidae), curved (*e.g.* most Veneridae) or enrolled or spiral (Glossidae) (plural: umbos); "umbone" is an acceptable alternative name but Carter et al. (2012) suggest that "umbo" should be preferred.

Umbonal cavity: the part of the inside of the valve situated within the umbo and under the hinge.

Umbonal reflection: the back-folded dorsal margin of Pholadidae valves, situated in front of or over the umbo. The anterior adductor muscle is attached to this reflection.

umbonal ridge: #posterior angle.

V

valve: a separable hard part of the molluscan shell that is attached to other hard part(s) by elastic components and is movable. The bivalves have two valves, the chitons have eight. The term is also used for other animals outside molluscs (Brachiopoda, Cirripedia).

variety (varietas): a different form of a species (*e.g.* in colour or shape) without any taxonomic value (in contrast to the #subspecies), although still today «form names» are occasionally given.

veliger: the later stage of the pelagic molluscan larva, it has a thin shell, a foot and a ciliated lobe (velum) for swimming. The very late stage just before settling down and metamorphosis is called pediveliger.

ventral margin: the margin of the valves which is opposite to hinge and beaks and where the valves open most widely; normally also the physiological ventral side of the animal.

vicarianist theory: in biogeography, a theory stating that all distributions should be explained by the partitioning of a former extensive distribution as a consequence of the onset of barriers (see also dispersalist theory).

W

width: a measurement of the #inflation or tumidity of a bivalve (measured perpendicularly to length and height).

wing: an angular extension on one or both sides of the dorsal margin of a valve (e-g. in Pteriidae), also called «ear».

Abbreviations

Abbreviatons of museums and organisms

AMNH ..... American Museum of Natural History, New York, N. Y., USA
ANSP ..... Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania, USA
BMNH ..... British Museum (Natural History) (now The Natural History Museum), London, England, U.K.
CRO ..... Centre de Recherches Océanographiques, Abidjan, Côte d'Ivoire.
CRODT ..... Centre de Recherches Océanographiques Dakar-Thiaroye, Dakar, Senegal
FAO ..... Food and Agriculture Organization of the United Nations, Rome
GBIF ..... Global Biodiversity Information Facility, Copenhagen
Ifan ..... Institut Fondamental d'Afrique Noire (formerly Institut Français d'Afrique Noire), Dakar, Senegal
IRD* ..... Institut de Recherche pour le Developpement (since 1999 new name and acronym for Orstom), Paris, France
IRSNB ..... Royal Belgium Institute of Natural Sciences, Brussels, Belgium (Flemish abbreviation is KBIN, French one is RBINS)
MCZ ..... The Museum of Comparative Zoology, Harvard University, Cambridge, Mass
MNCN ..... Museo Nacional de Ciencias Naturales, Madrid, Spain
MNHN ..... Muséum national d'Histoire naturelle, Paris, France
MOM ..... Musée Océanographique de Monaco, Monte Carlo, Monaco
MTD ..... Staatliches Museum für Tierkunde, Dresden, Germany
NHMW ..... Haturhistorisches Museum Wien, Austria
NHMUK ..... The Natural History Museum London, U.K. (formerly British Museum (Natural History)
NMR ..... Natuurhistorisch Museum Rotterdam, the Netherlands
NMW ..... National Museum of Wales, Cardiff, Wales, U.K.
Obis ..... Ocean Biogeographic Information System, Intergovernmental Oceanographic Commission (IOC) of Unesco.
Orstom* ..... Office de Recherche Scientifique et Technique d'Outre-Mer. Former name (until 1984) of IRD (Institut français de Recherche Scientifique pour le Developpement en Coopération). The acronym Orstom was still used after the name change, until 1998. In this book, the IRD is cited under its former and well-known acronym Orstom for all facts prior to the end of 1998.
RMNH ..... Rijksmuseum van Natuurlijke Historie (now Nationnaal Natuurhistorisch Museum Naturalis), Leiden, the Netherlands
SMF ..... Forschungsinstitut und Natur-Museum Senckenberg, Frankfurt/M.
SMNH ..... Naturhistoriska Riksmuseet (Swedish Museum of Natural History), Stockholm, Sweden
USNM ..... United States National Museum (now National Museum of Natural History), Smithsonian Institution, Washington, D.C., USA
ZMB ..... Zoologisches Museum (now Museum für Naturkunde) der Humboldt-Universität Berlin, Germany
ZMUC ..... Universitets Zoologisk Museum, Copenhagen, Denmark
ZIM ..... Zoologisches Institut und Zoologisches Museum der Universität Hamburg, Germany

Other abbreviations

lv ..... left valve
R/V ..... research vessel
rv ..... right valve
ht ..... height (dorso-ventral)

Index

The species treated in the book are indicated in bold italic font.

A

abbreviata, Tropidomya ... 1012, 1042, 1043
aberrans, Keletistes ... 403, 422-424
abildgaardiana, Gastrana ... 628
Abra ... 544, 554, 678, 680, 684, 685
abrupta, Rhinoclama ... 1012
abscondita, Modiola ... 216
abscondita, Talochlamys ... 240, 260-261
abyssorum, Yoldiella ... 69
Acar ... 100, 102, 154
Acesta ... 286, 288, 291, 292
Acharax ... 64, 65
achatina, Sanguinolaria ... 556, 708-709
acinula, Ledella ... 68
aculeata, Centrocardita ... 323, 352-354, 356
acutangulus, Donax ... 553, 652-654, 656
acutecarinata, Myonera ... 1012
acutissima, Scissodesma ... 512, 758, 782, 786, 787
adami, Dosinia ... 848, 918, 919
adami, Teredo ... 998
adamsi, Arcopsis ... 154
adamsii, Vesicomya ... 804
adansoni, Dosinia ... 920
adansoni, Lasaea ... 471, 478, 479
adansoni, Lucina ... 403, 406, 407
adansonii, Tagelus ... 18, 142, 314, 557, 716, 717, 726
adriaticus, Phaxas ... 744
adusta, Potamocorbula ... 33, 42, 947, 968, 969
aegeensis, Ennucula ... 66, 80
aeolicum, Lyrocardium ... 39, 45, 306, 511, 532, 533
aequatorialis, Tinalucina ... 403, 448, 449
Aequipecten ... 236, 238
Aeretica ... 548, 612
afer, Mytilus ... 179
affinis, Venus ... 864
afra, Arcopsis ... 105, 152, 154, 155, 306
afra, Dosinia ... 848, 918, 920-922
afra, Glans ... 323, 334, 350, 351
africana, Cryptomya ... 945, 950, 951
africana, Dione ... 892
africana, Dosinia ... 920
africana, Kurtiella ... 471, 501
africana, Mytilopsis ... 947, 970, 971
africana, Panacca ... 1013
africana, Paramya ... 471, 506, 507
africana, Sanguinolaria ... 708, 709
africana, Xylophaga ... 975
africana, Yoldiella ... 69
africanus, Mytilus ... 179
africanus, Sinupharus ... 722, 734-736, 738, 742
afroccidentalis, Solecurtus ... 60, 557, 710, 711
afroccidentalis, Tellina ... 550, 566, 567
Afrolucina ... 396, 401
Afrophysema ... 47, 396, 400
agassizi, Cardiolucina ... 416
agglutinans, Lioberus ... 175, 210, 216, 217
aguiarii, Galateia ... 672
ajar, Cardiocardita ... 18, 323, 338, 339, 342, 344, 348
Akardita ... 47, 320, 322, 327, 348
alba, Abra ... 554, 679
alba, Crassatina ... 326, 388-390
alba, Pristigloma ... 69
alba, Ungulina ... 802, 816, 817
aldrovandi, Panopea ... 750
algosus, Semimytilus ... 175
alleni, Axinulus ... 405
allocostata, Mesocibota ... 104, 112, 120, 121, 314
ambigua, Mactra ... 764
ameliae, Condylocardia ... 324, 366, 367
ampullacea, Tampaella ... 550, 586, 587
Amygdalum ... 170, 174
Anadara ... 100, 101, 103, 136, 141
anatina, Tugonia ... 44, 945, 948, 949, 1083
anaxium, Lyrocardium ... 45, 532
Anchomasa ... 972, 974, 981
anechoensis, Bankia ... 977, 1003
angolensis, Acesta ... 288, 292, 293
angolensis, Cetoconcha ... 1010

