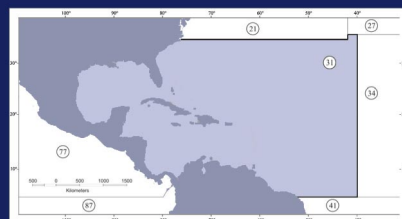




THE LIVING MARINE RESOURCES OF THE WESTERN CENTRAL ATLANTIC



**Volume 1 Introduction, molluscs, crustaceans, hagfishes,
sharks, batoid fishes and chimaeras**



AMERICAN
SOCIETY OF
ICHTHYOLOGISTS
AND
HERPETOLOGISTS



FOOD AND
AGRICULTURE
ORGANIZATION
OF THE
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COMMISSION



FAO SPECIES IDENTIFICATION GUIDE FOR FISHERY PURPOSES
and
AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS
SPECIAL PUBLICATION No. 5

THE LIVING MARINE RESOURCES OF THE WESTERN CENTRAL ATLANTIC

VOLUME 1

Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes and chimaeras

edited by

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with the support of the
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SUMMARY

This 3 volume field guide covers the species of interest to fisheries of the major marine resource groups exploited in the Western Central Atlantic. The area of coverage includes FAO Fishing Area 31. The marine resource groups included are the bivalves, gastropods, cephalopods, stomatopods, shrimps, lobsters, crabs, hagfishes, sharks, batoid fishes, chimaeras, bony fishes, sea turtles, and marine mammals. The introductory chapter outlines the environmental, ecological, and biogeographical factors influencing the marine biota, and the basic components of the fisheries in the Western Central Atlantic. Within the field guide, the sections on the resource groups are arranged phylogenetically according to higher taxonomic levels such as class, order, and family. Each resource group is introduced by general remarks on the group, an illustrated section on technical terms and measurements, and a key or guide to orders or families. Each family generally has an account summarizing family diagnostic characters, biological and fisheries information, notes on similar families occurring in the area, a key to species, a checklist of species and a short list of relevant literature. Families that are less important to fisheries include an abbreviated family account and no detailed species information. Species in the important families are treated in detail (arranged alphabetically by genus and species) and include the species name, frequent synonyms and names of similar species, an illustration, FAO common name(s), diagnostic characters, biology and fisheries information, notes on geographical distribution, and a distribution map. For less important species, abbreviated accounts are used. Generally, this includes the species name, FAO common name(s), an illustration, a distribution map, and notes on biology, fisheries, and distribution. The final volume concludes with an index of scientific and common names.

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Editorial Notes

Geographical Limits

The area of coverage corresponds exactly with FAO fishing area 31. It includes the tropical and subtropical waters of the western Atlantic and is bordered by 35° north latitude corresponding to Cape Hatteras in North America, 40° west longitude, 5° north latitude corresponding to the coast of French Guiana of South America, and in the west by the corresponding coastline of South, Central, and North America.

Project Institutional Affiliations

This identification guide was prepared under the direction of the Species Identification and Data Programme (SIDP) of the Marine Resources Service, Fishery Resources Division, Fisheries Department, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy. Publication support came from the American Society of Ichthyologists and Herpetologists (ASIH). A workshop to edit and test the taxonomic accuracy of the fish chapters, was held in Belize in 1999. FishBase (www.fishbase.org) staff assisted in the preparation and carrying out of this workshop. Workshop support came from the European Commission (DG VIII) through a Fisheries and Biodiversity project of the International Center for Living Aquatic Resource Management (ICLARM). Maps for this guide were prepared at Conservation International (CI) Washington, DC. Project implementation, editorial management, and desk top publication was carried out at Old Dominion University, Norfolk, Virginia, USA.

Objectives

The purpose of this guide is to provide an accurate means to identify to the appropriate taxonomic level those organisms that are of potential use or likely to be captured by marine fisheries in the region. Correct identification is of utmost importance in marine resource management. The quality of fisheries statistics depends on the ability to correctly assign landing and catch data to taxon-specific categories. The species name is the link to all relevant biological and ecological information in the literature. This information is fundamental in any attempt to manage a fishery. Correct identification is also important for those scientists gathering biological data relevant to marine resource management. The fishery manager cannot confidently use the relevant biological data if the scientist collecting this information did not have an accurate means of identifying the species to begin with. Therefore, this identification tool will benefit fisheries workers gathering catch statistics and resource assessment information, and marine biologists researching information pertinent to resource management. This is particularly important for the WCA area because it encompasses the highest diversity of marine organisms exploited by fisheries in the Atlantic Ocean.

An additional objective of this guide is to document whenever possible the extent of the biodiversity likely to be affected by fisheries. Many of the questions regarding exploitation of resources are linked to issues of biodiversity because of potential adverse environmental effects of fisheries. Therefore, in important groups where it is feasible, as in the finfishes, an attempt has been made to list all species present in all families recorded from the WCA area.

History of the Project

In 1978, Walter Fischer, the founder and senior editor of the SIDP, produced the FAO Species Identification Sheets for Fishery Purposes, Western Central Atlantic (Fishing Area 31). This was the third regional series completed by him. Previous coverage included the Mediterranean area and the eastern Indian Ocean/western Pacific. Both of these first two regional guides have been more recently updated (*Fiches FAO d'Identification des Espèces pour les Besoins de la Pêche, Révision 1. Méditerranée et Mer Noire*, 1987, 2 volumes, edited by W. Fischer, M. Schneider, and M.-L. Bauchot; FAO Species Identification Guide for Fishery Purposes, the Living Marine Resources of the Western Central Pacific, 1998-2001, 6 volumes, edited by K.E. Carpenter and V.H. Niem).

Many taxonomic improvements have occurred since the original western central Atlantic guide and a main purpose for this project was to incorporate these changes into a new edition. However, it should be pointed out that the fauna of the western central Atlantic region was fairly well studied prior the production of the 1978 edition and much of what is in the new edition is essentially unchanged. In addition, many improvements for the current edition are a result of the effort put in to the production of the *FAO Field guide to the commercial marine and brackish-water resources of the northern coast of South America* produced in 1993 and authored by F. Cervigón, R. Cipriani, W. Fischer, L. Garibaldi, M. Hendrickx, A.J. Lemus, R. Márquez, J.M. Poutiers, G. Robaina, and B. Rodríguez. The primary new contribution of this edition is the additional coverage of many more finfish species, expansion of the use of dichotomous keys for identification, and the attempt to catalogue

the entire biodiversity of the ichthyofauna. In addition, the 1978 edition is out of print and the current update is intended to make this body of information more readily available in the region.

A stimulus for this revision originated with the need to improve the information in the FishBase database (managed by Rainer Froese). This led to support for the workshop that was held in Belize City, Belize in July 1999 specifically for the purpose of improving the information in the finfish sections of the guide. The emphasis on finfish later resulted in additional project support that originated in the Special Publication Committee of the American Society of Ichthyology and Herpetology. Conservation International agreed to produce the distribution maps into a publishable figure and into a geographical information system through their Center for Applied Biodiversity Science. This served as the basis for part of the biogeographical information included in the introductory chapter to these volumes.

FAO and AFS/ASIH Common Names

Some official common names for finfishes differ between the FAO and those of the joint committee of the American Fisheries Society (AFS) and American Society of Ichthyologists and Herpetologists (ASIH). In order to allow cross reference between these two widely used systems, whenever the English common name differs substantially, the AFS/ASIH English common name, as in the manuscript for the sixth edition planned for publication in 2003, is listed in parentheses after the FAO common name. To simplify, small differences between the English names, such as a space or hyphen between compound words, or an 'ed' ending are not noted. No attempt was made to note differences between official Spanish FAO and AFS/ASIH names since this part of the AFS/ASIH list is not yet complete.

Finfish scientific names and Eschmeyer's *Catalog of Fishes*

W.N. Eschmeyer has tirelessly researched the scientific names of finfishes and his species and genera database is found in the California Academy of Sciences publication, the *Catalog of Fishes*, which is also available online. The spelling and citation of all scientific names follows this database unless an author specifically disagreed with a listing.

The FAO Codes Currently Included in the Identification Guide Series

The 3 letter code listed to the right of certain species names are alpha identifiers used by agencies to report catches and landings to the FAO. Those species with these 3 alpha codes are those species currently in the FAO database as a statistical taxonomic unit.

Different Levels of Taxonomic Coverage

In addition to the great diversity of species covered in this guide, there is also a wide diversity in the extent and methods of fisheries utilization. We attempt to give more extensive coverage to those species that are more important in fisheries. However, it is also often difficult to judge how fisheries importance will change with time, and whether an organism has potential for exploitation. In addition, exploitation must be carefully weighed against ecological impacts in order to ensure sustainability. Included in this consideration is the issue of biodiversity. Ideally, this document would include a comprehensive list of all species in the groups covered so that it can also be used as a benchmark for biodiversity. However, for many of the invertebrate groups which are very speciose, the work required to compile species lists is beyond the scope of this work. However, for the vertebrate groups, comprehensive species lists were possible and are included here.

The families most important in fisheries are covered with a family section summarizing family diagnostic characters, biological and fisheries information, notes on similar families occurring in the area, a key to species, a list of species, and a short list of relevant literature. However, for certain groups, family accounts are omitted and extensive information is included only under the species accounts. Species in the important families have a single side of a page to include the species name, frequently encountered synonyms (or combinations) and misidentifications, the FAO common name or names, an illustration, diagnostic characters, biology and fisheries information, notes on geographical distribution, and a map showing a generalized area of coverage. For less important species, abbreviated accounts are used. This includes the species name, FAO common name or names, notes on biology and distribution, an illustration, and a generalized distribution map. Families which are monotypic or contain a single species in the area are covered similar to important species except that frequently 2 sides of a page are used and notes on similar species occurring in the area are included. Families that are less important have a family section similar to those for important families except a key to species may or may not be included, and no detailed species pages follow. For finfish, the maximum size and a brief distribution description are included for those species in a list of species not additionally covered in a species account.

Sizes Reported

All sizes listed are the total lengths unless otherwise specified.

The Distribution Maps

The maps included for species of importance to fisheries are generalized maps with a total expected range. This masks the complexity of distribution of many species since the actual records of occurrence are not shown. Points in between geographical limits are included in many maps and this gives the impression that species may also be found in inappropriate habitats. Obviously, however, a fish normally found on a coral reef is not expected to occur in the intervening open ocean indicated on the generalized map. These maps should be used to give a quick indication of the known or expected limits of geographical limits of occurrence, rather than as an absolute indication of occurrence.

Distribution maps were digitized and collated into a geographical information system at the Center for Applied Biodiversity Science, Conservation International, Washington, DC, USA with support from the Gordon and Betty Moore Foundation and Bay Foundation. Project manager for this was M.L. Smith. The geographical information systems work was supervised by R.W. Waller and V. Katariya. Digitizing was done by C. Standlee, S. Aggarwal, and S. Musinsky.

Peer Review and Citations

Each separate finfish family was reviewed by a minimum of 2 peer reviewers and therefore can be considered a peer review publication. When citing a specific taxonomic work, the author or authors should be listed first. For example:

Smith-Vaniz, W.F. 2002. Carangidae. In K.E. Carpenter (ed.). The living marine resources of the Western Central Atlantic. Vol. 3: Bony fishes part 2 (Opistognathidae to Molidae), sea turtles and marine mammals. *FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5*. Rome, FAO. pp. 1426-1468.

When citing this work in its entirety the editor should be listed first:

Carpenter, K.E. (ed.). 2002. The living marine resources of the Western Central Atlantic. *FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5*. Vols 1-3. Rome, FAO. 2150p.

The 1999 Belize City, Belize Workshop to Review Finfish Sections

The Belize workshop participants included project staff, identification key testers, authors, and experts who reviewed manuscripts and worked with testers during identification exercises. The objective of testing the identification keys using both fresh and preserved specimens was to improve the usefulness of the keys for those fishery workers that are likely to use these keys. The authors interacted with testers during these exercises in order to gain feedback on ways to make the identification guide more efficient and easier to use for fishery workers.

Special thanks are due N. Nagassar who worked tirelessly as project coordinator before and during the workshop. An important element for making the workshop effective was the collection of specimens that were used during tests of identification keys. M. DeGravelle, T. Orrell, and T. Wasaff did an excellent job collecting these specimens prior to and during the workshop. T. Orrell deserves special thanks for helping to curate and manage the specimens in a database. The editor thanks all those who participated and helped:

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National Systematics Laboratory; L.J.V. Compagno, South African Museum; J.K. Dooley, Adelphi University; W.N. Eschmeyer, California Academy of Sciences; I. Harrison, American Museum of Natural History; K. Hartel, Harvard University; P.C. Heemstra, J.L.B. Smith Institute of Ichthyology; G.D. Johnson, National Museum of Natural History; P. Lobel, Boston University; K. Matsuura, National Science Museum; J. McCosker, California Academy of Sciences; J. D. McEachran, Texas A&M University; J.A. Moore, National Marine Fisheries Service; I. Nakamura, Kyoto University; T. Orrell, Virginia Institute of Marine Science; N. Parin, P.P. Shirshov, Institute of Oceanology; J. R. Paxton, The Australian Museum; S.G. Poss, Gulf Coast Research Laboratory; J.E. Randall, B.P. Bishop Museum; B.C. Russell, Museums and Art Galleries of the Northern Territory; G. Sedberry, South Carolina Marine Resources Research Institute; W.F. Smith-Vaniz, U.S. Geological Survey; B.A. Thompson, Louisiana State University; M.W. Westneat, Field Museum of Natural History; E. Wiley, University of Kansas; J.T. Williams, National Museum of Natural History.

Contributing Illustrators

The scientific illustrator for these volumes was E. D'Antoni who rendered most of the illustrations appearing here for the first time. A number of other illustrators and authors also provided original illustrations. These include: P. Caruso (Lophiidae); N.L. Chao (Sciaenidae); K. Harrison (Cynoglossidae); K.E. Marsh (Virginia Beach; Atheriniformes); K.H. Moore (National Systematics Laboratory, National Marine Fisheries Service); M. Tavares (Crustaceans); C.S. Toxey (Old Dominion University; various families).

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Special thanks are due W.N. Eschmeyer (California Academy of Sciences) for checking all the scientific names of finfishes against his database and to J.S. Nelson (University of Alberta) for checking all the finfish common names against the updated AFS/ASIH list. A very special thanks to the production staff who are listed in the title pages. In addition, a number of people have helped at some stage in the production of these volumes. The editor extends his sincere thanks to all: D. Blessich, F. Carocci, K. Cochrane, L. Garibaldi, J. Minow, M.T. Ruspantini-Campi, G. Sciarrappa-Demuro (FAO, Rome); C.M. Carpenter (Virginia Beach); M. DeGravelle, C. Kimbro (Old Dominion University); E. Luchetti (Studio Cyan, Rome); M. Neighbors (ASIH).

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An Introduction to the Oceanography, Geology, Biogeography, and Fisheries of the Tropical and Subtropical Western Central Atlantic

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This identification guide focuses on marine species occurring in the Western Central Atlantic Ocean including the Gulf of Mexico and Caribbean Sea; these waters collectively comprise FAO Fishing Area 31 (Fig. 1). The western parts of this area have often been referred to as the “wider Caribbean Basin” or, more recently, as the Intra-Americas Sea (e.g., Moors and Maul, 1998). The latter term draws attention to the fact that marine waters lie at the heart of the Americas and that they constitute an American Mediterranean that has played a key geopolitical role in the development of the surrounding societies.

In geographic terms, the Western Central Atlantic (**WCA**) is one of the most complex parts of the world ocean, consisting of a highly subdivided set of

lithospheric units, deep ocean basins separated by relatively shallow sills, and extensive systems of island platforms, offshore banks, and continental shelves (Figs 2,3). One consequence of this geography is a fine-grained pattern of biological diversification that adds up to the greatest concentration of rare and endemic species in the Atlantic Ocean Basin. Of the 987 fish species treated in detail in these volumes, some 23% are rare or endemic to the study area. Such a high level of endemism stands in contrast to the widespread view that marine species characteristically have large geographic ranges and that they might therefore be buffered against extinction.

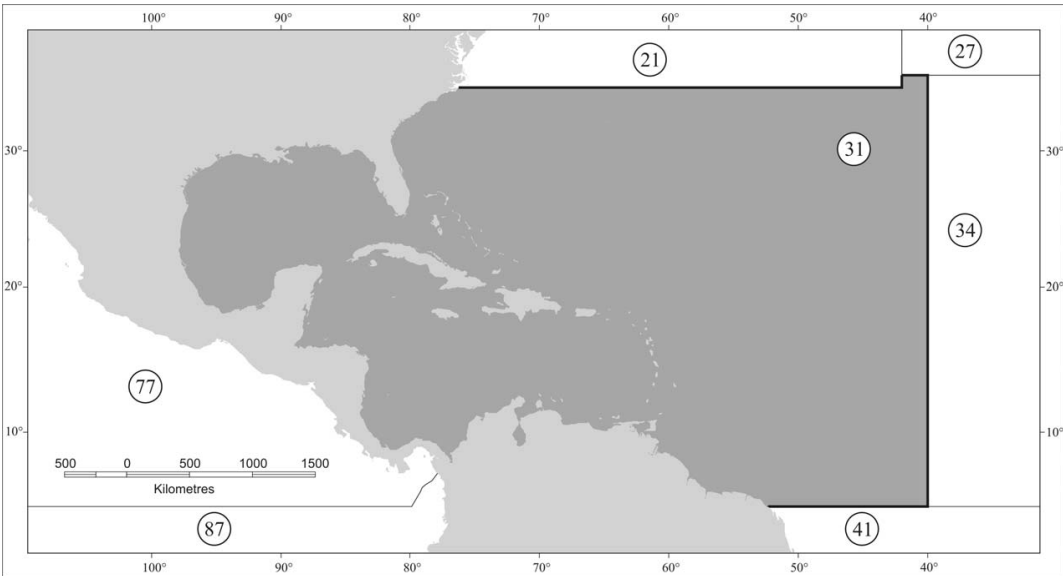


Fig. 1 Area covered by this guide (shaded): FAO Fishing Area 31 or the Western Central Atlantic Ocean (adjacent FAO fishing areas are numbered)

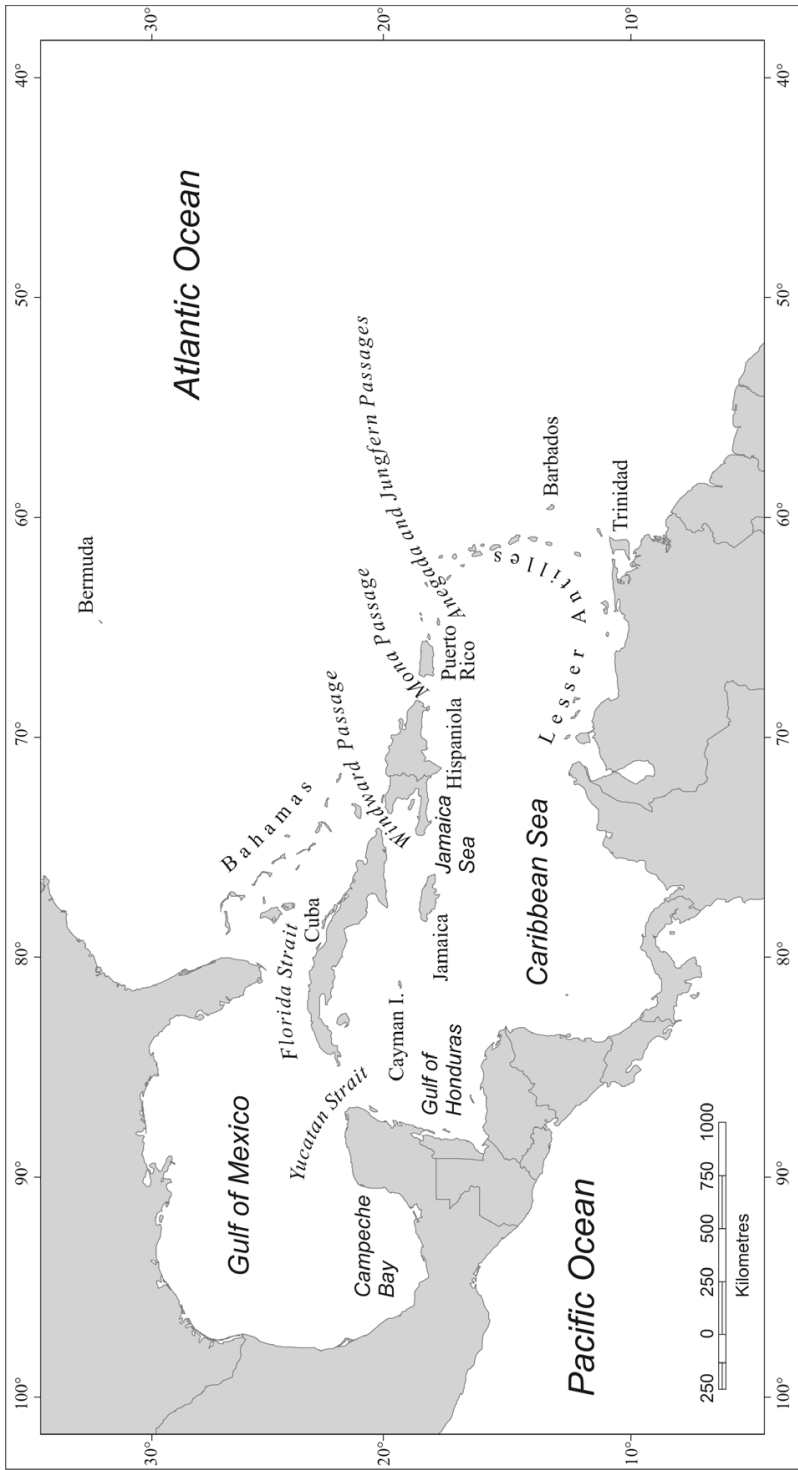


Fig. 2 The major seas, gulfs, and island groups of the Western Central Atlantic

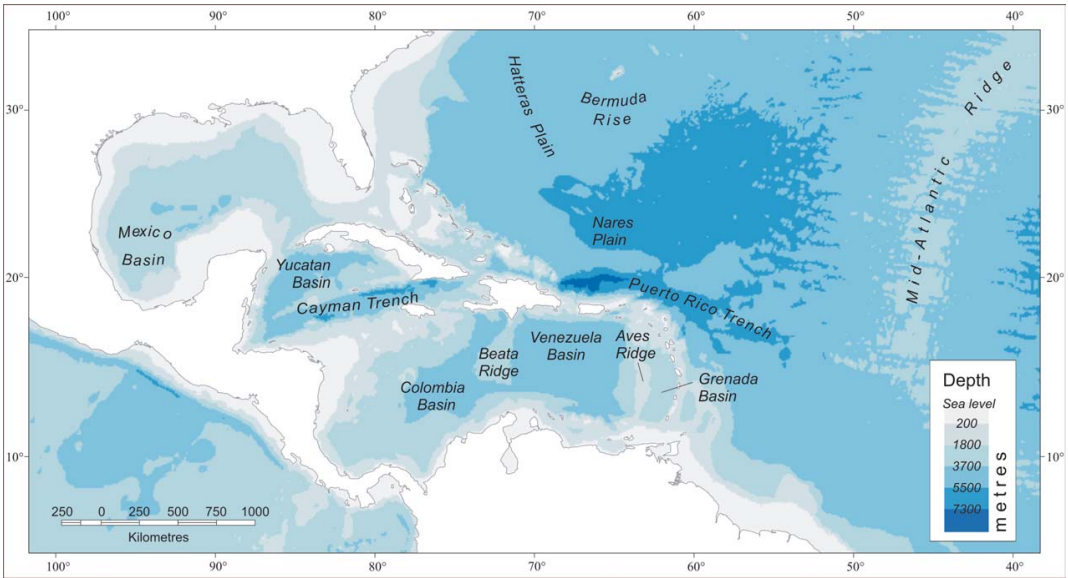


Fig. 3 Depth patterns showing major submarine basins and ridges

The geographic intricacies that resulted in the region’s high levels of biological richness are also associated with social and political diversity. The Western Central Atlantic includes the world’s greatest concentration of small countries, and they represent the full range of the world’s major political systems. All of the Caribbean Sea and nearly all of the Gulf of Mexico are included within one or another of the region’s 42 jurisdictional units (Fig. 4), the largest

number found in any ocean area of this size. When the Exclusive Economic Zones are compared to the geographic and ecological features of the same area (Figs 2,3,5), it becomes clear that the countries of the region are faced with managing the biological outcomes of oceanic and ecological processes that operate on a scale that is far larger than any of the region’s individual management units.

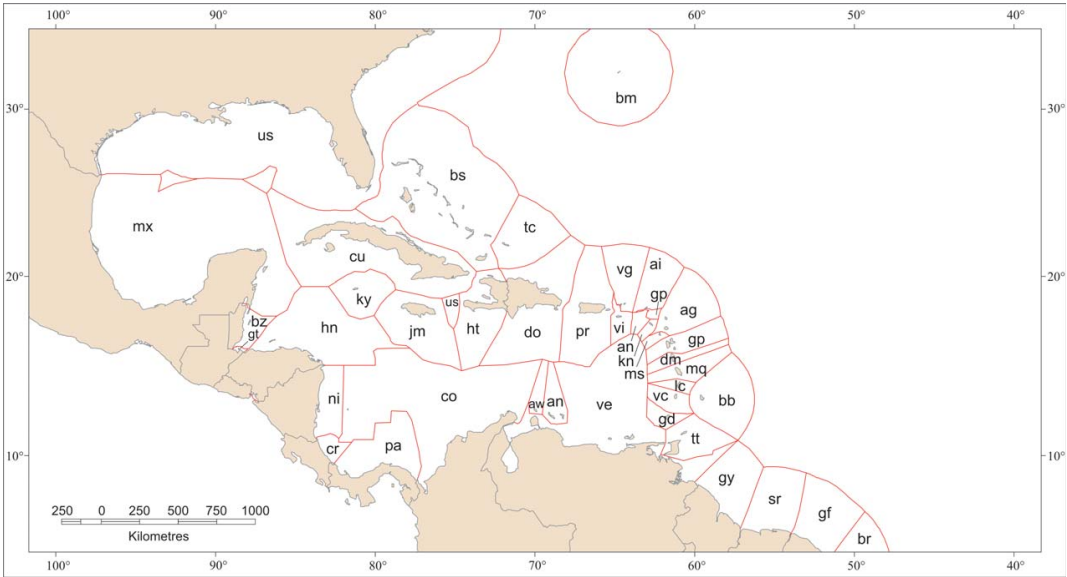


Fig. 4 Maritime boundaries in the Western Central Atlantic Ocean demarcating the Exclusive Economic Zones (EEZs) of the Western Central Atlantic states. Two open areas in the Gulf of Mexico represent “doughnut holes,” that is, international waters beyond the EEZs of Mexico, the USA, and Cuba. Country codes are explained in “Map Data Sources” [Modified from Sullivan Sealey and Bustamante, 1999]

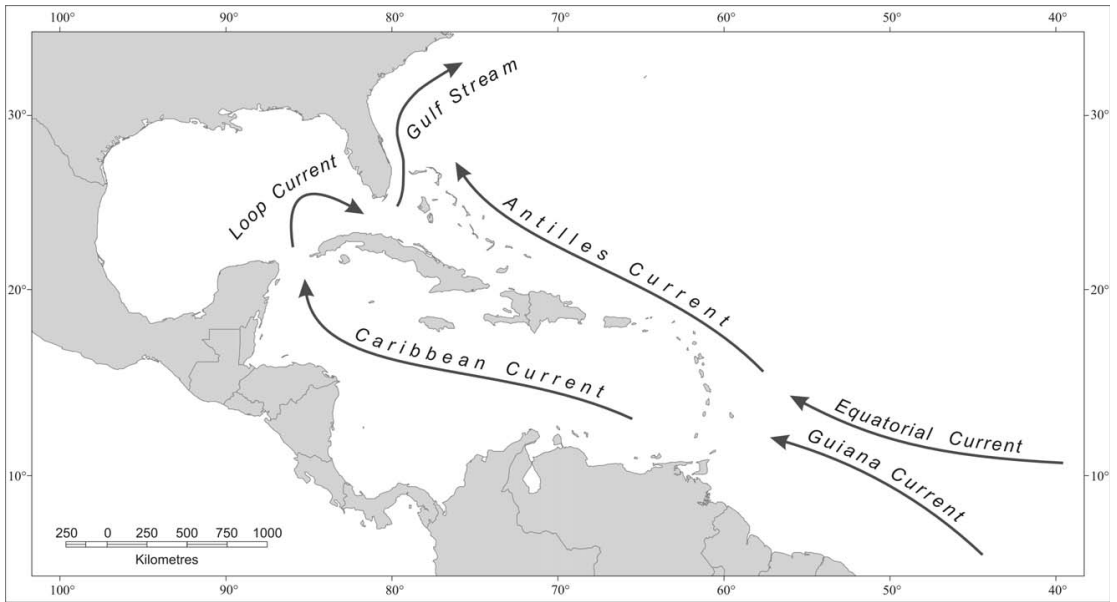


Fig. 5 Major surface currents

This guide expands upon the FAO Species Identification Sheets for Fishery Purposes, Western Central Atlantic (Fischer, 1978). All species accounts with distribution maps have been revised and updated, and the number of species treated in detail has increased from 533 to 1 172. This guide is the geographic complement to the FAO identification guide to the Eastern Central Atlantic (Fischer et al., 1981); together, the two guides provide coverage of subtropical and tropical marine species across the Atlantic with the exception of Brazilian waters.

The distributional data presented in the species accounts comprises the most extensive set of geospatial information so far assembled on marine biodiversity for the region, and the range maps will therefore be of interest in the search for, and explanation of, general patterns of distribution, species richness, and endemism. This chapter provides an introduction to the physical and geohistorical setting that creates the basic constraints for the evolution of such patterns. Particular attention is called to the water masses and currents which show a clear structure throughout the region, but especially so in the Caribbean Sea and Gulf of Mexico where their configurations are constrained by ridges, archipelagos, and the continental margins. They provide a marked physical and chemical structure that influences the distributions of many of the region's species.

Physical Topography

The dominant geomorphological feature in the eastern reaches of the WCA is the Mid-Atlantic Ridge which slopes westward to abyssal plains (including the Nares and Hatteras Plains) at depths typically ranging from 5 000 to over 7 000 m (Fig. 3). In

the north, the plains are interrupted by the Bermuda Rise which is crowned by the world's northern-most coral reefs around the Bermuda Islands (Smith-Vaniz et al., 2001). Topographic features in these parts of the WCA are generally similar to those of most parts of the North Atlantic Basin (see maps in Earle, 2001), and the plains are broadly open to deep-water circulation. In contrast, the central and western parts of the WCA are broken into a very complex set of sub-basins that are surrounded by ridges and trenches that are inferred to have been generated primarily by interactions between the Caribbean tectonic plate and the surrounding North American and South American plates.

The Caribbean Sea constitutes the largest marginal sea of the Atlantic Ocean with a surface area of $2.52 \times 10^6 \text{ km}^2$ and volume of $6.48 \times 10^6 \text{ km}^3$ (twice that of the Mediterranean). It is separated from the open Atlantic by ridges that emerge, in places, as the Greater and Lesser Antilles islands. Passages between the islands allow exchange of water only at relatively shallow depths. The deepest passages and sills between the Caribbean and Atlantic are the Windward (1 540 m), Jungfern (1 815 m), and Anegada (1 910 m) Passages. The Caribbean Sea itself occupies five principal basins that have been separated from each other at various depths in the past (see below) and that are presently separated at depth by submerged ridges. These basins divide the deep circulation and hold water with significant residence times (NAS, 1990). From east to west, they are the Grenada Basin (typical depth about 3 000 m), Venezuela Basin (5 000 m), Colombia Basin (4 000 m), Cayman

Trench (6 000 m), and Yucatán Basin (5 000 m). The Caribbean is connected to the Gulf of Mexico through the Yucatán Channel which allows passage of water to the channel's maximum sill depth of 2 040 m. The Gulf is a single basin with typical depths of about 3 000 m. It has been suggested that the deeper waters of the Gulf of Mexico (greater than 1 500 m) have rather long residence times (300 to 500 years) and are only infrequently exchanged with adjacent water bodies (NAS, 1990).

Oceanography

Water Masses and Currents

The waters of the WCA are strongly structured as a system of discrete water masses and currents. Water masses are relatively coherent bodies of water that have a common history of formation and that can often be identified at great distances from their points of origin on the basis of characteristics of temperature, salinity, and oxygen content. The fundamental water masses of the WCA are described below in a general sequence from the bottom to the surface (based on Wright and Worthington, 1970; Emery and Meincke, 1986; Mooers and Maul, 1998; and Baum, 2001).

Antarctic Bottom Water is formed in the Weddell and Ross Seas with temperatures ranging from -0.8 to 0°C and salinities from 34.6 to 34.7‰. It is the densest water in the free ocean (that is, outside of regional basins where denser water is blocked by sills, such as in the Mediterranean or Norway seas). Antarctic Bottom Water spreads across the Nares and Hatteras Plains, forming the deepest water mass in most of the WCA, but ridges prevent it from entering the Caribbean basins and Gulf of Mexico.

North Atlantic Deep Water is marked by relatively high oxygen levels (greater than 5.5 ml/l) and salinity greater than 34.9‰. This water mass originates primarily in the Greenland-Iceland-Norway seas and spreads into the Atlantic as dense overflows through sills on either side of Iceland to fill the depth range from about 1 000 to 4 000 m. Its upper layers enter all sub-basins of the Caribbean and Gulf of Mexico.

Antarctic Intermediate Water originates from a circumpolar layer with most of the Atlantic component coming from the Drake Passage and Falkland Current. It fills the basins of the Caribbean and Gulf of Mexico at depths ranging from about 500 to 1 000 m and can be recognized in those basins by a distinct salinity minimum at 34‰ (NAS, 1990).

Subtropical Underwater originates in the tropical central Atlantic and sinks to about 200 to 500 m as it enters the Caribbean. It is readily recognized in the Caribbean and eastern Gulf of Mexico by its high salinity, 36.7‰.

The relatively shallow sills surrounding the Caribbean Sea restrict the connection to the deep-water masses of the open Atlantic. The uppermost part of North Atlantic Deep Water can enter the Caribbean through the Windward Passage (1 540 m) and the Anegada and Jungfern Passages (1 800 m). Antarctic Intermediate Water can enter at several points that have sill depths from 800 to 1 400 m. The two water masses mix upon entering just above sill depth and the mixture fills the lower reaches of the Caribbean basins with a distinctive and remarkably uniform bottom water. It passes subsequently through the Yucatán Strait into the Gulf of Mexico at about 2 000 m.

The movement of high-density, polar-sourced water masses into the WCA and its sub-basins must be compensated by displacement of water of equal mass, and this density balance is a primary feature of circulation on an Atlantic-wide scale. The precise course of return flow is controlled in part by the Coriolis force and, at the surface, by the trade winds and seasonal tropical storms. The most obvious circulatory feature of the WCA is its "western boundary current," a generic term for intensification of the western limb of the subtropical gyres in each major ocean basin. Stommel (1948) established that western boundary currents (e.g., the Caribbean Current/Gulf Stream in the North Atlantic or the Kuroshio in the North Pacific) are the inevitable consequences of three conditions: a rotating earth, a meridional boundary, and a zonal wind stress pattern. These conditions have prevailed to some degree in the WCA since the Central American Isthmus began to be elevated in the middle Miocene. Modern circulation became established with full emergence of the Panamanian Isthmus in the Pliocene.

At the point where the western boundary current enters the WCA, it includes components of the North Equatorial Current and the Guiana Current (Fig. 5). Upon encountering the Antilles, it splits into two branches. The Antilles Current skirts the Antilles on the Atlantic side to merge eventually with the Florida Current. The second part flows through several passages in the Windward Islands to become the Caribbean Current, a warm and powerful body of water that increases in velocity as it flows along the western margins of the Caribbean to the Yucatán Channel. The trajectories of satellite-tracked drifters show that the Caribbean Current should be referred to only in a statistical sense, as it consists of meanders, eddies and filaments of currents under a general pattern of movement (Gallegos, 1996). It and the Antilles Current are sometimes referred to as the roots of the Gulf Stream (Mooers and Maul, 1998).

The Caribbean Current enters the Gulf of Mexico through the Yucatán Channel to become the Loop Current, a much more coherent feature that can be traced as a swift and narrow stream flowing northward into the Gulf of Mexico and then looping back to exit through the Straits of Florida where it is known as the Florida Current. It is rejoined by the Antilles Current to become the Gulf Stream.

Paleoceanography

The present-day circulation patterns in the WCA are relatively young, having been established in association with the closure of the Central American Seaway, and it is likely that the basic distribution of marine biodiversity in the region reflects patterns of circulation and topography that are significantly older. On a global basis, the fundamental pattern of ocean circulation has evolved from one dominated by circulation at tropical latitudes (that is, through the former seaway between North and South America; Fig. 6) to today's condition of circum-Antarctic circulation, via the southern ocean (Roth et al., 2000). The key developments in this evolution, including late Cenozoic climatic changes, were triggered by the appearance of barriers to circulation at various depths in the area now occupied by the WCA. The record of pelagic sediments shows that the Inter-American seaway was generally open at all depths for a period of some 20 million years following separation of the Americas in the middle Mesozoic, that there have been occasional incomplete barriers to circulation (e.g., deep ridges and/or incomplete island chains), especially during the Oligocene and Miocene, and that the Caribbean or its sub-basins have been connected alternately to the Atlantic or the Pacific at different times.

The history of isolation of Atlantic and Pacific water masses can be inferred in remarkable detail from pelagic sediments that reflect the characteristics of the over-lying water masses that produced the deposits. The Ocean Drilling Program (ODP) and its precursor, the Deep Sea Drilling Project (DSDP), have resulted in an array of 160 drilling sites in the WCA and nearby waters (Fig. 7) that provide a record of changes in the region's water masses over a period extending to the middle Mesozoic (see numerous reports in *Proceedings of the Ocean Drilling Program, Scientific Results* and specific citations below).

With respect to deep-water circulation, past barriers can be inferred from the accumulation of siliceous sediments because the Atlantic and Pacific differ in processes of silica dissolution and transport (Broecker, 1974; Donnelly, 1985, 1989). When the low-latitude seaway between the Americas is closed (as is the case today), deep water that originates in the Atlantic flows into the Pacific only via the seas around Antarctica, carrying silica from the Atlantic to the Pacific. The deep water of Atlantic origin upwells in the Pacific, and the dissolved silica is immediately taken up by siliceous organisms in shallow waters. These in turn contribute a fraction of the silica in their skeletons to Pacific deep-sea sediments. Return flow to the Atlantic occurs near the surface and therefore consists of water from which silica has been removed. The result is a net accumulation of silica in Pacific water masses and their sediments. Whenever conditions like those of today prevail (i.e., deep-water circulation takes place only via the southern ocean), then Atlantic waters and their pelagic sediments are silica-poor relative to those of the Pacific at the same time.

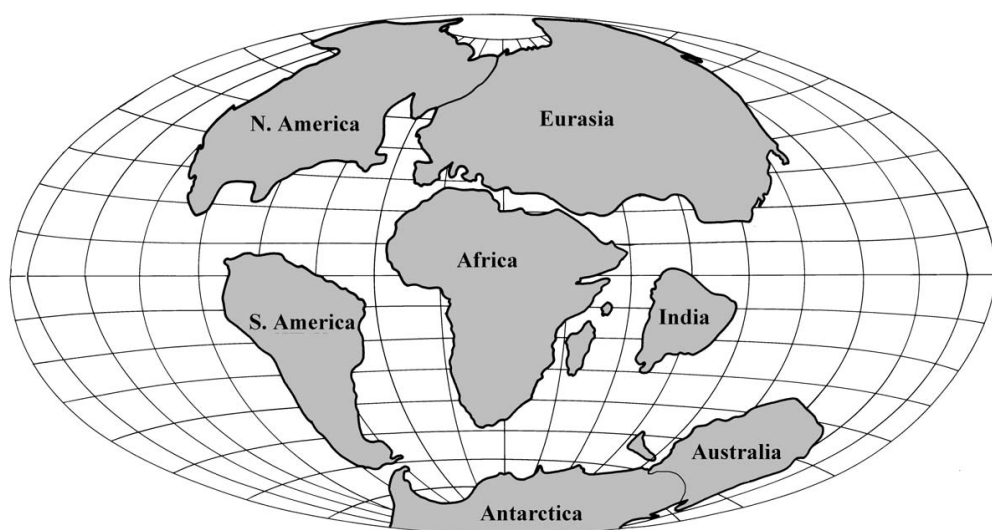


Fig. 6 Position of the continents and inter-oceanic seaways 65 million years ago

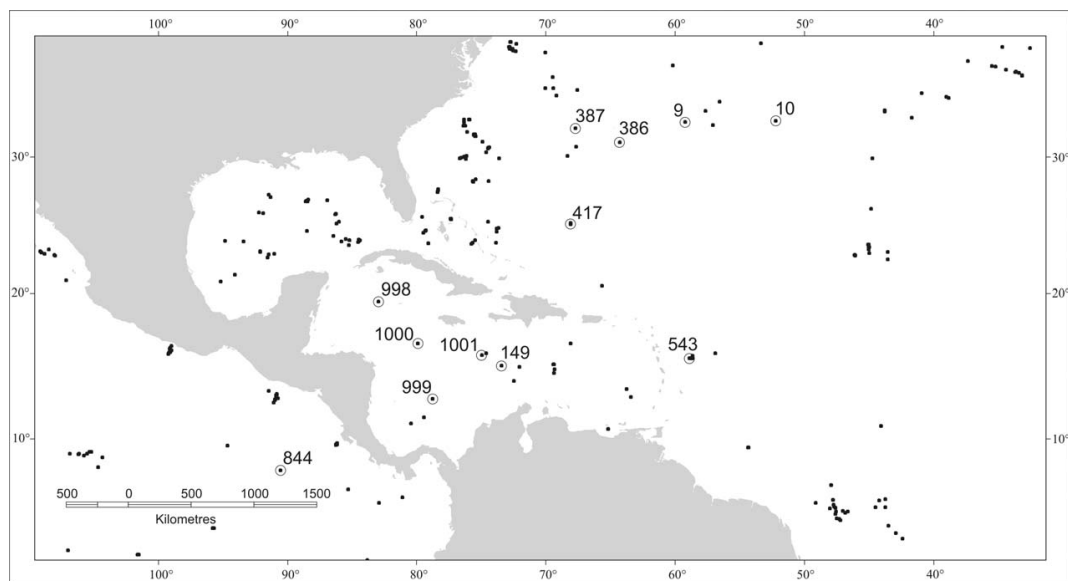


Fig. 7 Site locations of the Deep Sea Drilling Program and Ocean Drilling Program. Numbered sites are referred to in the text (site 846 lies off the map south of the Galapagos Islands)

When the low-latitude seaway is open to deep-water circulation between the Americas, silica-laden waters return to the Atlantic so that sediments in both ocean basins have similar silica content. The chronological record of silica at core sites therefore provides a basis for detecting former deep-water barriers between them.