angolensis, Condylocardia ... 324, 359, 364
angolensis, Crassatella ... 378, 380
angolensis, Petricola ... 848, 934, 935
angolensis, Plicatula ... 275, 284, 285
angolensis, Scissodesma ... 38, 758, 782, 783
angulare, Dacrydium ... 175
angulata, Crassostrea ... 303
angulatus, Solecurtus ... 716
angustior, Lutraria ... 1047
Anisocorbula ... 944, 946, 962
Anodontia ... 400, 444
Anomia ... 272, 273, 276, 812
anomioides, Pedalion ... 234
anteai, Microcirce ... 848, 880, 881
Antigona ... 845
antiquatus, Solen ... 714
aperta, Clavagella ... 1009, 1028, 1029
appendiculatus, Megaxinus ... 403, 428-430
approximans, Iphigenia ... 670
aquitanicum, Nemocardium ... 45
arabicus, Megaxinus ... 428
arata, Pholadomya ... 1013
aratus, Modiolus ... 212
Arca ... 100, 101, 104, 108, 141, 532
Arcopagia ... 544, 548
Arcopella ... 544, 548
Arcopsis ... 100, 105
arctica, Hiatella ... 723, 748, 749
Arcuatula ... 170, 172
Argopecten ... 238
aristatus, Leiosolenus ... 46, 175, 198, 199
artipica, Yoldiella ... 69
Asbjornsenia ... 544, 548, 604, 606
ascensionis, Tellina ... 1047
aspersum, Oxyperas ... 778
aspersus, Pecten ... 264
asperula, Bentharca ... 104
assiniensis, Corbula ... 968
Astarte ... 320, 325
atacellana, Nucula ... 66
atalantae, Isorropodon ... 804
atalantae, Lucinoma ... 403, 460
atlanta, Halonympha ... 1012
Atlantella ... 548, 592
atlantica, Cardilia ... 758, 796, 797
atlantica, Cuspidaria ... 1012
atlantica, Policordia ... 232, 1011
atlantica, Pteria ... 223, 232, 233
atlantica, Thyasira ... 405
atlantica, Vesicomya ... 804
atlanticus, Aequipecten ... 240, 254
atlanticus, Sinucultellus ... 722, 742, 743
Atrina ... 220, 222, 226-229
atropurpureus, Mytilus ... 182
attenuata, Cuspidaria ... 1038
aureocincta, Sanguinolaria ... 708
auri, Trigoniocardia ... 520
auriculata, Diplodonta ... 836
aurita, Limopsis ... 107, 169
australis, Panopea ... 750
Austromacoma ... 314, 544, 549, 550, 626, 627
avellana, Arca ... 104, 112, 113
Avicula ... 223
Azorinus ... 544, 556

B

bagidaensis, Bankia ... 977, 1004
balalaika, Bornia ... 471, 488, 489
balaustina, Arcopella ... 550, 610, 611
Bankia ... 972, 977, 996, 1002
barbatellus, Modiolus ... 190
Barbatia ... 100, 102
barbatus, Modiolus ... 175, 202-204
barnardi, Cuspidaria ... 1012
Barnea ... 848, 972-974, 981, 1080
Barymactra ... 754, 756
Bassina ... 844
Basterotia ... 466, 471
Bathyarca ... 100, 103, 126
belcheri, Pitar ... 880, 896, 902
Bellucina ... 399
bengoensis, Galatea ... 553
benguelensis, Neolepton ... 849, 943
bernardi, Sinupharus ... 552, 553, 668, 669, 722, 736-738
bernardii, Galatea ... 553
bertrandi, Moerella ... 550, 598, 599
biali, Gari ... 704
biangulata, Anadara ... 130
biangulata, Galatea ... 672
bicolor, Isognomon ... 234

bicolor, Petricola *934, 937*
bicolor, Tivela *29, 848, 888-890*
bicuspidatus, Lembulus *68, 94, 95*
bidentata, Kurtiella *471, 501, 502*
bigoti, Isorropodon *804, 841*
bilanta, Yoldiella *69*
bimaculatus, Heterodonax *706*
biplicata, Thyasira *405, 462, 463*
bissauensis, Pholas *975, 980*
bistrigata, Mesocibota *120*
bisulcata, Lithophaga *200*
bisulcata, Sheldonella *144*
boomerang, Bathymodiolus *175, 310*
borealis, Lucinoma *403, 456, 457*
Bornia *466, 469, 487, 488*
Bosemprella *546, 562*
boucheti, Condylocardia *324, 365*
boucheti, Moerella *550, 596-598, 602*
bouvieri, Arca *104, 108, 110, 111, 140, 532*
Brachidontes *170, 172*
Bractechlamys *236, 238, 248*
branchiata, Parapholas *975, 988, 989*
brasiliana, Crassostrea *314, 315*
brasiliana, Iphigenia *664*
bravensis, Condylocardia *324, 358, 362*
brevidentata, Cyrenoida *839*
brevis, Axinulus *405*
britannica, Arcopella *610*
brocchii, Diplodonta *378, 802, 822, 824-826*
brongniarti, Venus *868*
bruuni, Macomopsis *550, 618-620*
Bryopa *1006, 1009*
Bucardium *47, 508, 510, 518*
budkeri, Lutraria *758, 790, 791*
burnupi, Donax *42, 553, 660-662*
bushae, Ennucula *66*
bushae, Mendicula *405*
Bythosphaera *396, 401*

C

cadenati, Corbula *947, 954, 962, 963*
cailliaudi, Galatea *553*
californica, Cryptomya *950*
Callanaitis *844*
Callista *842, 845, 892*
callistiformis, Tindaria *69*
Callistotapes *847, 926*
Calloarca *100, 102*
calva, Parapholas *988*
calyculata, Cardita *323, 328-330, 332*
camerunense, Periploma *1009, 1026, 1027*
camerunensis, Anadara *104, 138, 139*
campechiensis, Pholas *975, 978-980*
canariensis, Rhomboidella *175, 195*
cancellata, Lajonkairia *1048*
cancellata, Rostrimacoma *550, 634, 635, 984*
cancellatum, Neolepton *943*
candeanus, Malleus *223*
candida, Barbatia *114*
candida, Barnea *114, 975*
candida, Psammacoma *1048*
candidus, Solecurtus *712, 713*
canonica, Moerella *602*
caparti, Europicardium *510, 511, 522-524, 526*
capensis, Carditella *324*
capensis, Lucinoma *403*
capeverdensis, Cyclopecten *241*
Capsa *551*
capsa, Ostrea *310*
capsicum, Tellina *570*
Cardilia *754, 758, 796*
Cardiocardita *47, 320, 322, 338, 340, 346*
Cardiolucina *396, 399, 416*
Cardiomya *1006, 1012*
Cardita *320-322, 332, 359*
Carditamera *320, 322*
Cardites *320, 323, 340*
carditoides, Condylocardia *324, 359, 364, 365*
Carditopsis *320, 324, 359*
Cardium *47, 508, 509, 512, 516*
caribbaea, Lima *289*
carinata, Bankia *977, 1002*
carmenae, Leiosolenus *175, 200, 201*
carnea, Pinna *224*
carrozzae, Mendicula *405*
carvalhoi, Modiolus *204*
Caryatis *846*
Caryocorbula *944, 946*
casina, Venus *848, 854-856*
castanea, Ervilia *554, 689*

castrensis, Gari ... 526, 556, 700, 701
catherinae, Ctenoides ... 288, 290
caudigera, Lithophaga ... 198
Cavilucina ... 428
centralis, Iphigenia ... 552, 553
Centrocardita ... 320, 323
Cerastoderma ... 508, 511
Chama ... 18, 798-800, 806
chamasolen, Azorinus ... 557, 714, 715
charpentieri, Mytilus ... 180
chautardi, Atrina ... 222, 228, 229
chavani, Divaricella ... 403, 434, 435
chenui, Pharus ... 44, 342, 722, 728, 729, 740, 1048
chesneyi, Congetia ... 148
chetelati, Quadrans ... 560, 561
chevalieri, Afrophysema ... 403, 438, 439, 442
chevreuxi, Venus ... 848, 866, 867
chiclaya, Ceratobornia ... 488
Chlamys ... 237, 260, 262
chudeaui, Corbula ... 947, 954, 958, 960, 961
chudeaui, Tellina ... 632
chuni, Laubiericoncha ... 804, 805
chuni, Vesicomya ... 804
circinata, Chama ... 808
Circomphalus ... 47, 842-844, 854, 870
circularis, Argopecten ... 252
circularis, Diplodonta ... 802, 812, 816, 830, 831
clancula, Basterotia ... 471, 505
clarkei, Yoldiella ... 69
clathrata, Acar ... 124
clausa, Pholas ... 984
Clausinella ... 842, 844
Clavagella ... 1006, 1009
clavata, Pholas ... 987
coalita, Galeomma ... 468, 472, 474, 475
coarctatus, Solen ... 714
cochlear, Neopycnodonte ... 302, 308, 309
Codakia ... 402
cognata, Petricolaria ... 939
collignoni, Divaricella ... 434
columbella, Lucina ... 406
colymbus, Pteria ... 232
combieri, Sinupharus ... 722, 740, 741
commutata, Saccella ... 68, 82, 83
commutatus, Aequipecten ... 42, 240, 252-254
compacta, Cavilinga ... 403
complanata, Barbatia ... 104, 112, 114-116
complanata, Lutraria ... 1047
compressa, Mactrotoma ... 142, 758, 764, 765
compressa, Tellina ... 550, 580, 581
concava, Jupiteria ... 84
concentrica, Glycymeris ... 106, 166, 167
Condylocardia ... 320, 324, 358-360, 362, 365, 366
Congetia ... 100, 105
congica, Galatea ... 553
congo, Iphigenia ... 670
congoensis, Congetia ... 105, 148, 149
congoensis, Crassatina ... 326, 392, 394
congoensis, Fulvia ... 38, 45, 266, 511, 528, 538, 539
congoensis, Phacoides ... 416
congoensis, Teredo ... 1004, 1005
congoensis, Timoclea ... 848, 884, 885
constricta, Austromacoma ... 549
contigua, Carditamera ... 323, 332-334
contraria, Crassatina ... 326, 376-378, 380
contrarius, Keletistes ... 403, 420-422, 426
cor, Glycymeris ... 167
cor, Pitar ... 146, 848, 908, 910, 911, 960
corallinoides, Bractechlamys ... 240, 248, 249
corallinoides, Nodipecten ... 1047
corallinus, Hinnites ... 44, 48, 240, 262, 263, 282
Coralliophaga ... 798, 803
coralliophaga, Gregariella ... 192
Corbula ... 944, 946, 947, 952, 962
corbuloidea, Thracia ... 1008, 1020, 1021
corbuloides, Anadara ... 104, 130, 131
corbuloides, Ennucula ... 66
cornidei, Nuculana ... 68
cornucopiae, Ostrea ... 317
corrugata, Crassatina ... 326, 378, 532
corrugata, Venerupis ... 848, 930, 931
coseli, Tellina ... 550, 582-584
costata, Lutraria ... 1047
costata, Psammobia ... 696
Costatoleda ... 64, 68
costatum, Cardium ... 511-514, 516
costellata, Cardiomya ... 1012, 1040, 1041
Costellipitar ... 842, 846, 902
costulata, Gari ... 556, 702, 703
costulatus, Musculus ... 175, 187

couvrili, Laevicardium *1047*
crassa, Arcopagia *608, 1048*
crassa, Notolimea *288, 299*
Crassadoma *239*
Crassatella *326*
Crassatina *47, 320, 326, 327, 376, 382, 386, 388, 394, 395, 532*
crassicostata, Nucula *66, 79*
crassidens, Nucula *66, 73*
Crassinella *326*
Crassostrea *2, 33, 112, 120, 276, 300, 303, 305*
crassum, Laevicardium *511, 534-536*
crebrisulca, Venus *848, 862-864*
Crenella *173*
crenulata, Chama *140, 306, 312, 532, 800, 806, 807*
Crepispisula *757*
Cricoploma *1008*
crispus, Hinnites *263*
cristata, Limopsis *107, 168*
cristella, Pseudochama *800, 812, 813*
crosnieri, Tellina *550, 584, 585*
croulinensis, Axinulus *405*
cruziana, Cyathodonta *1024*
Cryptodon *404*
Cryptomya *944, 945, 950*
Ctena *396, 403*
Ctenoides *286, 287, 290*
cuccullata, Saccostrea *34, 45, 304, 305, 316, 317*
cumana, Macomopsis *550, 614-616, 618, 620, 624, 1048*
cumingiana, Mactra *766*
Cuna *320, 324, 370*
cuneata, Ungulina *814*
cuneatus, Donax *1048*
cuneiformis, Gastrochaena *752*
Cuneus *551*
curta, Iphigenia *553, 666-668*
curta, Yoldiella *69*
curtum, Isorropodon *804*
curtus, Sinupharus *266, 722, 738, 739, 960*
Cuspidaria *1006, 1012, 1036*
cuspidata, Cuspidaria *1012, 1036, 1037*
Cyathodonta *1006, 1008, 1024*
Cyclocardia *322, 348*
cyclopana, Glycimeris *750*
Cyrenoida *798, 802, 838*

D

dakarensis, Bathyarca *104*
dakarensis, Crassatina *326, 390-392, 1047*
dalli, Teredo *996*
Dallocardia *510*
dartevellei, Carditopsis *324, 368*
dautzenbergi, Corbula *960*
dautzenbergi, Diplodonta *802, 826, 827*
dautzenbergi, Tellina *572*
decipiens, Ennucula *66, 80, 81*
declivis, Venus *140, 848, 858-860, 952*
decurtata, Cardita *328*
decussata, Ctena *454*
decussatus, Ruditapes *848, 928, 929*
Delectopecten *236, 240*
delessertii, Iphigenia *553, 668-670*
demosia, Abra *554, 688*
Dendostrea *300, 303*
Dendrostrea *303*
densestriata, Tellina *582*
densicostata, Policordia *1011*
dentata, Divaricella *434*
denticulata, Striostrea *304, 305, 318, 319, 476*
dentifera, Lamellolucina *408*
dentifera, Perna *235*
depressa, Gari *556, 698-700*
deshayesii, Donax *1048*
desmaresti, Lucina *418*
despecta, Arca *108, 109*
dhofarensis, Trochita *45*
diaphana, Diplodonta *802, 828-830, 832*
Diberus *200*
dicroa, Lyrodus *977, 997*
digitalis, Teredo *1005*
Digitaria *320, 325*
digitaria, Digitaria *325, 374, 375*
diluvii, Anadara *128*
diolensis, Mactra *764*
Diplodonta *47, 798, 800-802, 826, 836*
discontinua, Afrolucina *403, 446, 447*
discus, Periploma *1026*
disjecta, Bassina *870*
distorta, Lozouetia *471, 491*
distorta, Moerella *548, 550, 592, 593, 600*
distorta, Thracia *1008, 1022, 1023*

divaricalx, Lithophaga *200*
Divaricella *396, 400*
divergens, Ctena *454*
dollfusi, Solamen *175, 194*
domaini, Donax *553, 662, 663*
domingensis, Acar *124*
donacina, Moerella *548, 550, 590, 591*
donacina, Parvicirce *848, 886, 887*
Donax *29, 42, 496, 544, 545, 551, 640, 654, 656, 660, 886*
Dosinia *18, 842, 846, 916, 924*
dosiniformis, Joellina *403, 432, 433*
Dreissena *970*
dubia, Rocellaria *723, 752, 753*
dubiosa, Cyathodonta *1024*
dunkeri, Arca *141*
dunkeri, Brachidontes *182*
dunkeri, Isognomon *112, 223, 234, 235*
dunkeri, Lucina *406*
dupontia, Cyrenoida *802, 838, 839*
durus, Polititapes *848, 926, 927, 952*

E

Eastonia *754, 758*
eborensis, Anadara *104, 132-134*
eborensis, Pholadidea *975, 992*
eburnea, Ctena *403, 454, 455*
Edentaria *1012*
edentula, Anodontia *438*
edule, Cerastoderma *511, 540-542*
edulis, Mytilus *176*
effossa, Globivenus *848, 872-874*
egenum, Oxyperas *758, 776-778*
Egeria *552*
elata, Abra *554, 680, 682, 683, 688*
elata, Lucina *418*
elatus, Pitar *848, 894, 900, 901, 908*
elegans, Arcuatula *175, 184, 185*
elegans, Nasopharus *266, 722, 730, 732, 733, 738, 960*
elegantissima, Aporrhais *278, 279*
elinguor, Yoldiella *99*
ella, Yoldiella *69*
elliptica, Lima *298, 480, 950*
elongata, Jolya *214*
elongata, Kelliella *804*
elongata, Lutraria *788*
elongatum, Isorropodon *804*
elongatum, Oxyperas *778*
elouardi, Leporimetis *550, 638, 639*
enigmatica, Diplodonta *802, 822, 823, 826*
Ennucula *64, 66*
Ensis *49, 718, 719, 721, 734*
epetrima, Striarca *105, 152, 153*
ephippium, Anomia *120, 274, 276-278*
Ephippodonta *466, 468, 476*
equalis, Thyasira *405*
ercolaniana, Talochlamys *260*
erebus, Neilonella *69*
erronea, Venus *864*
erubescens, Pitar *38, 848, 894, 898, 899*
Ervilia *544, 554*
estheriopsis, Malletia *69*
Eucrassatella *326*
eumyarius, Genaxinus *405*
Europicardium *47, 508, 510, 1047*
eutornus, Afrophysema *438*
excavata, Acesta *288, 291, 292*
excavata, Teredothyra *977, 1000*
exgaini, Lamylucina *403, 410, 412, 413*
exilis, Lima *294*
exoleta, Dosinia *848, 914-916*
exotica, Lissochlamys *136, 214, 240, 266, 267, 836*
explanata, Talona *975, 984, 985*
exserta, Scacchia *471, 482*