Other parameters provide the basis for corroboration or for detection of circulation patterns at different depths. Ancient water masses can be compared on the basis of the paleodepth at which calcareous microfossil debris dissolves in deep water (Lyle et al., 1995; Roth et al., 2000) or in terms of the biotic composition of nannofossil assemblages that reflect connections in shallow waters (e.g., Kameo and Sato, 2000). Analyses of these phenomena at ODP sites in and around the WCA provide the following outline of the opening and closing of seaways and of the consequent re-organization of ocean circulation.

Cores from widely distributed sites show that both Pacific and Atlantic water masses in and near the WCA carried a high silica content during the latest Cretaceous and early Cenozoic (Donnelly, 1985), i.e., the Inter-American Seaway was open to effective circulation at all depths. Throughout this period (and until the middle Miocene), the Circum-Tropical Current was well developed and flowed from the North Atlantic into the Pacific between the American continents. Given that no meridional boundary was yet in existence and that the Atlantic Ocean was narrower than it is today, the gyral circulation system in the North Atlantic was only weakly established.

During the Eocene, sediments in the Pacific and Caribbean were similar to each other in having high levels of silica, but silica content had plummeted in Atlantic sediments. This implies that Caribbean and Pacific waters were still confluent at depth, but that deep Atlantic waters were segregated by a deep-water barrier in the position of the Antilles or Aves Ridge, either of which was in position to separate the deep water masses over-lying the respective sets of drilling sites (Site 149 in the Caribbean and Sites 9, 10, 386, 387, 417, 543 in the Atlantic; Figs 7, 8b). This was followed in the early Miocene by a decrease in the silica content of Caribbean sediments, showing that the exchange of deep water between the Caribbean and Pacific was becoming restricted by the elevation of submerged structures in the position of present Central America. Although these structures rose into waters shallower than 1500 m (Donnelly, 1989), the Inter-American Seaway remained open to surface circulation into the middle Miocene, as shown by shared assemblages of shallow-water nannofossils at Sites 999 (Caribbean) and 844 and 846 (Pacific) (Roth et al., 2000; Kameo and Sato, 2000). During much of the Miocene, the northern and southern basins of the Caribbean were separated by the Nicaragua Rise, inferred in part from differences in calcareous coccolith assemblages at Sites 998 (Cayman Trench) and 999 (Colombia Basin). The Rise stood in the way of a western boundary current and helped shunt the Circum-Tropical Current into the eastern Pacific (Fig. 8).

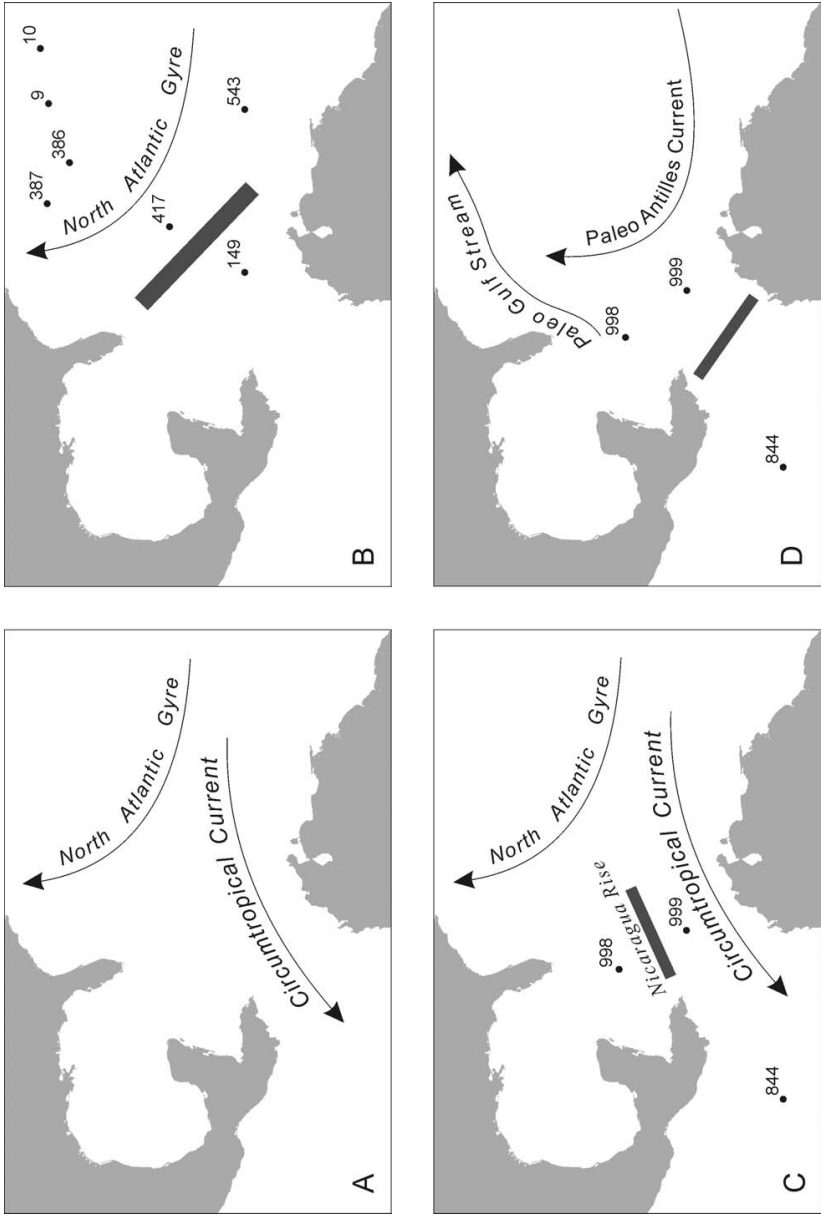


Fig. 8 Summary of paleoceanographic evolution of the WCA. Coastlines are for orientation and are not contemporaneous with the depicted events. Solid bars indicate position of barriers to circulation. A) Early Cenozoic: Silica content is high in sediments at broadly distributed Pacific and Atlantic drilling sites (Donnelly, 1985). The Inter-American Seaway is open; the Circumtropical Current is well developed; and the North Atlantic Gyre is weak. B) Eocene: Silica content is high in Caribbean sediments (site 149), but low in Atlantic sediments (e.g., sites 9, 10, 386, 387, 417, 543) (Donnelly, 1989). The Caribbean and Pacific are confluent at all depths, but are separated from deep-water circulation with the Atlantic by developing ridges (Antilles and/or Aves Ridges). C) Early Miocene: Shallow-water coccolith assemblages are similar in the Pacific (site 844) and Colombian (site 999) Basins, but distinctive in the Yucatan Basin (site 998) (Kameo and Sato, 2000). The Inter-American Seaway is open, and a barrier in the position of the Nicaragua Rise shunts a strong Circumtropical Current into the Pacific. D) Middle Miocene: Coccolith assemblages are similar within the Caribbean Basin and different from those in the Pacific (Kameo and Sato, 2000). The Nicaragua Rise has foundered and the Inter-American Seaway is temporarily closed for the first time

The Inter-American Seaway was substantially, though temporarily, closed for the first time at the transition from middle to late Miocene, based on divergence of nannofossil assemblages in younger layers at Caribbean Site 999 and Pacific Sites 844 and 846 (Roth et al., 2000), but inter-ocean surface exchange was again taking place in the latest Miocene (Kameo and Sato, 2000). Final closure of the Inter-American Seaway by complete emergence of the Isthmus of Panama in the Pliocene was originally documented using diverse geological evidence (Duque-Claro, 1990; Coates et al., 1992) and by foraminiferal studies at sites on both sides of the Isthmus (Keigwin, 1978; Keller et al., 1989). The date of closure has been further constrained to the late Pliocene (2.76 ~ 2.51 Ma) based on provincialism of microfossil assemblages in the western Caribbean (Sites 989 and 999) and eastern equatorial Pacific (Sites 844, 846, and 850) (Kameo and Sato, 2000).

Foundering of the Nicaragua Rise in the middle Miocene opened a new gateway for the North Atlantic's western boundary current inside the Caribbean basin (Droxler et al., 1992; Roth et al., 2000) and is linked to the initiation of the North Atlantic Deep Water. As the Inter-American Seaway gradually closed, the strengthening Caribbean Current transported warm, saline waters of the Caribbean to the northern Atlantic via the Loop Current, Florida Current, and Gulf Stream, all of which were becoming established late in the middle

Miocene. During this transition, the Caribbean region acted as a discriminating valve in which the opening and closing of gateways at different depths modified the global circulation pattern (Roth et al., 2000) and triggered the global climatic changes of the Pliocene (Raymo et al., 1989).

Tectonic Setting

Four major lithospheric plates underlie the Western Central Atlantic (Fig. 9). These include a small part of the African Plate to the east of the mid-Atlantic spreading boundary, all of the Caribbean Plate, and parts of the North American and South American Plates. In addition, two lithospheric units in the eastern Pacific, the Cocos and Nazca Plates, were involved in key tectonic processes that created the WCA's western margins. The North and South American plates are moving generally westward from the mid-Atlantic spreading boundary, while the Cocos and Nazca plates are moving generally eastward from their spreading boundary with the Pacific plate. This means that the larger lithospheric units that surround the Caribbean plate are all converging upon it from the east or west, and this compression is offset by subduction at its eastern and western extremities that has resulted in the formation of the trenches and volcanic arcs of the Antilles and Central America. On its northern and southern boundaries, the continental plates are moving past the Caribbean plate.

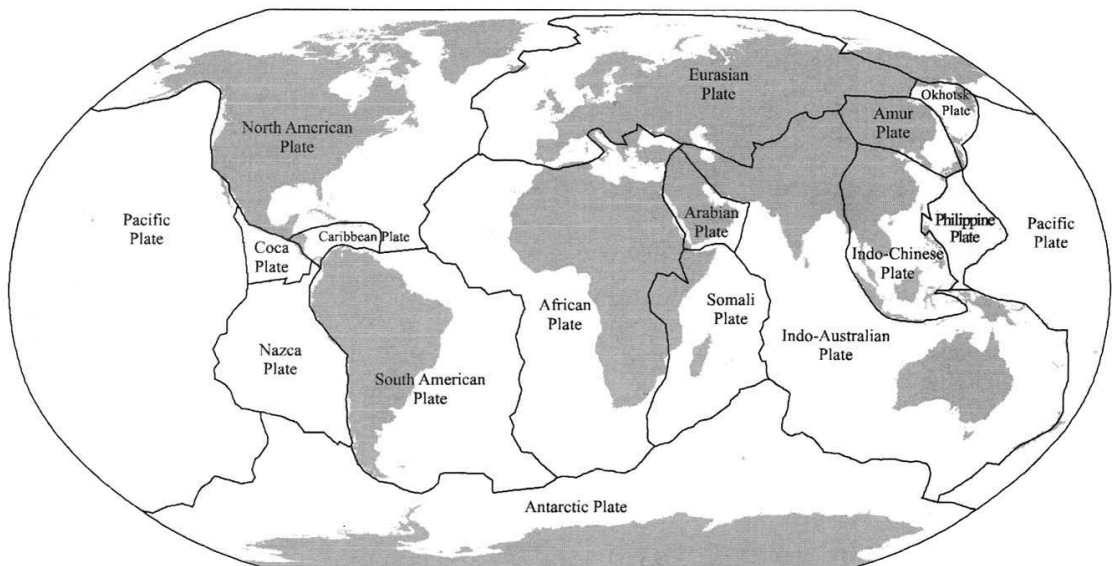


Fig. 9 Major lithospheric plates of the world

The Caribbean Plate, which occupies a central position in relation to the others, provides a useful reference point for understanding their interactions and relative motions. There are two fundamentally different kinds of models for its formation and evolution. Models based on the hypothesis of in situ origin (e.g., Weyl, 1973; Meyerhoff and Meyerhoff, 1972; Donnelly, 1989) suggest that the anomalously thick crust that gives the plate its identity is the result of a flood basalt event that occurred between the two American continents as they separated in the early Mesozoic, between 200 and 165 Ma. In general, these models involve movement of South America and Africa (which were a single unit at that time) to the east-south-east with respect to North America. The movements of separation between the American continents are hypothesized to have ended at about 120 to 130 Ma as Africa separated from South America, reducing the rate of movement of the latter continent and initiating the opening of the South Atlantic Ocean (Donnelly, 1989), a feature that is therefore younger than the Intra-Americas Sea.

Alternative models are based on the hypothesis that the Caribbean Plate originated in the Pacific. These models propose that the thick flood basalts were created to the west of the North and South American Plates, perhaps genetically related to the Galapagos hotspot according to some models, and that the Caribbean Plate has been transported subsequently to its present position between the two continents (e.g., Malfait and Dinkelman, 1972; Pindell, 1994). Using paleomagnetic data from ODP Sites 998 to 1001, Acton et al. (2000) estimated that the Caribbean plate was 5 to 15° south of its current position at about 80 Ma, placing it directly over the equator in the late Cretaceous. The inferred displacement implies an over-all rate of progression of 18 km/my. These results are compatible with models that have the Caribbean plate originating more than 1 000 km from its current position relative to North and South America.

The northern and southern boundaries of the Caribbean plate are best described as plate boundary zones or broad belts in which boundaries are not well defined and the effects of plate interaction are difficult to specify. A special problem occurs on the northern boundary where Cuban terranes in the Antillean arc collided with the North American plate and became fused to it in latest Paleocene or early Eocene. Subsequently, transform movement has taken place near the Cayman Trench, south of the Cuban platform.

Historical Biogeography

The science of biogeography was revolutionized in the 1960s in light of the formalization of plate tectonics and the general acceptance by biologists of a mobilist view of the earth's crust. The recognition that whole biotas could be transported in unison with mobile terranes led to entirely new

models and methodologies for the explanation of the distributions of organisms. As a result, descriptive biogeography based on ad hoc delineation of biotic units (e.g., biogeographic realms, regions or provinces), was generally succeeded by historical biogeography based on phylogenetic inference and the objective search for areas of endemism. In an independent but nearly simultaneous development, MacArthur and Wilson (1963, 1967) developed the theory of island biogeography which seeks explanations about the composition of island biotas that are independent of phylogeny and that are of interest on much shorter time scales. Both of these two trajectories in biogeography - historical and ecological - were developed to a substantial degree on the basis of cases from the Caribbean region, probably because of its complex geographic subdivision and because its geographic units contain the high diversity of organisms necessary to resolve multiple events and, possibly, multiple processes that underlie them. A review of the relationship between the two approaches as applied to the Caribbean is provided by Pregill and Crother (1999).

A change of emphasis also occurred **within** the field of historical biogeography. Prior to the acceptance of plate tectonics, it was taken for granted that it was mobile organisms that dispersed relative to a stable physical geography. Discussion was heavily based on terrestrial organisms, and debate centred on the relative roles of two hypothesized means of dispersal among islands and continents, i.e., whether particular examples were best explained by dispersal of terrestrial species over expanses of water or by means of land bridges. Once it was recognized that units of lithosphere are themselves moving, the debate shifted to the relative contribution of dispersal or vicariance (subdivision of biotas due to geographic isolating events) as mechanisms in determining the distributions of organisms. Vicariant events in the marine realm include geotectonic events that alter topography as well as changes in circulation or the distribution and characteristics of water masses.

Patterns of Diversity

Generalized patterns of distribution among the species treated in these volumes were sought by combining the range maps of individual species. The species maps contributed by authors were digitized using ESRI ArcInfo and compared in a system of cells, 0.5° on each side. Cells have an area of 2 539 to 3 078 km² at the northern and southern boundaries of the WCA respectively (35 to 5°N). The difference (17%) was deemed negligible because much greater variance in the area of aquatic habitat within cells is created by intersection with the region's many small islands and its extensive coastline. Cells were considered

to be occupied by a species range if the range entered any part of the cell.

The composite distribution of all 1 172 species mapped in these volumes (Fig. 10) shows that the area of highest species richness is located in waters surrounding southern Florida, the eastern Bahamas, and northern Cuba. Secondary centres of diversity are located (in descending order of

richness) on the continental shelves of northern South America, Central America, and in the northern Gulf of Mexico. These patterns of richness are apparently robust as they are repeated in the composite distributions for fishes (Fig. 11) and invertebrates (Fig. 12) taken separately. The distributions of tetrapods are quite general, and are not shown separately.

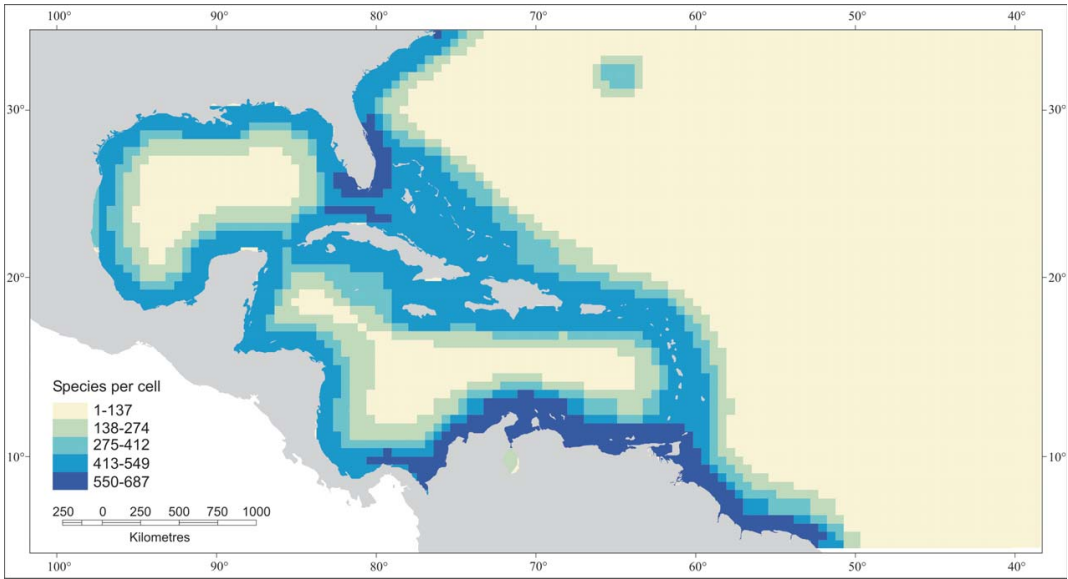


Fig. 10 Composite distributions of 1 172 species of invertebrates, fishes, and tetrapods based on maps in this guide

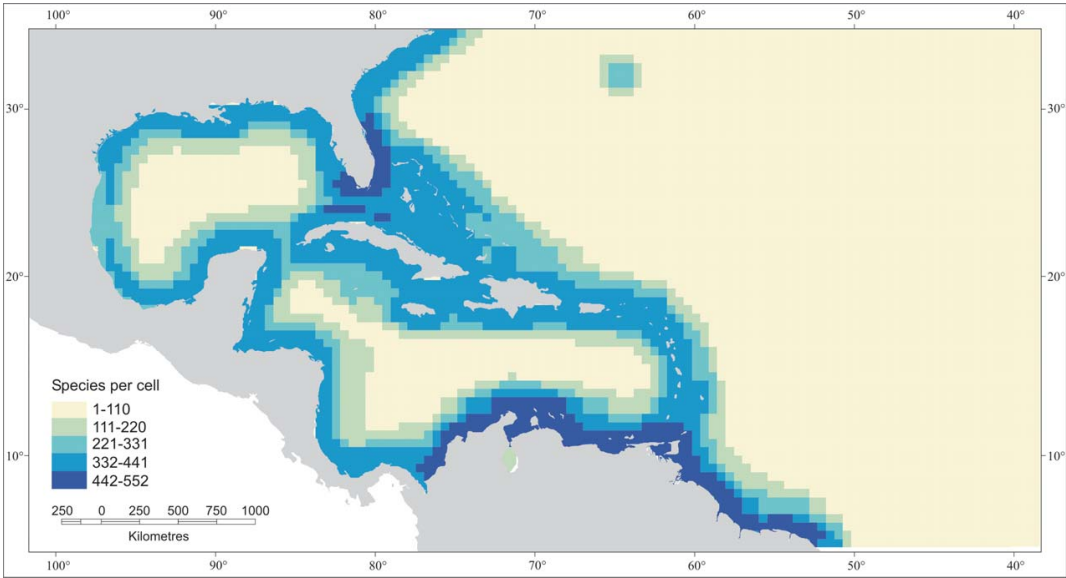


Fig. 11 Composite distributions of 987 fish species based on maps in this guide

Although a comprehensive analysis of patterns of richness across the whole Atlantic Ocean has never been undertaken, the tropical and subtropical waters of the wider Caribbean region are generally regarded as having the highest species richness. For comparison, the FAO guide to Mediterranean marine fisheries resources covers 156 species (Fischer, 1973) and that for the tropical waters along the coast of Africa covers 681 species (Fischer et al., 1981) compared to 1 172 in this guide. Given that the Strait of Florida has by far the highest richness in the WCA, it is likely to rank as the most species-rich area within the Atlantic Basin.

Areas of Endemism

A search for areas of endemism was based on fishes which are represented by a much larger sample size than are the other taxa. In order to identify concentrations of endemic fishes, maps were examined in order to identify range polygons that are contained wholly within the WCA. Some of the polygons so identified are disjunct parts of the ranges of species that occur outside the WCA. For example, several morays have disjunct populations in the Caribbean and Ascension Island. Such cases were eliminated by comparison to range statements in the species accounts in these volumes or in the published literature. A total of 227 fish species or 23% were found to be endemic to the WCA. Based on the ranges in the species accounts (which reflect maximum extent of occurrence), these restricted-range species occupy areas from approximately 8 616 to 333 152 km² (3 to 116 cells). Given that three of the borders of the WCA are formed by arbitrary lines through aquatic

habitat rather than by physical limits to distributions, these limits may intersect the ranges of restricted-range species. Because transboundary species are not counted as endemics, these additional restricted-range species are not included in our considerations of range size (that is, we are dealing with a minimum estimate).

The combined distributions of the 75 smallest endemic fish ranges are shown in Fig. 13. Areas of endemism occur in roughly the same places that show high species richness. That is, the greatest concentration of endemic fishes occurs in the northern WCA (centred on the Strait of Florida), followed in order by the northern coast of South America, the Caribbean coast of Central America and the northern Gulf of Mexico.

The high degree of endemism in the region contradicts the general view that marine species have large distributions. In fact, marine species show a range in the size of their distributions just as do terrestrial organisms, and this includes numerous micro-endemics in our region. The maps in these volumes show fine-grained patterns of micro-endemism in various groups including 11 species of toadfishes (Batrachoididae), and 11 species of silversides (Atherinopsidae). It should be noted that the sample of species covered in this guide is probably biased against the notion of fine-grained endemism, as many groups expected to show high endemism (e.g., gobies) have not yet been treated.

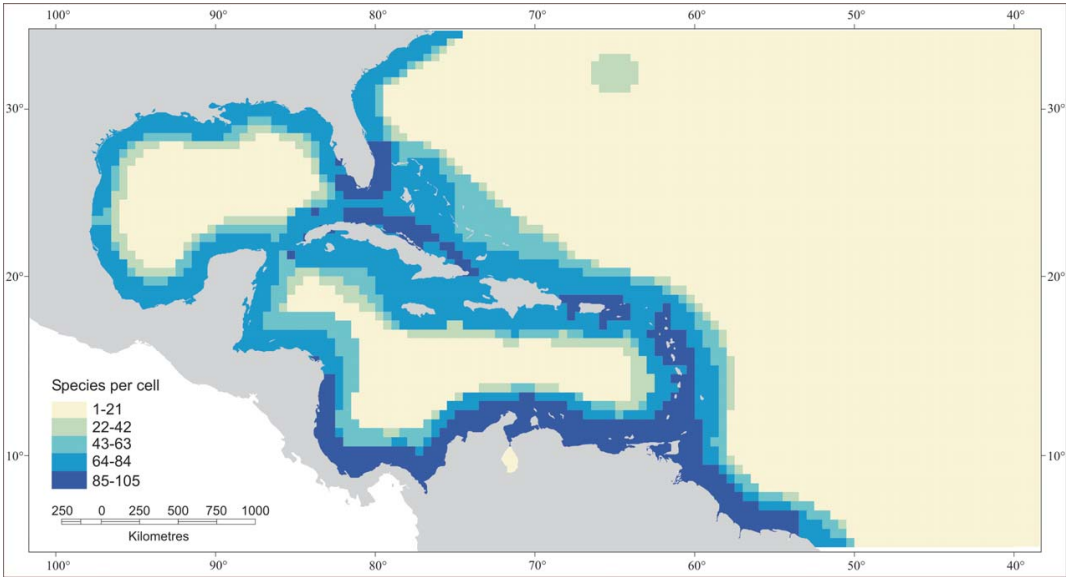


Fig. 12 Composite distributions of 144 invertebrate species based on maps in this guide

Prominence of Shelf Fishes

The two primary areas of endemism in the WCA, the Strait of Florida and the coastal waters of Venezuela and Colombia, have quite different species composition and they could be viewed as separate hotspots for marine biodiversity. The differences may reflect the fact that these areas represent distinct continental faunas that were separated by the Inter-American Seaway during most of the history of the Caribbean Basin.

A striking aspect of species distribution in the WCA is the degree to which species richness is dominated by the fauna along the coasts of the continents (Figs 11,12). There are 212 species or 21% of fishes associated with the continental shelves. These species are absent from island platforms that are separated from the continents by wide expanses of water deeper than 140 m and that therefore remained separate from the continental shelves even during low sea stands of the Pleistocene.

The fishes that are restricted to the continental shelves can be considered to comprise 4 components. Ten shelf species span the WCA from north to south and therefore provide no resolution of

biogeographic events inside the WCA. Eighty-six species are WCA endemics that are restricted to small parts of the continental shelves. Forty-nine shelf species have distributions entering the WCA from the eastern coast of North America and extending to varying degrees along the Central American shelf or farther south (Fig. 14). On the southern side of the WCA, 67 species have ranges extending into the WCA to some degree (Fig. 15). These patterns suggest that the emergence of the Central American Isthmus may have been associated with a marine faunal exchange similar to the “great American biotic interchange” that is well documented in the terrestrial biotas (Stehli and Webb, 1985), but that has not been noted as an aspect of marine biogeography. The elevation of ridges in the position of present Central America, (see Paleooceanography, above), would have established a continuous continental shelf between the Americas for the first time in early to mid-Miocene, based on barriers to deep and intermediate circulation inferred to have arisen at that time. The relatively low levels of endemism and species diversity on the Central American shelf may reflect, in part, its relatively recent connection to the older faunas of the North and South American continental shelves.

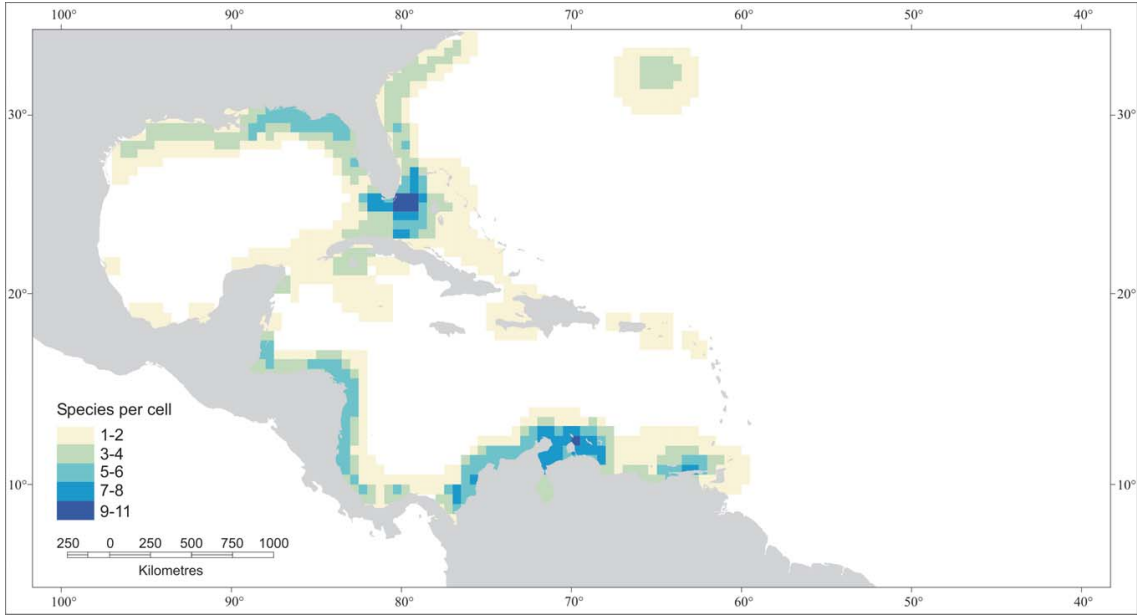


Fig. 13 Composite distributions of 75 endemic species of fishes with the smallest range sizes (3 to 116 cells)

Vicariance Due to Climate Change

In several cases, the present distributions of inshore species appear to conserve information about climate change. Over most of its length, the modern coastline of the Western Atlantic Ocean runs from north to south so that species in most sections of the continental shelves might readily adjust their latitudinal positions in response to changing climate. An exception occurs in the Gulf of Mexico which forms

a large-scale cul-de-sac that is open to the south, but closed at its northern end. This circumstance is associated with one of the more conspicuous and well known patterns in the distribution of Western Central Atlantic species.

Many species that occur in the northern Gulf of Mexico also occur at higher latitudes along the eastern coast of North America, but they are not present in southern Florida. This disjunction

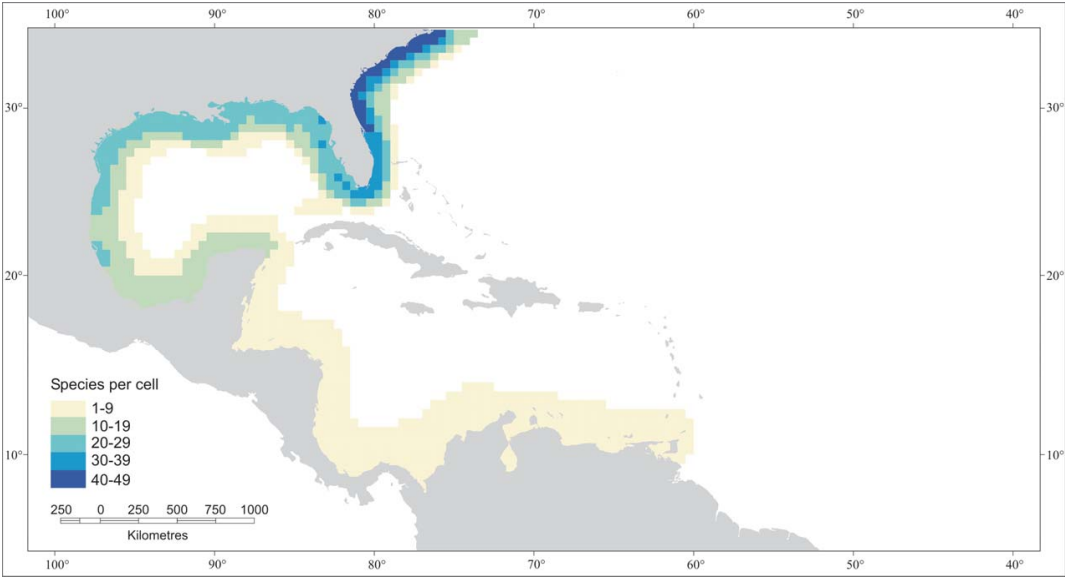


Fig. 14 Composite distributions of 49 shelf fishes entering the WCA from North America

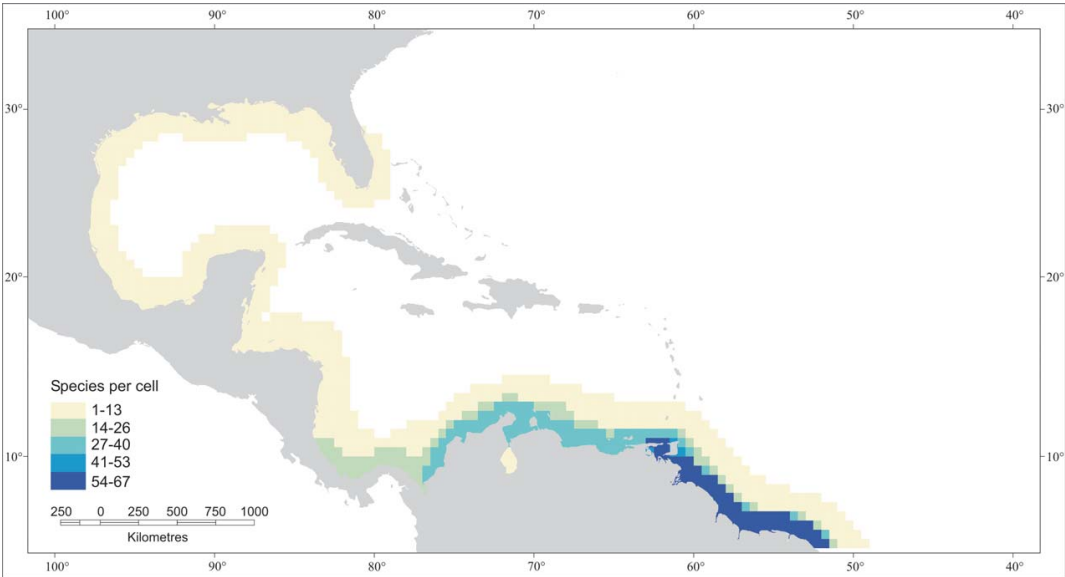


Fig. 15 Composite distributions of 67 shelf fishes entering the WCA from South America

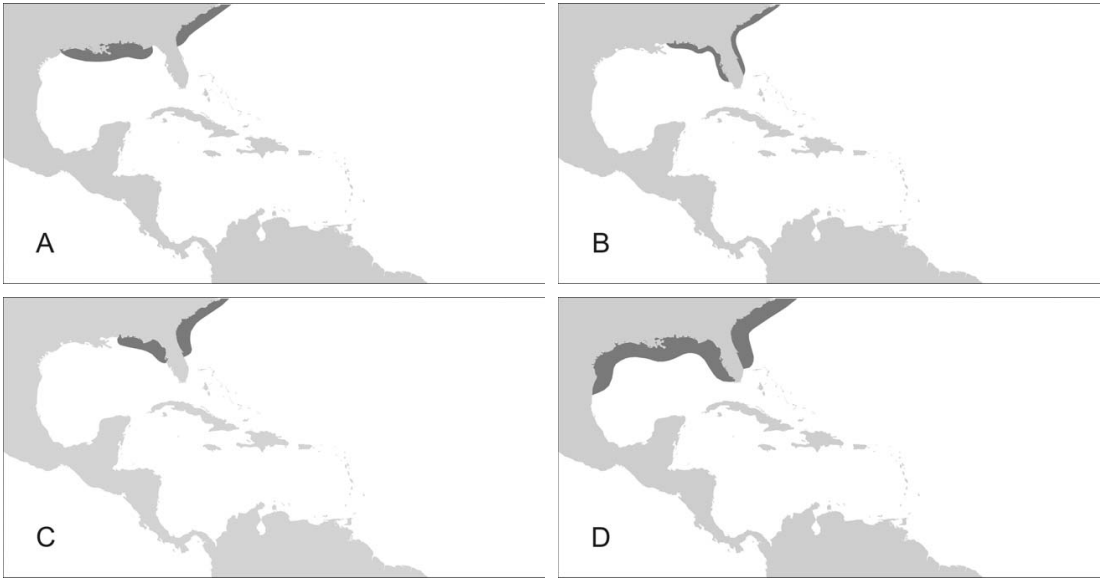


Fig. 16 Composite map of disjunct distributions of inshore fishes in four families: A) *Morone saxatilis*, Moronidae, B) *Etropus cyclosquamus*, Paralichthyidae, C) *Larimus fasciatus*, Sciaenidae, and D) *Centropristis striatus*, Serranidae

recurs in the distributions of several families of fishes (Fig. 16) and in the distributions of tunicates (Van Name, 1954), molluscs (Rehder, 1954), nemertean worms (Coe, 1951, 1954), and other groups of invertebrates (Hedgpeth, 1953; Frey, 1965). The recurrence of a common feature in the distributions of taxa with diverse ecologies implies a common historical cause. In this case, the most general explanation is that the distributions of midlatitude species on the east coast of North America were displaced southward and around the southern tip of Florida during periods of lowered sea temperatures contemporaneous with the glacial ages (Frey, 1965). With the rise of sea temperatures during inter-glacials, the southern distributional limits of midlatitude species were displaced northward on both sides of the Florida Peninsula, resulting in disjunctions in the ranges of inshore species. Such climate-induced vicariance is likely associated with differentiation of populations on opposite sides of Florida (e.g., the shads *Alosa alabamae* on the Gulf coast and *Alosa sapidissima* on the Atlantic coast north of central Florida; Rivas, 1954), therefore contributing to endemism in the northern Gulf of Mexico.

Fisheries

The fisheries of the WCA are the most diverse of all FAO fishing areas in the Atlantic. This is in terms of both numbers of species and numbers of

countries that exploit these resources. The management of this diversity is complicated by the geographical complexity of the region, with a patchwork of numerous islands with varied local current systems (Appeldoorn et. al, 1987) and a continental shelf that is traversed by several major rivers. This results in what is presumably a very complex stock structure. This apparently contributes to the fact that very little is known of the actual status of individual stocks in the WCA. Cochrane (2001) reported that of the 57 stocks falling under the jurisdiction of the United States Gulf of Mexico Fisheries Management Council, the status of 46 (81%) was unknown or undefined. This situation is worse for those 179 stocks falling under the jurisdiction of the United States Caribbean Fisheries Management Council (CFMC) wherein the status of 175 (98%) is unknown or undefined. Cochrane (2001) suggests that fisheries assessment status elsewhere in the WCA is likely to be similar to or worse than that of the CFMC.

One thing that is fairly certain about the status of fisheries in the WCA is that the overall fisheries resources of the area appear to be at or to have exceeded their maximum level of exploitation. Catches steadily increased until a peak in 1984 of 2.2 million t, followed by a decline and leveling off at around 1.8 million t of total annual catches (Fig. 17). This general trend is consistent among all major resource groups.

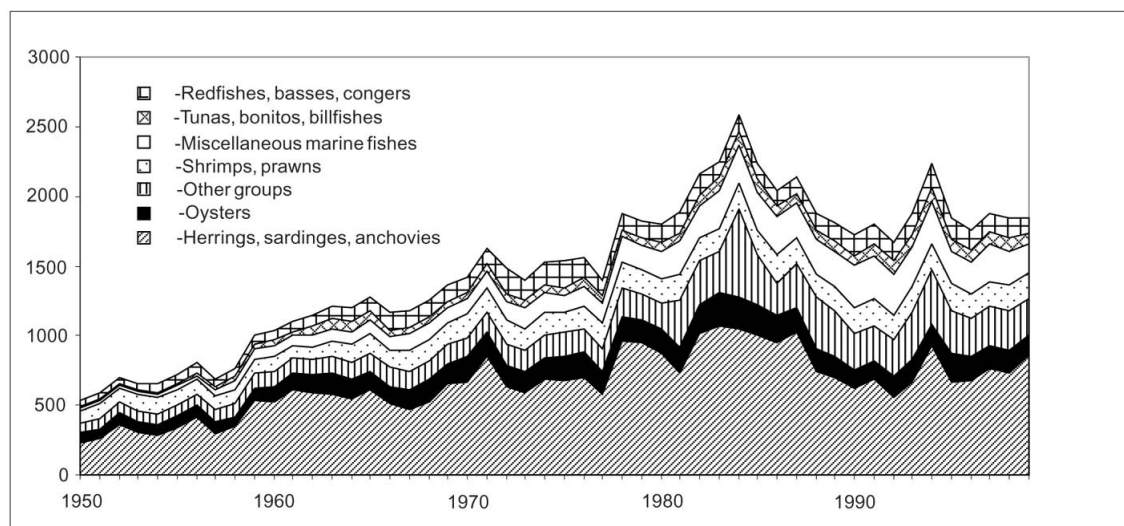


Fig. 17. Landings according to FAO Fisheries statistics from 1950 to 1999

The major fishing regions of the area can be roughly classified as Gulf of Mexico, northern coast of South America, islands of the Antilles, and Caribbean Central America. The Gulf of Mexico is the most productive in the area with landings from both Mexico and the USA coming mostly from these Gulf fisheries (Table 1). These two countries reported the first and third highest average annual landings in the area with the USA contributing between about 772 and 1 022 thousand t per year between 1996 and 2000 and Mexico between about 275 and 321 thousand t per year between 1996 and 2000. Prominent catches in the Gulf of Mexico are related to its extensive continental shelf area (Table 2). The northern coast of South America is the second most productive in the area with Venezuela contributing the second highest average annual landings. This ranged between about 272 and 391 thousand t per year between 1996 and 2000. Guyana also figured prominently with landings ranging between about 48 and 53 thousand t for the same period. Colombia, Suriname, and French Guiana also contributed substantially to South American catches in the area and ranged between about 3 and 27 thousand t per year between 1996 and 2000. In the Antilles, catches from Cuba, the Dominican Republic, and Jamaica dominated with between 49 and 59, 9 and 13, and 6 and 12 thousand t annually for the same period, respectively. From the Caribbean Central America, Nicaragua and Honduras annually contributed between about 10 and 15 and 2 and 7 thousand t, respectively, between 1996 and 2000.

A number of extralimital countries also report landings from Area 31 (Table 3). These include mostly large pelagics such as tunas and billfishes but sharks also make up a minor part of the catch. Taiwan Province of China and Japan report the bulk of foreign landings with annual ranges between 4 and 6 and 1

and 4 thousand t, respectively, from 1996 to 2000. Unlike nearly all of the countries bordering Area 31, these extralimital fishers are steadily increasing their landings.

FAO currently lists 1 255 taxonomic statistical units in its Yearbook of Fishery Statistics (FAO, 2002). This includes fresh-water species and units typically not added to totals such as corals and sponges. In the WCA, area landings were reported for 187 marine and brackish-water taxonomic statistical units (excluding 4 units not typically included in totals) for the period between 1996 and 2000. The most important 75 of these taxonomic units include a wide taxonomic range from molluscs to bony fish (Table 4). The top 10 taxonomic unit landings were dominated by the Gulf Menhaden, *Brevoortia patronus*, which accounted for between 29 and 39% of the total reported landings for the area between 1996 and 2000. This species is restricted to the Gulf of Mexico, caught mostly by purse seines and gill nets, and used mostly for extraction of fish oil and for fish meal. The American cupped oyster, *Crassostrea virginica* had the second highest landings in 2000 and ranged between about 85 and 223 thousand t from 1996 to 2000. The catch-all group bony fishes or Osteichthyes, however, more consistently ranked second in total landings and ranged between about 188 and 263 thousand t from 1996 to 2000. The fact that a large percentage of species are being reported as simply unidentified bony fish underscores the need for improved species identification. Biological management of fisheries requires species-specific population parameters. These aggregate statistical units will hopefully dissemble over time as species identification becomes more practical using this guide.

Country	1996	1997	1998	1999	2000
Anguilla	200	250	250	250	250
Antigua and Barbuda	1 209	1 437	1 415	1 361	1 481
Aruba	150	205	182	175	163
Bahamas	9 866	10 439	10 124	10 473	10 500
Barbados	3 512	2 809	3 644	3 250	3 100
Belize	977	1 045	911	1 185	886
Bermuda	465	461	465	452	286
British Virgin Islands	506	105	116	115	43
Cayman Islands	110	125	125	125	125
Colombia	23 888	6 235	26 825	3 040	15 196
Costa Rica	437	420	364	666	1 050
Cuba	48 799	58 896	53 386	51 533	51 500
Dominica	1 030	1 079	1 212	1 200	1 150
Dominican Republic	12 606	13 468	9 076	7 804	10 842
French Guiana	7 377	6 602	6 709	6 271	5 237
Grenada	1 574	1 548	1 852	1 802	1 696
Guadeloupe	9 570	10 480	9 084	9 114	10 100
Guatemala	390	285	328	292	366
Guyana	47 783	53 373	52 215	53 241	48 018
Haiti	4 745	4 801	4 759	4 500	4 500
Honduras	2 691	6 560	2 332	1 865	7 093
Jamaica	12 054	7 748	6 110	8 058	5 226
Martinique	3 500	5 500	5 500	6 000	6 314
Mexico	294 231	320 829	302 157	285 833	274 532
Montserrat	38	45	46	50	50
Netherlands Antilles	1 000	950	950	950	950
Nicaragua	9 685	9 451	12 011	13 127	14 838
Panama	0	0	0	20	714
Puerto Rico	2 701	3 187	3 006	3 020	4 154
Saint Kitts and Nevis	352	216	407	348	257
Saint Lucia	1 274	1 311	1 314	1 718	1 759
Saint Vincent/Grenadines	889	947	1 283	1 031	7 294
Suriname	12 850	13 800	15 995	16 000	16 000
Trinidad and Tobago	9 205	11 088	9 027	8 728	9 661
Turks and Caicos Is.	1 297	1 250	1318	1 300	1 300
United States of America	771 970	867 630	822 594	943 641	1 021 580
US Virgin Islands	400	350	300	263	300
Venezuela	378 795	362 474	390 785	304 680	271 515
Total	1 678 126	1 787 399	1 758 177	1 753 481	1 810 026

Table 1. Landings in metric tonnes (t) of all countries bordering FAO Fishing Area 31 from 1996 to 2000 (FAO, 2002)

Location	Area ('000 km ²)
US east coast	110
Gulf of Mexico	600
Yucatán - Eastern Venezuela	250
Guyana, Suriname, French Guiana	200
Islands and offshore banks	380
Total	1 540

Table 2. Locality and area of the major coastal shelf zones in the Western Central Atlantic (Stevenson 1981)

Country	1996	1997	1998	1999	2000
Japan	1 454	1 262	1 605	4 133	3 415
Korea, Republic of	626	143	621	1 789	3 327
Philippines	0	0	28	549	376
Spain	906	3 145	2 090	1 998	2 224
Taiwan Province of China	4 516	3 669	2 430	5 663	6 039
Total	7 502	8 219	6 774	14 132	15 381

Table 3. FAO Fishing area 31 landings in metric tonnes (t) of countries not bordering Area 31 from 1996 to 2000 (FAO, 2002)

Invertebrates or ‘shellfish’ contributed prominently to total landings in the area (Table 4). The most important crustaceans included *Farfantepenaeus aztecus* (northern brown shrimp), *Litopenaeus setiferus* (northern white shrimp), *Callinectes sapidus* (blue crab), *Penaeus* spp. (unidentified penaeid shrimps), *Panulirus argus* (Caribbean spiny lobster), and *Xiphopenaeus kroyeri* (Atlantic seabob). Each contributed between around 17 and 63 thousand t yearly between 1996 and 2000. Of these shrimps, found primarily in the northern part of the area, none are not considered to be over fished, except for the Atlantic seabob, whose status is unknown (Cochrane, 2001). The spiny lobster stocks in the CFMC area are not considered to be overfished but elsewhere they are mostly fully or over exploited. In addition to *Crassostrea virginica*, other molluscs contributed substantially with landings between 1996 and 2000 for *Arca* spp between about 34 and 47 thousand t, *Octopus vulgaris* (an aggregate species) between about 17 and 29 thousand t, and *Strombus*

spp. (conch species) between about 11 and 17 thousand t. Within the area of the CFMC, the most important conch species, the pink or queen conch (*Strombus gigas*) is considered to be over exploited while elsewhere in the WCA status estimates ranged from lightly to over exploited (Cochrane, 2001).

The most important finfish group in terms of landings came from pelagic resources captured primarily from purse seines, gill nets, and longlines. This included small pelagics in the family Clupeidae (Table 5), with *Brevoortia patronus* (Gulf menhaden), *Sardinella aurita* (round sardinella), and *Brevoortia tyrannus* (Atlantic menhaden) contributing the bulk of the 664 to 860 t landings for this family between 1995 and 1999 (Table 4). Cochrane (2001) reports that these menhaden species are currently overfished but that the round sardinella, fished mostly in Venezuela, may be under to fully exploited. Another group of small pelagics, the flyingfishes (Exocoetidae), are locally important in some of the

Statistical taxonomic unit (common name)	1996	1997	1998	1999	2000
<i>Brevoortia patronus</i> (Gulf menhaden)	491 612	597 565	497 461	694 242	591 434
<i>Crassostrea virginica</i> (American cupped oyster)	108 971	95 608	101 957	85 150	222 866
<i>Osteichthyes</i> (bony fishes)	230 812	263 826	232 790	196 376	188 613
<i>Sardinella aurita</i> (round sardinella)	155 426	143 116	190 895	128 048	75 571
<i>Penaeus aztecus</i> (northern brown shrimp)	54 703	44 459	50 722	60 527	62 713
<i>Penaeus setiferus</i> (northern white shrimp)	27 461	31 928	39 799	44 014	52 280
<i>Callinectes sapidus</i> (blue crab)	48 222	58 859	59 162	44 846	50 237
<i>Penaeus</i> spp (penaeid shrimps)	50 122	53 816	50 679	40 810	48 203
<i>Arca</i> spp (ark clams)	33 888	42 117	30 880	41 145	47 209
<i>Panulirus argus</i> (Caribbean spiny lobster)	29 650	29 226	27 216	30 905	35 204
<i>Xiphopenaeus kroyeri</i> (Atlantic seabob)	17 310	21 464	16 603	18 648	24 764
<i>Thunnus albacares</i> (yellowfin tuna)	24 775	26 131	27 172	24 413	24 426
<i>Brevoortia tyrannus</i> (Atlantic menhaden)	24 169	0	27 779	18 815	23 812
<i>Octopus vulgaris</i> (common octopus)	28 608	17 809	16 565	19 120	22 562
<i>Epinephelus</i> spp (groupers)	20 170	19 352	18 855	16 757	21 980
Ariidae (sea catfishes)	22 150	14 885	16 385	16 442	20 306
<i>Strombus</i> spp (conches)	11 389	16 025	12 688	14 390	16 857
<i>Opisthonema oglinum</i> (Atlantic thread herring)	5 634	15 191	14 592	17 066	14 802
Mugilidae (mullets)	11 315	16 618	15 846	10 628	14 779
Lutjanidae (snappers)	12 317	13 457	15 444	10 017	14 450
<i>Cynoscion</i> spp (weakfishes)	14 011	10 577	13 551	6 394	12 799
<i>Mugil cephalus</i> (flathead grey mullet)	16 721	13 593	10 583	10 023	10 657
Haemulidae (grunts)	13 881	18 081	15 565	11 338	10 006
<i>Caranx</i> spp (jacks)	12 030	12 833	12 376	9 517	9 917
<i>Thunnus alalunga</i> (albacore)	3 706	2 958	1 400	5 500	9 623
<i>Scomberomorus cavalla</i> (king mackerel)	9 639	12 769	8 021	9 559	8 980
Elasmobranchii (sharks and rays)	11 499	12 371	10 059	11 176	8 822
<i>Penaeus duorarum</i> (northern pink shrimp)	4 757	10 761	12 452	3 806	8 513
<i>Scomberomorus maculatus</i> (look in Scombridae)	11 183	8 720	8 625	9 050	6 999
Rajiformes (skates and rays)	7 591	8 852	9 885	8 021	6 584
Carcharhinidae (requiem sharks)	12 145	9 785	8 588	6 254	6 451
<i>Cynoscion nebulosus</i> (spotted weakfish)	3 610	3 797	6 786	6 742	6 367
<i>Scomberomorus brasiliensis</i> (look in Scombridae)	5 389	5 940	5 782	4 158	5 537
<i>Mercenaria mercenaria</i> (northern quahog)	0	0	0	0	5 506
Scombroidei (tuna-like fishes)	16 756	2 221	24 915	2 824	5 272
<i>Centropomus undecimalis</i> (common snook)	5 132	4 867	5 012	5 119	5 034
<i>Portunus</i> spp (swimming crabs)	1	289	224	4 042	4 995
<i>Lutjanus campechanus</i> (northern red snapper)	6 346	6 264	5 166	5 412	4 841
<i>Katsuwonus pelamis</i> (skipjack tuna)	4 853	5 576	5 863	4 186	4 483

Table 4. The landings in metric tonnes (t) of the 40 most important statistical taxonomic units from FAO Fishing Area 31 from 1996 to 2000 (FAO, 2002). All aggregate taxa (other than species) are not elsewhere included

Scientific (common) name	1995	1996	1997	1998	1999
Clupeidae (herrings)	663875	678662	758166	732544	859791
Osteichthyes (bony fish)	232888	231195	266901	236218	205135
Scombridae (tunas)	77580	76573	80446	75517	76326
Mugilidae (mullets)	37659	31895	32044	29628	23789
Lutjanidae (snappers)	25401	26583	28152	29120	23049
Sciaenidae (croakers)	34747	27038	24147	32468	20688
Carangidae (jacks)	20880	20949	22844	23405	19365
Serranidae (groupers)	26982	21417	21057	20384	18037
Ariidae (sea catfishes)	26630	22150	14885	16385	16442
Haemulidae (grunts)	14261	13881	18081	15565	11335
Elasmobranchii (sharks and rays)	12494	10728	10495	9941	8815
Centropomidae (snooks)	7089	6576	6036	6093	8257
Rajiformes (rays)	7710	7591	8852	9886	8021
Perciformes (perciforms)	8085	8305	9326	8129	7216
Carcharhinidae (requiem sharks)	12215	12149	9795	8623	6278
Gerreidae (mojaras)	9698	9756	5911	5487	4091
Coryphaenidae (dolphinfishes)	3849	3549	4300	3586	4064
Trichiuridae (cutlassfishes)	4965	4632	5060	5413	4043
Scombroidei (tuna-like fishes)	2108	17919	3163	26287	3384
Xiphiidae (sword fish)	3371	1703	2611	2872	3231
Sparidae (porgies)	3607	2838	3748	2670	2545
Exocoetidae (flyingfishes)	1843	2148	1623	2835	2165
Sphyracnidae (barracudas)	1742	1596	2130	2072	1907
Stromateidae (butterfishes)	2695	2685	648	1821	1664
Engraulidae (anchovies)	1605	1472	904	1897	1621
Istiophoridae (billfishes)	1199	1242	1057	1268	1305
Paralichthyidae (sand flounders)	1926	2192	1059	1333	1020
Pomatomidae (bluefish)	1458	758	1147	899	756
Rachycentridae (cobia)	499	392	757	717	630
Pleuronectiformes (flatfishes)	770	335	487	558	594
Balistidae (triggerfishes)	1457	810	551	717	496
Branchiostegidae (tilefishes)	611	114	425	374	406
Squalidae (dogfish sharks)	26	138	310	334	222
Scaridae (parrotfishes)	156	99	100	118	99
Hemiramphidae (halfbeaks)	529	399	295	443	92
Mullidae (goatfishes)	380	276	180	170	91
Belonidae (needlefishes)	159	66	33	67	65
Cynoglossidae (tonguefishes)	0	0	0	0	59
Labridae (wrasses)	821	529	1456	52	52
Gempylidae (snake mackerels)	0	0	0	61	44
Holocentridae (squirrelfishes)	85	80	41	67	27
Lophiidae (anglerfishes)	0	0	25	12	19
Megalopidae (tarpons)	283	167	43	53	16
Elopidae (tenpounders)	30	143	745	979	15
Ophidiidae (cusk eels)	198	118	97	42	14
Acanthuridae (surgeonfishes)	5	11	4	9	7
Moronidae (temperate basses)	7	9	12	14	4
Triakidae (houndsharks)	46	253	27	45	3
Anguillidae (fresh-water eels)	43	35	19	9	2
Gadiformes (gadiform fishes)	0	0	4	2	1
Ostraciidae (boxfishes)	0	0	1	1	1
Gadidae (cods)	0	0	0	0	1
Lamnidae (mackerel sharks)	0	0	1	1	0
Berycidae (alfonsinos)	278	22	0	0	0

Table 5. The landings in metric tonnes (t) of statistical taxonomic units aggregated to family, order, or class from FAO Fishing Area 31 from 1996 to 2000 (FAO, 2001)

small island countries although they contribute only about 2 to 3 thousand t annually to overall landings. The family Scombridae (tunas) also contributed substantially to landings of pelagic resources with between about 76 and 80 thousand t annually between 1995 and 1999. A large part of this catch came from the yellowfin tuna, *Thunnus albacares*, which, along with other large pelagics such as the skipjack tuna (*Katsuwonus pelamis*) and the albacore (*Thunnus alalunga*) is considered to be fully or over exploited in the area (Cochrane, 2001).

Six bottom-associated, or groundfish, families of finfishes contributed an annual average of around 20 thousand t or more in recently reported landings (Table 5). Between 1995 and 1999 yearly landings for these families ranged between about 15 and 38 thousand t. This included mullets (Mugilidae) which are bottom feeders caught mostly with gill nets, snappers (Lutjanidae), jacks (Carangidae), and groupers (Serranidae) which are mostly hard substrate associated and caught with hook-and-line, and croakers (Sciaenidae) and sea catfishes (Ariidae) which are caught mostly with trawls over soft substrates. The majority of the most important groundfish species are known to be over fished (Cochrane, 2001). This includes the red snapper (*Lutjanus campechanus*), red grouper (*Epinephelus morio*), Nassau grouper (*Epinephelus striatus*), goliath grouper (*Epinephelus itajara*), red drum (*Sciaenops ocellata*), and vermilion snapper (*Rhomboplites aurorubens*). The status of the majority of the lesser important reef fishes is unknown.

Elasmobranchs (sharks and rays) have also figured prominently in landings of the area. The aggregate landings of unidentified elasmobranchs, requiem sharks identified only to family level (Carcharhinidae), and rays and skates (Rajiformes) ranged between about 22 and 32 thousand t annually between 1995 and 2000 (Fig. 17). Landings of this aggregate increased dramatically over the last half of last century with less than 5 thousand t in 1950 and peaking at 37 thousand t in 1994. In recent years there has been a steady decline in catches (Fig. 17), raising concerns that this resource may be over exploited. Elasmobranchs are slow-growing, slowly maturing species with low fecundity and therefore particularly vulnerable to over fishing.

The diversity of species and countries in the WCA, and the unknown status of most of the stocks being fished, results in a challenging fisheries management environment. The FAO's Western Central Atlantic Fishery Commission (WECAFC) has a number of working and advisory groups to help improve assessment and management of some of the most important resources. For example, the WECAFC Scientific Advisory Group drew attention to the need for more detailed collection of information on shark catches to the lowest appropriate taxonomic level (Cochrane, 2001). It is generally recommended that steps should be taken to improve the information base for key species, indicator stocks, and important communities. This new edition of the WCA species identification guide is intended to aid in this endeavor.

Map Data Sources

The projection for WCA maps is Cylindrical Equal-Area, central meridian 74°W, standard parallel 22°N. Country and continent borders are from Environmental Systems Research Institute (ESRI), "ESRI Data and Maps CD" data set, 1999. Plate boundaries are based on the data set in ESRI ArcAtlas: Our World. Fishing area boundaries were provided by FAO. Bathymetric data are from Digital Relief of the Surface of the Earth (ETOPO5), NOAA, National Geophysical Data Center, Boulder, Colorado, 1988. Drilling site locations were obtained from the Ocean Drilling Program on-line database, <http://www-odp.tamu.edu/sitemap/sitemap.html> (August 2002). ISO country codes in Fig. 4 correspond to countries as follows: AI, Anguilla; AG, Antigua and Barbuda; AN, Netherlands Antilles; AW, Aruba; BB, Barbados; BM, Bermuda; BR, Brazil; BS, Bahamas; BZ, Belize; CO, Colombia; CR, Costa Rica; CU, Cuba; DM, Dominica; DO, Dominican Republic; GD, Grenada; GF, French Guiana; GP, Guadeloupe; GT, Guatemala; GY, Guyana; HN, Honduras; HT, Haiti; JM, Jamaica; LC, St. Lucia; KN, St. Kitts and Nevis; KY, Cayman Islands; MQ, Martinique; MS, Montserrat; MX, Mexico; NI, Nicaragua; PA, Panama; PR, Puerto Rico; SR, Suriname; TC, Turks and Caicos Islands; TT, Trinidad and Tobago; US, United States; VC, St. Vincent and the Grenadines; VE, Venezuela; VI, U.S. Virgin Islands; VG, British Virgin Islands.

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Literature Cited

- Acton, G.D., B. Galbrun, and J.W. King. 2000. Paleolatitude of the Caribbean Plate since the late Cretaceous. *Proc. Ocean Drilling Progr., Sci Results*, 165:149-173.
- Appeldoorn, R., G. D. Dennis, and O. Monterossa López, 1987. Review of shared demersal resources of Puerto Rico and Lesser Antilles Region. *FAO Fish. Rep.*, 383: 36-106.
- Baum, S.K. 2001. *Glossary of Physical Oceanography and Related Disciplines*. Electronic publ. <http://stommel.tamu.edu/~baum/paleo/ocean/ocean.html>
- Broecker, W.S. 1974. Chemical Oceanography. New York, Harcourt Brace Jovanovich, 214 p.
- Coates, A.G., J.B.C. Jackson, L.S. Collins, T.M. Cronin, H.J. Dowsett, L.M. Bybell, P. Jung, and J.A. Obando. 1992. Closure of the Isthmus of Panama: the near-shore marine record of Costa Rica and western Panama. *Geol. Soc. America Bull.*, 104:828-841.
- Cochrane, K. 2001. The status of fisheries resources in the western central Atlantic region. Unpublished Report, FAO, Rome.
- Coe, W.R. 1951. The nemertean faunas of the Gulf of Mexico and of southern Florida. *Mar. Sci. Gulf and Caribbean Bull.* 1:149-186.
- Coe, W.R. 1954. The nemertean fauna of the Gulf of Mexico. In *Gulf of Mexico: Its Origin, Waters, and Marine Life*, edited by P.S. Galston, *U.S. Fish Wildl. Serv. Fishery Bull.* 89:303-309.
- Donnelly, T.W. 1985. Mesozoic and Cenozoic Plate Evolution of the Caribbean Region. In *The Great American Biotic Interchange*, edited by F.G. Stehli and S.D. Webb. New York, Plenum Press, pp. 89-121.
- Donnelly, T.W. 1989. History of marine barriers and terrestrial connections: Caribbean paleogeographic inference from pelagic sediment analysis. In *Biogeography of the West Indies: Past, Present and Future*, edited by C.A. Woods, Gainesville, Sandhill Crane Press, pp. 103-118.
- Droxler, A.W., A. Cunningham, A.C. Hine, P. hallock, D. Duncan, E. Rosencrantz, R. Buffler, and E. Robinson. 1992. Late middle Miocene segmentation of an Eocene-early Miocene carbonate megabank on the northern Nicaragua Rise tied to the tectonic activity at the North America/Caribbean plate boundary zone. *Eos*, (Suppl. 43)73:299.
- Duque-Claro, H. 1990. Neogene stratigraphy, paleoceanography and paleobiogeography in northwest South America and the evolution of the Panama Seaway. *Paleogeogr., Paleoclimatol., Paleoecol.*, 77:203-234.
- Earle, S.A. 2001. *National Geographic Atlas of the Ocean: The Deep Frontier*. Washington, Nat. Geogr. Soc., 192 p.
- Emery, W.J. and J. Meincke. 1986. Global water masses: summary and review. *Oceanologica Acta*, 9:391.
- FAO Fishery Information, Data and Statistics Unit, 2001. *Yearbook of Fishery Statistics - Capture Production 2000*. Vol. 89/1. Rome, Italy, FAO. 617 p.
- FAO Fishery Information, Data and Statistics Unit, 2002. *Yearbook of Fishery Statistics - Capture Production 2001*. Vol. 90/1. Rome, Italy, FAO. 617 p.
- Fischer, W. (ed.). 1978. FAO Species Identification Sheets for Fishery Purposes. Western Central Atlantic (FAO Fishing Area 31). Vols. 1-7. Rome, FAO, pag. var.
- Fischer, W., G. Bianchi, and W.B. Scott (eds.). 1981. FAO Species Identification Sheets for Fishery Purposes. Eastern Central Atlantic; Fishing Areas 34, 47 (in part). Ottawa, Department of Fisheries and Oceans Canada, Vols. 1-7, pag. var.
- Frey, D.G. 1965. Other invertebrates - An essay in biogeography. In *The Quaternary of The United States* edited by H.E. Wright and D.G. Frey. Princeton, Princeton University Press, pp. 613-631.
- Gallegos, A. 1996. Descriptive physical oceanography of the Caribbean Sea. In *Small Islands: Marine Science and Sustainable Development* edited by G. A. Maul. Washington, American Geophys. Union, pp. 36-55.
- Hedgpeth, J.W. 1953. An introduction to the zoogeography of the northwestern Gulf of Mexico, with reference to the invertebrate fauna. *Inst. Mar. Sci. Texas Publ.* 3:107-224.
- Kameo, K. and T. Sato. 2000. Biogeography of Neogene calcareous nannofossils in the Caribbean and the eastern equatorial Pacific—floral response to the emergence of the Isthmus of Panama. *Marine Micropaleont.*, 39:201-218.
- Keigwin, Jr., L.D. 1978. Pliocene closing of the Isthmus of Panama, based on biostratigraphic evidence from nearby Pacific Ocean and Caribbean Sea cores. *Geology*, 6:630-634.
- Keller, G., C.E. Zenker, and S.M. Stone. 1989. Late Neogene history of the Pacific-Caribbean gateway. *J. South Amer. Earth Sci.*, 2:73-108.
- Lyle, M., K.A. Dudley, and J.W. Farrell. 1995. The late Miocene (11-8 Ma) eastern Pacific carbonate crash: Evidence for reorganization of deep-water circulation by the closure of the Panama Gateway. *Proc. Ocean Drilling Progr., Sci. Res.*, 138:821-838.
- MacArthur, R.H. and E.O. Wilson. 1963. An equilibrium theory of insular zoogeography. *Evolution*, 17:373-387.
- MacArthur, R.H. and E.O. Wilson. 1967. *The Theory of Island Biogeography*. Princeton, Princeton Univ. Press, 203 p.
- Malfait, B.T. and M.G. Dinkelman. 1972. Circum-Caribbean tectonic and igneous activity and the evolution of the Caribbean Plate. *Geol. Soc. America Bull.*, 83:251-272.
- Moore, C.N.K. and G. A. Maul. 1998. Intra-Americas Sea circulation. In A. R. Robinson and K. H. Brink (eds.), *The Sea, Vol. 11: The Global Coastal Ocean - Regional Studies and Syntheses*. Wiley, pp. 183-208.

- Meyerhoff, A.A. and H.A. Meyerhoff. 1972. Continental Drift, IV: the Caribbean "Plate." *J. Geol.*, 80:34-60.
- NAS. 1990. *Assessment of the U.S. Outer Continental Shelf Environmental Studies Program: I. Physical Oceanography*. Technical Report, National Academy of Sciences.
- Pindell, J.L. 1994. Evolution of the Gulf of Mexico and the Caribbean. In *Caribbean Geology: an introduction* edited by S.K. Donovan and T.A. Jackson. Kingston, Univ. West Indies Press, pp. 13-39.
- Pregill, G.K. and B.I. Crother. 1999. Ecological and historical biogeography of the Caribbean. In *Caribbean Amphibians and Reptiles* edited by B.I. Crother. San Diego, Academic Press, 495 pp.
- Raymo, M.E., W.F. Ruddiman, J. Backman, B.M. Clement, and D.G. Martinson. 1989. Late Pliocene variation in Northern Hemisphere ice sheets and the North Atlantic deep water circulation. *Paleoceanography*, 4:413-446.
- Rehder, R.H. 1954. Mollusks. In *Gulf of Mexico: Its Origin, Waters, and Marine Life*, edited by P.S. Galston, *U.S. Fish Wildl. Serv. Fishery Bull.* 89:469-474.
- Rivas, L.R. 1954. The origin, relationships, and geographical distribution of the marine fishes of the Gulf of Mexico. In *Gulf of Mexico: Its Origin, Waters, and Marine Life*, edited by P.S. Galston, *U.S. Fish Wildl. Serv. Fishery Bull.* 89:503-505.
- Roth, J.M., A.W. Droxler, and K. Kameo. 2000. The Caribbean carbonate crash at the middle to late Miocene transition: Linkage to the establishment of the modern global ocean conveyor. *Proc. Ocean Drilling Prog., Sci. Res.*, 165:249-273.
- Smith-Vaniz, W.F., B.B. Collette, and B.E. Luckhurst. 2001. Fishes of Bermuda: History, Zoogeography, Annotated Checklist, and Identification Keys. *American Soc. Ichthyol. Herpetol., Spec. Publ.*, 4, 424 pp.
- Stehli, F.G. and S.D. Webb (eds.). 1985. *The Great American Biotic Interchange*. New York, Plenum Press, 422 p.
- Stevenson, D.K. 1981. A review of the marine resources of the WECAFC region. *FAO Tech. Pap.* 211.134pp.
- Stommel, H. 1948. The western intensification of wind-driven ocean currents. *Trans. American Geophys. Union*, 29:202-206
- Sullivan Sealey, K. and G. Bustamante. 1999. Setting Geographic Priorities for Marine Conservation in Latin America and the Caribbean. Arlington, Nature Conservancy, 125 p.
- Van Name, W.G. 1954. The Tunicata of the Gulf of Mexico. In *Gulf of Mexico: Its Origin, Waters, and Marine Life*, edited by P.S. Galston, *U.S. Fish Wildl. Serv. Fishery Bull.* 89:495-497.
- Weyl, R. 1973. Die palaeogeographische Entwicklung Mittelamerikas. *Zentralb. Geol. Palaeontol. Monatsh.*, 5:275-281.
- Wright, W.R. and L. V. Worthington. 1970. The water masses of the North Atlantic Ocean: A volumetric census of temperature and salinity. American Geographical Society, *Serial Atlas of the Marine Environment*, Folio 19. Unpag.

BIVALVES

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GENERAL REMARKS

The Bivalvia is the second most speciose class in the phylum Mollusca. Bivalves are distinctive within the Mollusca in that they are almost always completely enclosed within their shells. They are laterally compressed, typically with shells divided in two halves, or valves, hinged together dorsally by an elastic, chitinous, external or internal ligament. The bivalve shell probably originated from an evolutionary split of a single ancestral, cap-like shell along a longitudinal line. The bivalve hinge bears sets of interlocking teeth that prevent the valves from sliding along each other as a result of external forces (e.g., predation), or improperly shut. The shell is kept shut by action of the paired adductor muscles. The adductor muscles counter the tension in the elastic ligament, which tends to keep the shell valves spread apart.

Most of the bivalve body is located dorsally in the shell. The mantle cavity in bivalves is located ventrally and laterally. Folds of the mantle margin form the exhalant and inhalant siphons.

Most of the mantle cavity is occupied by the paired ctenidia, which in bivalves perform not only their original role as site of gas exchange, but also become the major food-gathering and food-sorting organs in filter-feeders. Ctenidia are important and remarkably variegated organs in the Bivalvia, and most of the higher classification in the class is based on their morphology and function.

The head in bivalves is reduced, probably as result of a sedentary or attached lifestyle. Bivalves have lost the radula, eyes, or tentacles as present in other molluscs, but some have acquired secondary tentacles and eyes along the mantle margin. The mouth is located well inside the animal, and a pair of fleshy labial palps helps direct the food particles toward the mouth after these particles have been collected and sorted by the ctenidia.

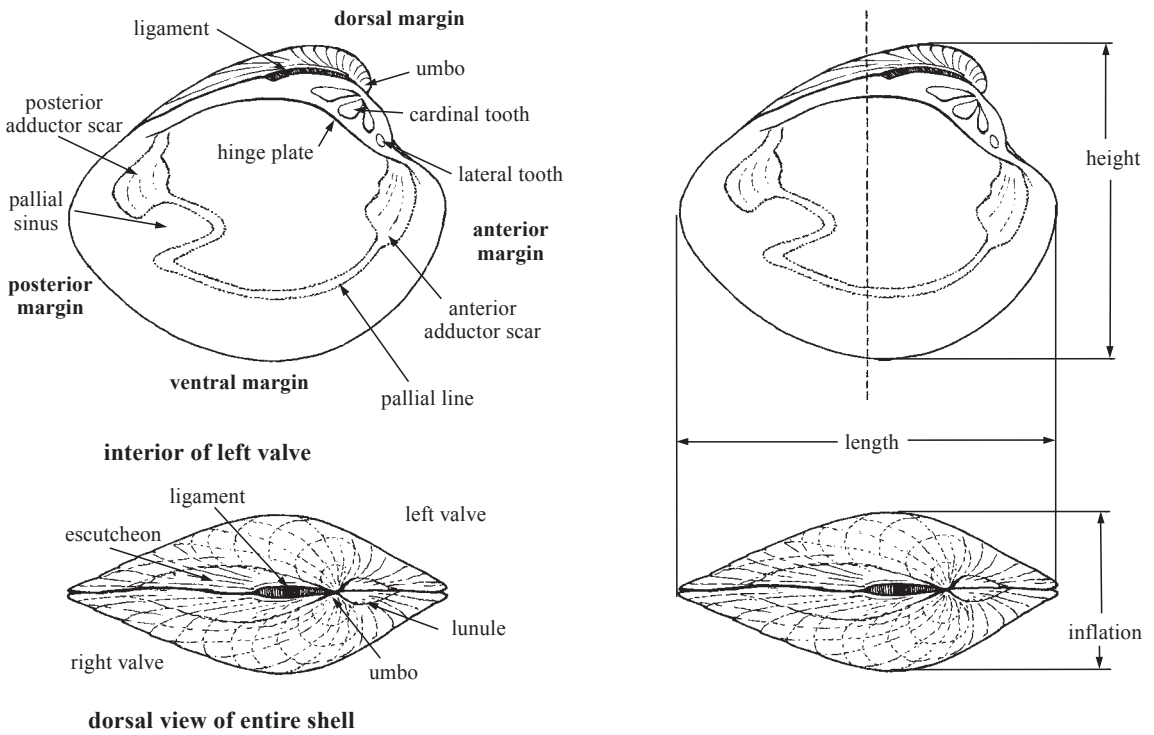
Bivalves can be deposit-feeders (subclass Protobranchia), using their long, modified labial palps to collect food particles from the bottom surface. Protobranchs do not use their ctenidia as food-collecting organs. Most bivalves are filter-feeders (e.g., subclasses Pteriomorphia and Heterodonta). Filter-feeders have well-developed ctenidia that display an elaborate sorting system of cilia-lined grooves and surfaces that select particles of the right size and density for feeding. In addition, the highly specialized carnivore bivalves in the order Septibranchia have their ctenidia modified as septa that help pump water in, sucking in small crustaceans and other small prey.

Like gastropods, bivalves can live in a highly diverse gamut of habitat conditions: oysters permanently attach themselves to hard substrates, mussels and ark shells live temporarily attached by bundles of protein fibers called byssus, most clams burrow in sand or mud, and representatives of a number of different families can bore themselves for life into rock, wood, or other hard substrates.

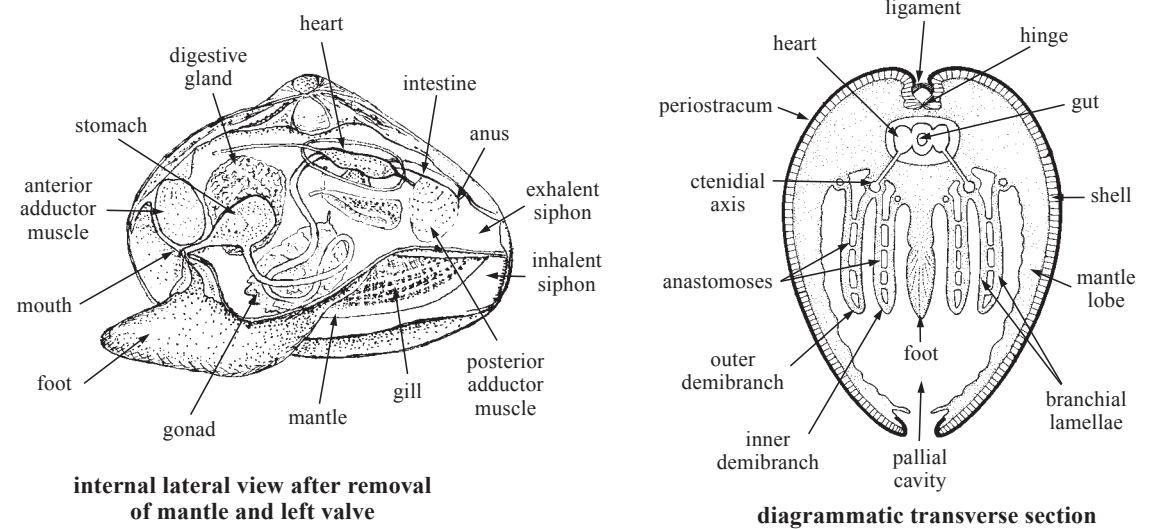
Reproduction in bivalves is mostly through external fecundation and, like gastropods, bivalves display a wide range of modes of development, from species having planktotrophic, long-duration veliger stages to those brooding their offspring in the mantle cavity.

The total catch by weight in 2000 for bivalves in Fishing Area 31 was 283 135 t, which represents about 15% of the total catch for the area. The American cupped oyster, *Crassostrea virginica*, comprised 222 866 t of the total for bivalves for that year.

TECHNICAL TERMS AND MEASUREMENTS



main features of a bivalve shell



general anatomy of bivalves

GLOSSARY OF TECHNICAL TERMS

Albino - shell lacking normal pigmentation.

Anterior - region situated near the head. In bivalves: region opposite to the siphons, consequently, opposite to the shell sinus.

Beak - same as umbo.

Bivalve - molluscs that have, among other features, shell comprised of 2 halves, or valves.

Byssal - position relative to byssus.

Byssal gap - gap or opening sometimes present on the ventral margin of bivalve shells for passage of byssus.

Byssus - bundle of fibers secreted by some bivalves attaching the animal to the bottom. Mussels, some arks, and pen shells are attached to the substrate by byssus.

Cancellate - cross-barred sculpture. In bivalves, radial and concentric elements will cross to produce a cancellate sculpture.

Chondrophore - depression in spoon-like form housing the internal ligament of some bivalve shells.

Chomata - marginal crenulations in Ostreidae and Gryphaeidae, occurring all around the inner side of valves or only near the hinge, composed of small tubercles or ridgelets on the right valve, and corresponding pits on the left valve.

Compressed - outline of bivalves which are flattened laterally.

Concentric - feature of sculptural elements curving about the umbo in bivalves.

Cord - element of gastropod shell sculpture, usually spirally oriented, thicker than lines.

Cordlet - same as cord.

Corrugated - appearance of surfaces forming wrinkles.

Crenulated - appearance of surfaces which are delicately notched or corrugated. Usually applied to wrinkled shell margin or edge.

Crenulations - notches, or wrinkles which are small and delicate.

Depressed - outline of low, pressed-down gastropod shells. OBS: Term usually applied to some top shells or baby ear.

Dorsal - in bivalves, the region of the hinge.

Elongate - shell with length significantly larger than width.

Equivalve - characteristic of bivalves that have the 2 valves or halves of same size.

Escutcheon - an area of the posterodorsal shell surface near a ligament that is differentiated by sculpture and frequently demarcated by a marginal ridge or furrow.

Excavated - appearance of a hollow, concave surface.

Foliated - characteristic of being leaf-like.

Foot - in bivalves, hatchet-like, expandable structure involved in burrowing.

Glassy - surface resembling glass, vitreous, transparent.

Granulated - surface covered with minute grains, pustules, or beads.

Growth lines - lines on shell surface indicative of alternating periods of growth and rest; sometimes corresponding to seasonal changes.

Hinge - region of the bivalve shell where the two valves are joined together, usually including interlocking teeth and the ligament.

Hinge teeth - projections that interlock on the inner side of the bivalve shell hinge helping to prevent the two valves from sliding sideways past each other.

Horny - substance that is hardened, proteinaceous; partially or completely forming the ligament, shell periostracum, and possibly other structures.

Incised lines - features of shell sculpture represented by cuts or narrow grooves on the shell surface.

Indented - surface bearing an indentation.

Inequivalve - characteristic of having the two valves (halves) of different size.

Inflated - characteristic of being 'fat', rotund, and frequently lightweight.

Interspaces - spaces between sculptural features, e.g., ribs, costae, or cords.

Juvenile - characteristic of being young, immature, not fully grown.

Knob - large nodule, rounded projection.

Knobbed - surface bearing knobs.

Lamella - thin plate or blade-like projection

Lamellation - same as lamellae.

Ligament - structure that is horny, proteinaceous, acting as a spring tending to keep the valves opened in bivalve shells. Usually situated in the region of the hinge, either internally or externally.

Line - sculptural feature narrowly incised on shell surface.

Lunule - impression on the external side of the hinge, anterior to the umbo, usually heart-shaped.

Mantle - fleshy sheet surrounding vital organs and composed of 2 lobes, one lining and secreting each valve.

Margin - edge of shell.

Nacreous - characteristic of being iridescent, like mother-of-pearl.

Nodules - projections which are rounded as tubercules.

Nodulose - surface bearing nodules.

Notch - cut or depression, as on a shell margin.

Opalescent - characteristic of being whitish, but with nacreous luster.

Ovate - characteristic of having the form of an egg.

Oval - same as ovate.

Pallial line - fine scar-like impression present internally; in bivalve shells produced by the edge of the mantle.

Periostracum - layer of the outside part of the shell. It is horny and sometimes hair-like.

Plication - same as fold.

Posterior - in bivalves, the region of the shell sinus away from the foot.

Prodissoconch - shell in larval state remaining on the umbonal region of well-preserved bivalve shells.

Radial - structures that are directed away from the umbo toward the shell margin in bivalve shells.

Radiating - same as radial.

Reticulate - feature of shell sculpture consisting of criss-crossed, net-like texture formed by the intersection of lines at right angles.

Reticulated - same as reticulate.

Ribs - structural elements forming a well-defined, narrow ridge in gastropod shells. Term usually applied to those elements forming a plane with (or slightly oblique to) shell axis.

Riblets - diminutive of ribs.

Scales - sculptural elements that are small, raised, and plate-like.

Septum - partition found in the internal side of gastropod shells; characteristic of slipper-shells.

Serrated - outline resembling tiny saw teeth.

Shell sinus - embayment on the pallial line of bivalve shells that correspond to the position of the siphons.

Siphon - prolongation of the mollusc mantle used to convey water into or out of the mantle cavity.

Spiral - direction following the coiling of the gastropod shell. Usually applied as a modifier to sculptural terms such as 'spiral cords'.

Striation - fine, repeated lines or furrows on shell surface.

Suture - line or region of junction between two adjacent whorls in the gastropod shell.

Synonym - a scientific name applied to a species that has received an earlier name. Usually, the earlier name is the valid one.

Thread - same as line.

Trigonal - same as triangular.

Umbo (pl. umbones) - projected portion of the hinge. OBS: First-formed part of the bivalve shell.

Varix (pl. varices) - axial sculptural element that is more prominent than a costa, and usually more widely spaced; evidence of a growth halt during which a thickened lip develops.

Valve - one half of the bivalve shell.

Ventral - region of the animal opposite the dorsal region; usually region of the foot in bivalves.

GUIDE TO FAMILIES OCCURRING IN THE AREA

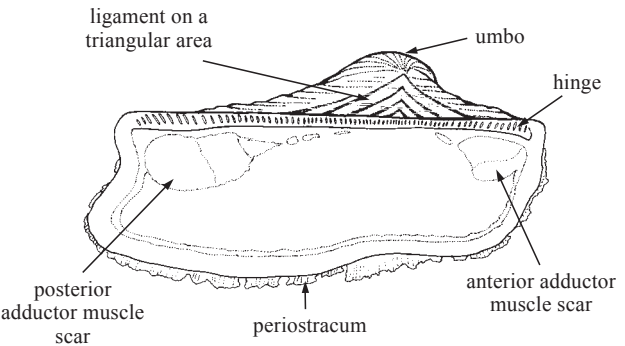
The following guide is intended to facilitate the identification of marine or brackish-water bivalve families regularly exploited or occasionally found in markets of the area. Additionally included are those families that are similar to exploited families but do not contain species that are regularly utilized. The families in this guide represent only a small part of the bivalve fauna occurring in the area, and it is probable that their number will increase once we have better information on the fisheries and utilization of this group of resources.

ARCIDAE

p. 41

Ark shells

Three species of interest to fisheries in the area.

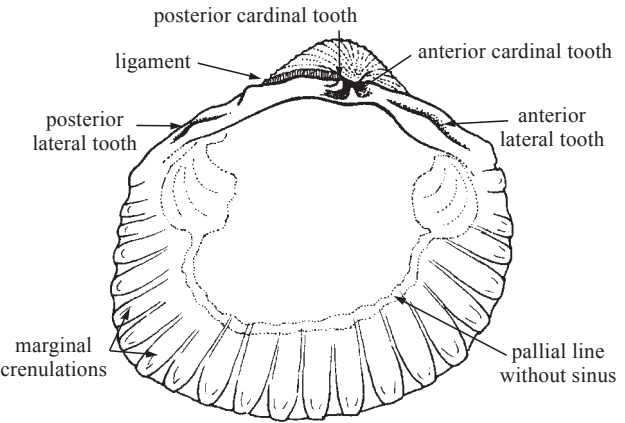


CARDIIDAE

p. 46

Cockles

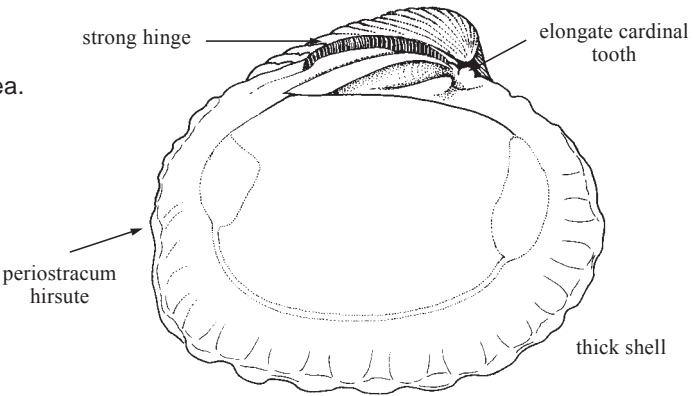
Two species of interest to fisheries in the area.