F

fabula, Yoldiella *69*
faeroeensis, Gari *690*
fallax, Psammacoma *622, 624*
Falsolucinoma *396, 398*
fasciata, Clausinella *868*
faujasi, Panopea *751*
Felania *47, 48, 800, 801, 816, 818, 828, 834*
fenestratum, Parvamussium *241*
ferrugineus, Axinus *464*
ferruginosa, Kellia *464*
ferruginosa, Mendicula *405, 464, 465*
fervensis, Gari *526, 556, 690-692*
filatovae, Bathyspinula *69*
filatovae, Silicula *69*
filocarinata, Cuspidaria *1012*

Fischeria 552
flabellum, Aequipecten 240, 250, 251
flexuosa, Halicardia 1011
flexuosa, Thyasira 462
flexuosus, Chlamys 1047
florida, Psammobia 698
floridella, Callista 45, 848, 892, 893
foliaceolamellosus, Circomphalus 848, 854, 870, 871
foliata, Barbatia 114
folium, Dendostrea 312
forlii, Lembulus 90
formosa, Allogramma 141, 1011
formosa, Anadara 141
formosa, Glycymeris 106, 162, 163, 165
forskahlii, Ostrea 317
fragilis, Atrina 222, 226, 227
fragilis, Fulvia 38, 45, 266, 511, 528, 538, 539
fragilis, Gastrana 38, 628
fragilis, Loripinus 444
fragilis, Mactrotoma 764
fragilis, Nuculana 82
franziusi, Teredo 996
friedbergi, Limopsis 168
frons, Dendostrea 312
Fulvia 508, 510, 511, 528
fulvidum, Salaputium 326, 390
fusca, Astarte 325, 348, 372, 373
fusca, Crassatina 384

G

gabonensis, Barbatia 104, 116, 117
gabonensis, Cardiocardita 323, 342, 344, 345
gabonensis, Dosinia 848, 916, 917
gabonensis, Nodipecten 246
gadirae, Acharax 65
gaederopus, Spondylus 270
gaini, Lamylucina 403, 410-413
Galatea 47, 544, 551-553, 672
Galateia 552
Galateola 552
Galathaea 552
galatheae, Ledella 68
galatheae, Limopsis 107
galatheae, Neilonella 69
galatheae, Sinupharus 722, 740
Galatheia 552
Galeomma 466, 468, 473
galloprovincialis, Mytilus 175-179
gambiensis, Cuna 324, 370, 371
gambiensis, Stenocista 92, 105, 136, 146, 147, 984
Gari 544, 555
gasar, Crassostrea 305, 314
Gastrana 544, 549
Gastrochaena 723
geissei, Anadara 104, 140, 141, 526
generosa, Panopea 750
geoffroyi, Bornia 471, 487
geographica, Venerupis 930
ghanaensis, Barnea 975, 981
gibba, Corbula 947, 964-966
gibba, Pompholigina 403, 436, 437
gibberosa, Dreissensia 970
gibbosa, Anadara 104, 128, 129
gibbus, Pecten 252
gigas, Crassostrea 303
glabrata, Mactra 29, 45, 266, 526, 758-761, 794, 1047
glacialis, Bathyarca 1047
gladius, Solen 724
Glans 320, 322, 323
Glauconome 843
glaucum, Cerastoderma 511, 542, 543
Globivenus 842, 844
globosa, Diplodonta 826
globosa, Iphigenia 666
globulosa, Anatina 948
glycimeris, Panopea 723, 750, 751
Glycymeris 53, 100, 106, 162
glycymeris, Glycymeris 164
Gobraeus 555
gofasi, Carditopsis 324, 366, 368, 369
gofasi, Gari 556, 704, 705
goodallioides, Circe 886
goreensis, Ensis 722, 746, 747
goreensis, Lucina 406
gorii, Pandora 1010, 1030
Gouldia 842, 844
gracilenta, Gari 704
gracilis, Petricolaria 848, 938, 939
gracilis, Tellina 572
gradata, Acar 124, 125

Graecina ... 396, 402
grandis, Axinus ... 104, 405
granulata, Haliris ... 1034
granulata, Poromya ... 1010, 1032, 1033
granum, Corbula ... 947, 964, 966, 967
grayi, Huberimactra ... 758, 770, 772, 773
gregaria, Ephippodonta ... 468, 476, 477
Gregariella ... 170, 173
grenophia, Bathyarca ... 126
grimaldii, Abra ... 554
gruneri, Diplodonta ... 828, 829
gruveli, Lembulus ... 68, 88-90
gryphina, Pseudochama ... 800, 810, 811
gryphoides, Chama ... 800, 808, 809
guerinii, Coralliophaga ... 840
guinaica, Gastrana ... 628
guineensis, Brevinucula ... 66
guineensis, Crassatina ... 326, 382-384
guineensis, Cuspidaria ... 1012
guineensis, Limopsis ... 107
guineensis, Neilonella ... 69
guineensis, Ostrea ... 305, 310
guineensis, Solen ... 716, 726
guineensis, Verticordia ... 1011
guineensis, Vesicomya ... 804
guineensis, Wareniconcha ... 804
guineensis, Xylophaga ... 975
guinensis, Solen ... 720, 726, 727
guiness, Elenaconcha ... 804
gwyni, Limatula ... 288, 298

H

haeckeli, Waisiuconcha ... 804
halimera, Rhinoclama ... 1012
Haliris ... 1006, 1011, 1034
hamsoni, Ledella ... 68
hanleyi, Macomopsis ... 550, 615-618
helblingii, Barbatia ... 114
hepatica, Dosinia ... 45, 924
hessleri, Tindaria ... 69
Heteranomia ... 272, 273
Heterodonax ... 544, 555, 706
hians, Cardium ... 516
hians, Gastrochaena ... 752
hians, Limaria ... 296
hians, Mosambicarca ... 141
Hiatella ... 486, 718, 722
hilleri, Bathyspinula ... 69
Hinnites ... 236, 239, 263
hiraseanus, Circomphalus ... 870
hirundo, Pteria ... 223, 230-232
Homoeodesma ... 1008
hoskynsi, Cyclopecten ... 241
Huberimactra ... 47, 754, 756, 772
hyalina, Omala ... 550, 588, 589
hybrida, Ostrea ... 264
hybridum, Pseudamussium ... 266
hyotis, Hyotissa ... 306
Hyotissa ... 300, 302
Hyrrokkin ... 292

I

imbricata, Arca ... 1047
impolitum, Acrosterigma ... 1047
inaequivalvis, Pandora ... 1030
inanis, Jallenia ... 448
incarnata, Tellina ... 45, 550, 562, 563
incomparabile, Palliolum ... 240, 265
inconspicua, Cavilinga ... 403
inconspicua, Yoldiella ... 69
inconstans, Huberimactra ... 742, 758, 770-772
indicum, Procardium ... 511, 516, 517
inequisculpta, Bathyarca ... 104
inequivalvis, Omala ... 588
inermis, Cardilia ... 796
inermis, Spondylus ... 270
inexpectata, Psammacoma ... 550, 622, 624, 625
inflata, Limaria ... 294
inflata, Mendicula ... 405
inflata, Tellina ... 632
innominata, Macoma ... 626
inquinata, Centrocardita ... 323, 354, 355
intermedia, Psammobia ... 696
interruptus, Donax ... 553, 640, 642, 643
intesi, Abra ... 554, 687
ionthados, Calloarca ... 104, 122, 123
Iphigenia ... 544, 551, 664
iridescens, Striostrea ... 318
irpex, Divaricella ... 434
Irus ... 842, 847

irus, Irus 848, 932, 933
irus, Tellina 1048
isocardia, Dosinia 45, 142, 848, 924, 925
Isognomon 57, 220, 222, 223, 234, 235, 1079
isognomum, Isognomon 234
Isorropodon 798, 803
Ixartia 1008, 1022, 1023

J

jacobaeus, Pecten 242, 1047
jagon, Ctena 454
Jagonia 403
jarli, Abra 554, 685-687
jeffreysi, Cuspidaria 1012
jeffreysi, Yoldiella 69
Joellina 396, 400
johnsoni, Coralliophaga 840
johnsoni, Malletia 69
Jolya 170, 174, 212, 214, 215
Jouannetia 972, 975, 994
jousseaumeana, Gari 556, 692, 693, 698, 702
jousseaumei, Lamysia 802, 836, 837
Jupiteria 64, 67

K

karinae, Graecina 403, 452, 453
Keletistes 396, 399, 418, 426
Kellia 464, 466, 469, 487
kempfi, Globivenus 876
keppeliana, Venus 1048
keppelianus, Pecten 240, 242-244, 1047
knockeri, Crassatina 384
knoxi, Nototeredo 977, 1005
knudseni, Diplodonta 802, 834, 835
kobelti, Cardium 526
kraemmeri, Abra 680, 681
Kurtiella 466, 470