CARDITIDAE

Carditas

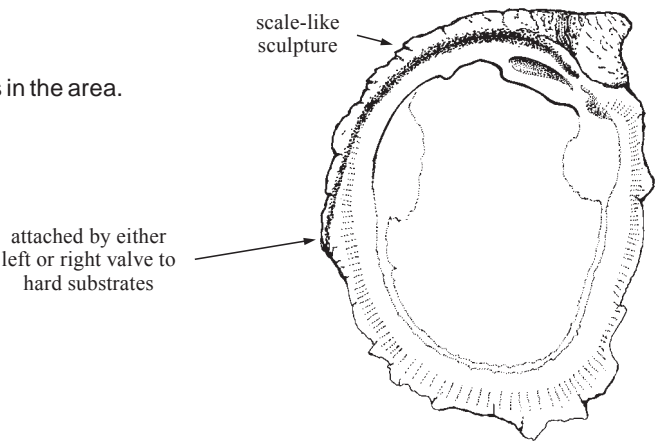
No species of interest to fisheries in the area.



CHAMIDAE

Jewel box shells

No species of interest to fisheries in the area.

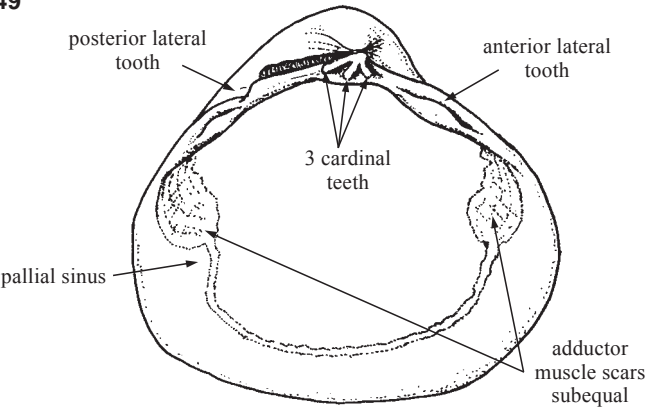


CORBICULIDAE

p. 49

Marsh clams

Three species of interest to fisheries in the area.

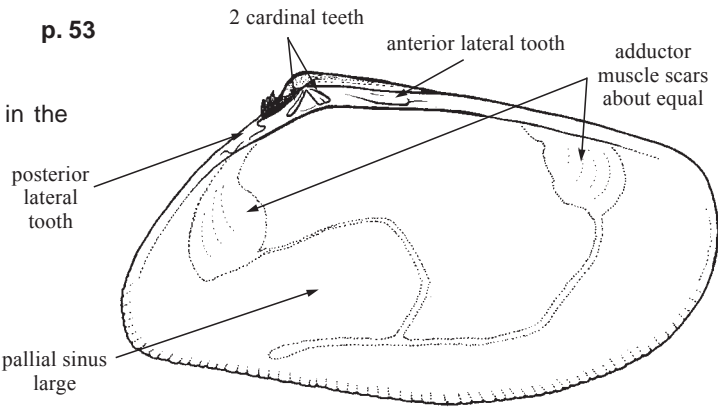


DONACIDAE

p. 53

Donax clams

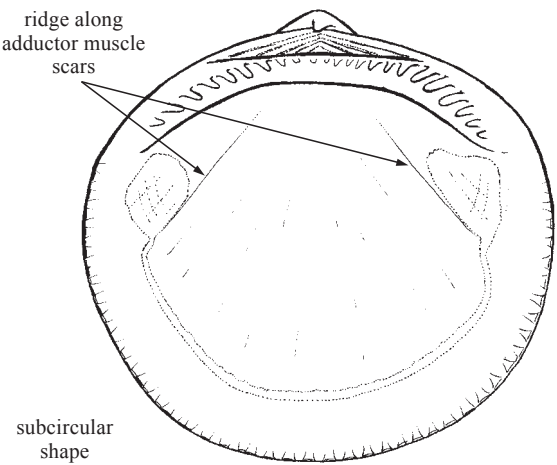
Three species of interest to fisheries in the area.



GLYCYMERIDIDAE

Bittersweet clams

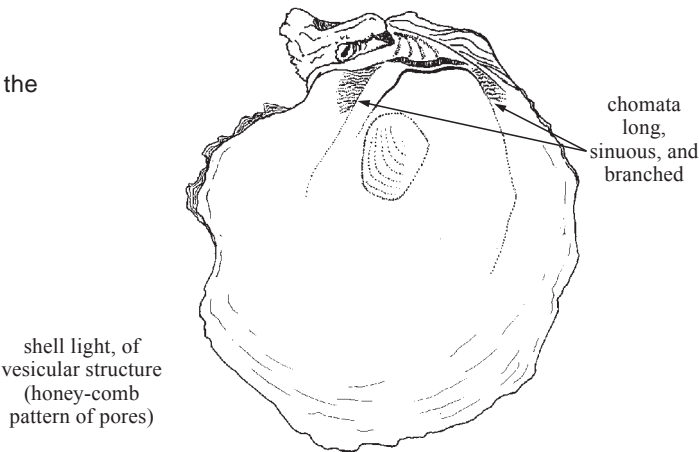
No species of interest to fisheries in the area.



GRYPHAEIDAE

Honeycomb oysters

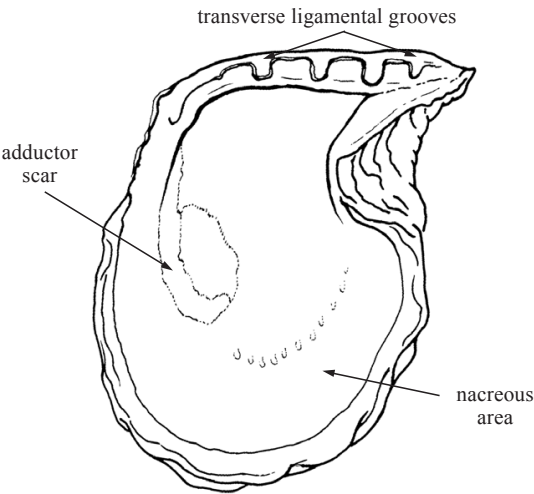
No species of interest to fisheries in the area.



ISOGNOMONIDAE

Tree oysters

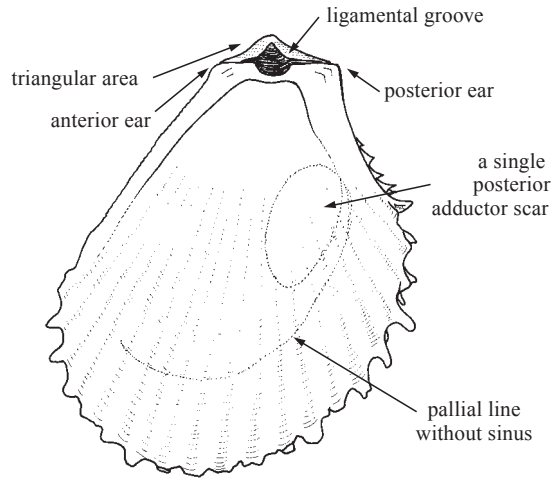
No species of interest to fisheries in the area.



LIMIDAE

File shells

No species of interest to fisheries in the area.

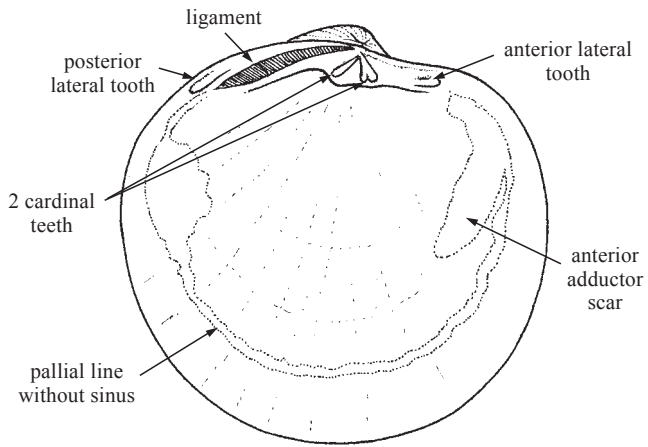


LUCINIDAE

p. 57

Lucinas

One species of interest to fisheries in the area.

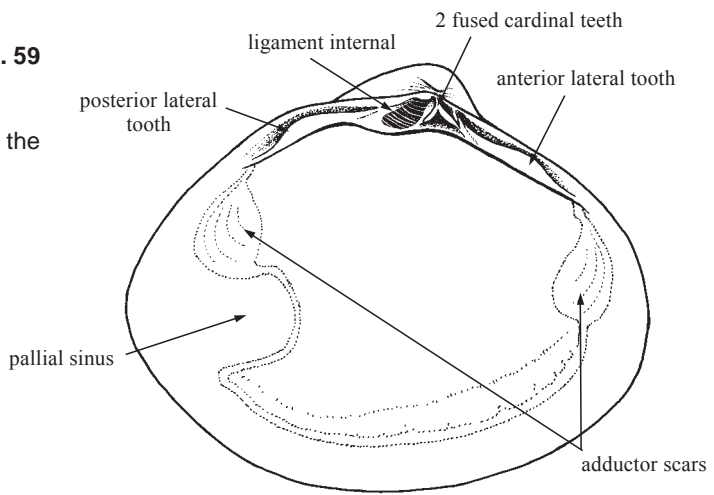


MACTRIDAE

p. 59

Trough shells

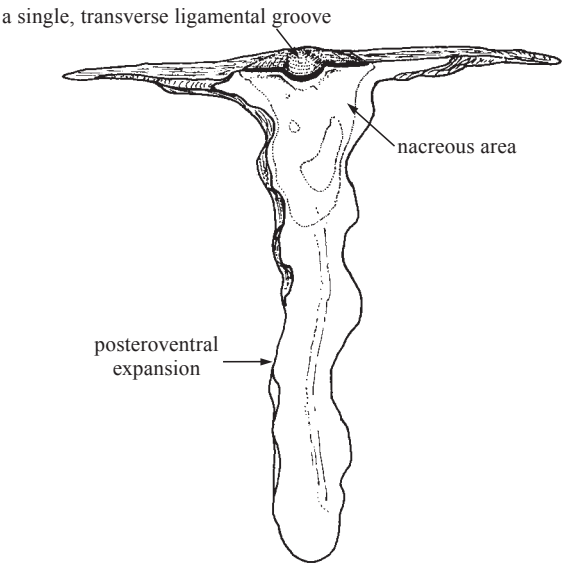
Two species of interest to fisheries in the area.



MALLEIDAE

Hammer oysters

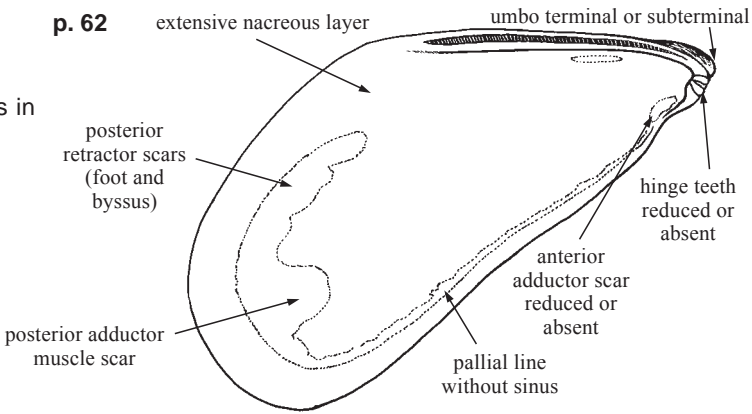
No species of interest to fisheries in the area.



MYTILIDAE

Sea mussels

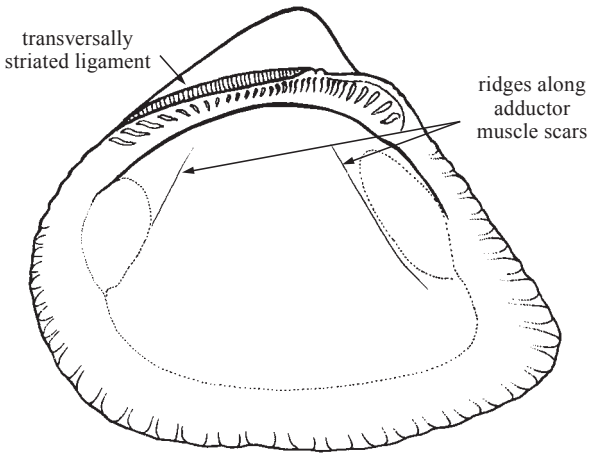
Six species of interest to fisheries in the area.



NOETHIDAE

Noetiid ark shells

No species of interest to fisheries in the area.

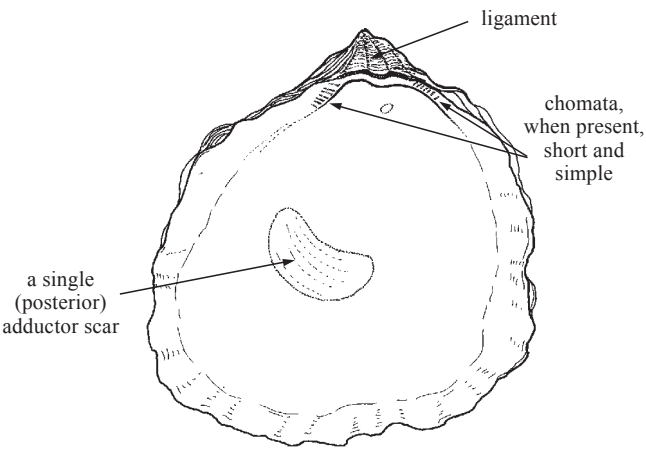


OSTREIDAE

p. 67

Oysters

Two species of interest to fisheries in the area.

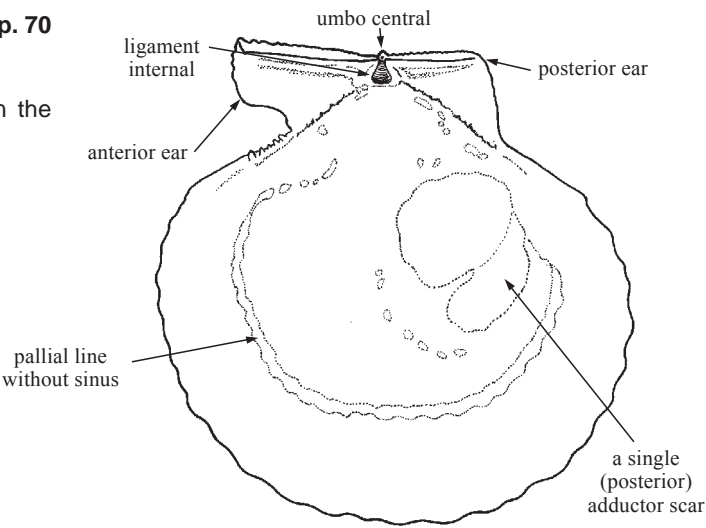


PECTINIDAE

p. 70

Scallops

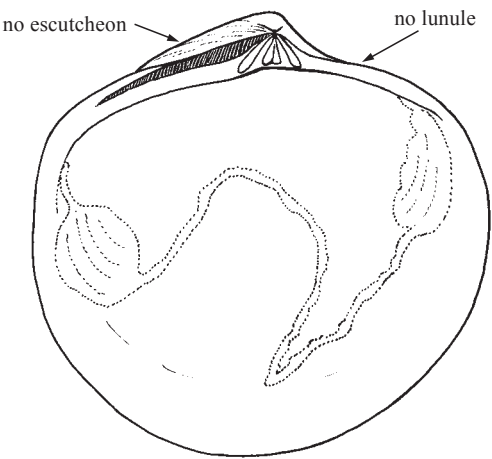
Four species of interest to fisheries in the area.



PETRICOLIDAE

Petricolid clams

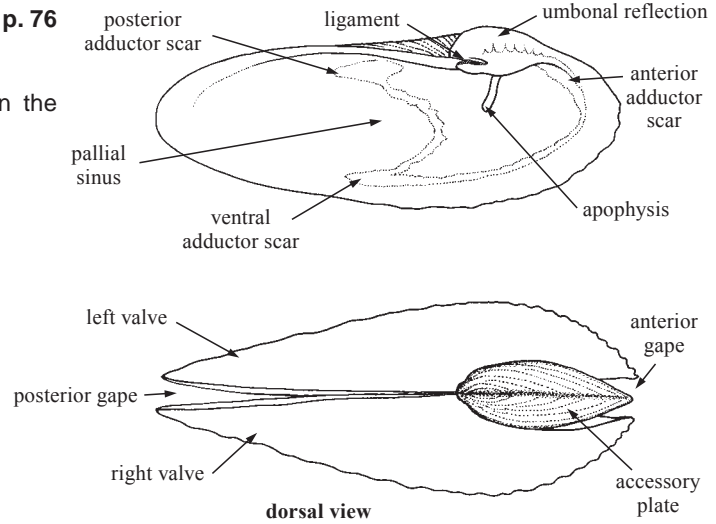
No species of interest to fisheries in the area.



PHOLADIDAE

Angel wings

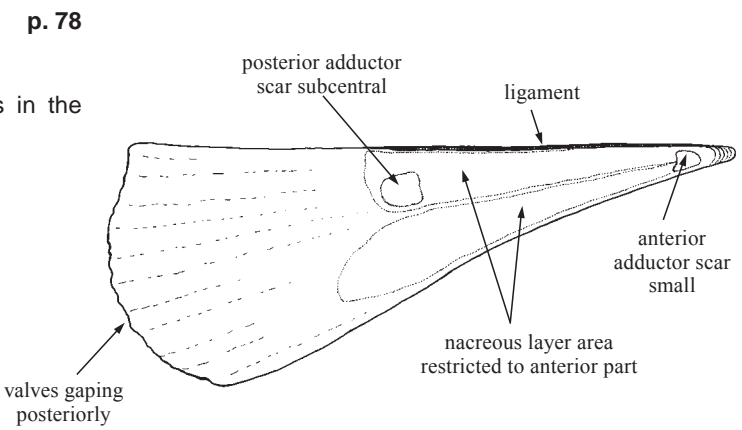
One species of interest to fisheries in the area.



PINNIDAE

Pen shells

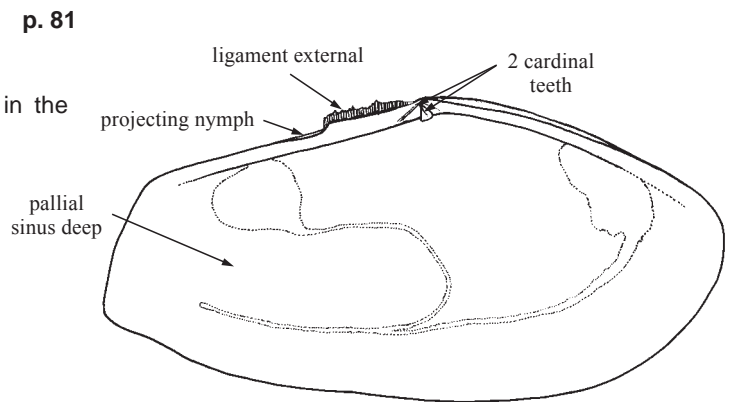
Two species of interest to fisheries in the area.



PSAMMOBIIDAE

Sunset clams, sanguins

One species of interest to fisheries in the area.

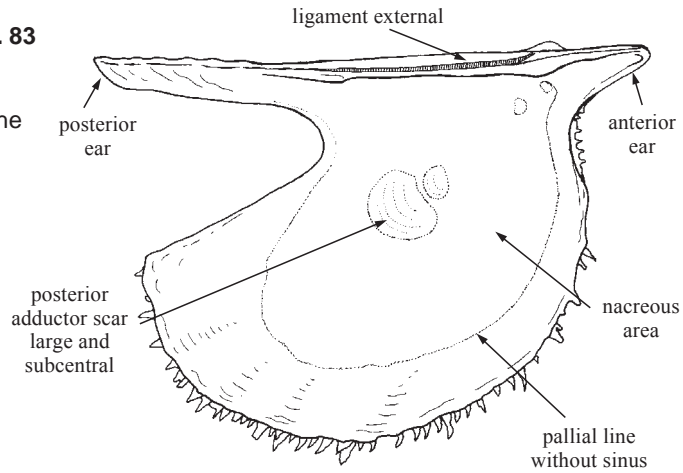


PTERIIDAE

Pearl oysters

One species of interest to fisheries in the area.

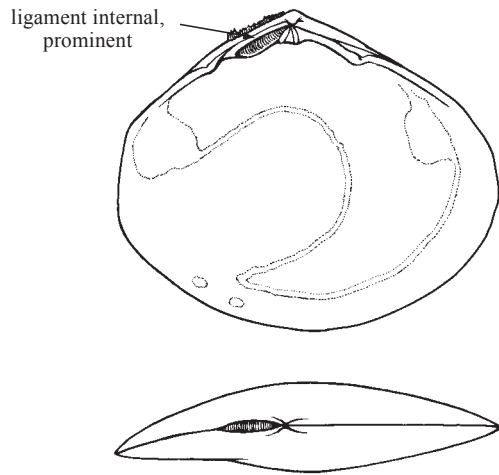
p. 83



SEMELIDAE

Semelids

No species of interest to fisheries in the area.

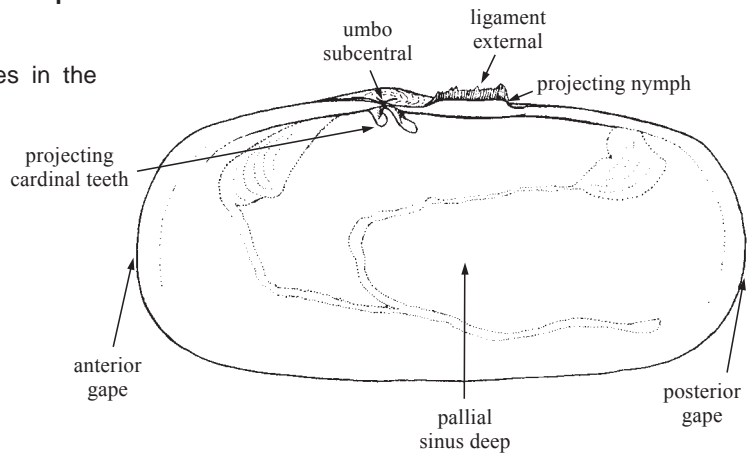


SOLECURTIDAE

Short razor clams

One species of interest to fisheries in the area.

p. 85

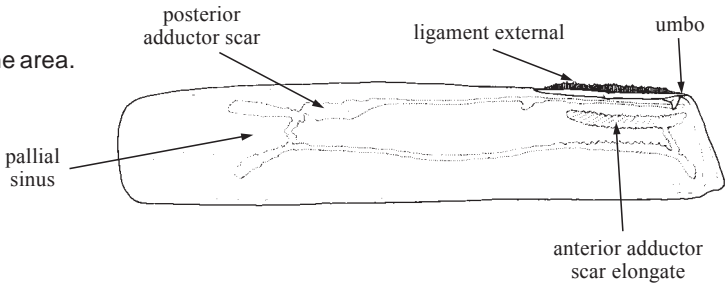


SOLENIDAE

p. 87

Knife and razor clams

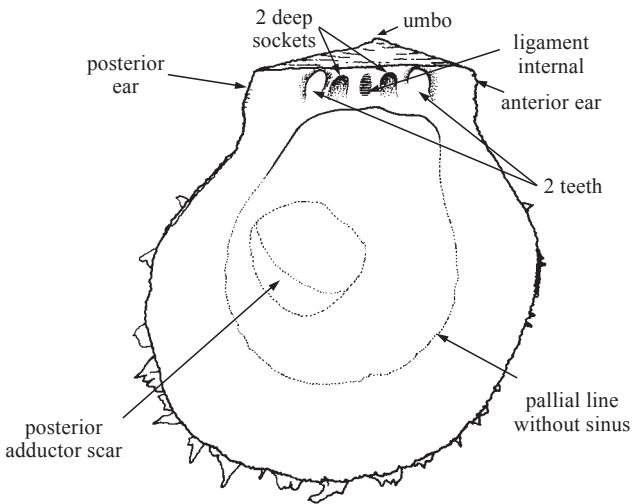
One species of interest to fisheries in the area.



SPONDYLIDAE

Thorny oysters

No species of interest to fisheries in the area.

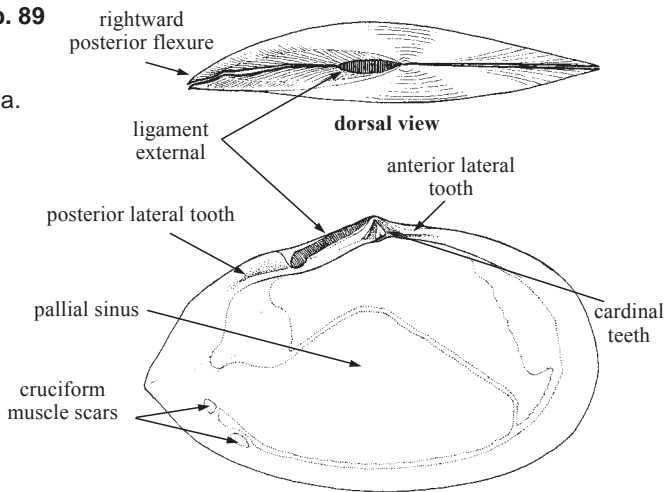


TELLINIDAE

p. 89

Tellins

Two species of interest to fisheries in the area.

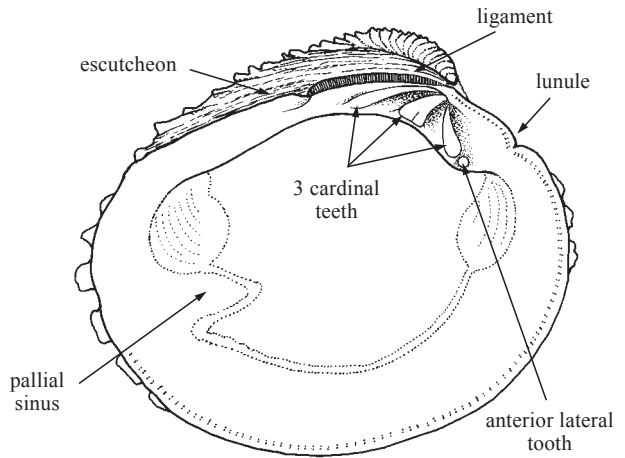


VENERIDAE

p. 92

Venus clams

Five species of interest to fisheries in the area.



**LIST OF FAMILIES AND SPECIES OF INTEREST TO FISHERIES
OCCURRING IN THE AREA**

The symbol 🐚 is given when species accounts are included.

ARCIDAE

- 🐚 *Anadara brasiliiana* (Lamarck, 1819).
- 🐚 *Anadara notabilis* (Röding, 1798).
- 🐚 *Arca zebra* (Swainson, 1833).

CARDIIDAE

- 🐚 *Dinocardium robustum* (Lightfoot, 1786).
- 🐚 *Trachycardium muricatum* (Linnaeus, 1758).

CORBICULIDAE

- 🐚 *Polymesoda caroliniana* (Bosc, 1801).
- 🐚 *Polymesoda triangula* (Philippi, 1849).
- 🐚 *Polymesoda arctata* (Deshayes, 1854).

DONACIDAE

- 🐚 *Donax denticulatus* Linnaeus, 1758.
- 🐚 *Donax striatus* Linnaeus, 1767.
- 🐚 *Iphigenia brasiliiana* (Lamarck, 1818).







LUCINIDAE

- 🐚 *Codakia orbicularis* (Linnaeus, 1758).



MACTRIDAE

- 🐚 *Mactrellona alata* (Spengler, 1802).
- 🐚 *Rangia cuneata* (G. B. Sowerby I, 1831).





MYTILIDAE

-  *Geukensia demissa* (Dillwyn, 1817).
-  *Modiolus americanus* (Leach, 1815).
-  *Modiolus squamosus* Beuperthuy, 1867.
-  *Mytella guyanensis* (Lamarck, 1819).
-  *Mytella strigata* (Hanley, 1843).
-  *Perna perna* (Linnaeus, 1767).

OSTREIDAE

-  *Crassostrea rhizophorae* (Guilding, 1828).
-  *Crassostrea virginica* (Gmelin, 1791).



PECTINIDAE

-  *Amusium laurenti* (Gmelin, 1791).
-  *Argopecten gibbus* (Linnaeus, 1758).
-  *Argopecten irradians* (Lamarck, 1819).
-  *Euvola ziczac* (Linnaeus, 1758).

PHOLADIDAE

-  *Cyrtopleura costata* (Linnaeus, 1758).

PINNIDAE

-  *Atrina rigida* (Lightfoot, 1786).
-  *Atrina seminuda* (Lamarck, 1819).

PSAMMOBIIDAE

-  *Asaphis deflorata* (Linnaeus, 1758).

PTERIIDAE

-  *Pinctada imbricata* (Röding, 1798).

SOLECURTIDAE

-  *Tagelus plebeius* (Lightfoot, 1786).






SOLENIDAE

-  *Solen obliquus* Spengler, 1794.

TELLINIDAE

-  *Tellina fausta* Pulteney, 1799.
-  *Tellina laevigata* Linnaeus, 1758.

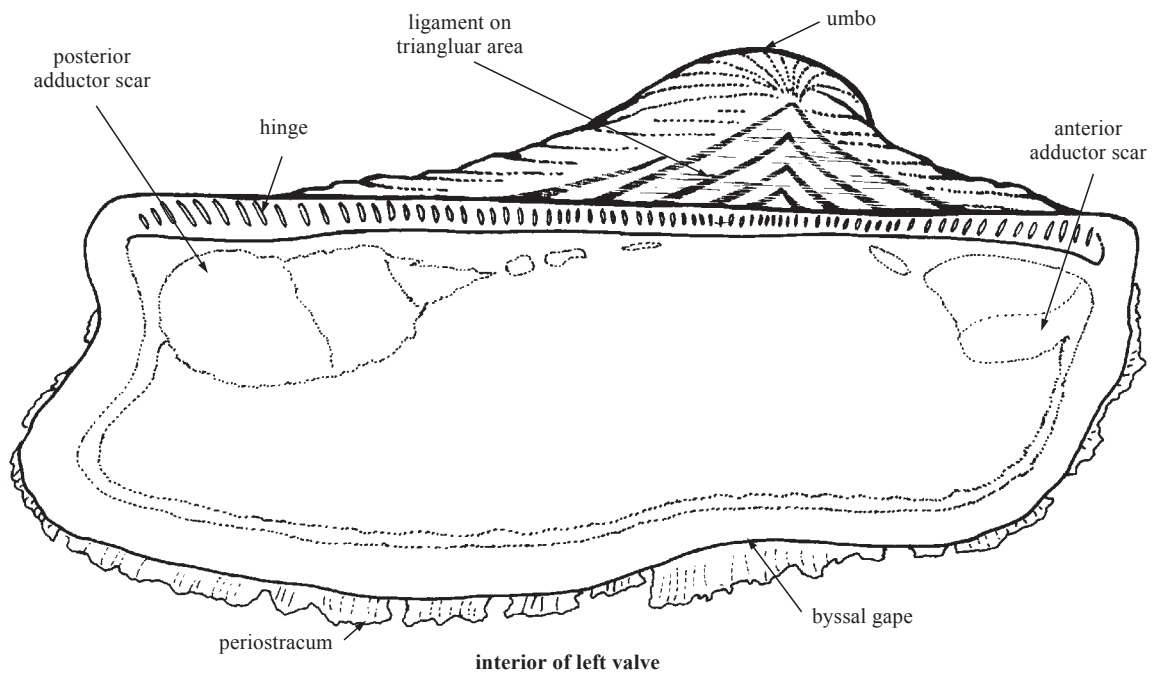
VENERIDAE

-  *Chione cancellata* (Linnaeus, 1767).
-  *Macrocallista maculata* (Linnaeus, 1758).
-  *Macrocallista nimbosa* (Lightfoot, 1786).
-  *Mercenaria campechiensis* (Gmelin, 1791).
-  *Tivela mactroides* (Born, 1778).

ARCIDAE

Ark shells

Diagnostic characters: Shells very thick, heavy, box-like. Hinge with a large number of teeth perpendicular to main shell axis, usually of equal size and perpendicular to main shell axis. Usually with thick, dark periostracum.



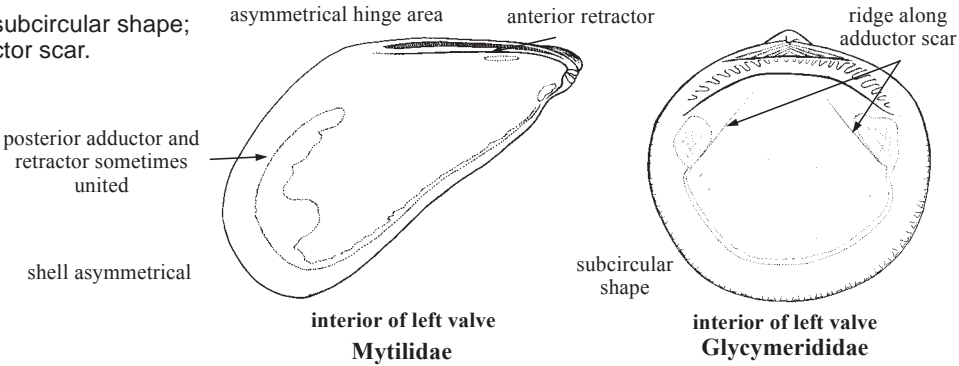
Habitat, biology, and fisheries: Most representatives of the family (for example, the genera *Arca* and *Barbatia*) live attached by byssus to the underside of rocks, coral heads, and other hard substrates. Other species (for example, the genus *Anadara*) live buried in sandy mud.

Remarks: Species listed are edible and mostly collected for food in the southern half of the area. Not usually eaten in the USA because of their bitter taste and because of the hemoglobin content of the blood in some species.


Similar families occurring in the area




Mytilidae: shell elongate, with umbones near or at anterior end; ligament in anterior margin; hinge without teeth or with tiny denticles; internal surface nacreous; adductor muscle scars differing in size, the anterior small or absent.

Glycymerididae: subcircular shape; ridge along adductor scar.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

-  *Anadara notabilis* (Röding, 1798).
-  *Arca zebra* (Swainson, 1833).
-  *Scapharca brasiliana* (Lamarck, 1819).

References

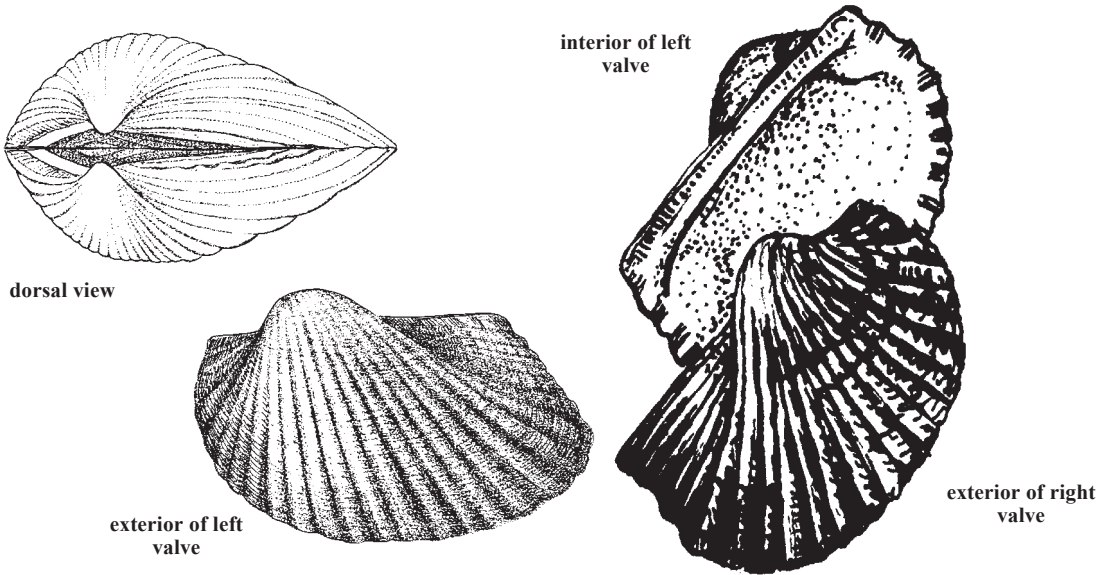
- Manrique, R. 1982. *Estudio de la producción y algunos aspectos ecológicos de la pepitona roja Anadara notabilis del Golfo de Cariaco*. Tesis Licenciatura en Biología, Universidad de Oriente, Cumaná, Venezuela, 94 p.
- Waller, T. R. 1980. Scanning electron microscopy of shell and mantle in the order Arcoida (Mollusca: Bivalvia). *Smithsonian Contr. Zool.*, 313:1-58.

***Anadara notabilis* (Röding, 1798)**

NDL

Frequent synonyms / misidentifications: None / *Scapharca brasiliiana* (Lamarck, 1819).

FAO names: En - Eared ark; Fr - Arche auriculée; Sp - Arca auriculada.

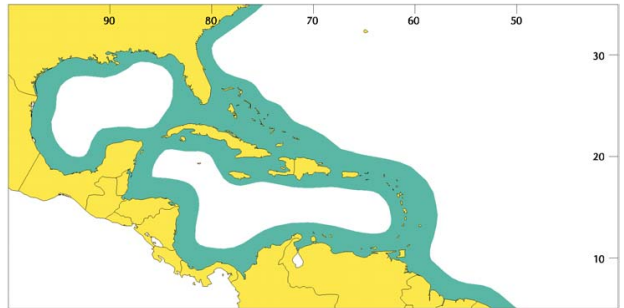


Diagnostic characters: Shell heavy, sturdy, inequivalve, with one valve slightly larger than the other. Anterior end short and rounded, posterior end longer and angled. Hinge straight. Sculpture of 25 to 27 radial ribs crossed by fine concentric lines prominent between ribs. Ribs never bifurcated. Umbones prominent, ligamental area large, hinge long, straight. Periostracum heavy. **Colour:** white; periostracum brown.

Size: To 90 mm.

Habitat, biology, and fisheries: Soft bottoms (mud or sand), sometimes in seagrass environments, at shallow intertidal depths. Consumed locally in soups and chowders.

Distribution: North Carolina to eastern Florida, Caribbean, south to Brazil.

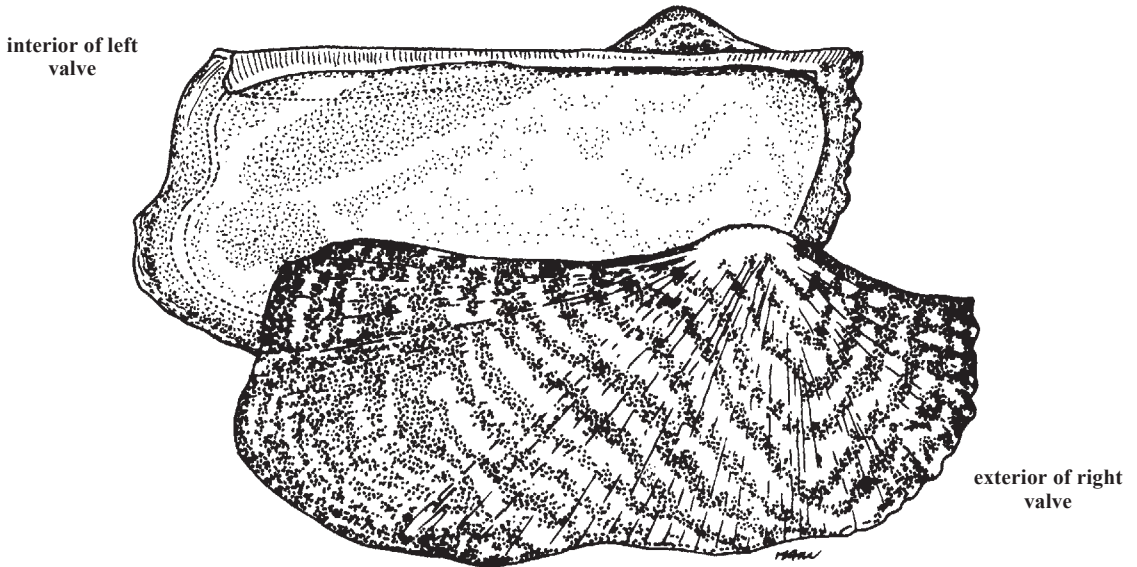


Arca zebra (Swainson, 1833)

RQZ

Frequent synonyms / misidentifications: None / *Arca imbricata* Bruguière, 1789

FAO names: En - Turkey wing; Fr - Arche zèbre; Sp - Arca cebra.

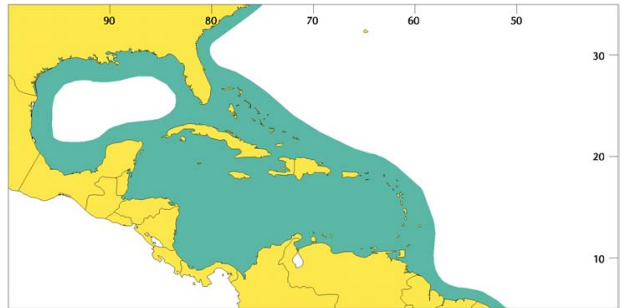


Diagnostic characters: Shell rectangular, elongate (twice as long as wide), equivalve. Sculpture of about 24 to 30 irregular radial ribs, and fine concentric threads that cross-ribs and interspaces. Byssal gap present opposite to hinge, moderately narrow. Hinge long, straight. **Colour:** creamy white, streaked with reddish to dark brown wavy bands. Periostracum brown and dense on fresh shells, covering colour pattern almost completely.

Size: To 100 mm.

Habitat, biology, and fisheries: Attached to the underside of rocks and coral heads by byssus. A relatively important resource in the southern half of the area (e.g., Venezuela), although detailed data about its fisheries are not available.

Distribution: North Carolina to Florida, Texas, Caribbean, south to Brazil, and Bermuda.

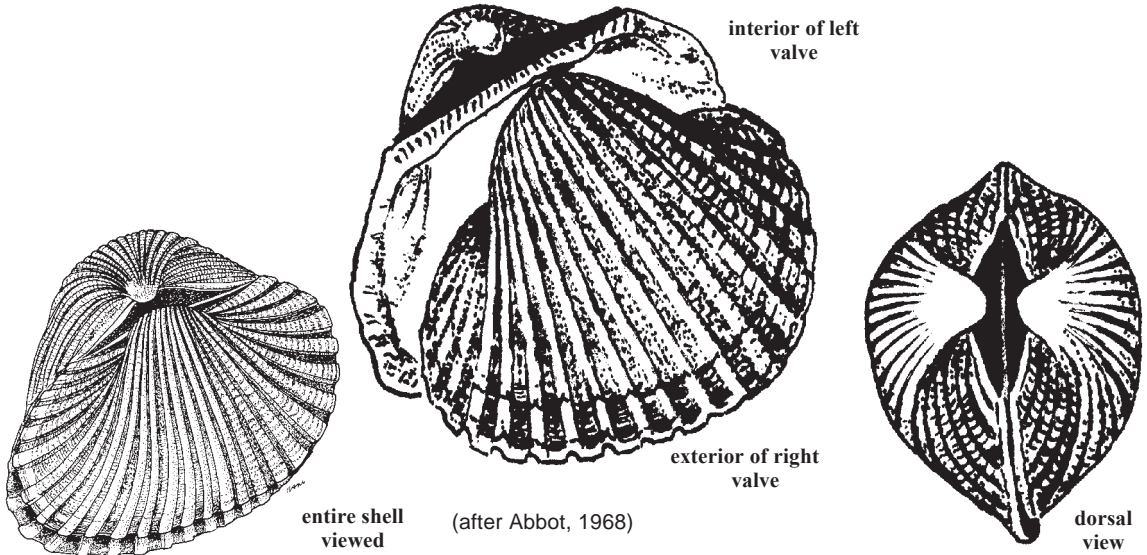


Scapharca brasiliiana (Lamarck, 1819)

FCR

Frequent synonyms / misidentifications: None / *Anadara notabilis* (Röding, 1798).

FAO names: En - Incongruous ark; Fr - Arche incongrue; Sp - Arca pepitona.

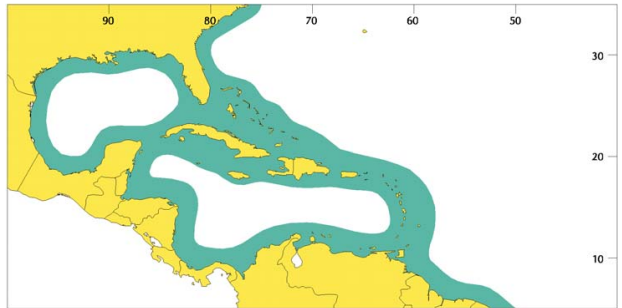


Diagnostic characters: Shell heavy, sturdy, almost as high as long, inequivalve, with left valve overlapping right. Sculpture of 26 to 28 radial ribs of square cross-section, each with prominent beads. Umbones facing each other. Hinge straight, ligament short, ligamental area with transversal striations. Periostracum thin. **Color:** white, periostracum light brown.

Size: To 78 mm.

Habitat, biology, and fisheries: On sand, shell rubble, and seagrass beds, at shallow subtidal depths. Collected for food mostly in the southern half of the area.

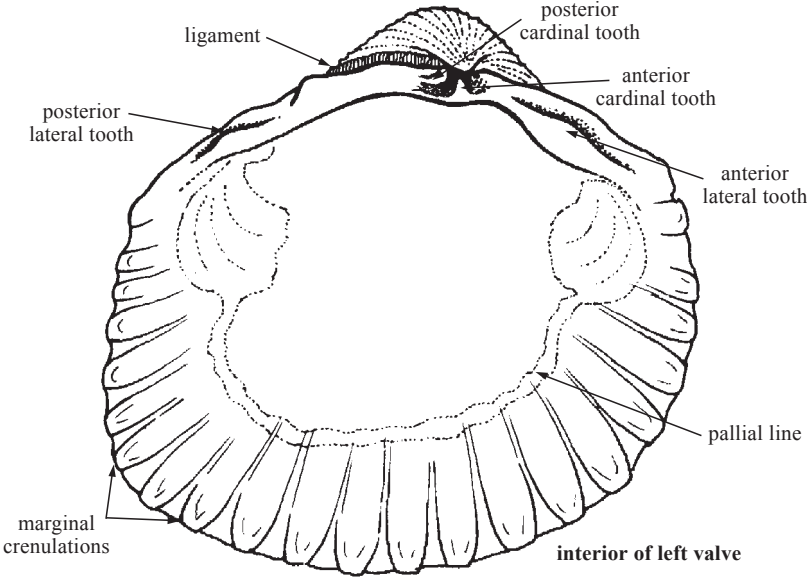
Distribution: North Carolina to Florida, Texas, Caribbean, and south to Brazil.



CARDIIDAE

Cockles

Diagnostic characters: Shell round, large, inflated, usually with strong radial sculpture that yields crenulated shell margins; scales or spines sometimes present along radial sculpture elements. Foot long and strong.

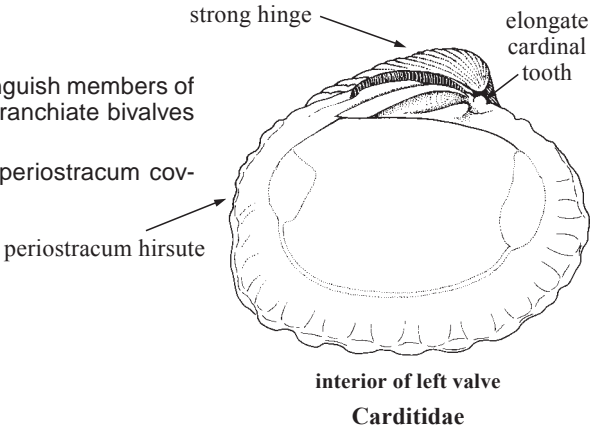


Habitat, biology, and fisheries: In sand, from the intertidal zone to deeper, sublittoral waters. Collected locally for food, mostly in the southern Caribbean.

Similar families occurring in the area

The characteristic features of the hinge easily distinguish members of the Cardiidae from other radially ribbed eulamellibranchiate bivalves such as the Carditidae.

Carditidae: hinge strong; cardinal tooth elongate; periostracum covered with hairy projections.



List of species of interest to fisheries occurring in the area

The symbol 🐚 is given when species accounts are included.

🐚 *Dinocardium robustum* (Lightfoot, 1786).

🐚 *Trachycardium muricatum* (Linnaeus, 1758).

References

Schneider, J.A. 1992. Preliminary cladistic analysis of the bivalve family Cardiidae. *Am. Malac. Bull.*, 9(2):145-155.
Schneider, J.A. 1995. Phylogeny of the Cardiidae (Mollusca, Bivalvia): Protocardiinae, Laevicardiinae, Lahiliinae, Tulongoncardiinae subfam. n. and Pleurocardiinae subfam. n. *Zool. Scripta*, 24(4):321-346.

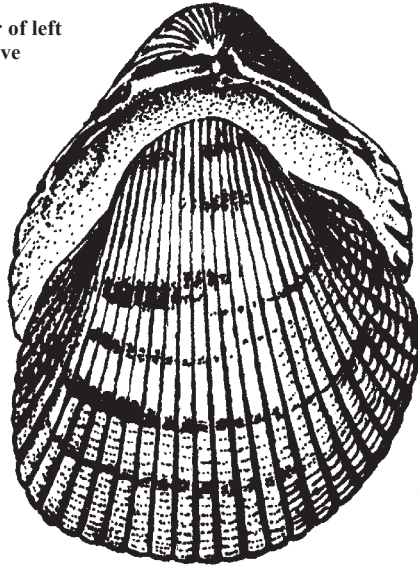
Dinocardium robustum (Lightfoot, 1786)

DKR

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Giant Atlantic cockle (AFS: Atlantic giant cockle); **Fr** - Bucarde géant de l'Atlantique; **Sp** - Berberecho del Atlántico.

interior of left
valve



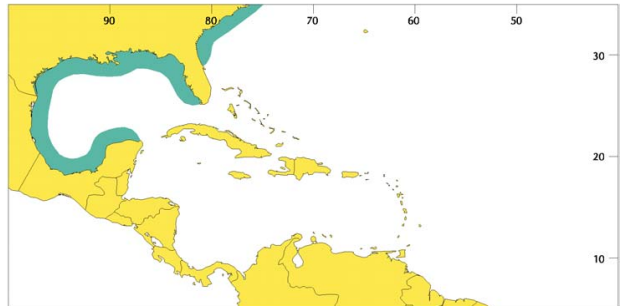
exterior of right
valve

Diagnostic characters: Shell very large for family, inflated, obliquely ovate. Sculpture of about 32 to 36 rounded, smooth radial ribs. Pallial line simple. Margins crenulated. Umbones rounded. **Colour:** pale tan to yellowish brown, mottled irregularly with red-brown. Posterior slope mahogany brown. Interior salmon pink.

Size: To 125 mm.

Habitat, biology, and fisheries: Buried in sand in shallow subtidal environments. Hand-collected, consumed locally in chowders and soups.

Distribution: Virginia to Florida, Texas, and Mexico.

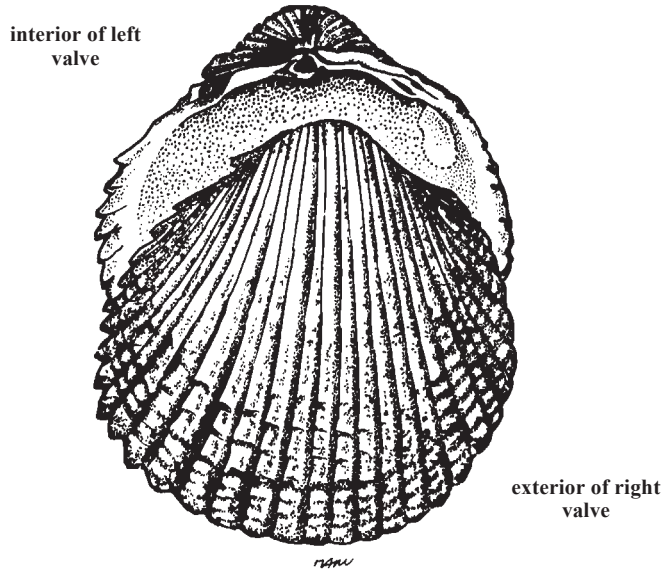


Trachycardium muricatum (Linnaeus, 1758)

TIX

Frequent synonyms / misidentifications: None / *Trachycardium egmontianum* (Shuttleworth, 1856); *Trachycardium magnum* (Linnaeus, 1758).

FAO names: **En** - American yellow cockle (AFS: Yellow prickly cockle); **Fr** - Bucarde jaune; **Sp** - Berberecho amarillo.

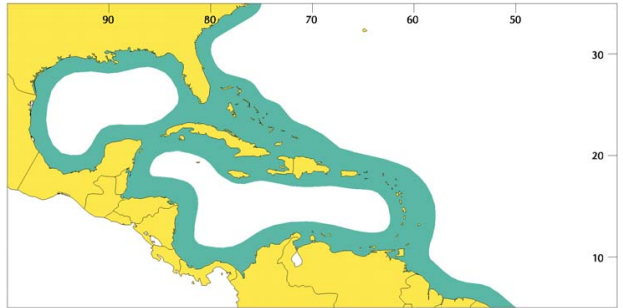


Diagnostic characters: Shell with circular to oval outline, equivalve, higher than long. Sculpture of 30 to 40 radial ribs with sharp scales. Scales less prominent on central ribs. Hinge well developed. **Colour:** externally light cream with irregular patches of brownish red or yellow; internally white, rarely yellowish.

Size: To 50 mm.

Habitat, biology, and fisheries: Buried in sand in moderately shallow subtidal conditions, sometimes in coral reef environments. Collected by hand, consumed locally in stews, chowders, and soups.

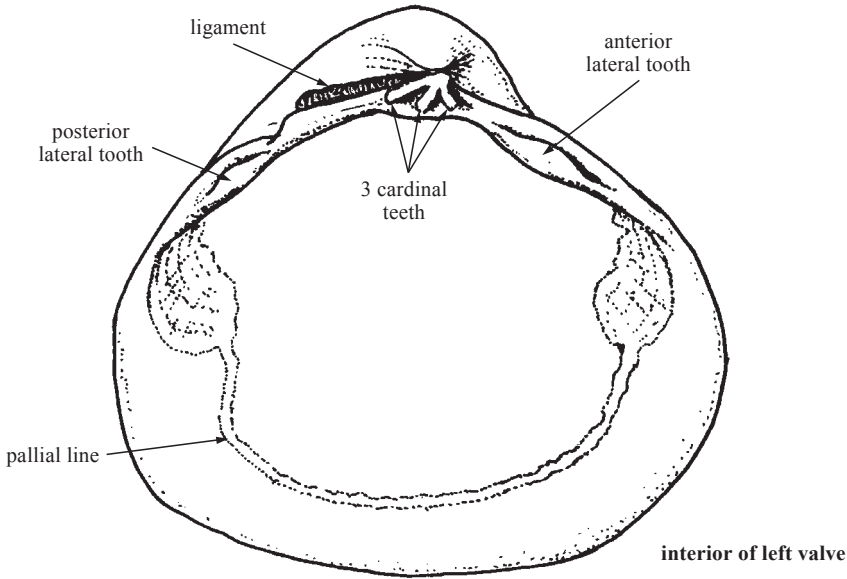
Distribution: North Carolina to Florida, Texas, Caribbean, and south to Brazil.



CORBICULIDAE

Marsh clams

Diagnostic characters: Shell oval to triangular. No lunule or scutcheon. Hinge with 3 cardinal teeth in either valve. Pallial sinus short to absent.

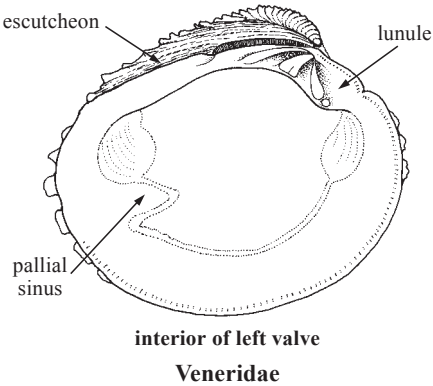


Habitat, biology, and fisheries: Buried in mud in estuaries, coastal lagoons, and other brackish-water environments. The listed species are consumed locally.


Remarks: Fisheries for these species in the USA are mainly prevented by restrictions prompted by degradation of enclosed brackish-water habitats.




Similar families occurring in the area

Veneridae: shell usually solid, umbones anterior to midline, lunule and scutcheon usually present, sculpture usually concentric, sometimes lacking; ligament external; hinge with 3 or rarely 2 cardinal teeth in each valve; adductor muscles (and their scars) usually equivalent in size



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

-  *Polymesoda arctata* (Deshayes, 1854).
-  *Polymesoda caroliniana* (Bosc, 1801).
-  *Polymesoda triangula* (Philippi, 1849).

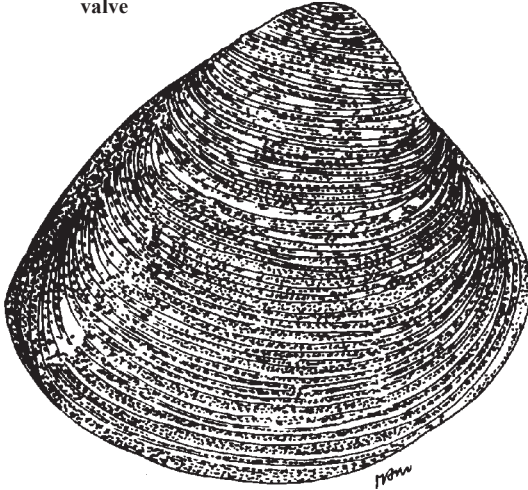
Polymesoda arctata (Deshayes, 1854)

YMK

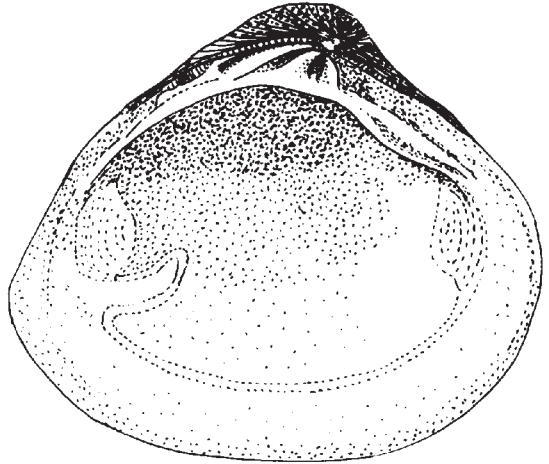
Frequent synonyms / misidentifications: None / *Polymesoda triangula* (Philippi, 1849), *Polymesoda aequilatera* (Deshayes, 1854).

FAO names: **En** - Slender marsh clam; **Fr** - Cyrène élancée; **Sp** - Guacuco de marjal esbelto.

exterior of right
valve



interior of left
valve



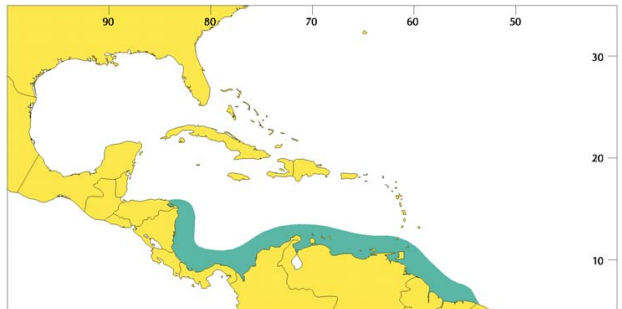
Diagnostic characters: Shell outline subtriangular, as high as long, inflated, heavy, slightly pointed posteriorly. Sculpture of well-defined concentric threads. Hinge with 3 cardinal teeth situated under umbo; 1 anterior and 1 posterior lateral tooth. Lateral teeth smooth. Ligament long, narrow. Periostracum with minute scales, fuzzy. **Colour:** externally cream-white, sometimes tinged with purple or grey, internally white often stained with purple and frequently with darker radial stripes at both ends; periostracum pale or dark brown.

Size: To 40 mm.

Habitat, biology, and fisheries: Infaunal in mud or sandy-mud in estuaries, mangrove swamps and coastal lagoons. Consumed locally, boiled.

Distribution: Southern Caribbean and northern South America.

Remarks: The similar species *Polymesoda aequilatera* (Deshayes, 1854) is apparently restricted to Suriname and Guyana.



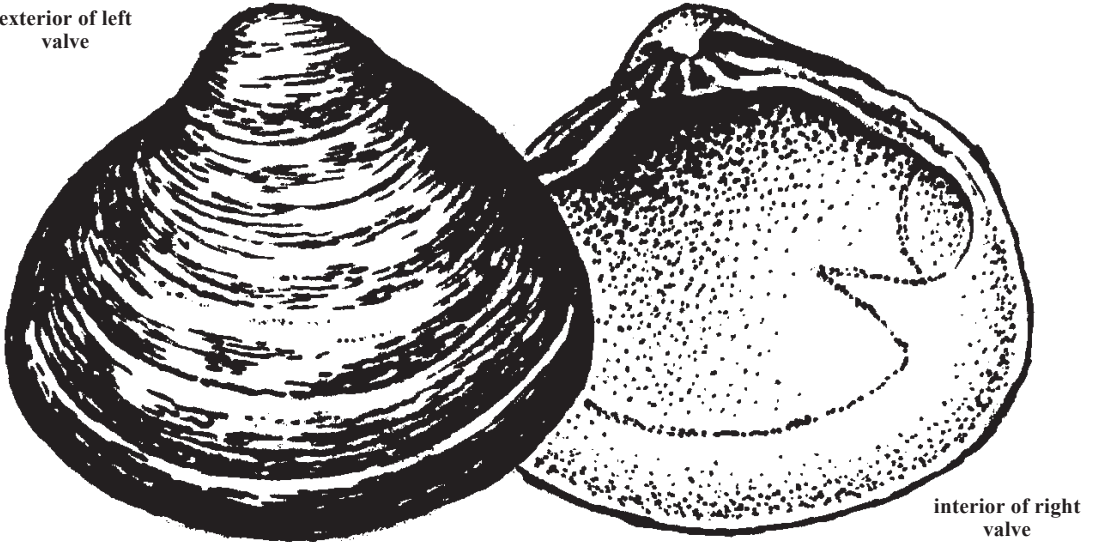
***Polymesoda caroliniana* (Bosc, 1801)**

YMR

Frequent synonyms / misidentifications: None / *Polymesoda triangula* (Philippi, 1849).

FAO names: **En** - Carolina marsh clam; **Fr** - Praire marais de la Caroline; **Sp** - Almeja de marjal.

exterior of left
valve



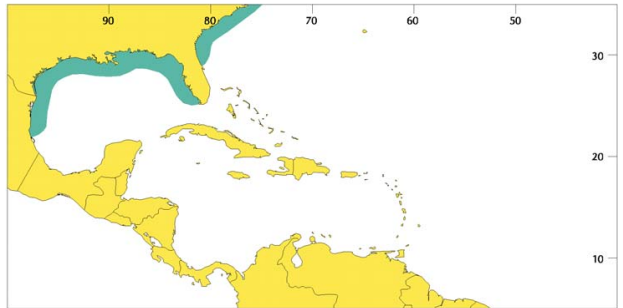
interior of right
valve

Diagnostic characters: Shell outline subtriangular, as high as long, inflated, heavy. Shell smooth, sculpture absent. Hinge with three cardinal teeth situated under umbo; 1 anterior and 1 posterior lateral tooth. Ligament long, narrow. Periostracum with minute scales, fuzzy, thin. **Colour:** externally dull white, internally white rarely stained with purple; periostracum glossy brown.

Size: To 35 mm.

Habitat, biology, and fisheries: Infaunal in mud or sandy mud in estuaries, mangrove swamps, and coastal lagoons. Consumed locally boiled, restrictions due to habitat degradation hamper exploitation in parts of area.

Distribution: Texas and Virginia to northern Florida.

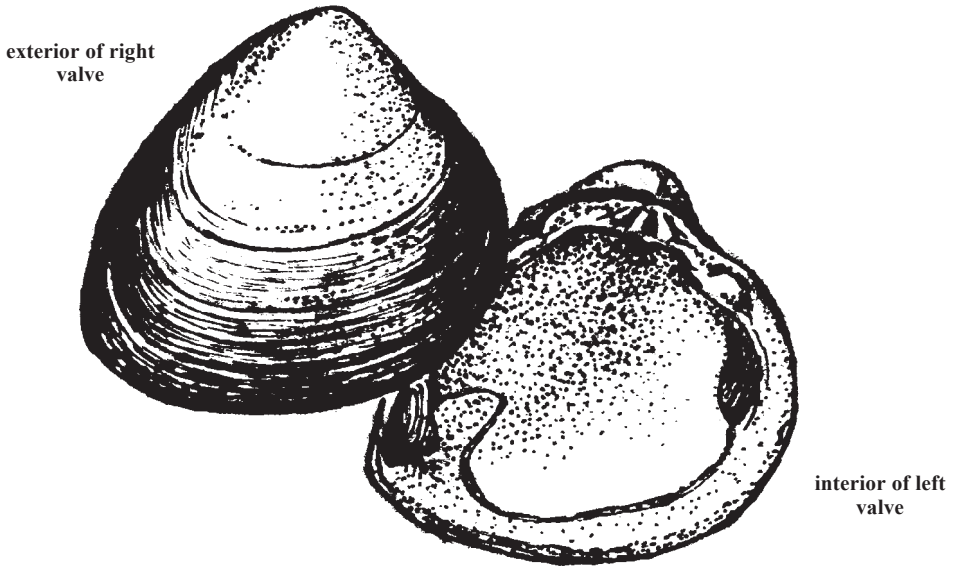


Polymesoda triangula (Philippi, 1849)

YMT

Frequent synonyms / misidentifications: None / *Polymesoda arctata* (Deshayes, 1854), *Polymesoda aequilatera* (Deshayes, 1854).

FAO names: **En** - Triangular marsh clam; **Fr** - Praire marais triangulaire; **Sp** - Almeja de marjal triangular.



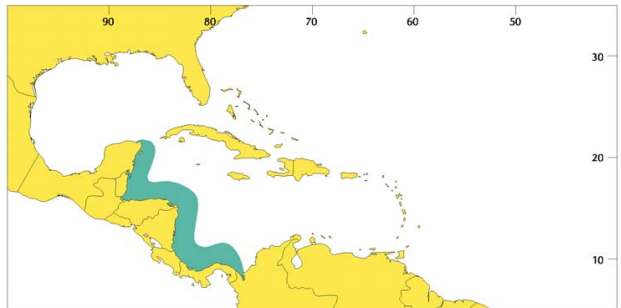
Diagnostic characters: Shell outline triangular, as high as long, inflated, heavy. Shell smooth, sculpture absent. Hinge with 3 cardinal teeth situated under umbo; 1 anterior and 1 posterior lateral tooth. Ligament long, narrow. Periostracum smooth. **Colour:** externally dull white, internally white; periostracum grey to greyish brown.

Size: To 45 mm.

Habitat, biology, and fisheries: Infaunal in mud or sandy mud in estuaries, mangrove swamps, and coastal lagoons. Consumed locally boiled.

Distribution: Mexican Caribbean to Panama.

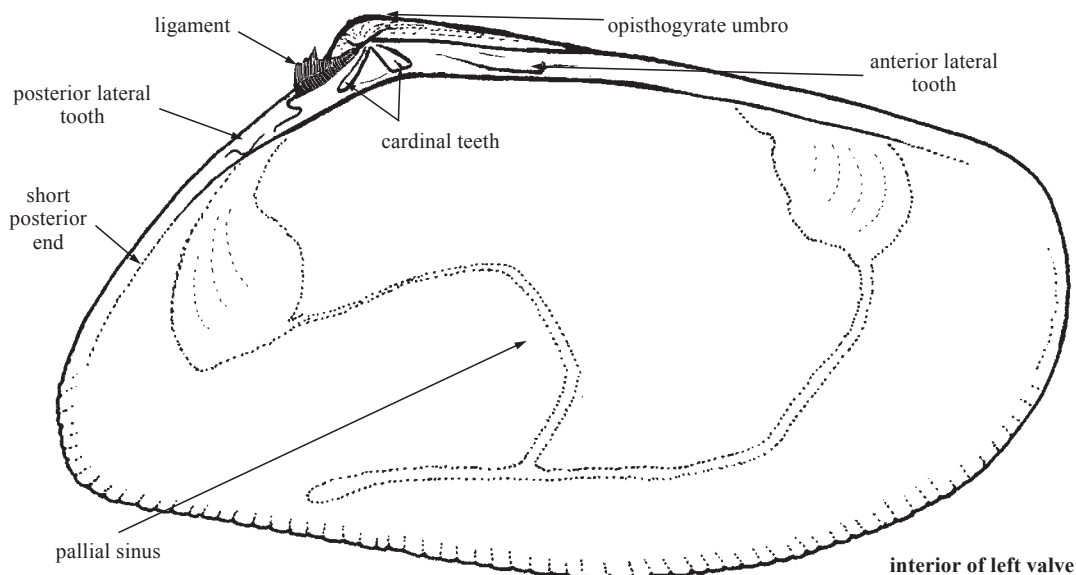
Remarks: The similar species *Polymesoda aequilatera* (Deshayes, 1854) is apparently restricted to Suriname and Guyana.



DONACIDAE

Donax clams

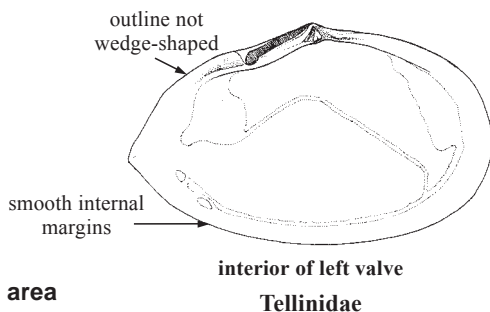
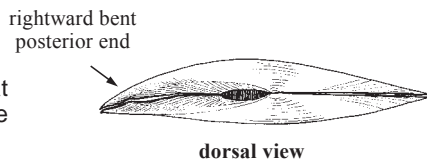
Diagnostic characters: Shell wedge-shaped, usually with an angled (keel-like) posterior surface. Ligament external. Hinge with 2 cardinal teeth on each valve. Adductor muscle scars subequal.



Habitat, biology, and fisheries: Species well-adapted to the intertidal zone of high-energy, sandy beaches. Three species of interest to fisheries in the area. Collected by hand, rakes, dredges, or shovels. Consumed locally raw, marinated, or in chowders.

Similar families occurring in the area

Tellinidae: shell compressed, oval to oblong, usually with flexed at posterior end; sculpture mostly lacking; ligament external; hinge with 2 cardinal teeth in each valve; pallial sinus deep.



List of species of interest to fisheries occurring in the area

The symbol 🐚 is given when species accounts are included.

🐚 *Donax denticulatus* Linnaeus, 1758.

🐚 *Donax striatus* Linnaeus, 1767.

🐚 *Iphigenia brasiliiana* (Lamarck, 1818).

Reference

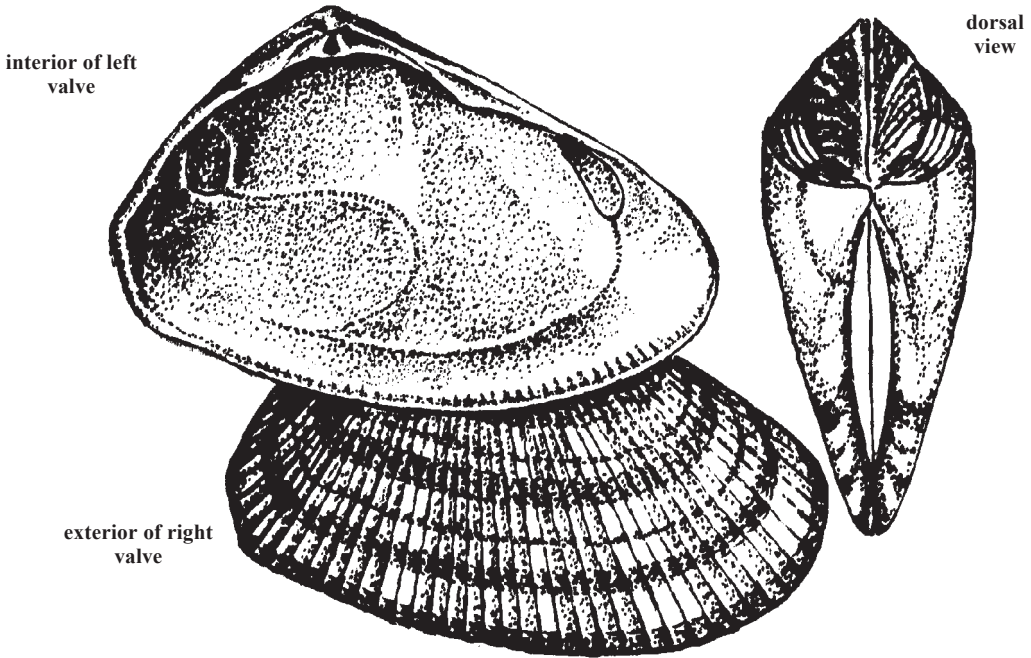
Adamkewicz, S.L. and M.G. Harasewych. 1996. Systematics and biogeography of the genus *Donax* (Bivalvia: Donacidae) in North America. *Am. Malac. Bull.*, 13:97-103.

Donax denticulatus Linnaeus, 1758

DXD

Frequent synonyms / misidentifications: None / *Donax striatus* Linnaeus, 1767.

FAO names: **En** - Common Caribbean donax; **Fr** - Flion des Caraïbes; **Sp** - Coquina del Caribe.

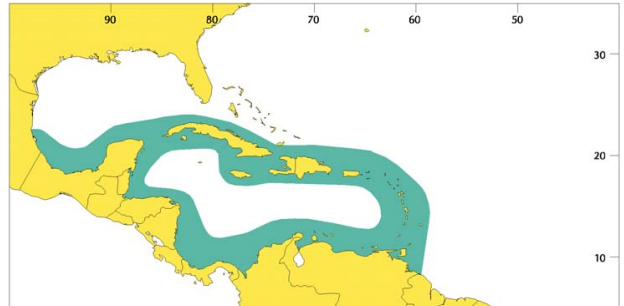


Diagnostic characters: Shell wedge-shaped, inflated. Posterior slope with 2 curved ridges. Surface sculpture consisting of fine radial grooves of microscopic pinpoints. **Colour:** variable, usually brown, yellowish, or purple, with rays of darker hues.

Size: To 25 mm.

Habitat, biology, and fisheries: Infaunal in shallow sand, usually in environments rich in particulate organic matter. Consumed locally in soups and chowders.

Distribution: Southeastern Caribbean to northern Brazil.

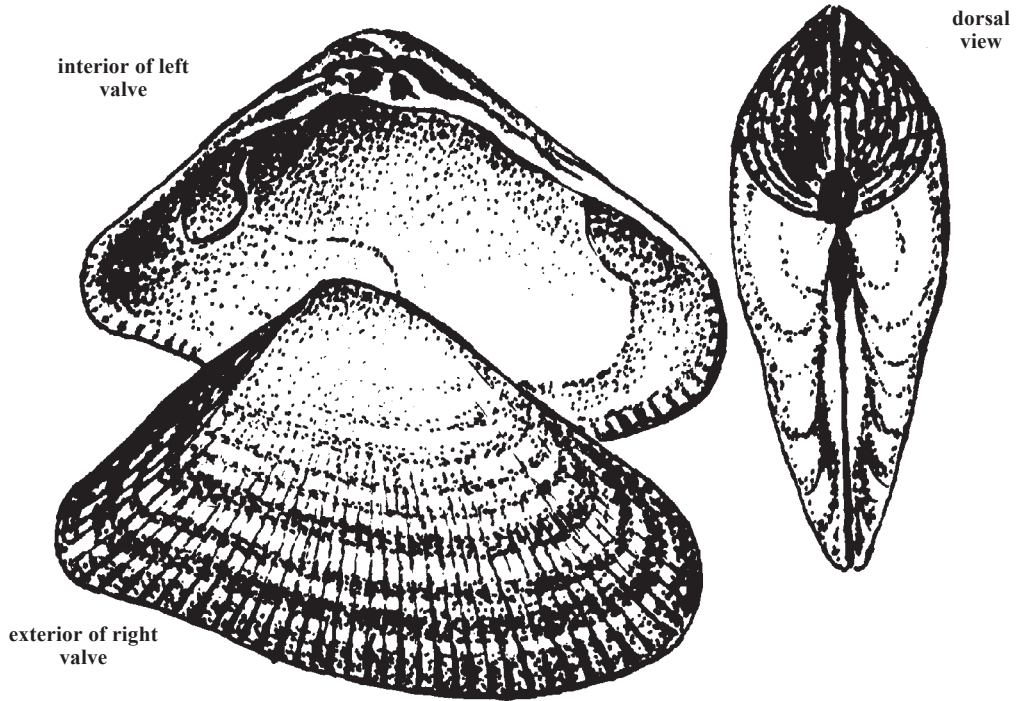


Donax striatus Linnaeus, 1767

DNT

Frequent synonyms / misidentifications: None / *Donax denticulatus* Linnaeus, 1758.

FAO names: En - Striate donax; Fr - Flion ridée; Sp - Coquina rayada.

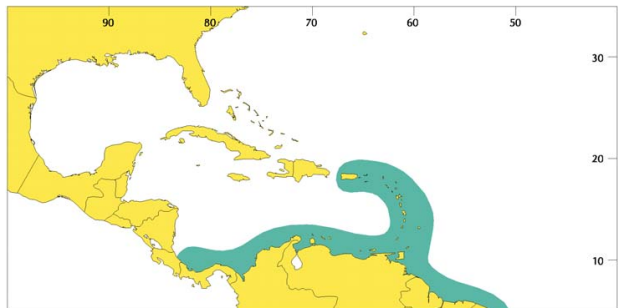


Diagnostic characters: Shell wedge-shaped, inflated. Posterior slope flat or concave, with fine radial threads.
Colour: variable, usually cream with purplish or bluish tinges. Umbones usually of darker hues.

Size: To 25 mm.

Habitat, biology, and fisheries: Infaunal in shallow sand, usually in environments rich in particulate organic matter. Consumed locally in soups and chowders.

Distribution: Caribbean and Lower Antilles to northern South America.

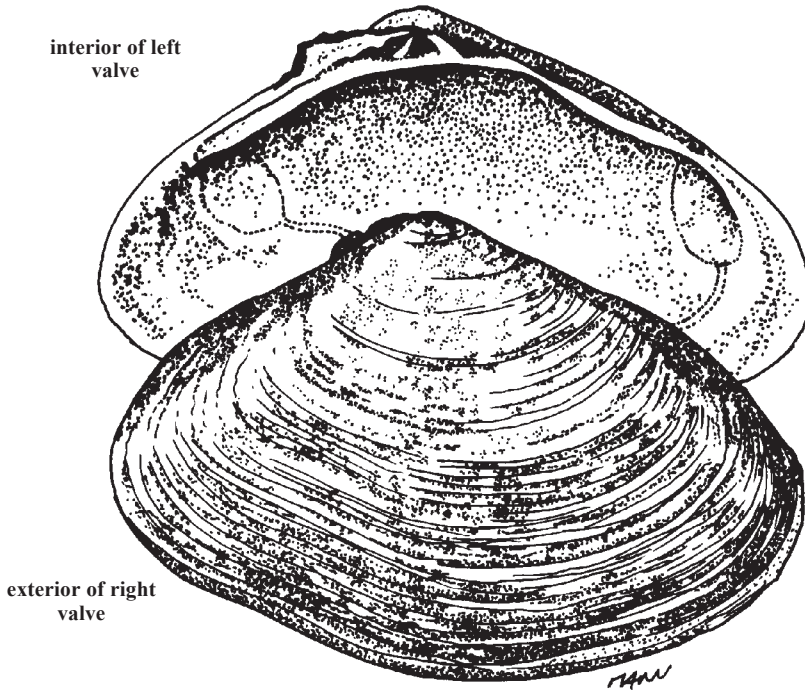


Iphigenia brasiliana (Lamarck, 1818)

IFB

Frequent synonyms / misidentifications: None / *Polymesoda arctata* (Deshayes, 1854).

FAO names: En - Giant false donax (AFS: Giant coquina); Fr - Donace géanté; Sp - Coquina gigante.

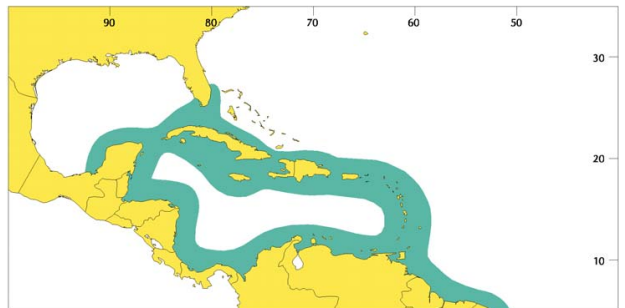


Diagnostic characters: Shell wedge-shaped, heavy, moderately inflated, with rhomboidal outline. Shell surface smooth. Posterodorsal slope somewhat flat. Pallial sinus large. Hinge with 2 lateral teeth (1 bifid) on each valve, lateral teeth absent. Umbones slightly posterior. Periostracum thin, glossy. **Colour:** tan cream with purple umbonal region; periostracum brown.

Size: To 65 mm.

Habitat, biology, and fisheries: Infaunal in shallow sandy bottoms. Consumed locally in stews and chowders.

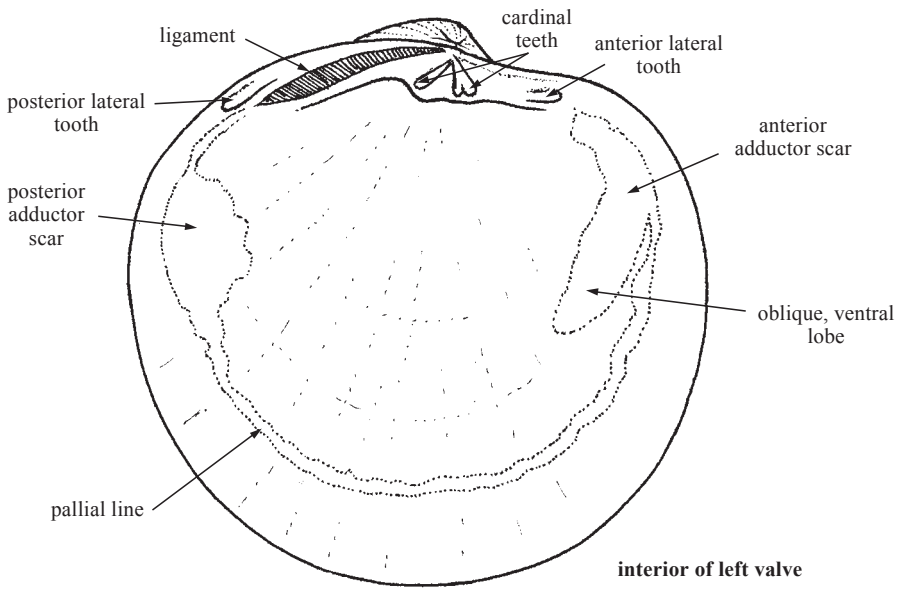
Distribution: Southern Florida to Brazil.



LUCINIDAE

Lucinas

Diagnostic characters: Shell disk-shaped, ligament external, hinge typically with 2 cardinal and 2 lateral teeth. Pallial sinus absent. Foot long.

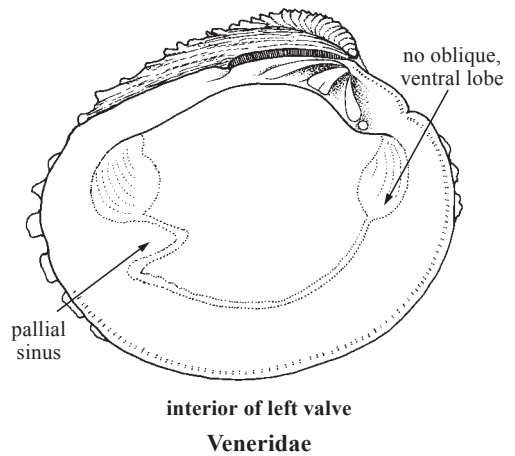


Habitat, biology, and fisheries: Shallow-water, subtidal habitat. Buried deeply in sand or sandy-mud. Hand-collected, consumed locally.

Remarks: Members of the family typically host symbiotic bacteria in their gills.

Similar families occurring in the area

Veneridae: shell usually solid, umbones anterior to midline, lunule and scutcheon usually present, sculpture usually concentric, sometimes lacking; ligament external; hinge with 3 or rarely 2 cardinal teeth in each valve; adductor muscles (and their scars) usually equivalent in size.



List of species of interest to fisheries occurring in the area

The symbol 🐚 is given when species accounts are included.

🐚 *Codakia orbicularis* (Linnaeus, 1758).

References

Brestsky, S. S. 1976. Evolution and classification of the Lucinidae (Mollusca: Bivalvia). *Paleontogr. Am.*, 8(50):219-337.
Gros, O., L. Frenkiel, and M. Mouëza. 1997. Embryonic, larval, and post-larval development in the symbiotic clam *Codakia orbicularis* (Bivalvia: Lucinidae). *Inv. Biol.* 116(2):86-101.