L

labelliformis, Diplodonta 824
lacerans, Ostrea 310
lacerata, Ostrea 312
lactea, Striarca 105, 150-153, 418
lacteus, Loripes 418
lacunosa, Capsa 344, 636
lacunosa, Cardiocardita 146, 323, 344, 346, 347
lacustris, Dreissensia 947, 970
Laevicardium 508, 511
laevigata, Austromacoma 626, 1048
laevigata, Iphigenia 552, 553, 664-666
laevis, Mytilus 182
lajonkairei, Lajonkairia 940
Lajonkairia 842, 848
lamarcki, Cerastoderma 543
Lamellolucina 396, 398
lamothei, Cardiolucina 403, 416, 417
lamothei, Haliris 1011, 1034, 1035
lamyi, Semele 46, 554, 674, 675
lamyi, Teredo 996
Lamylucina 396, 398
Lamysia 47, 798, 800, 801, 836
lanceolata, Limopsis 107
largillierti, Mactra 760
largillierti, Rostrimacoma 550, 632, 633
Lasaea 466, 469
lata, Papyridea 530
lateralis, Sheldonella 144
laticostata, Corbula 947, 956-958
Lazariella 47, 320, 322, 336
lecointrei, Abra 554, 684
legouxi, Keletistes 403, 426, 427
legumen, Barbatia 104, 118, 119
legumen, Pharus 728, 729, 1048
Leionucula 66
Leiosolenus 170, 173
leloeuffi, Falsolucinoma 403, 414, 415
leloeuffi, Moerella 550, 602, 603
Lembulus 64, 68, 86, 94
lenzi, Iphigenia 666
Lepidocardia 892
Lepilucina 398
Leporimetis 544, 550
Lepton 466, 469
Leptospisula 47, 754, 756, 768
letourneuxi, Jolya 136, 175, 212, 214, 215
leucoma, Lucina 418
leucophaeata, Mytilopsis 970
libellus, Globivenus 44, 532, 848, 872, 876, 877
lieberkindi, Uperotus 977, 1001
lilacea, Mactra 45, 760

Lima ... 286, 287, 289
lima, Lima ... 288, 289
Limaria ... 286, 288
Limatula ... 286, 288
Limatulella ... 297
Limopsis ... 100, 107, 168, 169
lincta, Dosinia ... 920
lineatus, Mytilaster ... 1047
Linga ... 398
lingulifer, Yoldiella ... 99
Lioberus ... 170, 174
lisbetae, Policordia ... 1011
lischkei, Ctenoides ... 290
Lissochlamys ... 236, 240
listeri, Tellinella ... 564, 574
listeroides, Globivenus ... 876
Lithodomus ... 173
Lithophaga ... 56, 170, 173, 196, 628
lithophaga, Lithophaga ... 175, 196, 197
lithophaga, Petricola ... 848, 936, 937
lithophagella, Coralliophaga ... 803, 840
Litigiella ... 491
locardi, Eastonia ... 792
locardi, Panacca ... 1013
lomensis, Teredo ... 996
longa, Vesicomya ... 686, 688, 804
longicallus, Abra ... 686
Longimactra ... 778
longior, Pitar ... 92, 136, 680, 738, 836, 848, 912, 913
Loripes ... 396, 399, 403, 418, 419
Loripinus ... 396, 401
loscombi, Limaria ... 288, 297
loscombiana, Pholadidea ... 975, 990-992
loveni, Pecten ... 266
Lozouetia ... 47, 466, 469
lucidum, Propeamussium ... 241
Lucina ... 396, 398, 406
lucinalis, Loripes ... 418
Lucinoma ... 396, 403, 458
ludwigii, Heterodonax ... 706
lulat, Modiolus ... 175, 210-212
lunata, Ephippodonta ... 476
lupinus, Dosinia ... 920, 922
lusitanensis, Ledella ... 68
luteus, Megangulus ... 1048
luteus, Mytilus ... 218
Lutraria ... 754, 757
lutraria, Lutraria ... 788, 790
lyra, Venus ... 848, 860, 861
Lyrocardium ... 508, 511, 532
Lyrodus ... 972, 976, 996

M

macandrewi, Pseudopythina ... 496, 498
Machaerodonax ... 551, 654
Macomangulus ... 546, 576
Macomopsis ... 544, 549
Macoploma ... 549
macrophylla, Irus ... 932
Mactra ... 754, 755, 776
mactroides, Melliteryx ... 471, 492, 493
Mactrotoma ... 754, 756, 764
madagascariensis, Tellina ... 550, 570, 571
Magallana ... 303
magna, Planktomya ... 42, 471, 504
malleolus, Teredora ... 977, 999
Mantellum ... 288
manumissa, Tellina ... 566
Manupecten ... 236, 238, 239, 257
marchadi, Crassatina ... 326, 392-394, 1047
marchadi, Pseudopythina ... 471, 500
marchali, Mysia ... 848, 942
margaritacea, Striostrea ... 318
marginatus, Solen ... 720, 724, 725
mariae, Nucula ... 66, 75-77
mariae, Tellina ... 588
marioni, Lima ... 288
mars, Tellina ... 142, 550, 572, 573, 993
Martesia ... 972, 974
martinicensis, Crassinella ... 1047
martinii, Semele ... 676
martorelli, Modiolus ... 175, 210, 212, 213
massa, Lyrodus ... 1048
matadoa, Gastrana ... 45, 526, 550, 628-630
maura, Scacchia ... 469, 471, 483
mauritanica, Callogonia ... 804
mauritanicus, Bathymodiolus ... 175
maxicostatum, Cardium ... 511, 514, 515
mazatlanica, Anadara ... 130
mcgintyi, Hyotissa ... 46, 302, 306, 307, 312

mcgintyi, Protothaca ... *1048*
mediterranea, Solemya ... *70*
mediterraneus, Pitar ... *848, 904-906*
Megadesma ... *552*
Megaxinus ... *396, 399*
Melliteryx ... *466, 470, 492*
melo, Macomopsis ... *550, 620, 621*
Mendicula ... *396, 404*
Mesocibota ... *100, 102*
messageri, Iphigenia ... *553, 668, 670, 671*
messanensis, Globivenus ... *876*
mexicana, Tellina ... *550, 574, 575*
michelottii, Cardilia ... *796*
Microcirce ... *842, 844*
micronitida, Scissodesma ... *92, 136, 146, 214, 266, 598, 680, 738, 742, 758, 782, 784-786, 836, 960*
Mimachlamys ... *236, 238*
minima, Bankia ... *1002*
minima, Gouldia ... *848, 878-880*
minuscula, Tindaria ... *69*
minuta, Limopsis ... *107, 168*
minuta, Thyasira ... *405*
minuta, Yoldiella ... *69*
minutalis, Sheldonella ... *105, 144, 145*
minutissimus, Solen ... *740*
minutus, Pecten ... *255*
mitis, Ctenoides ... *290*
modesta, Corbula ... *956, 957*
modesta, Crassatina ... *326, 348, 392, 394, 395*
modesta, Semele ... *46, 554, 676, 677*
modica, Moerella ... *550, 600, 601*
Modiola ... *174*
Modiolaria ... *172*
Modiolus ... *170, 171, 174, 206, 210, 212*
Moerella ... *544, 547, 548, 590*
Monia ... *272-274*
monodi, Akardita ... *323, 348, 349*
montagui, Lembulus ... *68, 92, 93, 146, 266, 680*
multangula, Gastrana ... *45, 628*
multistriata, Gregariella ... *175, 188-190*
multistriata, Talochlamys ... *45, 240, 258-260, 306, 378, 532*
multistriatus, Solecurtus ... *712*
murchlandi, Cryptodon ... *428*
Musculus ... *170, 172, 186*
Myoforceps ... *198*
myriamae, Lucinoma ... *403, 458, 459*
Myrtea ... *396, 399, 402, 450*
Mysia ... *842, 848*
Mytella ... *184*
Mytilopsis ... *944, 947*
Mytilus ... *170-172*