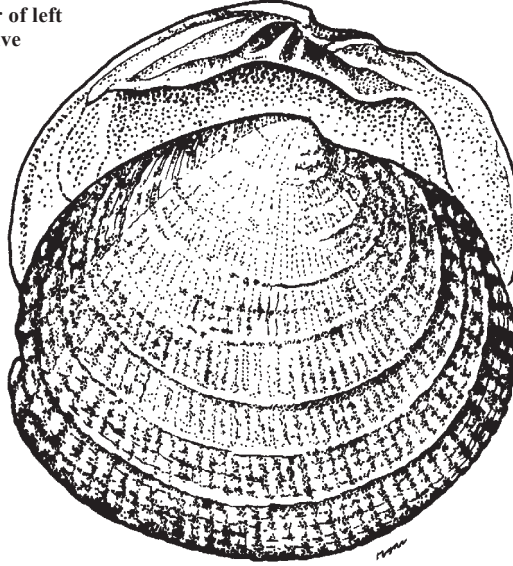
Codakia orbicularis (Linnaeus, 1758)

KKO

Frequent synonyms / misidentifications: None / *Codakia orbiculata* (Montagu, 1808); *Codakia costata* (d'Orbigny, 1842)

FAO names: **En** - Atlantic tiger lucine (AFS: Tiger lucine); **Fr** - Lucine tigrée américaine; **Sp** - Lucina tigre americana.

interior of left
valve



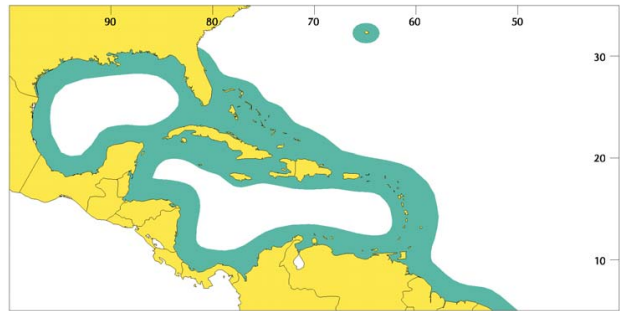
exterior of right
valve

Diagnostic characters: Shell circular (but slightly longer than taller), compressed, thick. Sculpture of radial lines crossed by finer concentric threads, except for smooth surfaces of umbones and 5 mm of subsequent growth. Lunule deep, heart-shaped, larger on right valve. Periostracum thin. **Colour:** externally white, internally white to pale lemon yellow, with pink margins; periostracum brownish.

Size: To 85 mm.

Habitat, biology, and fisheries: Infaunal, burying deeply in sand at subtidal depths. Consumed locally.

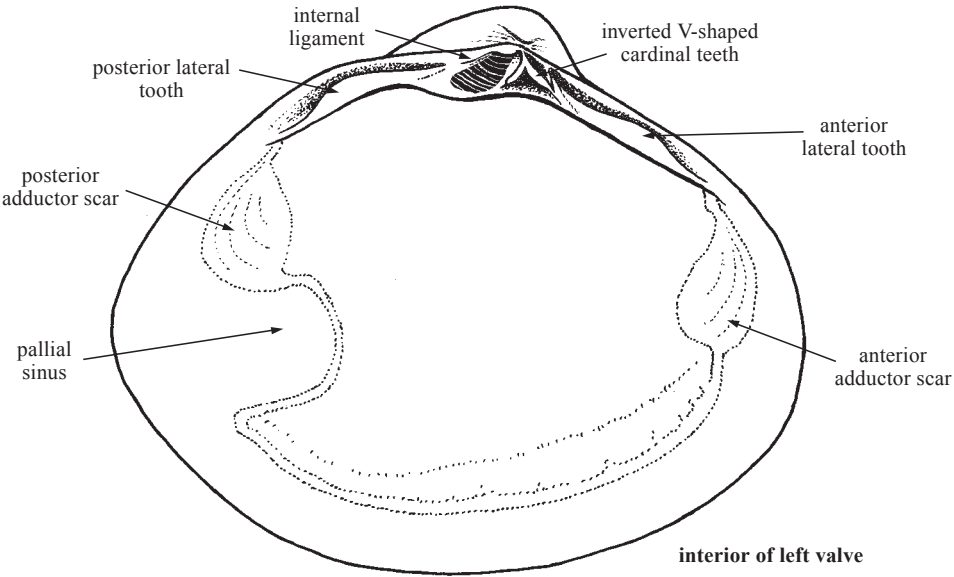
Distribution: Florida to Texas, Caribbean south to Brazil, and Bermuda.



MACTRIDAE

Trough shells

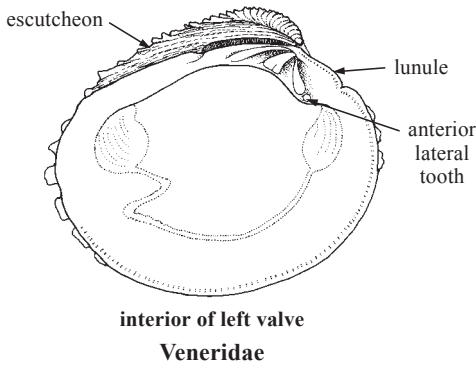
Diagnostic characters: Shell triangular to subtriangular, internal ligament, with chondrophore, typically with 2 fused cardinal teeth forming an 'inverted V' in left valve. Siphons fused.



Habitat, biology, and fisheries: Found in sandy or muddy sand bottoms. Outside area, surf clams are known to be added to catches of quahogs. Consumed locally in areas where pollution is minimal or nonexistent.

Similar families occurring in the area

Veneridae: Shell usually solid, umbones anterior to midline, lunule and scutcheon usually present, sculpture usually concentric, sometimes lacking; ligament external; hinge with 3 or rarely 2 cardinal teeth in each valve; adductor muscles (and their scars) usually equivalent in size.



List of species of interest to fisheries occurring in the area

The symbol 🐚 is given when species accounts are included.

- 🐚 *Mactrellona alata* (Spengler, 1802).
- 🐚 *Rangia cuneata* (G. B. Sowerby I, 1831).

References

Sundberg, K. and V.S. Kennedy. 1992. Growth and development in the Atlantic rangia, *Rangia cuneata*. *J. Shell. Res.*, 11(1):9-12.

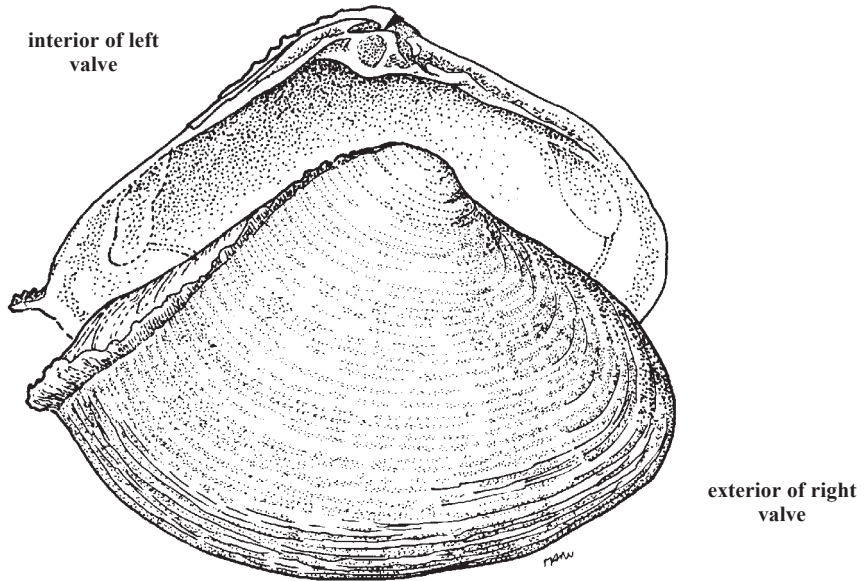
Sundberg, K. and V.S. Kennedy. 1993. Larval settlement of the Atlantic rangia, *Rangia cuneata* (Bivalvia: Mactridae). *Estuaries*, 16:223-228.

Mactrellona alata (Spengler, 1802)

WMC

Frequent synonyms / misidentifications: None / None.

FAO names: En - Caribbean winged mactra; Fr - Mactre ailée; Sp - Mactra alada.

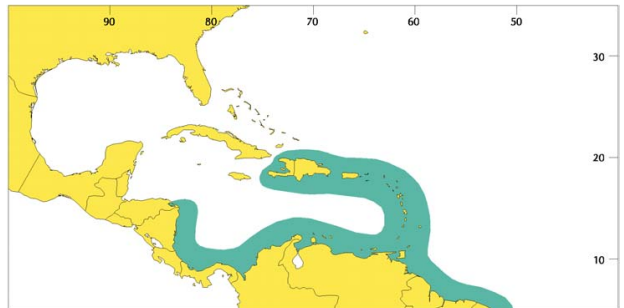


Diagnostic characters: Shell thin, triangular, inflated, light. Posterior slope typically flattened and bound by characteristically elevated, 'keel-like' ridge. Hinge with anterior lateral teeth short. Umbones prominent, twisted inward. Periostracum thin, flaky when dry. **Colour:** white; periostracum yellowish.

Size: To 100 mm.

Habitat, biology, and fisheries: Infaunal, in shallow subtidal sand. Consumed locally in chowders, soups, and stews.

Distribution: Caribbean to southeastern Brazil and tropical eastern Pacific.



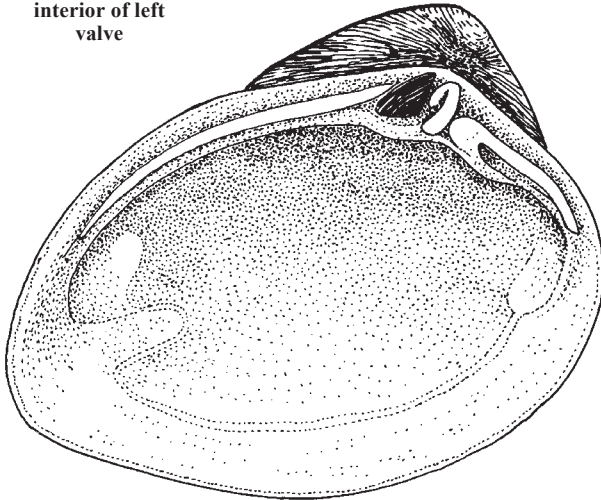
Rangia cuneata (G. B. Sowerby I, 1831)

RGQ

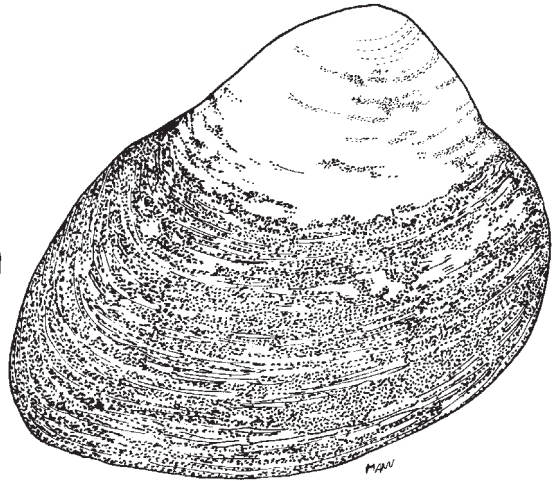
Frequent synonyms / misidentifications: None / *Tivela mactroides* (Born, 1778).

FAO names: **En** - Common rangia (AFS: Atlantic rangia); **Fr** - Rangie américaine; **Sp** - Rangia americana.

interior of left
valve



exterior of right
valve

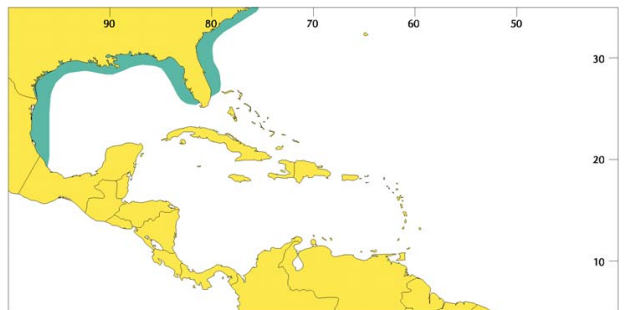


Diagnostic characters: Shell oval, heavy, very thick. Hinge with lateral teeth transversally striated. Pallial sinus reduced. Umbones anterior, pointing inward and in anterior direction. Periostracum strong and smooth.
Colour: externally dirt white, internally glossy white with slight blue-grey tinge; periostracum grey-brown.

Size: To 50 mm.

Habitat, biology, and fisheries: Infaunal in sandy mud, in very low salinity brackish water. Consumed locally in chowders.

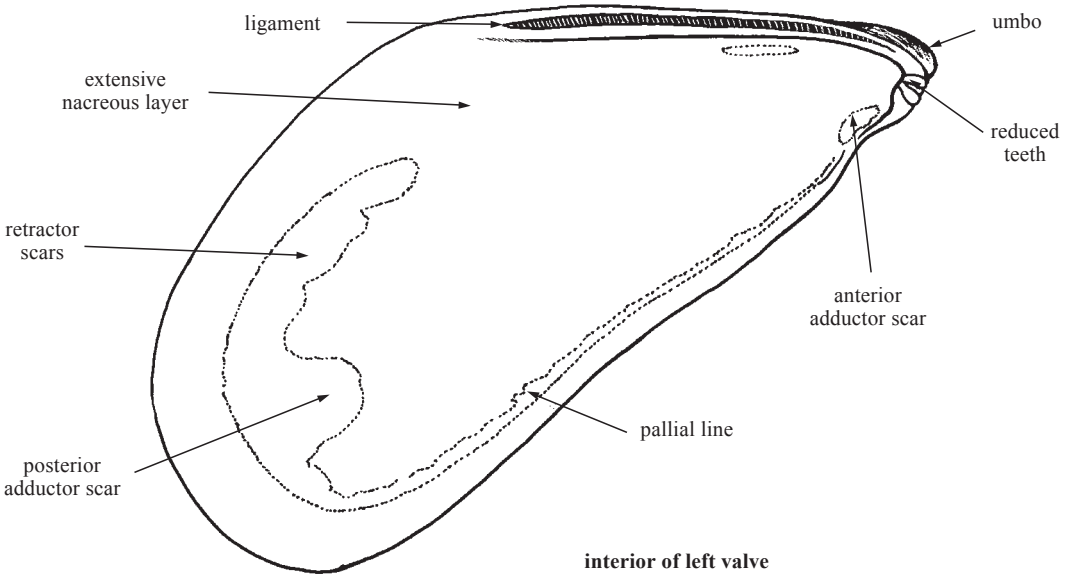
Distribution: Maryland to Texas and eastern Gulf of Mexico.



MYTILIDAE

Sea mussels

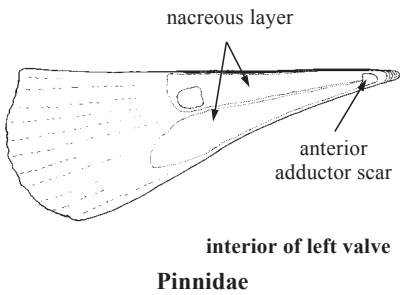
Diagnostic characters: Shell elongate, with umbones near or at anterior end. Ligament in anterior margin. Hinge without teeth or with tiny denticles. Internal surface nacreous. Adductor muscle scars differing in size, the anterior small or absent.



Habitat, biology, and fisheries: Species of interest to fisheries live attached to hard substrates by byssus in the intertidal. Mostly consumed locally, but species in the genus *Perna* and *Mytilus* heavily exploited commercially.

Similar families occurring in the area

Pinnidae: shell large, brittle, triangular, with pointed umbones at anterior end; ligament internal, posterior, inset along interior shell margin; adductor muscle scars different in size, anterior muscle small, near umbo, posterior muscle large, central.



List of species of interest to fisheries occurring in the area

The symbol 🐚 is given when species accounts are included.

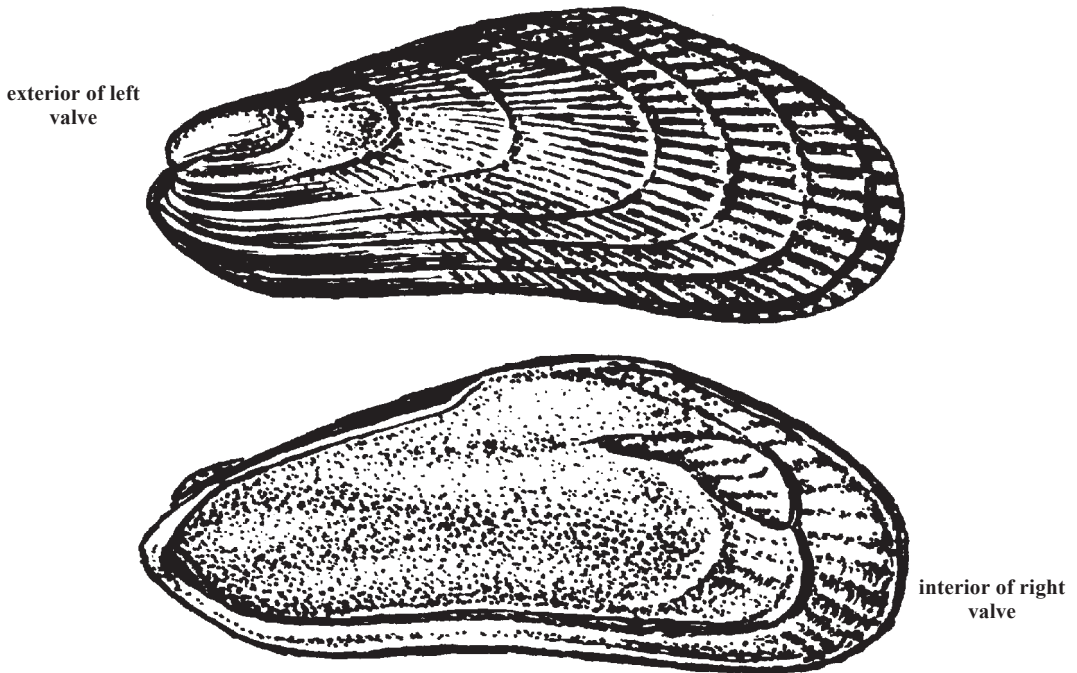
- 🐚 *Geukensia demissa* (Dillwyn, 1817).
- 🐚 *Modiolus americanus* (Leach, 1815).
Modiolus squamosus Beuperthuy, 1867.
- 🐚 *Mytella guyanensis* (Lamarck, 1819).
Mytella strigata (Hanley, 1843).
- 🐚 *Perna perna* (Linnaeus, 1767).

***Geukensia demissa* (Dillwyn, 1817)**

GKD

Frequent synonyms / misidentifications: None / *Ischadium recurvum* (Rafinesque, 1820); *Brachidontes exustus* (Linnaeus, 1758).

FAO names: **En** - Atlantic ribbed mussel (AFS: Ribbed mussel); **Fr** - Moule côtelé de l'Atlantique; **Sp** - Mejillón costilludo atlántico.

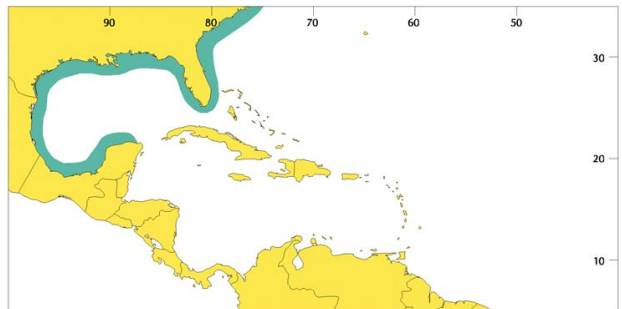


Diagnostic characters: Shell mussel-shaped, thin but strong. Shell margins crenulated. Sculpture of strong, numerous, bifurcating radial ribs, weaker on anteroventral area. Hinge teeth absent. **Colour:** externally variable, usually yellowish brown, greenish brown, or dark brown, internally bluish white with posterior end (rounded area) purplish.

Size: To 80 mm.

Habitat, biology, and fisheries: Lives attached to hard substrates intertidally or at shallow subtidal depths. Commercially exploited in the Yucatán/Campeche area of Mexico. Consumed locally boiled, grilled, or marinated.

Distribution: Canada to northeastern Florida; Gulf of Mexico; introduced to California.



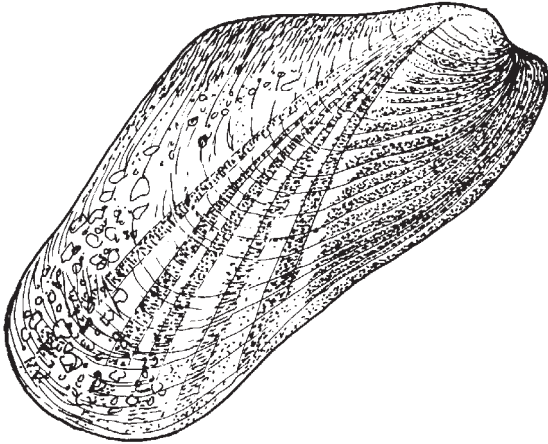
Modiolus americanus (Leach, 1815)

DJI

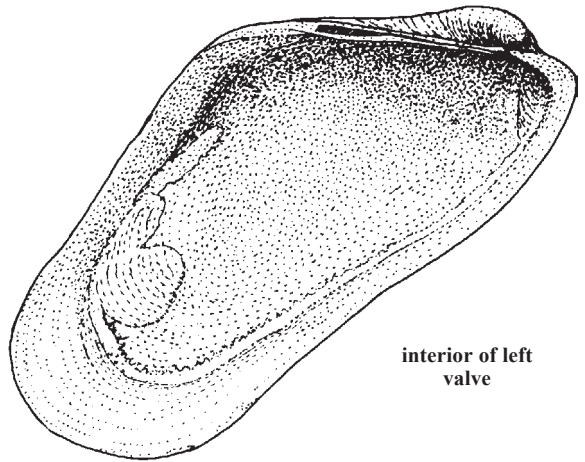
Frequent synonyms / misidentifications: None / *Modiolus modiolus* (Linnaeus, 1758)

FAO names: **En** - Tulip mussel (AFS: American horsemussel); **Fr** - Modiole tulipe; **Sp** - Mejillón tulipán.

exterior of right
valve



interior of left
valve

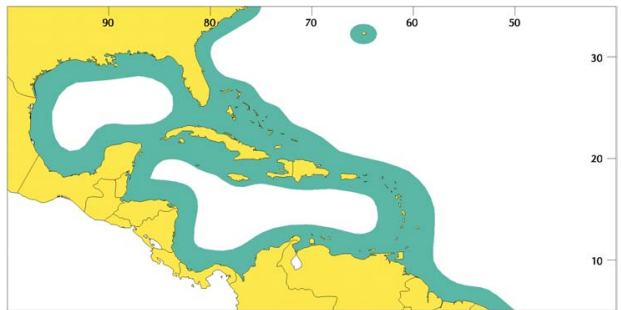


Diagnostic characters: Shell mussel-shaped, trigonal, thin. Sculpture of fine growth lines. Umbones swollen, not terminal (away from pointed end of shell). Hinge teeth absent. Periostracum heavy, sometimes hair-like. **Colour:** externally light brown with blush of rose, purple, or orange (concentrated on umbones) and purple streaks, but with a white oblique streak in middle of shell, internally pearly whitish, tinged with rose or purple.

Size: To 110 mm.

Habitat, biology, and fisheries: Lives attached to hard substrates intertidally or at shallow subtidal depths, mostly in coral reef areas. Consumed locally boiled, grilled, or marinated.

Distribution: South Carolina to Florida, Caribbean to Brazil, Bermuda, and Gulf of California to Peru.

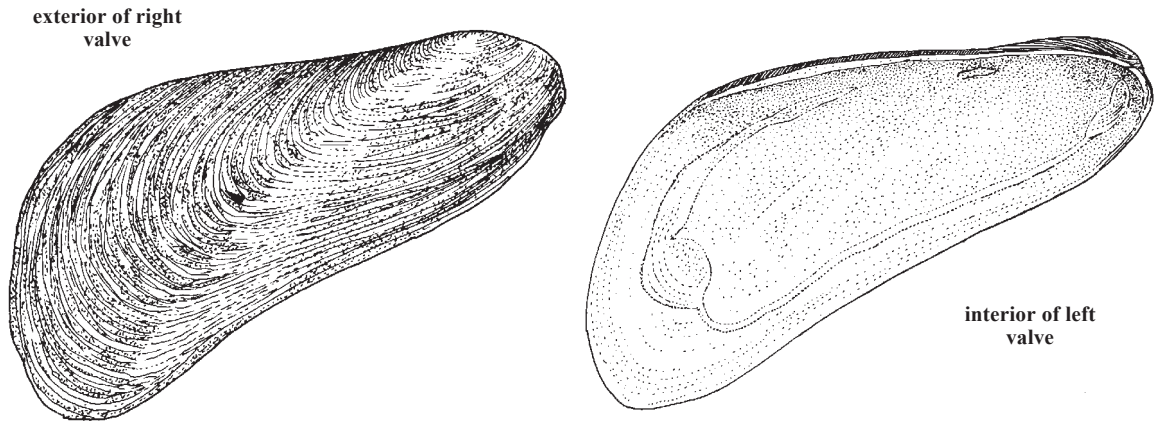


Mytella guyanensis (Lamarck, 1819)

YEG

Frequent synonyms / misidentifications: None / *Mytella strigata* (Hanley, 1843)

FAO names: **En** - Guyana swamp mussel; **Fr** - Moule de Guyane; **Sp** - Mejillón fanguero de Guayana.

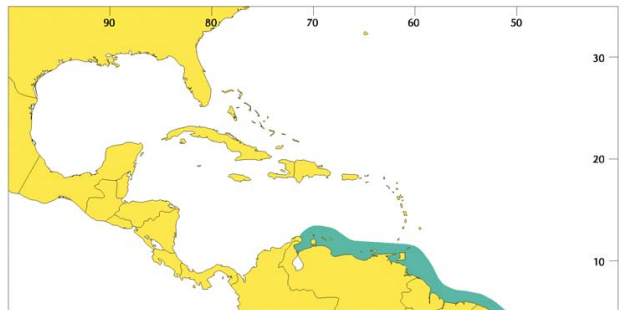


Diagnostic characters: Shell mussel-shaped, elongate, ventral region concave. Oblique ridge runs anterodorsal to posteroventral region of valve. Umbones subterminal. Posterior part of the mantle with branching tentacles. **Colour:** externally greenish on posterodorsal region (above ridge) and yellowish brown on anteroventral region (below ridge).

Size: To 90 mm.

Habitat, biology, and fisheries: Intertidal in bays and protected areas, forming clumps attached to mangrove prop roots or other hard substrates. Consumed locally (in southern part of area) in stews, boiled, grilled, or with rice.

Distribution: Southern Caribbean to southeastern Brazil.

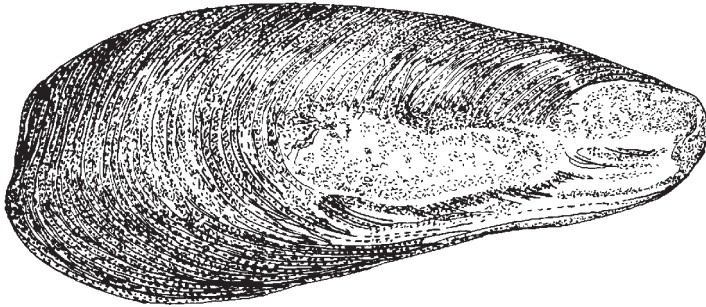


Perna perna (Linnaeus, 1767)

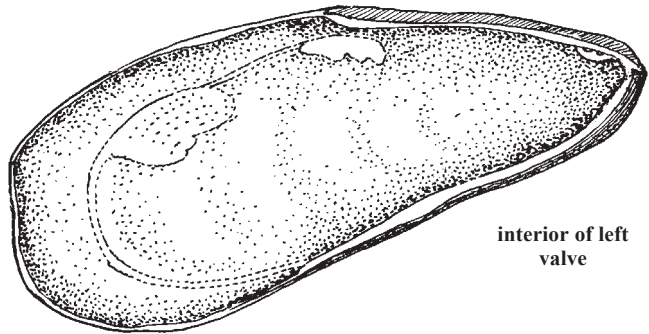
MSL

Frequent synonyms / misidentifications: None / *Mytilus edulis* Linnaeus, 1758.

FAO names: **En** - South American rock mussel (AFS: Brown mussel); **Fr** - Moule roche sudaméricaine; **Sp** - Mejillón de roca sudamericano.



exterior of right
valve



interior of left
valve

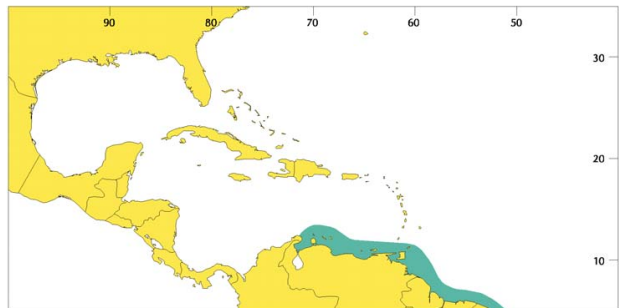
Diagnostic characters: Shell mussel-shaped, ventral margin straight, posterior end rounded. Shell surface smooth except for fine growth lines. Hinge with 1 or 2 teeth. Periostracum flaky. **Colour:** externally brown or light brown with concentric yellow bands near ventral margin, internally purple, nacreous.

Size: To 170 mm.

Habitat, biology, and fisheries: Attached by byssus onto hard substrates, common in high-energy rocky coasts. Species heavily exploited commercially, stocks are dwindling in southernmost part of range. Consumed boiled in own juices, marinated, grilled, with rice, or in a number of different local dishes. Canned industrially.

Distribution: Southern Caribbean to Brazil.

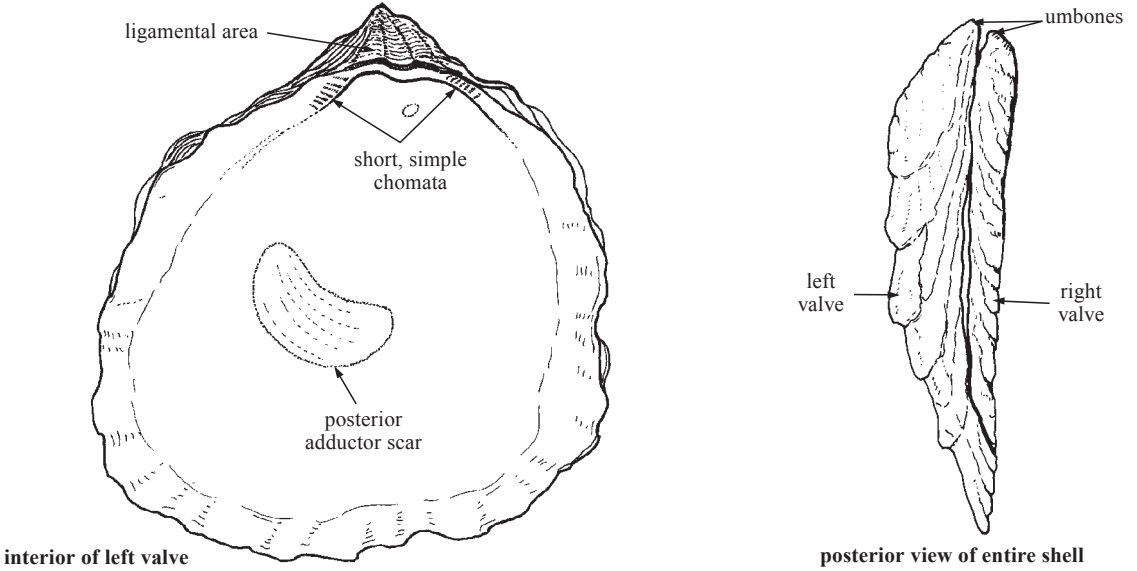
Remarks: Largest mytilid in area.



OSTREIDAE

Oysters

Diagnostic characters: Shell irregularly shaped, attached (cemented) to hard substrate by the left valve. Ligament external, in shallow depression. Only posterior adductor muscle scar present.

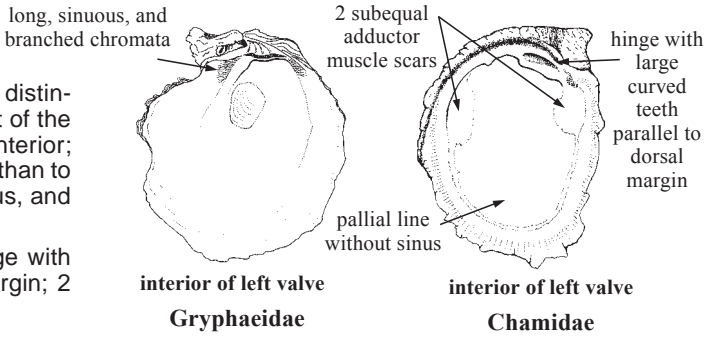


Habitat, biology, and fisheries: Oysters attach themselves to hard substrates, inhabiting the intertidal zone in protected, bay waters, usually in mangrove-associated habitats. The 2 species covered represent some of the most heavily exploited bivalves in the area. Populations have dwindled in several countries due to over-exploitation.


Similar families occurring in the area



Gryphaeidae: shell structure vesicular, distinguishable under a lens on an eroded part of the shell, or along peripheral area of the interior; adductor muscle scar nearer to the hinge than to the ventral margin; chromata long, sinuous, and branched.

Chamidae: pallial line without sinus; hinge with large curved teeth parallel to dorsal margin; 2 subequal adductor muscle scars.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

-  *Crassostrea rhizophorae* (Guilding, 1828).
-  *Crassostrea virginica* (Gmelin, 1791).

References

Harry, H. 1985. Synopsis of the supraspecific classification of living oysters (Bivalvia: Gryphaeidae and Ostreidae). *The Veliger*, 28:121-158.

Kennedy, V.S. 1996. The ecological role of the eastern oyster *Crassostrea virginica*, with remarks on disease. *J. Shell. Res.*, 15:177-183.

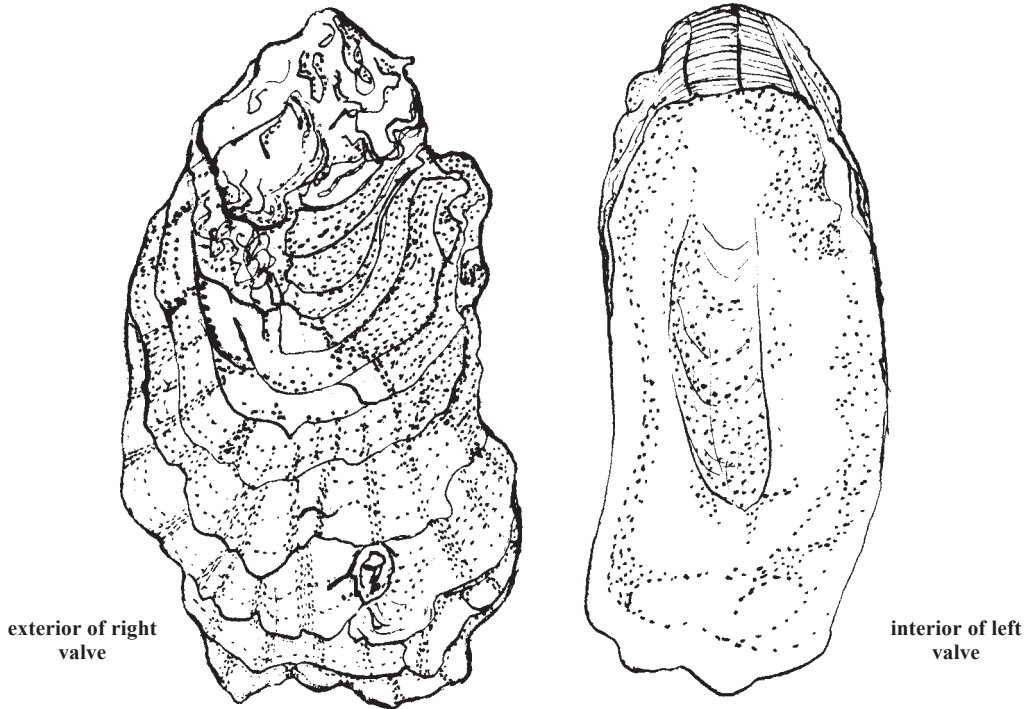
Littlewood, D.T.J. 1989. A bibliography of literature on the mangrove oyster *Crassostrea rhizophorae* (Guilding, 1828). *J. Shell. Res.*, 7:389-393.

Crassostrea rhizophorae (Guilding, 1828)

OYM

Frequent synonyms / misidentifications: None / *Crassostrea virginica* (Gmelin, 1791)

FAO names: **En** - Mangrove cupped oyster; **Fr** - Huître creuse des Caraïbes; **Sp** - Ostión de mangle.

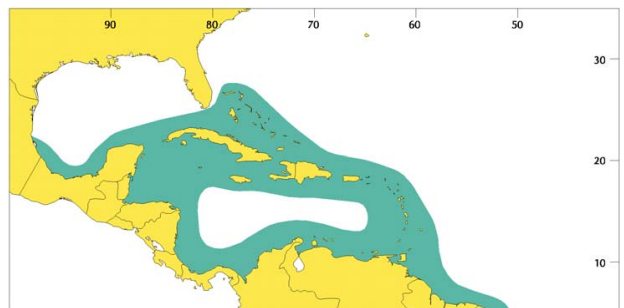


Diagnostic characters: Shell lightweight, deep-cupped, inequivalve, left valve (attached) larger than right. Shell shape and outline variable. Inner margin smooth. Resilium transversally striated. **Colour:** externally dirty light grey, internally whitish or light grey spotted with bluish purple.

Size: To 120 mm.

Habitat, biology, and fisheries: Attached to prop roots of red mangrove, *Rhizophora mangle*, rocks, or other oyster shells. It is mostly an intertidal or shallow-subtidal species. Represents one of the most heavily exploited bivalves in the area. Populations are strongly depleted due to over exploitation or contaminated by organic pollutants. The species may face ecological competition from the introduced Japanese oyster, *Crassostrea gigas* (Thunberg, 1793) in parts of the area. Consumed raw, fried, grilled, or boiled. Canned industrially.

Distribution: Caribbean to Brazil.

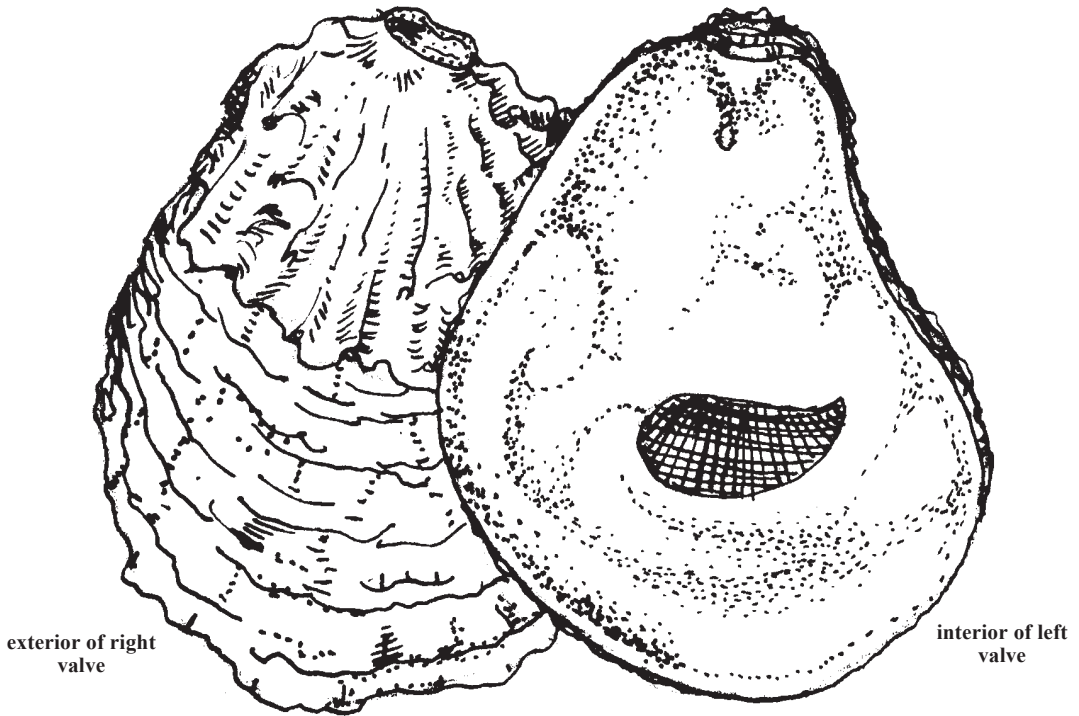


Crassostrea virginica (Gmelin, 1791)

OYA

Frequent synonyms / misidentifications: None / *Crassostrea rhizophorae* (Goulding, 1828).

FAO names: **En** - American cupped oyster (AFS: Eastern oyster); **Fr** - Huître creuse américaine; **Sp** - Ostión americano.

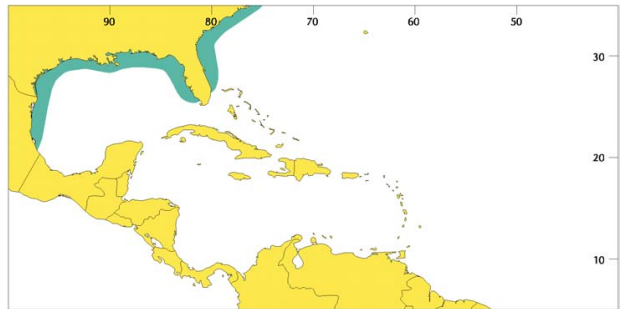


Diagnostic characters: Shell thick and heavy, usually narrow and elongate, but extremely variable in shape. Upper valve flatter, smaller than lower valve; lower valve convex. Shell shape and outline variable. Shell margins undulating to straight. Umbones long and curved. **Colour:** dirty to light grey, internally white with muscle scar deep purple.

Size: To 300 mm.

Habitat, biology, and fisheries: Species represents the northern counterpart of *Crassostrea rhizophorae* (distribution of the 2 species overlaps in the northern Caribbean). Lives attached to rocks, other oyster shells, or other hard substrates. It is mostly an intertidal or shallow-subtidal species. Represents one of the most heavily exploited bivalves in the area. Populations are strongly depleted due to over-exploitation or contaminated by organic pollutants. Consumed raw, fried, grilled, boiled. Canned industrially.

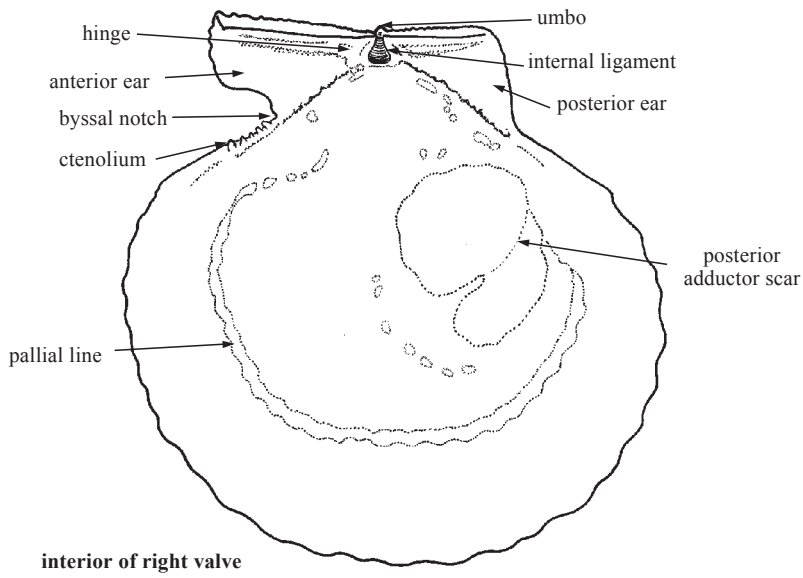
Distribution: Gulf of St. Lawrence (Canada) to the Gulf of Mexico.