N

nanus, Pholas ... *987*
Nasopharus ... *47, 718, 719, 721*
nasuta, Corbula ... *960*
nasutus, Nasopharus ... *722, 730-732*
natalensis, Panopea ... *750*
navicularis, Arca ... *108, 110*
ndarensis, Pseudopythina ... *471, 498, 499*
nebulosus, Pecten ... *264*
Neolepton ... *842, 849*
Neopycnodonte ... *300, 302, 308*
nicklesi, Aequipecten ... *240, 255*
nicklesi, Modiolus ... *175, 208, 209*
nicklesi, Nucula ... *66, 78*
nicklesi, Pitar ... *848, 880, 902-904, 908*
nicklesi, Pseudopythina ... *471, 494-496*
nicolloni, Chama ... *808*
niger, Brachidontes ... *112, 175, 182, 183*
nigeriensis, Modiolus ... *216*
Nipponarca ... *102*
nitens, Modiola ... *210*
nitens, Pristigloma ... *69*
nitida, Scissodesma ... *72, 758, 780-782, 784*
nitidosa, Nucula ... *66, 72, 73, 78*
nivea, Barbatia ... *114*
nivea, Leptospisula ... *758, 768, 769*
nivea, Limatula ... *298*
nizeryi, Diplodonta ... *802, 832, 833*
noae, Arca ... *45, 104, 108-110*
nobilis, Pinna ... *221, 224*
nobilis, Tugonia ... *44, 948*
Nodipecten ... *236, 238*
nodosa, Venus ... *852*
nodosus, Nodipecten ... *46, 240, 246, 247*
nodulifera, Bractechlamys ... *248*
nodulosa, Arca ... *1047*
Noetia ... *104*
Noetiella ... *105*

nolfi, Europicardium ... 511, 524, 525
norvegicum, Cardium ... 534
notabilis, Anadara ... 141
notabilis, Rhinoclama ... 1012
Notolimea ... 286, 288
Nototeredo ... 972, 977
nucleus, Isognomon ... 223, 235
nucleus, Nucula ... 66, 74
Nucula ... 64, 66
Nuculoma ... 66
nummaria, Glycymeris ... 166
nux, Galatea ... 553
nux, Venus ... 866, 906, 1048
nymphalis, Austromacoma ... 314, 550, 626, 627
nymphalis, Macoma ... 626, 627

O

obermulleri, Modiolaria ... 188
obesa, Cardiocardita ... 323, 338, 342-344
obesa, Rhomboidella ... 195
obliquata, Barbatia ... 118
obliquata, Dosinia ... 922
oblonga, Basterotia ... 505
oblonga, Lutraria ... 1047
oblonga, Pandora ... 1010, 1030, 1031
oblonga, Scacchia ... 471, 480-482
oblonga, Ungulina ... 814
oblongum, Laevicardium ... 534
obsoleta, Thyasira ... 405
obtusa, Malletia ... 69
ochracea, Mactra ... 760
ockelmanni, Dacrydium ... 175
Odoncineta ... 1007
olivercoseli, Acar ... 104, 124, 125, 152, 154, 1047
Omala ... 544, 547
omanensis, Megaxinus ... 428
opifex, Gregariella ... 192
opifex, Modiola ... 190
orbicularis, Pecten ... 266
orbiculata, Bathyarca ... 104, 824
orbiculatus, Loripes ... 403, 418, 419
orbignyi, Dosinia ... 848, 922, 923
oriens, Gari ... 700
ornata, Anomia ... 280
ornata, Crassatina ... 326, 380-382
ornata, Divaricella ... 434
ornata, Dreissensia ... 970
orstomi, Gastrana ... 550, 630, 631
orstomi, Yoldiella ... 68, 99
oryza, Asbjornsenia ... 550, 606, 607
Osteodesma ... 1007
Ostrea ... 300, 303, 310
Ostreola ... 310
Oudardia ... 546, 580, 582
ovalina, Mactrotoma ... 764
ovata, Timoclea ... 848, 882-884
owenii, Donax ... 658-660
owenii, Tellina ... 550, 560
Oxyperas ... 754, 757

P

pacifica, Arca ... 108
pacificus, Heterodonax ... 706
paeteli, Crassatina ... 326, 384, 385, 388
pallida, Katadesmia ... 69
pallida, Nuculana ... 69
Palliolum ... 236, 239, 265
panamensis, Uperotus ... 1001
Pandora ... 1006, 1010, 1079
Panopaea ... 723
Panopea ... 49, 55, 718, 722, 723
Paphia ... 926
paphia, Lirophora ... 843, 868
Papillicardium ... 508, 510, 520
papillosum, Papillicardium ... 511, 520, 521
papyracea, Leporimetis ... 550, 636, 637
papyracea, Thracia ... 1016
Papyridea ... 508, 510
paradoxa, Galatea ... 553, 672, 673
Parahyotissa ... 302, 306
Paramya ... 466, 471, 506
Parapholas ... 972, 974
parasitica, Ostrea ... 314
parva, Cuspidaria ... 1012
Parvicirce ... 842, 845, 886
parvus, Heterodonax ... 38, 556, 706, 707
patelliformis, Monia ... 274, 280, 281
patriarchalis, Arca ... 112
paucicaelata, Jupiteria ... 68, 84, 85
Pecten ... 236, 237, 273,

pecten, Ctena 454
pectinata, Pinna 226
pectinatum, Cardium 454
pectunculoides, Bathyarca 104, 126, 127
Pedalion 223
pedicellatus, Lyrodus 977, 996
pelagica, Limopsis 107
Pelecyora 846
peliferus, Pitar 848, 908, 909
pella, Lembulus 68, 86-88
pellucida, Limaria 288, 296
pellucida, Macomopsis 614
pellucidus, Phaxas 744
Penicillus 1009
pereffossa, Globivenus 848, 874, 875
perfragilis, Arcuatula 184, 185
Periglypta 845
perinesa, Barbatia 116
peripheralis, Aequipecten 252
Periploma 1006, 1008, 1009, 1026, 1079
Perna 170, 172, 223
perna, Isognomon 234
perna, Perna 175, 178, 179
pernula, Pinna 224
Peronaea 546, 566
perplicatus, Channelaxinus 405
pesfelis, Manupecten 240, 257
peslutrae, Pseudamussium 240, 264
petagnae, Gregariella 175, 188, 190
petitii, Teredo 998
Petricola 842, 847, 934
Petricolaria 842, 847
Phacosoma 916
Pharaonella 572
pharaonis, Brachidontes 180
phariformis, Donax 553, 654, 656, 657
Pharus 718-720, 729
phaseolina, Thracia 1008, 1016-1018
Phaxas 718, 719, 721
philippiana, Bathyarca 126
philippiana, Yoldiella 68, 98, 99
philippinarum, Ruditapes 928
Pholadidea 972, 974, 990
pholadiformis, Petricola 938, 939
Pholadopsis 972, 975
Pholas 972, 973, 1080
pictum, Laevicardium 536
pictus, Mytilus 179
pilosa, Glycymeris 164, 165
pilsbryi, Abra 554, 680-682
Pilsbrymetis 636
pini, Abra 554, 686, 687
pini, Atrina 222, 228, 687
Pinna 220, 221
piscatorum, Kurtiella 471
Pitar 842, 845, 900, 902, 908
Pitaria 846
placentina, Chama 806
plana, Scrobicularia 1048
planata, Astarte 395
planata, Tellina 550, 566, 567
Planktomya 466, 470
plebeia, Tellina 1048
plebeius, Tagelus 716
plicata, Acar 124, 125
plicata, Cyathodonta 1008, 1020, 1024, 1025
plicata, Modiola 214
plicata, Venus 870
Plicatula 272, 274, 284
pliomagnus, Pharus 729
plumula, Lithophaga 200
Pododesmus 272-274, 282, 283
polii, Anadara 128
polii, Gastrochaena 752
Polititapes 842, 846, 926
politum, Amygdalum 175, 218, 219
politus, Cultellus 734
polyaulax, Strigilla 612
polygona, Tellina 628
polygona, Thyasira 462
Pompholigina 396, 400, 436
Poromya 1006, 1010, 1032
posteli, Tellina 550, 578, 579
Potamocorbula 944, 947, 968
Potamophila 552
powelli, Spondylus 270
prideaux, Rhomboidella 195
prima, Planktomya 471, 504
prismatica, Striostrea 318, 578
proaspersum, Oxyperas 758, 776, 778, 779

Procardium 508, 509
procera, Corbula 968
proficua, Semele 46, 674
Profischeria 552
profundorum, Abra 554, 686
Psammacoma 544, 549, 624
Psammobella 555
Psammobia 555
Psammodonax 555
psammotella, Tellina 1048
pseudacutangulus, Donax 553, 654-656
Pseudamussium 236, 239
pseudobarbatus, Modiolus 175, 204-206, 208
Pseudochama 798, 800, 812
pseudocorbis, Myrtea 403, 451
pseudofallax, Psammacoma 550, 622-624, 1048
pseudopusilla, Asbjornsenia 550, 600, 604-606
Pseudopythina 466, 470, 487, 494, 496, 498
pseudoradiata, Galateia 672
pseudoweinkauffi, Gari 348, 556, 694-696
Pseudoxyperas 757, 778
Psiloteredo 972, 976
Pteria 220, 223, 230
Pterolucina 432
Ptychina 404
pubescens, Thracia 1008, 1014, 1015
puella, Callista 45
pulchella, Moerella 594
pulchellus, Donax 553, 644-646, 648
pulex, Xenostrobus 211
pullastra, Venerupis 930
punctigera, Clausinella 848, 868, 869
puniceus, Brachidontes 175, 180-182
purpurascens, Semele 674
pusillus, Pholas 553, 646, 647, 987
pusio, Talochlamys 258, 260
pustulosa, Ledella 68
pygmaea, Asbjornsenia 98, 600, 604, 606
pyrenoides, Limopsis 107, 168