PECTINIDAE

Scallops

Diagnostic characters: Shell oval to circular, umbones centrally located, hinge typically with wing-like expansions. In some genera (e.g., *Euvola*) top valve is flattish and bottom valve deeply convex. Ligament internal. Hinge without teeth. Single adductor muscle, pallial sinus absent.

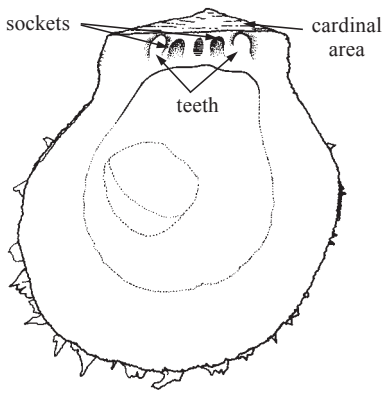


Habitat, biology, and fisheries: Species of interest to fisheries live on (or partially buried in) sandy bottoms and/or seagrass meadows at moderate depth, where individuals are capable of short bursts of active swimming. These species are usually short-lived, spawning throughout the year or seasonally. They (e.g., calico and bay scallops) are included amongst the most valuable and over-exploited species in area. Taken with designated bottom trawls.

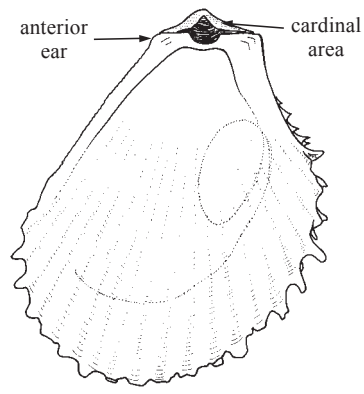
Similar families occurring in the area

Spondylidae: Shell stout, irregularly rounded, and higher than long; outer sculpture mainly radial, often scaly to spinose; umbones separated from hinge line by a triangular area; hinge line straight with a small triangular expansion at each end; ligament internal, in a deep median pit; single adductor muscle scar; no pallial sinus.

Limidae: shell equivalve, higher than long, slightly oblique; umbo separated from hinge line by a triangular area; hinge line straight, with 2 small expansions and a central ligamental groove; hinge toothless; single, faint adductor muscle scar; no pallial sinus.








interior of left valve
Spondylidae



interior of right valve
Limidae

List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

-  *Amusium laurenti* (Gmelin, 1791).
-  *Argopecten gibbus* (Linnaeus, 1758).
-  *Argopecten irradians* (Lamarck, 1819).
-  *Euvola ziczac* (Linnaeus, 1758).

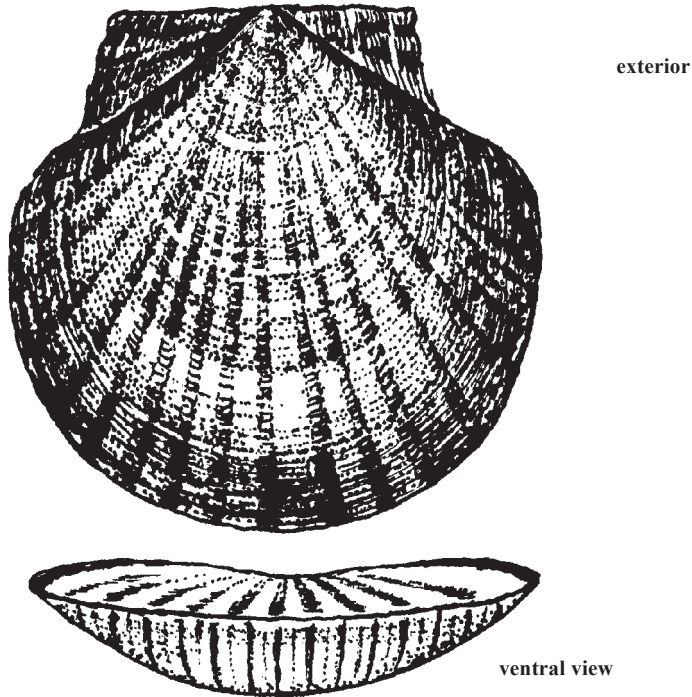
References

- Blake, N.J. and M.A. Moyer. 1991. The calico scallop, *Argopecten gibbus*, fishery of Cape Canaveral, Florida. In *Scallops: Biology, Ecology, and Aquaculture*, edited by S.E. Shumway. New York, Elsevier Science Publ. Co., pp. 899-911.
- Marelli, D.C., M.K. Krause, W.S. Arnold, and W.G. Lyons. 1997. Systematic relationships among Florida populations of *Argopecten irradians* (Lamarck, 1819). *The Nautilus*, 110:31-41.
- Moyer, M.A. and N.J. Blake. 1986. Fluctuations in calico scallop production (*Argopecten gibbus*). *Proc. 11th Ann. Trop. Subtrop. Fish. Conf. Am.*, pp. 45-58.
- Roe, R.B., R. Cummins, Jr., and H.R. Bullis, Jr. 1971. Calico scallop distribution, abundance and yield off eastern Florida, 1967-68. *Fish. Bull.*, 69:399-409.
- Waller, T.R. 1991. Evolutionary relationships among commercial scallops (Mollusca: Bivalvia: Pectinidae) In *Scallops: Biology, Ecology and Aquaculture*, edited by S. E. Shumway. New York, Elsevier, pp. 1-73.

Amusium laurenti (Gmelin, 1791)

Frequent synonyms / misidentifications: None / *Amusium papyraceum* (Gabb, 1873).

FAO names: **En** - Laurent's scallop; **Fr** - Peigne de Laurent; **Sp** - Peine lorenzo.

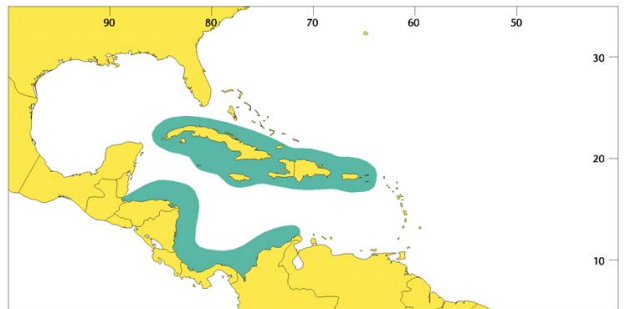


Diagnostic characters: Shell thin but strong, circular, moderately inflated, inequivalve. Wing-like projections small. Surface smooth, glossy, but internally with 30 to 40 paired radial ribs. Lower (right) valve more convex than upper (left) valve. Hinge straight. **Colour:** lower valve cream with light brown rays, upper valve reddish brown mottled with white.

Size: To 60 mm.

Habitat, biology, and fisheries: On sandy mud bottoms around 20 to 25 m.

Distribution: Northern Caribbean, from Honduras to Greater Antilles.

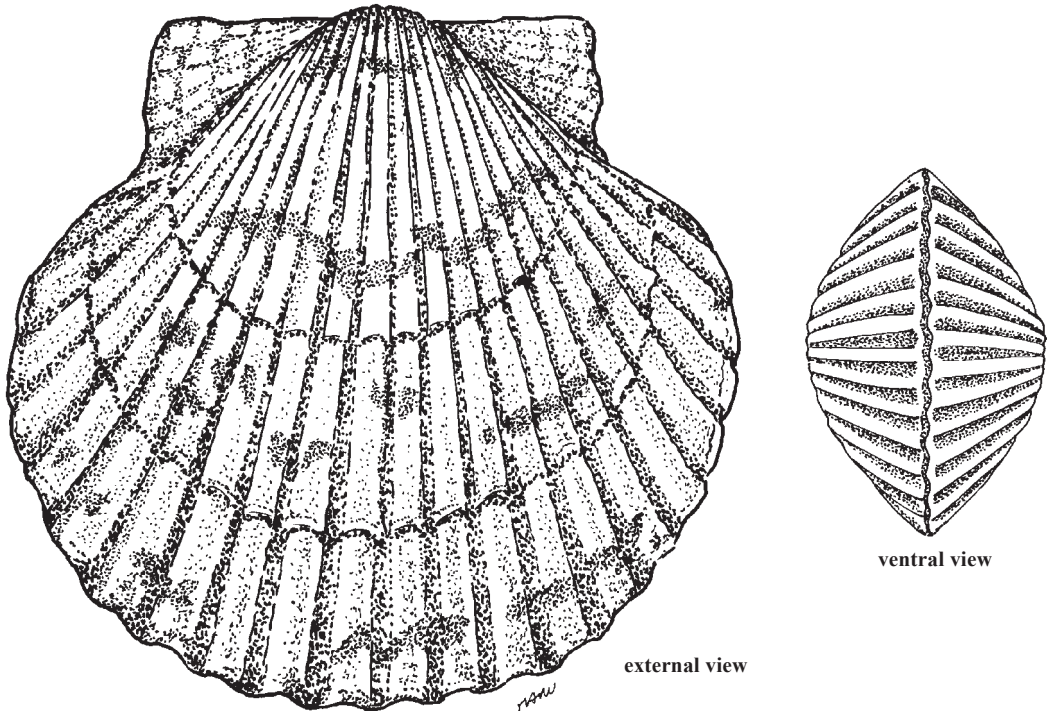


Argopecten gibbus (Linnaeus, 1758)

SCC

Frequent synonyms / misidentifications: None / *Argopecten irradians* (Lamarck, 1819).

FAO names: **En** - Calico scallop (AFS: Atlantic calico scallop); **Fr** - Peigne calicot; **Sp** - Peine percal.

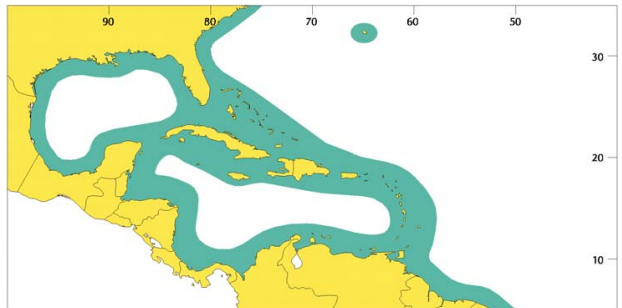


Diagnostic characters: Shell outline almost circular, valves very inflated, wing-like projections relatively poorly developed. Surface sculpture of about 20 ribs, smooth square in cross-section. Hinge straight. **Colour:** upper valve bright, variable, ranging from brown to red to lavender rose to whitish with purplish or reddish mottlings, colour of lower valve much lighter, whitish with lighter markings.

Size: To 63 mm.

Habitat, biology, and fisheries: Live in beds in shallow to moderately deep water, usually on (or buried in) sandy bottoms. Relatively short lifespan of about 18 to 24 months (Roe et al., 1971). Spawning and recruitment occur throughout the year, with peaks in late autumn and spring. Typically exploited in the northern half of the area. Catches in the USA have declined from more than 120 000 t (live weight) in 1988 to 262 t in 1992. In more recent years catches have slowly risen to 2 400 t in 1993 and about 3 000 t in 1994.

Distribution: Maryland to Florida, Texas, and south to northern Brazil, Bermuda.

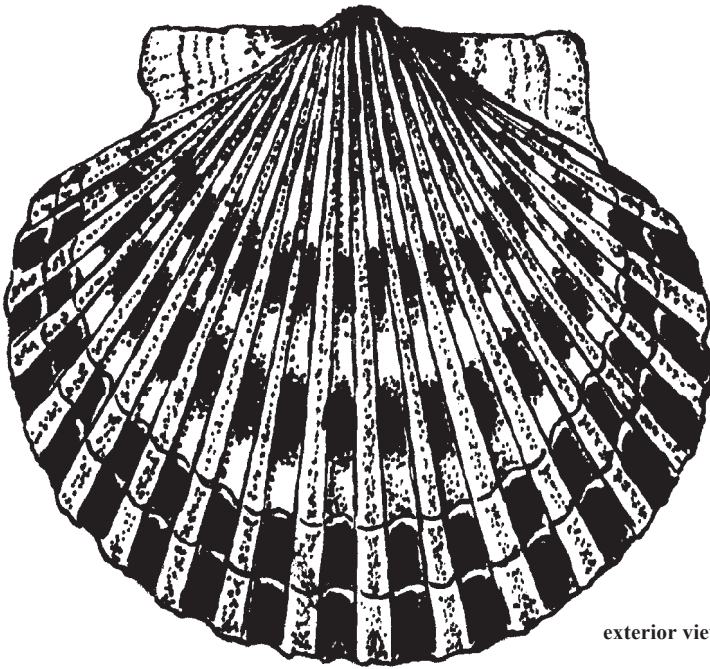


Argopecten irradians (Lamarck, 1819)

SCB

Frequent synonyms / misidentifications: None / *Argopecten gibbus* (Linnaeus, 1758).

FAO names: **En** - Atlantic bay scallop (AFS: Bay scallop); **Fr** - Peigne baie de l'Atlantique; **Sp** - Peine caletero atlántico.



exterior view



ventral view

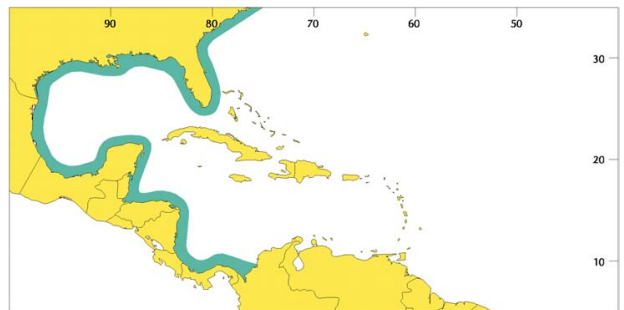
Diagnostic characters: Shell valves convex, upper valve less convex than more inflated lower valve. Surface sculpture of 19 to 21 strong, squarish ribs. Hinge with wing-like projections of about same size. **Colour:** lower valve light, usually whitish, upper valve dark brown to dark grey with darker markings.

Size: To 75 mm.

Habitat, biology, and fisheries: Form beds on sandy, eelgrass, or other seagrass bottoms. Average life span of 20 to 26 months. Spawns after 1 year of age, during mass-spawning events that take place almost always in July.

Distribution: Canada to Gulf of Mexico and southern Caribbean (Colombia).

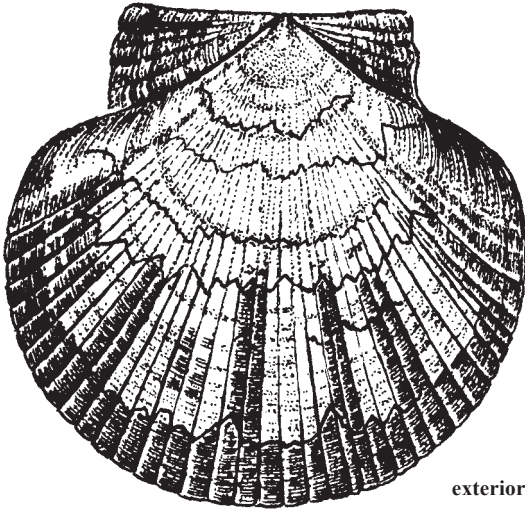
Remarks: A recent study has shown that the subspecific nomenclature for southwest Florida populations of the bay scallop is still unresolved.



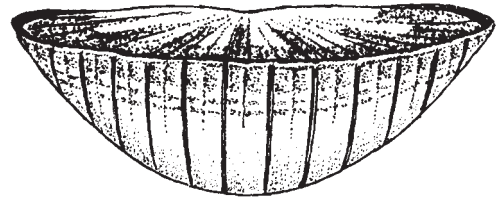
***Euvola ziczac* (Linnaeus, 1758)**

Frequent synonyms / misidentifications: *Pecten ziczac* (Linnaeus, 1758) / *Euvola raveneli* (Dall, 1898).

FAO names: En - Zigzag scallop; Fr - Peigne zigzag; Sp - Vieira zigzag.



exterior view



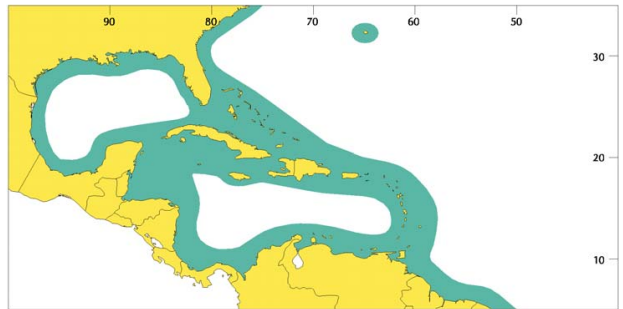
ventral view

Diagnostic characters: Shell circular, inequivalve, lower valve strongly concave, upper valve flatter, slightly convex. Hinge with wing-like projections of equal size. Sculpture on upper (flat) valve of about 35 ribs and interspaces of about same width. Lower (deep) valve with about 20 less prominent ribs. **Colour:** tan to light brown. Inner surface of lower valve white. Upper valve mottled with reddish brown and dark brown markings.

Size: To 110 mm.

Habitat, biology, and fisheries: Subtidal species, living in depths between 1 and 50 m, partly buried in sand. Individuals form aggregations. Commercially exploited in a broad part of the range.

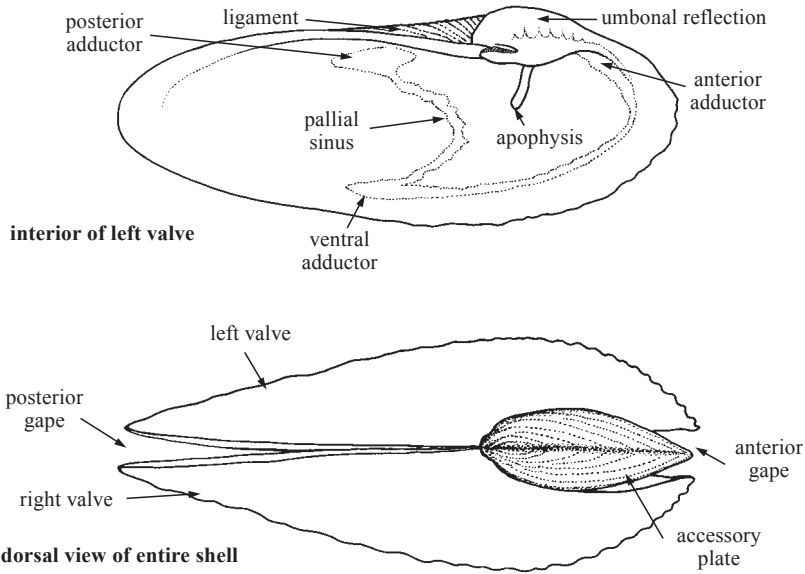
Distribution: North Carolina to Florida, Texas, Caribbean, south to southeastern Brazil, and Bermuda.



PHOLADIDAE

Angel wings

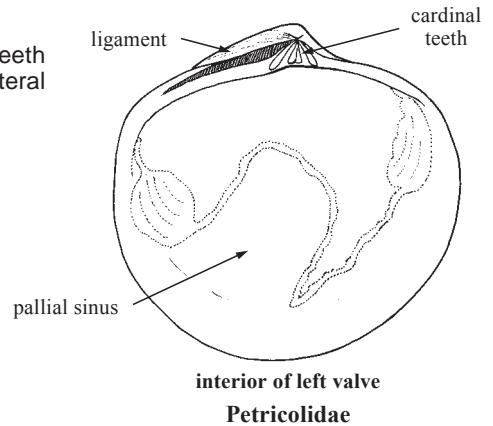
Diagnostic characters: Shell elongate, fragile, gaping at both extremities, shell surface with rough, scaly sculpture. Characteristic accessory plates present in hinge region. Dorsal margin rolled over umbones. Ligament internal. Siphons very long, fused, not retractable.




Habitat, biology, and fisheries: Species of interest to fisheries live deep in the mud in quiet, protected waters. Hand or shovel collected, consumed locally.

Similar families occurring in the area

Petricolidae: no lunule or escutcheon; hinge with cardinal teeth only (sometimes reduced): 3 in the left valve, 2 in the right; lateral teeth always absent; pallial sinus deep.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Cyrtopleura costata* (Linnaeus, 1758).

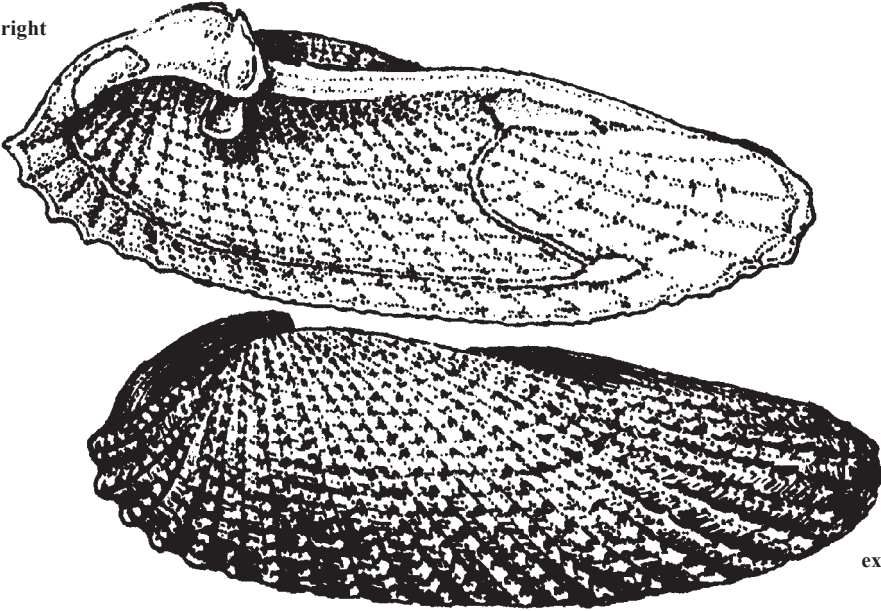
***Cyrtopleura costata* (Linnaeus, 1758)**

YPK

Frequent synonyms / misidentifications: None / *Pholas campechiensis* Gmelin, 1791.

FAO names: **En** - Angel wing; **Fr** - Aîle d'ange; **Sp** - Ala de ángel.

interior of right
valve



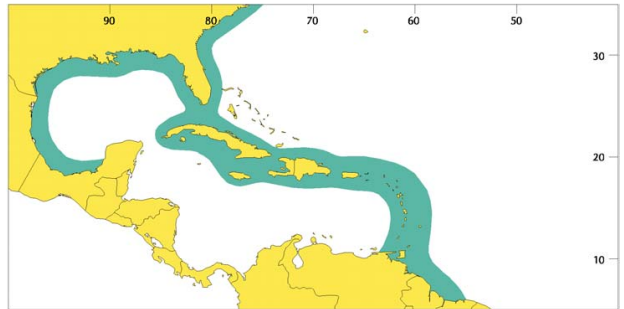
exterior of left
valve

Diagnostic characters: Shell light, thin, elongate. Sculpture of concentric ridges and strong radial ribs. Scale-like projections form at intersections of ridges and ribs. Pair of spoon-shaped structures under umbones, called apophyses, are points of attachment of foot muscles. **Colour:** pure white, seldom with delicate pinkish internal coloration.

Size: To 180 mm.

Habitat, biology, and fisheries: Infaunal in compact mud or sand, from intertidal to shallow subtidal depths. Borer in mud bottoms in protected bays. Consumed locally in soups and stews.

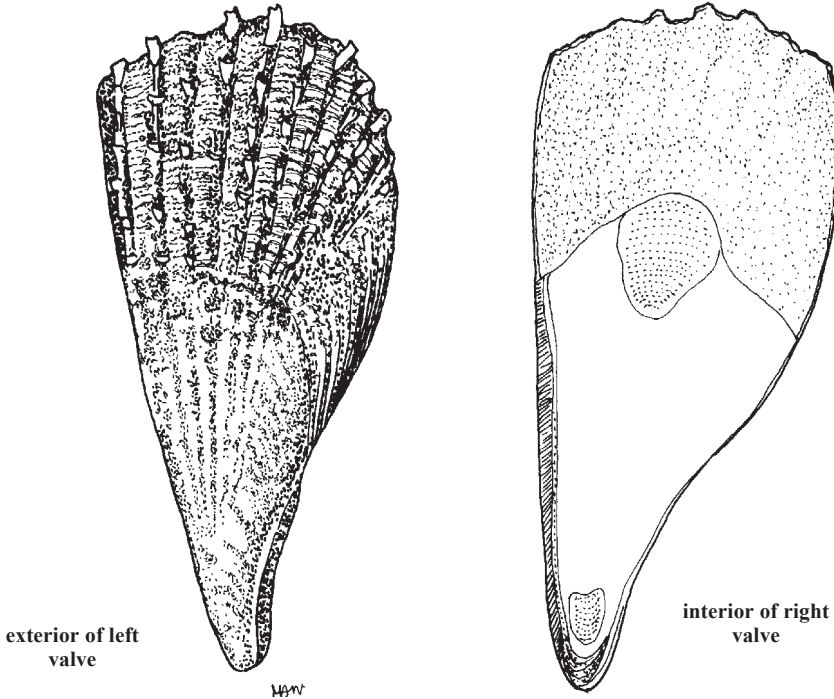
Distribution: Massachusetts to Texas and Caribbean to northeastern Brazil.



***Atrina rigida* (Lightfoot, 1786)**

Frequent synonyms / misidentifications: None / *Atrina seminuda* (Lamarck, 1819); *Atrina serrata* (Sowerby, 1825).

FAO names: **En** - Stiff pen shell; **Fr** - Jambonneau raide; **Sp** - Pina tiesa.

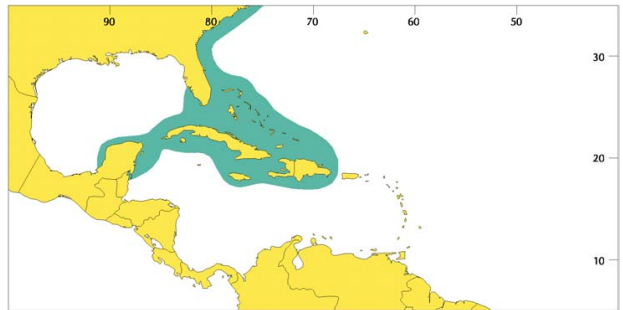


Diagnostic characters: Shell large, fan-shaped, triangular. Surface sculpture of about 15 narrow radial ribs separated by larger interspaces; ribs bearing regularly spaced, fluted spines. Large muscle scar inside shell touches border of nacreous area. Hinge area straight, representing larger side of triangular shell outline. Bysus at pointed extremity anchors penshell into seagrass bottom. Gaping shorter side of triangular shell outline oriented upward. **Colour:** dark olive brown; mantle colour bright golden orange.

Size: To 300 mm.

Habitat, biology, and fisheries: In shallow-water seagrass beds. Burrows in fine sand leaving only the broad posterior region exposed to the outside environment. Commercially exploited in and around Campeche, Mexico. Preyed upon by the horse conch, *Pleuroploca gigantea*. Consumed locally in soups, marinated, or grilled.

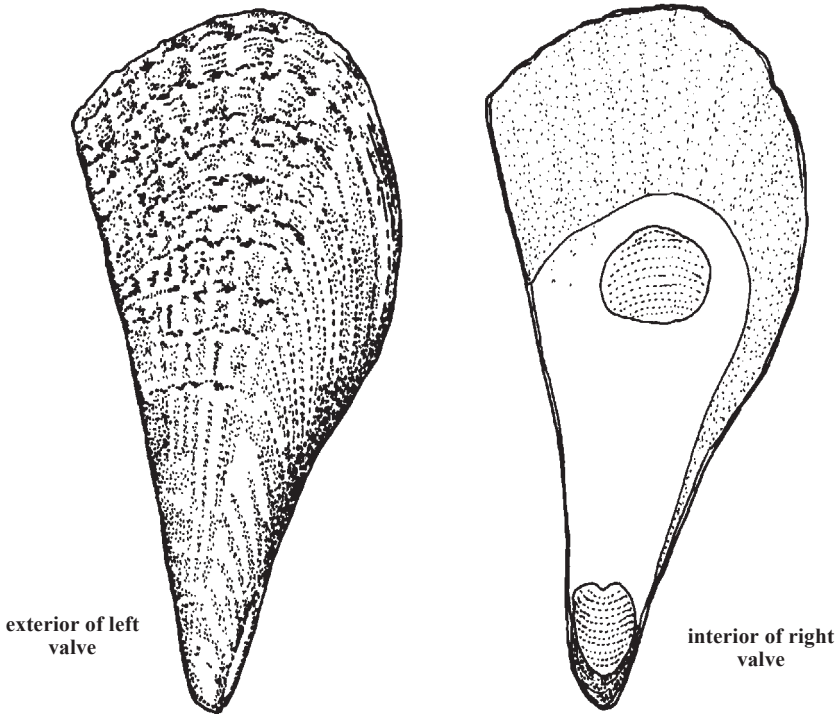
Distribution: North Carolina to Florida, Caribbean.



Atrina seminuda (Lamarck, 1819)

Frequent synonyms / misidentifications: None / *Atrina rigida* (Lightfoot, 1786); *Atrina serrata* (Sowerby, 1825).

FAO names: **En** - Half-naked pen shell; **Fr** - Jambonneau demi-lisse; **Sp** - Pina semilisa.



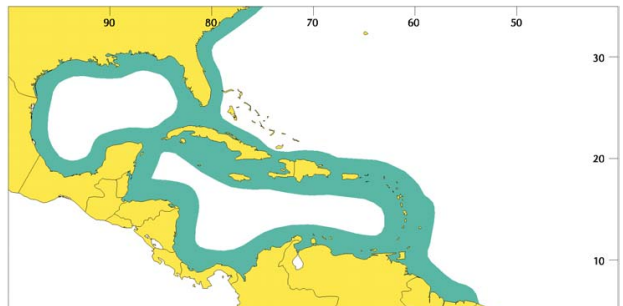
Diagnostic characters: Shell large, fan-shaped, triangular. Surface sculpture of about 15 narrow radial ribs separated by larger interspaces; ribs bearing regularly spaced, fluted spines. Muscle scar completely surrounded by nacreous layer. Hinge area straight, representing larger side of triangular shell outline. Byssus at pointed extremity anchors penshell into seagrass bottom. Gaping, shorter side of triangular shell outline oriented upward. **Colour:** dark olive brown; mantle colour pale yellow.

Size: To 230 mm.

Habitat, biology, and fisheries: In shallow-water seagrass beds. Burrows in fine sand leaving only the broad posterior region exposed to the outside environment. Consumed locally in soups, marinated, or grilled.

Distribution: North Carolina to Florida, Texas, and Caribbean to Argentina.

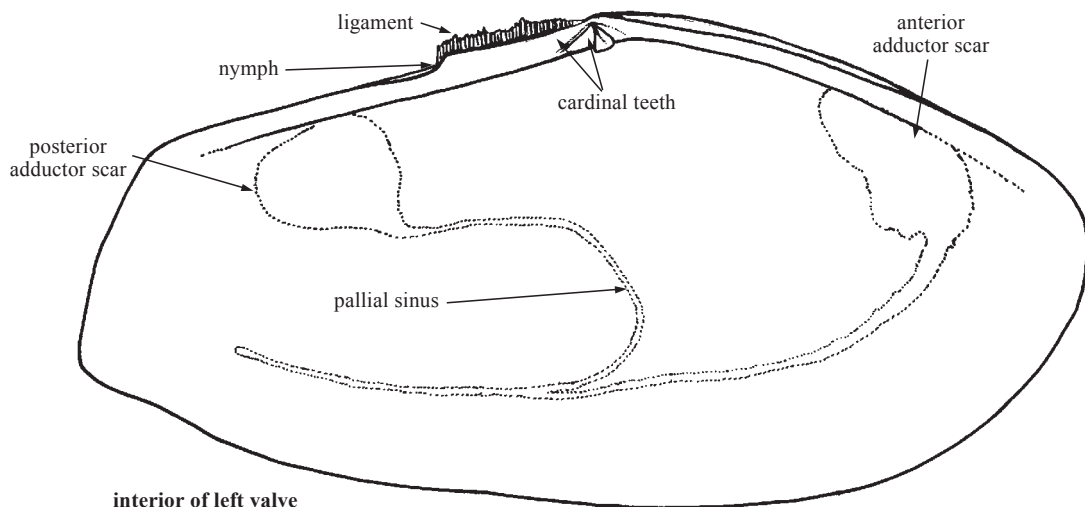
Remarks: Shell very similar to *Atrina rigida*, differing by position of posterior adductor scar well within the nacreous area.



PSAMMOBIIDAE

Sunset clams, sanguins

Diagnostic characters: Shell oblong to oval, slightly gaping, sculpture mostly concentric, ligament external, strong, attached behind umbones on projecting narrow shelves. Hinge with 2 small cardinal teeth. Pallial sinus large.

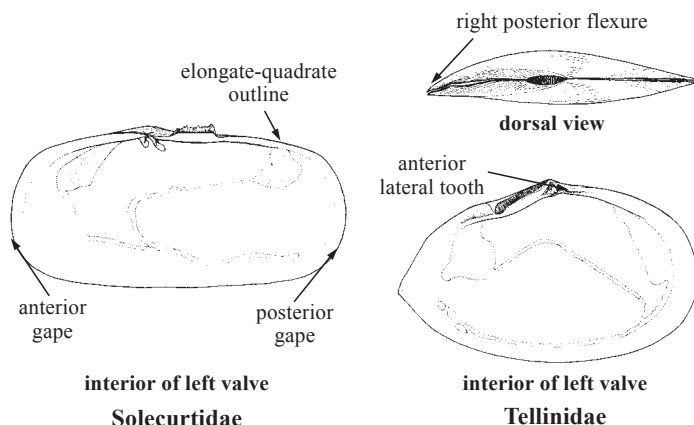


Habitat, biology, and fisheries: Subtidal in shallow water, in sand or sandy mud bottoms. Consumed locally and/or used as fish bait.


Similar families occurring in the area


Solecurtidae: shell elongate, gaping at both ends, umbones subcentral; ligament external, often on projecting shelves; hinge with 2 small cardinal teeth on each valve; siphons long, separate.

Tellinidae: shell compressed, oval to oblong, usually with flexed at posterior end; sculpture mostly lacking. Ligament external. Hinge with 2 cardinal teeth in each valve. Pallial sinus deep.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Asaphis deflorata* (Linnaeus, 1758).

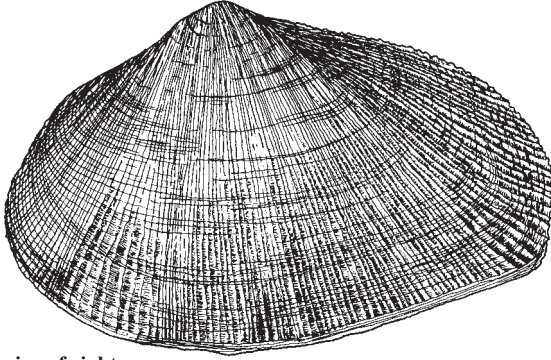
Reference

Berg, C. J. and P. Alatalo. 1985. Biology of the tropical bivalve *Asaphis deflorata* (Linné, 1758). *Bull. Mar. Sci.*, 37:827-838.

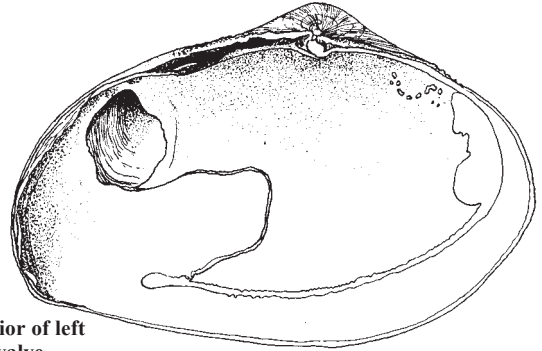
***Asaphis deflorata* (Linnaeus, 1758)**

Frequent misidentifications: None / *Papyridea soleniformis* (Bruguère, 1789); *Sanguinolaria cruenta* (Lightfoot, 1786); *Semele purpurascens* (Gmelin, 1791).

FAO names: **En** - Gaudy asaphis (AFS: Gaudy sanguin); **Fr** - Sanguinolaire ridée; **Sp** - Asafis arrugada.



exterior of right
valve



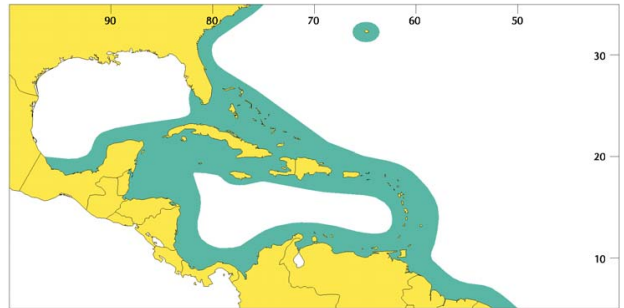
interior of left
valve

Diagnostic characters: Shell moderately elongate, moderately inflated. Sculpture of numerous, coarse radial threads irregular in size. Pallial sinus large. Hinge with 2 cardinal teeth, lateral teeth absent. Umbones slightly coiled inward. **Colour:** variable (usually brighter internally), yellow, or stained with red, rose, or purple.

Size: To 78 mm.

Habitat, biology, and fisheries: In shallow water, sand or sandy mud bottoms. Hand collected, consumed locally or as bait. Darkly coloured visceral mass and gritty texture are apparent causes for restricted consumption (Berg and Alatalo, 1985).

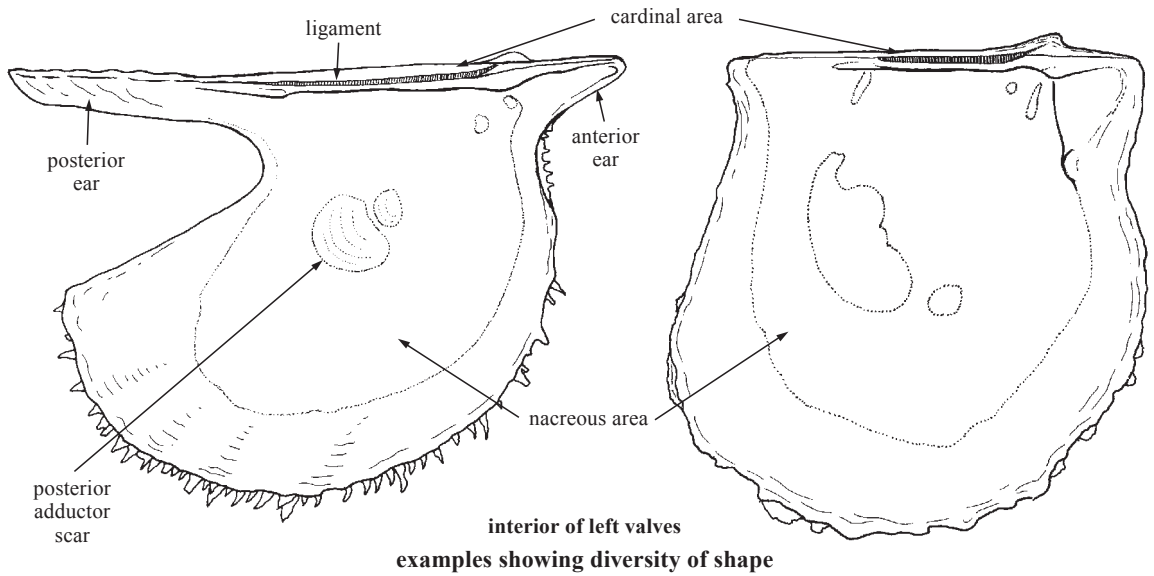
Distribution: Southeastern Florida, Caribbean to Brazil, and Bermuda.



PTERIIDAE

Pearl oysters

Diagnostic characters: Shell compressed, usually gaping, with concentric, often scaly, sculpture. Hinge lacking teeth, straight, projecting at both ends as wing-like expansions; posterior expansion usually longer. Ligament external, sunken. Anterior muscle scar very reduced or absent, posterior muscle scar large, central. Pallial sinus absent.

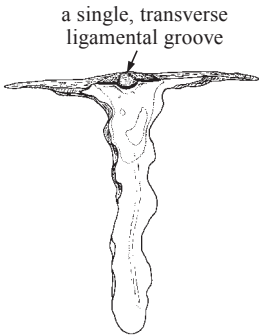


Habitat, biology, and fisheries: Lives attached by byssus to rocks or other hard substrates, in subtidal habitats between 1 to 20 m. Consumed locally raw or boiled. Traditionally exploited for the pearl market.

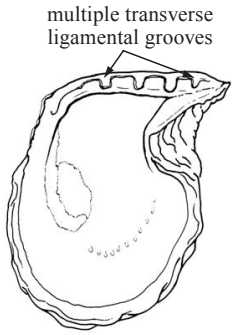
Similar families occurring in the area

Malleidae: cardinal area relatively wide, with a single transverse central groove for the ligament; shell often with a long, non-nacreous ventral to posteroventral expansion; dorsal margin of shell sometimes produced into very long wing-like expansions at both ends.

Isognomonidae: cardinal area with a series of transverse ligamental grooves.




Malleidae



Isognomonidae

List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Pinctada imbricata* (Röding, 1798).

References

Leon, L., T. Cabrera, and L. Troccoli. 1987. *Fijación y índice de engorde de la ostra perla Pinctada imbricata, Roding 1798 (Mollusca: Bivalvia) en tres bancos naturales de nororiente de Venezuela*. Universidad de Oriente, Centro de Investigaciones Científicas, Contribuciones Científicas 12, 44 p.

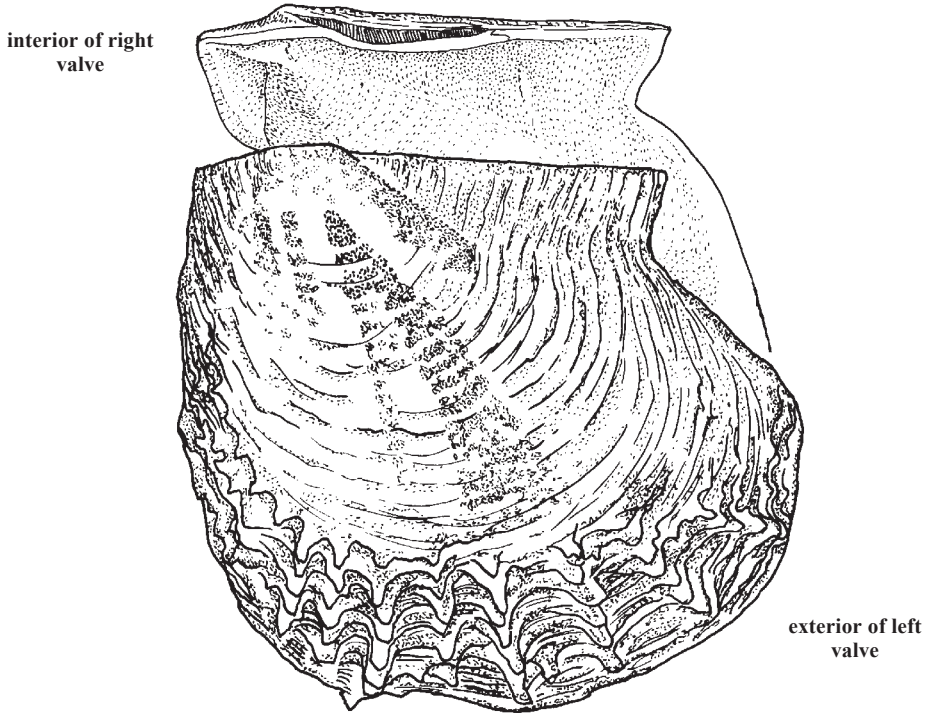
Romero, A., S. Chilbert, and M.G. Eisenhart. 1999. Cubagua's pearl-oyster beds: the first depletion of a natural resource caused by Europeans in the American continent. *J. Pol. Ecol.*, 6:57-78.