Q

quadrata, Verticordia 505, 1011

R

radiata, Galathea 672
radiata, Tellina 1047
Raeta 794
rafaelmesai, Glycymeris 106, 160, 161
ramulosa, Pinna 228
rasilis, Gari 555
recluzi, Paramya 506
regab, Christineconcha 175, 804, 805
regularis, Lazariella 323, 336, 337
rehderi, Cardiolucina 416
reinharti, Anadara 132
renovata, Cuspidaria 1038
revoluta, Corbula 962
reyrei, Lamellolucina 403, 408, 409
rhizoecus, Keletistes 403, 424, 425
rhizophorae, Crassostrea 315
rhodopyga, Cyrenoida 802, 839
rhomboidea, Modiola 215
Rhomboidella 170, 173
richardi, Arcopagia 550, 608, 609, 1048
ringens, Bucardium 511, 518, 519, 526, 952
Rocellaria 718, 723
rocquignyi, Natica 19
rolani, Carditamera 323, 334, 335
rosalina, Venus 862-864
rosea, Cyrenoida 839
rosea, Felania 830
rosea, Parahyotissa ..... —
rostrata, Barymactra 758, 766-768
rostrata, Cuspidaria 1012, 1038, 1039
rostrata, Iphigenia 664
Rostrilucina 399
Rostrimacoma 47, 544, 550, 634
rotundata, Diplodonta 802, 818-820
rotundata, Limaria 288, 294, 295
rotundatus, Solen 724
roumei, Corbula 947, 956, 958, 959
roumei, Thracia 1008, 1018, 1019
rubicincta, Moerella 550, 594, 595
rubra, Lasaea 478
rubra, Ungulina 696, 802, 814-816
rudentis, Laevicardium 1047
rudis, Pinna 46, 222, 224, 225
rudis, Pitar 378, 848, 904, 906, 907
rudis, Pododesmus 274, 282, 283
Ruditapes 842, 847

rufescens, Cardita 323, 327, 328, 330, 331
rufiscensis, Venerupis 926, 927
rugifera, "Pseudopythina" 500
rugosa, Cardiolucina 416
rugosa, Eastonia 758, 792, 793
rugosa, Glycymeris 750
rugosa, Hiatella 748
rugosa, Petricola 934
rugosus, Donax 29, 553, 640-643, 890
rupella, Perna 235
ryalli, Atlantella 590

S

Saccella 64, 67
Saccostrea 300, 304
Salaputium 326, 390, 392
sallei, Mytilopsis 970
sanctaehelenae, Arca 110
sandersi, Ledella 68
sandix, Tellina 584
Sanguinolaria 544, 556
sanguinolenta, Sanguinolaria 708
sarda, Chama 808
sarsii, Notolimea 299
sauliana, Mactra 758, 762, 763
Saxicava 722
Saxicavella 506
Scacchia 466, 469, 480, 484
Schizothaerus 405
schultzei, Macomopsis 550, 614, 618
Scissodesma 754, 755, 757, 781
Scissula 546, 584
Scissulatina 326, 382
scoliosa, Striarca 105, 150-152
scopula, Solecurtus 557, 712, 713
scripta, Glycymeris 106, 156-159, 161
sculpturata, Barbatia 116
secticostata, Anadara 141
segaruensis, Bankia 1002
Semele 544, 553, 608
semigranata, Gregariella 175, 191
semilirata, Lucina 428
seminuda, Atrina 228
Semipallium 239
semisculpta, Diplodonta 826, 827
semisulcata, Cardiia 796
semperiana, Cardiolucina 416
senegalense, Laevicardium 511, 534, 536
senegalensis, Anadara 92, 104, 136-138, 146
senegalensis, Cardita 330
senegalensis, Dendostrea 304, 310, 312, 313
senegalensis, Loripinus 403, 442, 443
senegalensis, Lutraria 758, 788-790, 1047
senegalensis, Macoma 614, 1048
senegalensis, Mytilus 180
senegalensis, Psiloteredo 18, 977, 998
senegalensis, Spheniopsis 1013, 1044, 1045
senegalensis, Spondylus 270, 271
senegalensis, Tellina 612
senegalica, Tumbeziconcha 758, 794, 795
senegambiensis, Tellina 512, 550, 564, 565
Senegona 47, 546
senhousia, Arcuatula 184
Senilia 100, 103
senilis, Senilia 33, 42, 44, 104, 142, 143, 314, 894
septemradiatum, Pecten 264
serra, Donax 553
serrata, Petricolaria 938
serrata, Tellina 550, 558, 559
Serratina 545, 558
serrulatum, Europicardium 511, 524, 526-528
Servatrina 222, 226
setigera, Arca 141
setosa, Coralliophaga 840
Sheldonella 100, 104
silicula, Mactra 64, 69, 764
Similipecten 236, 241, 269
similis, Similipecten 241, 269
similis, Yoldiella 69
simplex, Luzonia 1012
simplicifilis, Gregariella 190
simplis, Protocuspidaria 1012
simulans, Venus 848, 852, 853
Sinucultellus 47, 718, 719, 721
Sinupharus 47, 718, 719, 721, 734, 738, 740
smithi, Limatula 288
smithi, Megaxinus 428
Solamen 170, 173
solanderi, Eastonia 792
Solecurtus 544, 556

Solemya ... 64, 65, 70
Solen ... 718, 720, 726, 734, 1038
soleniformis, Papyridea ... 46, 511, 530, 531
Solenocurtus ... 556
solida, Pseudopythina ... 471, 496, 497
solidula, Dosinia ... 922
solidulus, Pecten ... 252
sootryeni, Yoldiella ... 69
spatiosus, Leiosolenus ... 173
spectabilis, Hinnites ... 263
speculum, Dacrydium ... 175
spengleri, Scissodesma ... 757
sphaerica, Arca ... 128
Spheniopsis ... 1006, 1013
spiculum, Donax ... 644
spinifera, Myrtea ... 403, 450, 451
spinosa, Jouannetia ... 994
Spisula ... 754-757
splendida, Strigilla ... 548, 550, 612, 613
Spondylus ... 236, 239, 241
squamosa, Lima ... 289
squamosum, Lepton ... 467, 471, 490
squamula, Heteranomia ... 274, 278, 279
Standella ... 768
stangeri, Gari ... 698
stellae, Petricolaria ... 938
stellata, Glycymeris ... 106, 158, 159, 161, 952
Stenocista ... 100, 105, 146
stentina, Ostrea ... 304, 310-312
stigmosa, Barbatia ... 114
Striarca ... 100, 105
striata, Anomia ... 280
striata, Asbjornsenia ... 280, 604
striata, Corbula ... 956, 958, 959
striata, Martesia ... 975, 986, 987
striatella, Mactra ... 768
striatissima, Corbula ... 956-958
striatum, Isorropodon ... 804
strigilatus, Solecurtus ... 710
Strigilla ... 544, 548
strigosa, Tellina ... 550, 566, 568-570
Striostrea ... 300, 304, 318
stultorum, Mactra ... 1047
stultorum, Modiolus ... 214
subalpina, Cardita ... 336
subauriculata, Limatula ... 298
subcircularis, Thyasira ... 405
subclavata, Modiola ... 191
subequatorius, Axinulus ... 405
subfragilis, Loripinus ... 403, 440, 444, 445
subglobosa, Anadara ... 104, 134-136
sublaevis, Lima ... 291
sublamellata, Lamellolucina ... 408
sublevis, Ledella ... 68
subnitens, Arca ... 142
subnodosus, Nodipecten ... 246
suborbicularis, Kellia ... 467, 471, 486
subovata, Paramya ... 506
subovata, Thyasira ... 405
subpictus, Musculus ... 175, 186
subrosalina, Venus ... 848, 864, 865
subrostrata, Bythosphaera ... 403, 440, 441
substriata, Lajonkairia ... 848, 940, 941, 1048
substriatus, Mytilus ... 182
subtruncata, Spisula ... 758, 774, 775
sulcata, Corbula ... 947, 952-956, 960
sulcata, Lima ... 298
sulcata, Modiola ... 190
sulcata, Nucula ... 66, 75, 76
swiftiana, Corbula ... 960
sybariticum, Laevicardium ... 46, 511, 536, 537
symmetrica, Striarca ... 150
symphenacis, Arca ... 45, 108

T

Tagelus ... 55, 544, 557, 716, 726
takanoshimensis, Lyrodus ... 997
Talabrica ... 326
talismani, Arca ... 128
Talochlamys ... 236, 239
Talona ... 972, 974, 984
Tampaella ... 544, 547, 586
tankervillei, Cardiocardita ... 340
tankervillii, Cardiocardita ... 140, 323, 340, 341, 526, 952
tarentina, Avicula ... 230
Tellina ... 544, 545
Tellinella ... 546
tellinoidea, Cytheraea ... 7, 50, 62, 545, 547, 557, 910
tellinoides, Sanguinolaria ... 708
tenella, Calloarca ... 122

tenella, Limopsis *107*
tenellus, Phaxas *722, 744, 745*
tenera, Ctenoides *290*
tenina, Isorropodon *804*
tenina, Kelliella *804*
Tentidonax *551, 553, 658-663*
tenuicola, Galatea *553*
Tenuicorbula *962*
tenuis, Abra *554, 678, 679, 688*
tenuis, Cultellus *720, 734, 742*
tenuis, Tellina *550, 576, 577*
tenuistriata, Pholas *987*
tenuistriatus, Brachidontes *182*
Teredo *977, 996*
Teredora *972, 976*
Teredothyra *972, 977*
tertia, Kurtiella *471*
testai, Cuspidaria *1012*
tetragona, Arca *104, 112*
thorsoni, Bathyspinula *69*
thorsoni, Modiolus *210, 211*
Thovana *972, 973*
Thracia *1006, 1007, 1014, 1079*
thracioides, Tumbeziconcha *794*
Thyasira *396, 404*
tillamookensis, Myonera *1012*
Timoclea *842, 845, 882*
Tinalucina *396, 402, 448*
tincta, Talochlamys *45, 258*
Tivela *18, 42, 842, 845, 1083*
togata, Solemya *65, 70, 71*
togoensis, Teredo *996*
tornata, Cetomya *1010*
torrida, Dosinia *922*
tortuosa, Thyasira *405*
transversa, Mendicula *405*
transversa, Ungulina *814*
transversus, Megaxinus *430*
trapezia, Glans *350*
triangularis, Goodallia *1047*
triangularis, Vertambitus *1011*
tridacniformis, Condylocardia *324, 360, 361*
trigona, Corbula *968*
tripartita, Galeomma *468, 473*
tripla, Tivela *848, 886, 888, 890, 891*
triquetra, Crassatina *326, 386-388*
tritubulata, Teredo *1000*
trochiformis, Trochita *45, 262*
Tropidomya *1006, 1012, 1042*
troscheli, Dosinia *916*
truncata, Barnea *975, 981-983*
truncata, Galatea *672*
truncata, Iphigenia *668*
trunculus, Donax *1048*
tuberculata, Costatoleda *68, 96, 97*
tuberculata, Limaria *288, 294, 295*
tuberosa, Venus *852*
Tugonia *49, 944, 945, 948*
tulipa, Crassostrea *2, 33, 112, 120, 276, 304, 305, 310, 314, 315, 812*
tulipa, Moerella *594*
Tumbeziconcha *754, 758*
tumens, Pitar *848, 894, 895, 908*
tumida, Iphigenia *666*
turbatrix, Arca *104, 112, 113*
turtoni, Galeomma *468, 472-474*
turtoni, Papillicardium *520*
turtoni, Pecten *240, 244, 245, 520, 574*

U

ultima, Ledella *69*
ultima, Mendicula *405*
umbonatus, Cardites *323, 356, 357*
uncinata, Jouannetia *975, 994, 995*
undata, Diplodonta *378, 802, 820, 821*
undata, Mysia *942*
undulata, Anomia *280*
unguiculinus, Megaxinus *403, 430, 431*
Ungulina *47, 798, 800, 801, 814, 815*
Uperotus *972, 977*

V

vagina, Solen *724, 726*
vaillanti, Crenella *195*
valdiviae, Calyptogena *804*
valdiviae, Vesicomya *804*
vancouverensis, Delectopecten *268*
vanderlindeni, Planktomya *471*
vanhengstumi, Glycymeris *106, 164, 165*
varia, Mimachlamys *240, 256, 258*

Varicorbula 944, 946
varicosa, Lirophora 868
varicosa, Pinna 224
Venerupis 842, 847
venetiana, Cytherea 906
ventricosa, Cuspidaria 1012
ventricosa, Tellina 632
Venus 842, 844, 850, 854, 858, 870
Vepricardium 510
vepris, Europicardium 511, 528, 529
verdensis, Condylocardia 324, 362, 363
verdensis, Donax 553, 648, 649
verdensis, Modiolus 175, 206-208
verdensis, Venus 848, 856, 857
verdiensis, Ledella 68
verityi, Protocuspidaria 1012
verrillii, Brevinucula 66
verrucosa, Venus 848, 850-853
Verticordia 1006, 1034
Vesicomya 798, 803, 804
vespertina, Gari 698
vestita, Lucinoma 403, 446, 460, 461
vestita, Modiola 216
vestita, Nuculana 68
vignoni, Gregariella 175, 192, 193
vignoni, Jouannetia 975, 993, 994
virescens, Barbatia 118
virgata, Gari 556, 696, 697
virginiae, Corbula 958
virginica, Crassostrea 315
virgo, Pitar 812, 830, 848, 894, 896-898, 900, 902, 908
vitrea, Mactra 708, 772
vitreus, Delectopecten 240, 268
vittatus, Donax 553, 650, 651
vovan, Glycymeris 159
vovan, Pectunculus 159
vulgaris, Lima 289
vulsella, Isognomon 234

W

watsoni, Bythosphaera 440
weinkauffi, Gari 694
wolffi, Lembulus 68, 90, 91
Woodia 325
wroblewskyi, Tellina 634

Y

yatei, Bassina 870
Yoldiella 64, 68, 99
yongei, Microgloma 69

Z

zabii, Kurtiella 471, 502, 503
zebra, Arca 108, 110
zibrowii, Neopycnodonte 302
zorni, Scacchia 469, 471, 483-485
Zozia 557

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Bivalves are one of the most important groups of marine animals: they are abundant in benthic communities, they are sought after as seafood or ornament, and their shells are almost always conspicuous on the world's beaches.

This identification guide for West African marine bivalves covers 462 species belonging to 59 families, based on an extensive material collected over several decades from Mauritania (Cap Blanc) to Angola (Baia dos Tigres), and now housed in Muséum national d'Histoire naturelle, Paris. Therefore, any bivalve collected in marine near shore in West Africa is most likely to be covered. Deep sea species (those normally collected below 500 m depth, an additional 150 species) are listed but not treated.

The book is profusely illustrated (over 3 500 colour and 1 600 greyscale photographs, 800 stippled drawings, an average of 12 views per species) so as to be accessible to the non-specialist as well. Each species is treated with: (1) a description accompanied by a drawing of the interior showing the diagnostic details of the hinge and internal impressions, and a photographic plate showing a selection of specimens from different localities across the species' range (2) an indication of distribution accompanied by a schematic map, (3) an indication of habitat, and (4) remarks, including comparisons with similar species. In the headings for each family, generic descriptions are illustrated with thumbnails of the included species, so as to serve as a visual orientation. Morphological terms used in descriptions are explained in a Glossary.

The taxonomic part is preceded by an introduction addressing the history of research, the physiography and hydrology of West African coasts, the general characteristics of bivalve molluscs and hints for collecting them.

Rudo von Cosel started his lifetime commitment to malacology back in 1969, with his first field collecting trip to Cameroon. He has been working with the Muséum national d'Histoire naturelle, Paris from 1983 to present and did extensive shore collecting in Senegal, Guinea, Cameroon, Gabon, Congo and elsewhere. From 1986 to 1989, as a marine biologist at ORSTOM (renamed in 1998, Institut de Recherche pour le Développement), he took care of the benthic sampling in several oceanographic campaigns off West Africa, off Casamance and off Guinea and Guinea-Bissau (the SEDIGUI, CHALGUI and CHALBIS) and started working on a comprehensive book on West African bivalves. He authored or coauthored about 50 scientific papers, in which 29 new genera and 168 new species are described, most of them bivalves; among these, his favorite group is definitely the razor shells, on which he is a recognized authority. He retired in 2005, but still continued research.

Serge Gofas teaches Zoology and Marine Biology at University of Málaga since 1998, and has research interests in the systematics and biogeography of marine mollusks in Europe and West Africa. He started his career in 1980 as a micropaleontologist for the oil industry, and then had the opportunity to sample most of the Angolan coasts during five years. In 1990, he joined the Muséum national d'Histoire naturelle in Paris for nearly ten years. He authored or coauthored about 100 scientific papers, in which six new genera and over 175 new species are described, most of them from West Africa and the Northeast Atlantic seamounts. A large, fully illustrated identification guide of the mollusca of southern Spain was also published in 2011 at his initiative. He is a taxonomic editor and member of the scientific committee in the «World Register of Marine Species» database since its beginning in 2009 and its forerunners back in 1995.

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