***Pinctada imbricata* (Röding, 1798)**

IKI

Frequent synonyms / misidentifications: None / *Pteria colymbus* (Röding, 1798).

FAO names: En - Atlantic pearl oyster; Fr - Huître perlière de l'Atlantique; Sp - Ostra perlera Atlántica.

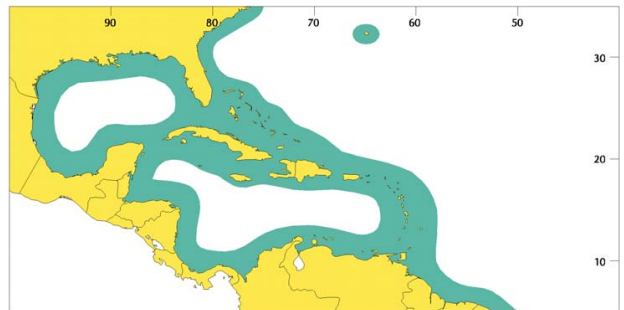


Diagnostic characters: Shell roundish, thin, flattened to moderately inflated, inequivalve. Hinge with 2 wing-like projections, posterior projection shorter than that of *Pteria colymbus*. Periostracum with flat, scale-like projections aligned concentrically. **Colour:** externally tan, brown, or purplish, with greenish cast, internally nacreous.

Size: To 76 mm.

Habitat, biology, and fisheries: Lives attached to rocks or other hard substrates, in shallow subtidal depths. Collected by free-diving by hand. Consumed locally, marinated or in stews. Historically exploited for the pearl market (Romero et al., 1999).

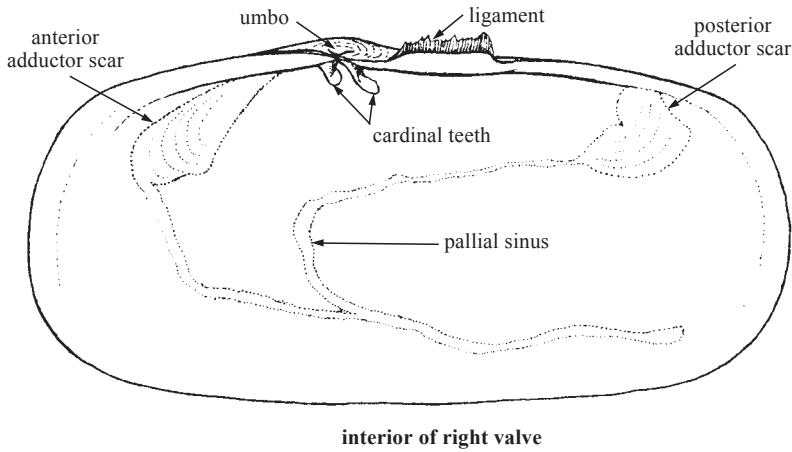
Distribution: South Carolina to Florida, Texas, and Caribbean to Brazil. Bermuda.



SOLECURTIDAE

Short razor clams

Diagnostic characters: Shell elongate, gaping at both ends, umbones subcentral. Ligament external, often on projecting shelves. Hinge with 2 small cardinal teeth on each valve. Siphons long, separate.

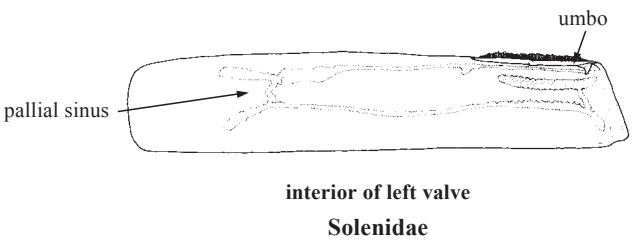
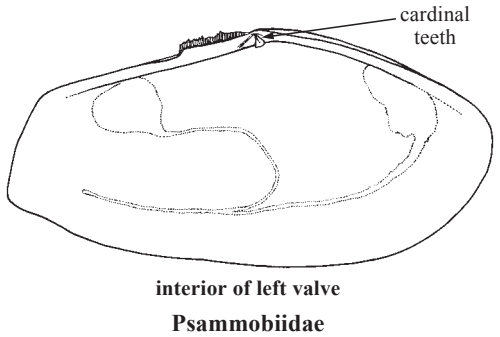


Habitat, biology, and fisheries: In mud in protected bays, from intertidal to shallow subtidal. Hand- or shovel collected, consumed locally in stews.


Similar families occurring in the area

Psammobiidae: shell inequilateral, ovate to subelliptical or trapezoidal in outline, less widely gaping and sometimes slightly flexed posteriorly.

Solenidae: shell narrowly elongate, very inequilateral; umbones near the anterodorsal end of valves; pallial sinus relatively shallow; siphons generally quite short, fused at their base.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

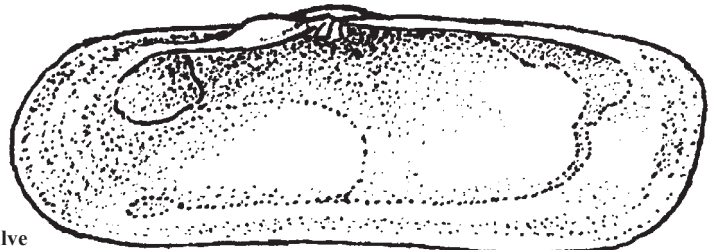
 *Tagelus plebeius* (Lightfoot, 1786).

Tagelus plebeius (Lightfoot, 1786)

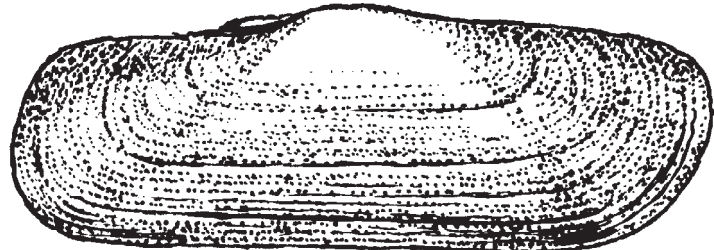
TEX

Frequent synonyms / misidentifications: None / *Tagelus divisus* (Spengler, 1794).

FAO names: En - Stout tagelus; Fr - Tagal corpulent; Sp - Tagelo plebeyo.



interior of right valve



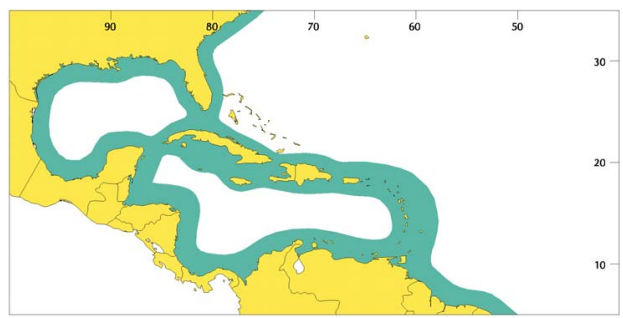
exterior of left valve

Diagnostic characters: Shell light, elongate, semi-cylindrical, inflated, posterior margin rounded, anterior margin straight but oblique. Weak radial ridge present posteriorly. Surface smooth except for fine concentric lines. Umbones slightly removed from centre of shell in posterior direction, indistinct. **Colour:** periostracum olive green to brownish yellow.

Size: To 80 mm.

Habitat, biology, and fisheries: Intertidal to shallow subtidal, in muddy sand or mud. Consumed locally stewed or grilled.

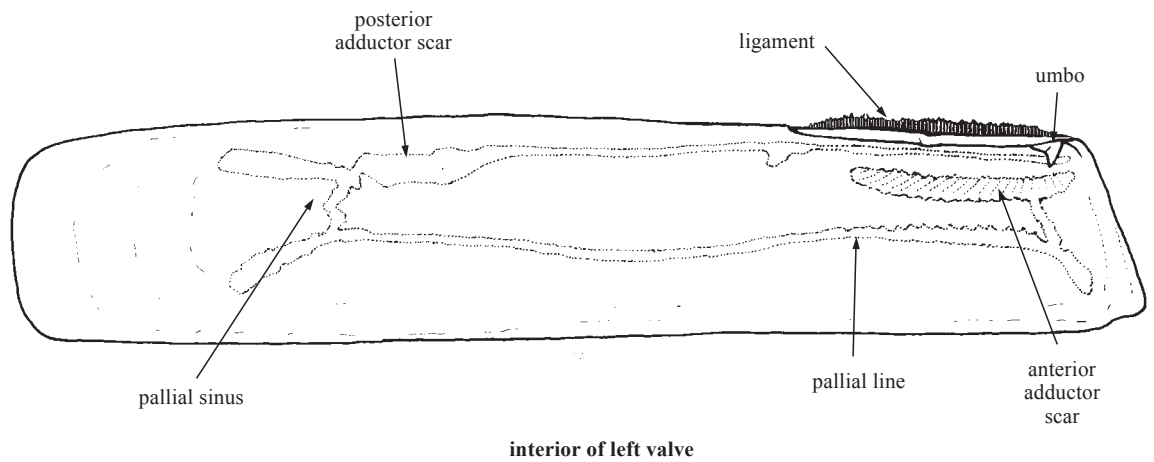
Distribution: Massachusetts to Florida, Texas, and Caribbean to Brazil.



SOLENIDAE

Knife and razor clams

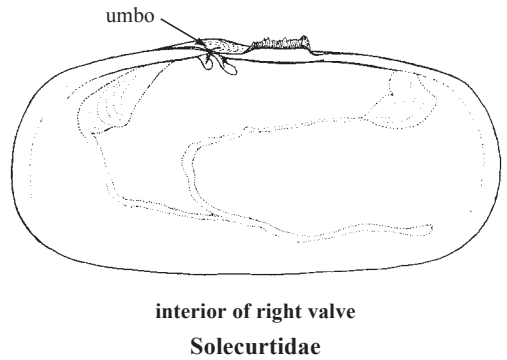
Diagnostic characters: Shell narrow, elongate, gaping at both ends. Umbones in anterior position. Anterior adductor muscle scar elongate, larger than posterior scar. Ligament external. Foot strong with an inflatable distal extremity.




Habitat, biology, and fisheries: In mud in protected bays, shallow subtidal. Hand or shovel collected, consumed locally in stews or fried.

Similar families occurring in the area

Solecurtidae: shell elongate, gaping at both ends, umbones subcentral; ligament external, often on projecting shelves; hinge with 2 small cardinal teeth on each valve; siphons long, separate.



List of species of interest to fisheries occurring in the area

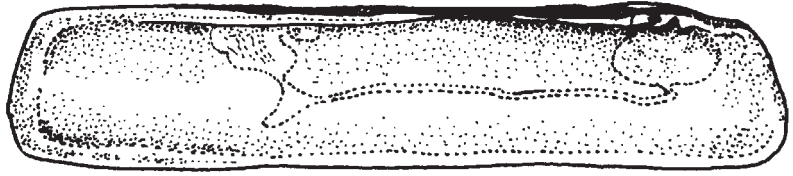
The symbol  is given when species accounts are included.

 *Solen obliquus* Spengler, 1794.

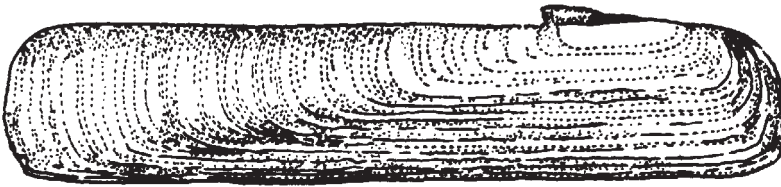
Solen obliquus Spengler, 1794

Frequent synonyms / misidentifications: None / *Solen rosewateri* Altena, 1971; *Solen tairona* Cosel, 1985.

FAO names: **En** - Antillean razor clam; **Fr** - Couteau antillais; **Sp** - Navaja antillana.



interior of left valve



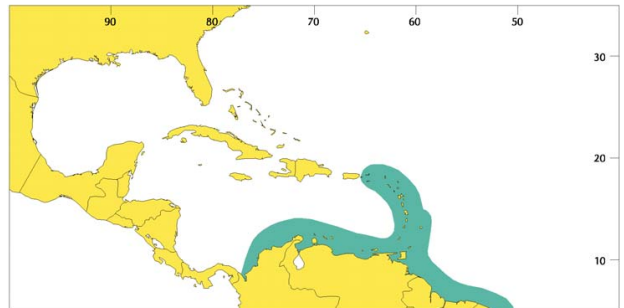
exterior of right valve

Diagnostic characters: Shell very elongate (ratio length: width 5:1), dorsal and ventral margins parallel, hinge posterior, with single pair of cardinal teeth. Shell thicker at anterior margin. Umbones at the angle formed by dorsal and posterior margins. **Colour:** brown to purple.

Size: To 96 mm.

Habitat, biology, and fisheries: Infaunal in muddy sand, in intertidal or shallow subtidal depths. Collected by hand, with shovels, or dredges. Consumed locally boiled, grilled, or fried.

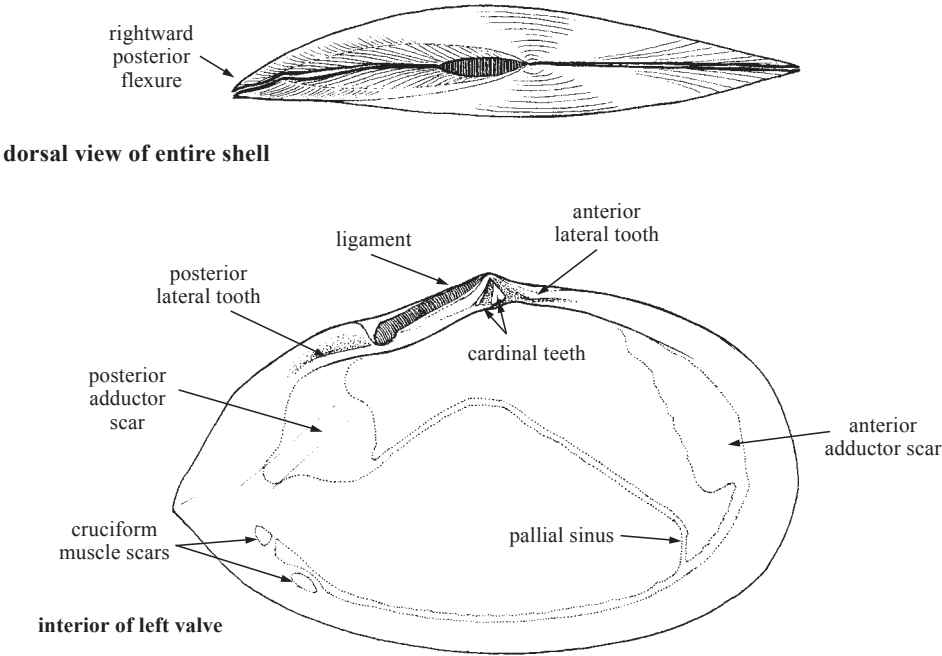
Distribution: Caribbean to Brazil.



TELLINIDAE

Tellins

Diagnostic characters: Shell compressed, oval to oblong, usually with flexed at posterior end. Sculpture mostly lacking. Ligament external. Hinge with 2 cardinal teeth in each valve. Pallial sinus deep. **Colour:** shell usually brightly coloured.

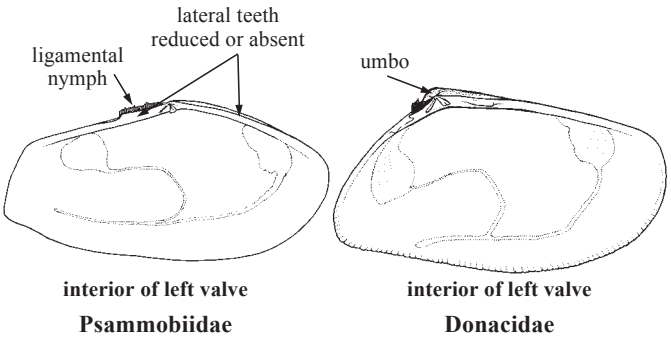


Habitat, biology, and fisheries: Buried in sand, usually in high energy environments. Hand-collected, consumed locally.

Similar families occurring in the area

Psammobiidae: shell oblong to oval, slightly gaping, sculpture mostly concentric, ligament external, strong, attached behind umbones on projecting narrow shelves; hinge with 2 small cardinal teeth; pallial sinus large.

Donacidae: shell wedge-shaped, usually with an angled (keel-like) posterior surface; ligament external; hinge with 2 cardinal teeth on each valve; adductor muscle scars subequal.



List of species of interest to fisheries occurring in the area

The symbol 🐚 is given when species accounts are included.

- 🐚 *Tellina fausta* Pulteney, 1799.
- 🐚 *Tellina laevigata* Linnaeus, 1758.

References

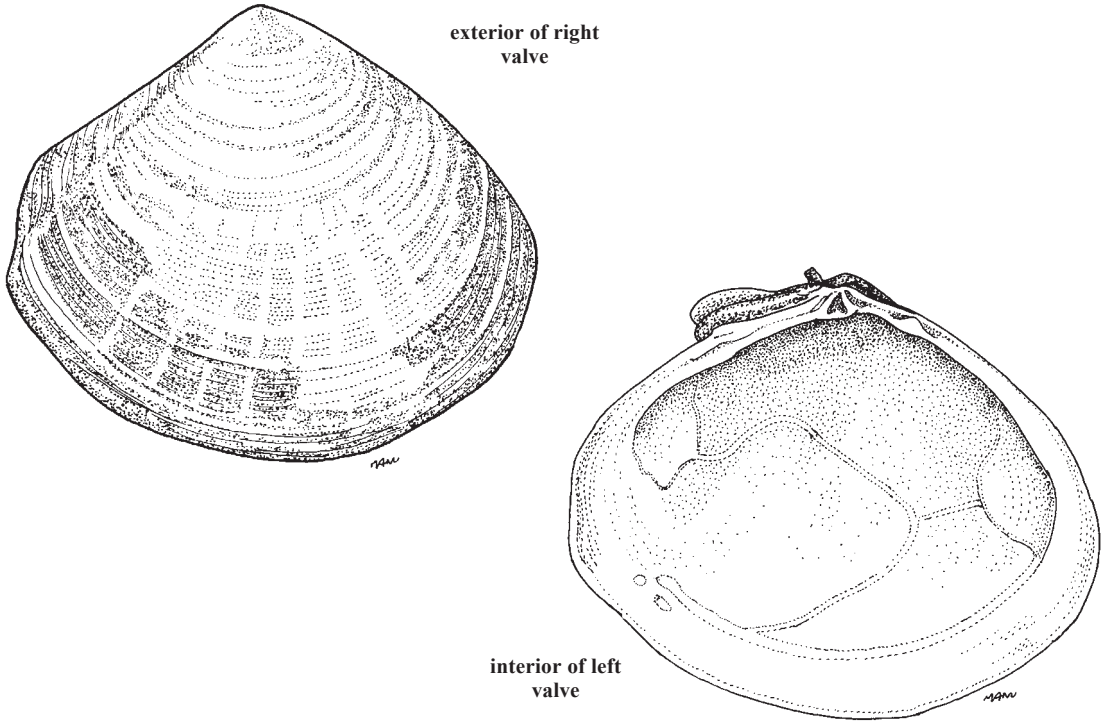
Boss, K.J. 1966. The subfamily Tellininae in the western Atlantic. The genus *Tellina* (part I). *Johnsonia*, 4(45):217-272.

Boss, K.J. 1968. The subfamily Tellininae in the western Atlantic. The genera *Tellina* (part II) and *Tellidora*. *Johnsonia*, 4(46):273-344.

Tellina fausta Pulteney, 1799

Frequent synonyms / misidentifications: None / None.

FAO names: En - Faust tellin (AFS: Favored tellin); Fr - Telline fasute; Sp - Tellina lisa.

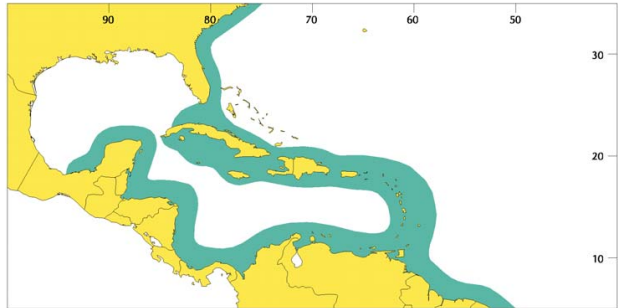


Diagnostic characters: Shell subcircular, heavy, inequivalve. Shell surface smooth except for fine, irregular growth lines. Hinge well developed, with posterior lateral tooth long and strong. Pallial sinus large, well developed. Umbones at central part of dorsal region. Oblique ridge runs from umbo to middle of posterior margin. Posterior shell margin sinuous in posterior view: posterior margin of right valve concave and of left valve concave. **Colour:** externally white, internally glossier white with yellow tinges.

Size: To 98 mm.

Habitat, biology, and fisheries: In shallow water, deeply burrowing in intertidal sand near seagrass beds. Consumed locally.

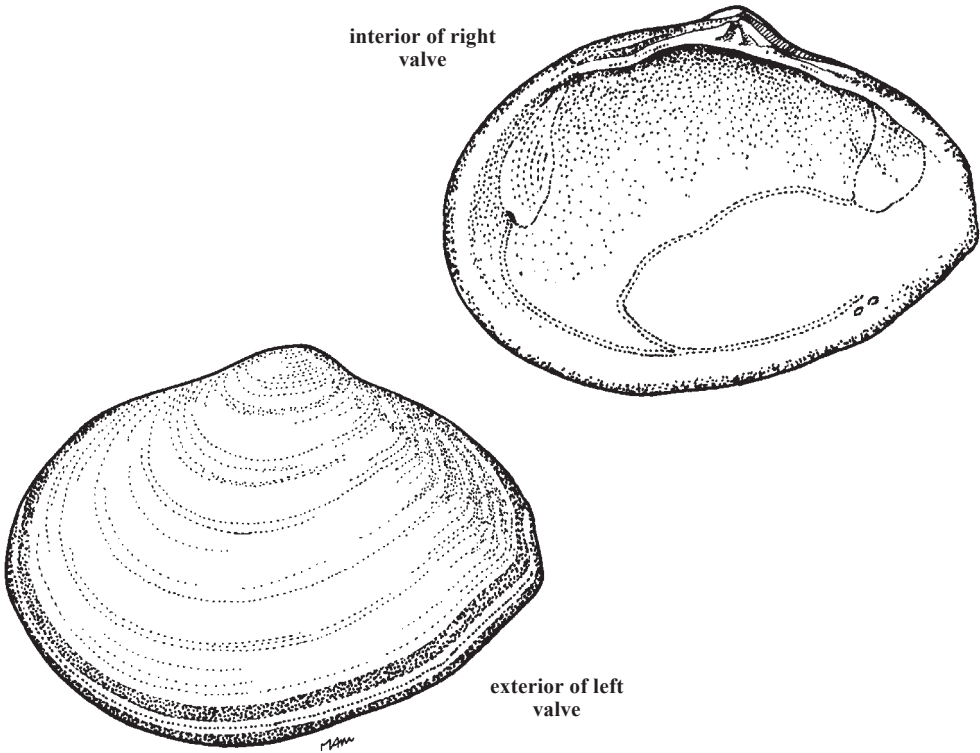
Distribution: North Carolina to southeastern Florida and Caribbean to Brazil.



Tellina laevigata Linnaeus, 1758

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Smooth tellin; **Fr** - Telline lisse; **Sp** - Telina lisa.

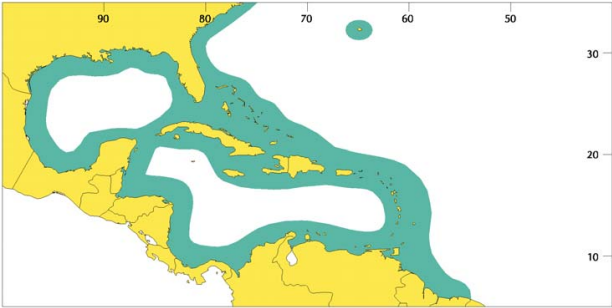


Diagnostic characters: Shell oval to slightly elongate, moderately compressed, strong. Surface smooth except for microscopic, irregular lines. Hinge with lateral and cardinal teeth present. **Colour:** externally whitish, rayed, or banded at ventral margins with light orange, internally white or with yellowish tinges.

Size: To 88 mm.

Habitat, biology, and fisheries: Sandy bottoms, in shallow water.

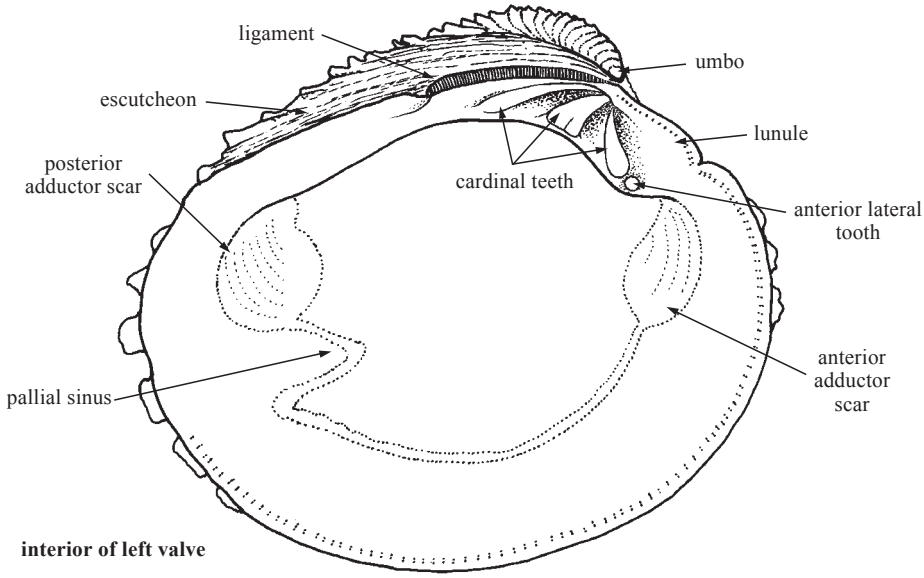
Distribution: North Carolina to southern Caribbean, and Bermuda.



VENERIDAE

Venus clams

Diagnostic characters: Shell usually solid, umbones anterior to midline, lunule and escutcheon usually present, sculpture usually concentric, sometimes lacking. Ligament external. Hinge with 3 or rarely 2 cardinal teeth in each valve. Adductor muscles (and their scars) usually equivalent in size.



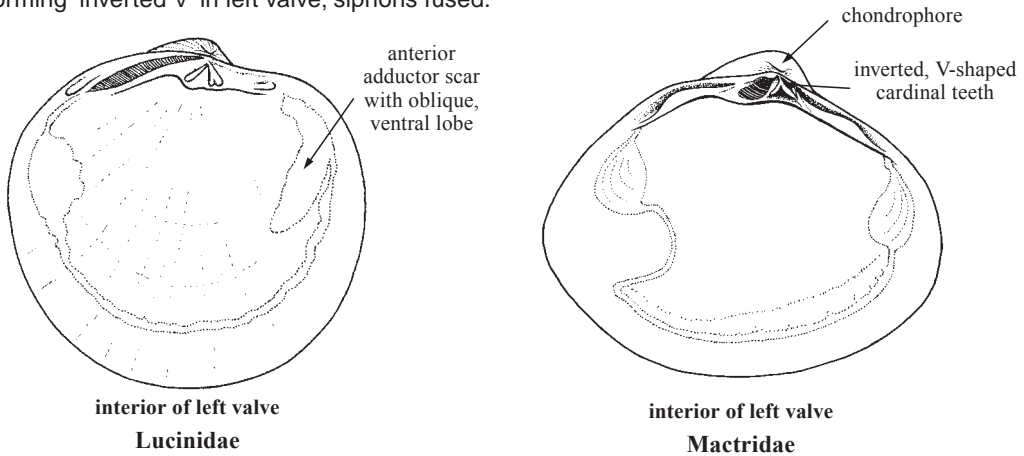
Habitat, biology, and fisheries: Species of interest to fisheries inhabit soft bottoms, usually in shallow subtidal environments. Some species, such as the southern quahog, represent a large fraction of local catches and efforts in aquaculture, particularly in the northern half of the area.

Remarks: Venus clams belong to the most specious family of marine bivalves. Due to a renewed interest in bi-valve systematics, the taxonomy of the family is currently undergoing major rearrangements.


Similar families occurring in the area

Lucinidae: shell disk-shaped, ligament external, hinge typically with 2 cardinal and 2 lateral teeth; pallial sinus absent; foot long.


Mactridae: shell triangular to subtriangular, internal ligament, with chondrophore, typically with 2 fused cardinal teeth forming 'inverted V' in left valve; siphons fused.




List of species of interest to fisheries occurring in the area


The symbol  is given when species accounts are included.

 *Chione cancellata* (Linnaeus, 1767).

 *Macrocallista maculata* (Linnaeus, 1758).

 *Macrocallista nimbosa* (Lightfoot, 1786).

 *Mercenaria campechiensis* (Gmelin, 1791).

 *Tivela mactroides* (Born, 1778).

References

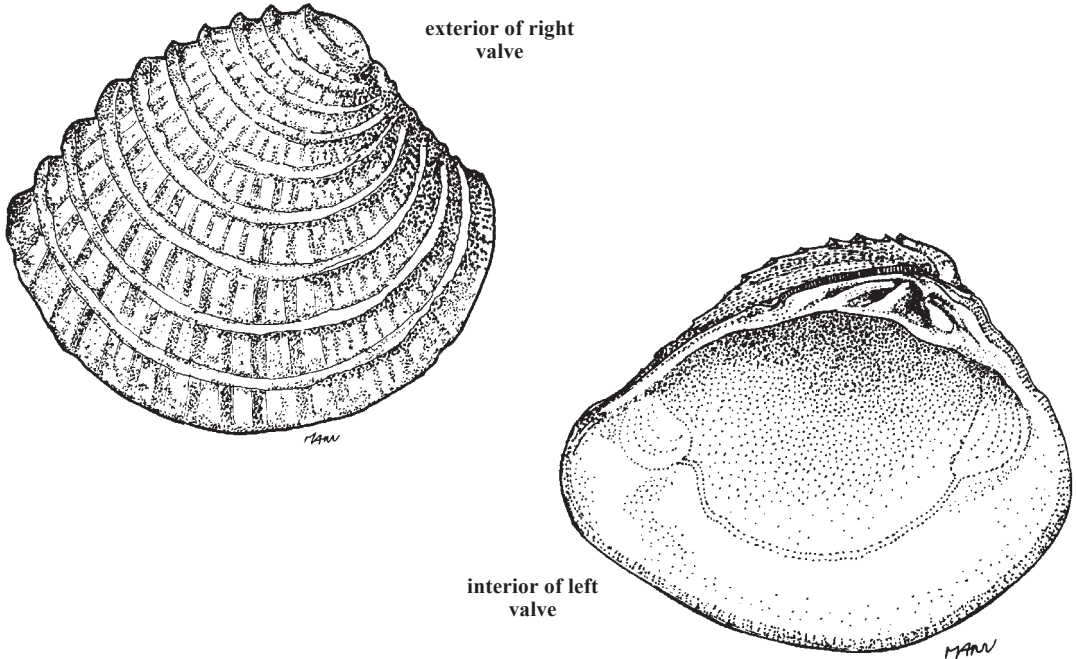
- Jolley, J.W., Jr. 1971. Exploratory fishing for the sunray venus, *Macrocallista nimbosa*, in northeastern Florida. *Fla. Dep. Nat. Res., Mar. Res. Lab., Tech. Ser.*, 67:42 p.
- Moore, H.B. and N.N. Lopez. 1969. The ecology of *Chione cancellata*. *Bull. Mar. Sci.*, 19(1):131-148.
- Prieto, A.S., C. Ramos, and D. Arrieche. 1998. Producción secundaria de una población de *Chione cancellata* de la costa sur del Golfo de Cariaco, Venezuela. *Rev. Biol. Trop.*, 46(4).
- Roopnarine, P. and G.J. Vermeij. 2000. One species becomes two: the case of *Chione cancellata*, the resurrected *Chione elevata*, and a phylogenetic analysis of *Chione*. *J. Moll. Stud.*, 66:517-534.

Chione cancellata (Linnaeus, 1767)

KNN

Frequent synonyms / misidentifications: None / *Chione elevata* (Say, 1822); juveniles of *Mercenaria campechiensis* (Gmelin, 1791).

FAO names: **En** - Cross-barred venus; **Fr** - Vénus quadrillée; **Sp** - Venus cuadrilla.



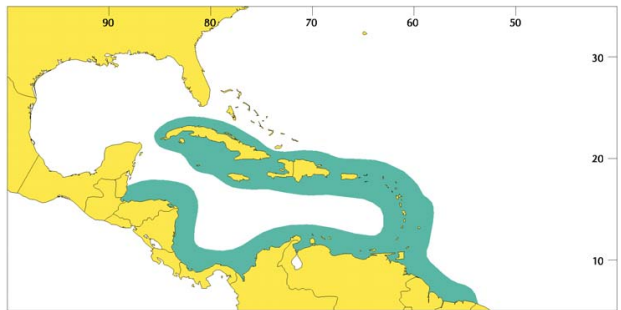
Diagnostic characters: Shell thick, trigonal. Sculpture of blade-like concentric ridges crossed by radial ribs. Interspaces between ribs smaller than between ridges. Lunule heart-shaped, dark. **Colour:** externally white to light grey, sometimes with brown rays, internally white, frequently with blue-purple markings.

Size: To 45 mm.

Habitat, biology, and fisheries: Sand in shallow subtidal environments, often in seagrass beds. Consumed locally in chowders or soups.

Distribution: Caribbean and from Honduras to southeastern Brazil.

Remarks: Populations formerly attributed to this species in northern sector of area (from Belize and Mexican Caribbean northward) have been shown by Roopnarine and Vermeij (2000) to belong to a separate species, *Chione elevata* (Say, 1822).

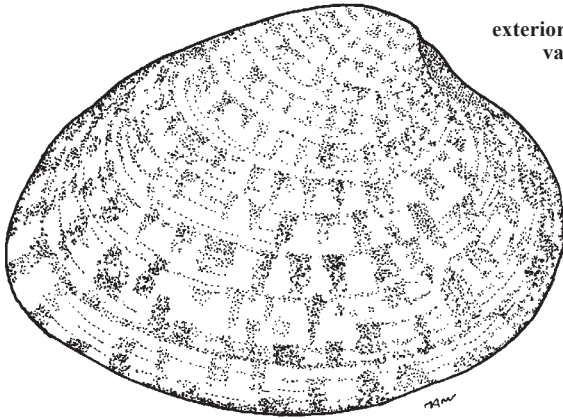


Macrocallista maculata (Linnaeus, 1758)

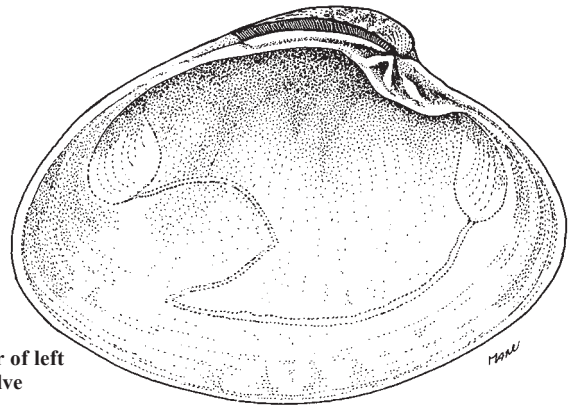
KSM

Frequent synonyms / misidentifications: None / *Macrocallista nimbosa* (Lightfoot, 1786)

FAO names: **En** - Calico clam; **Fr** - Vénus calicot; **Sp** - Almeja calico.



exterior of right
valve



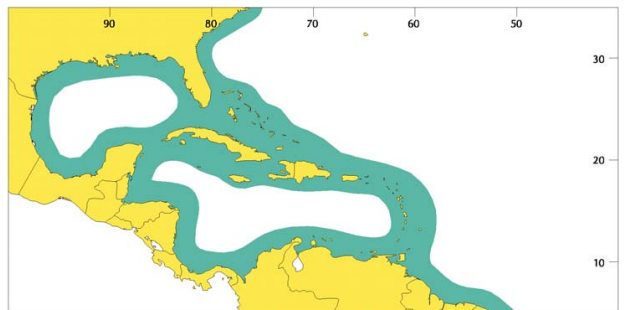
interior of left
valve

Diagnostic characters: Shell ovate, much less elongate than *Macrocallista nimbosa*. Surface highly glossy. Sculpture of very fine growth lines under glossy layer. Umbones small. Lunule small. **Colour:** tan with irregular brown marks, sometimes arranged in radial bands. Internally white.

Size: To 70 mm.

Habitat, biology, and fisheries: Lives in coarse sand, often near seagrass beds, in shallow subtidal depths. Consumed locally in southern half of area in chowders and stews.

Distribution: North Carolina to Florida, Texas, Caribbean to Brazil, and Bermuda.

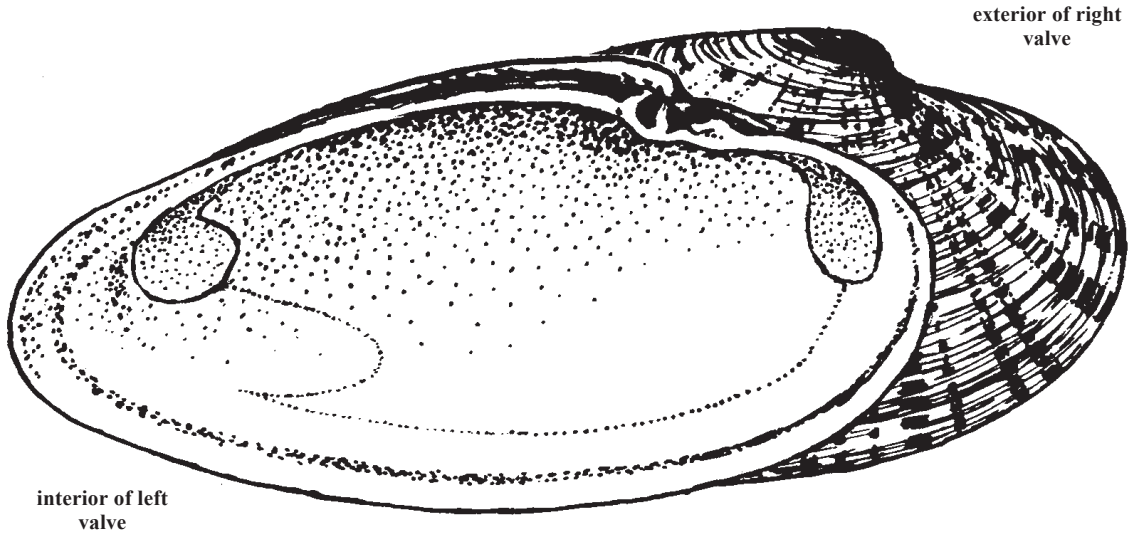


Macrocallista nimbosa (Lightfoot, 1786)

KSN

Frequent synonyms / misidentifications: None / *Macrocallista maculata* (Linnaeus, 1758).

FAO names: **En** - Sunray venus; **Fr** - Vénus rayon de soleil; **Sp** - Venus rayo de sol.

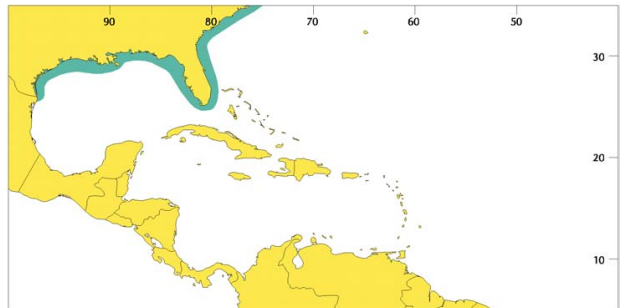


Diagnostic characters: Shell elongate, ovate. Surface glossy. Sculpture almost completely absent, except for weak growth lines and radial riblets. Lunule oval. Long external ligament. **Colour:** salmon to greyish purple, with darker, brownish radial bands; lunule purplish.

Size: To 150 mm.

Habitat, biology, and fisheries: Lives in sandy bottoms. Commercial production ceased in Florida in 1973. Consumed locally in chowders.

Distribution: North Carolina through Florida to Texas.

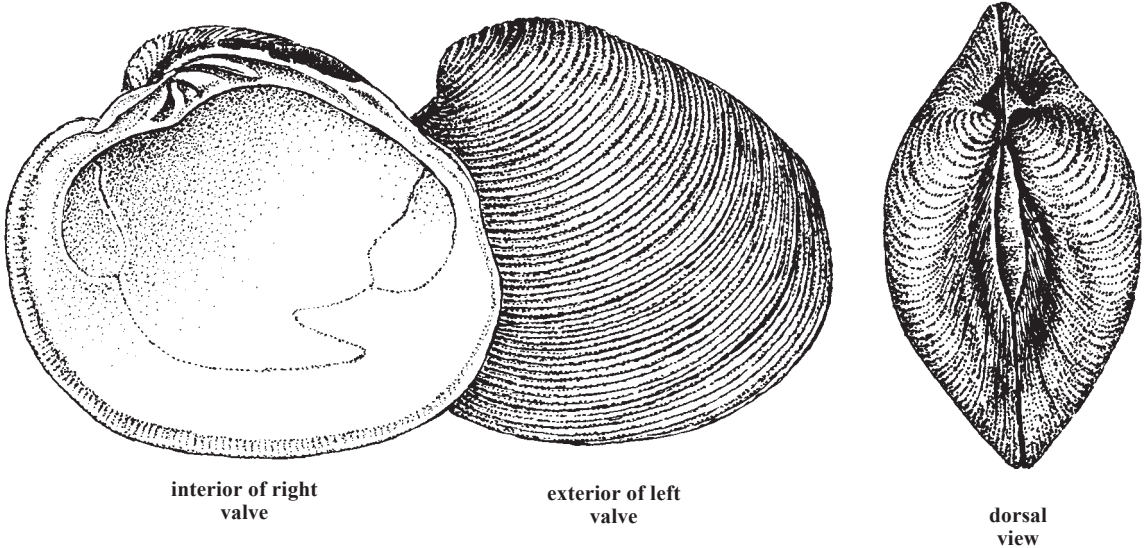


Mercenaria campechiensis (Gmelin, 1791)

EKK

Frequent synonyms / misidentifications: None / *Mercenaria mercenaria* (Linnaeus, 1758).

FAO names: **En** - Southern hardshell clam (AFS: Southern quahog); **Fr** - Praire du sud; **Sp** - Almeja del sur.



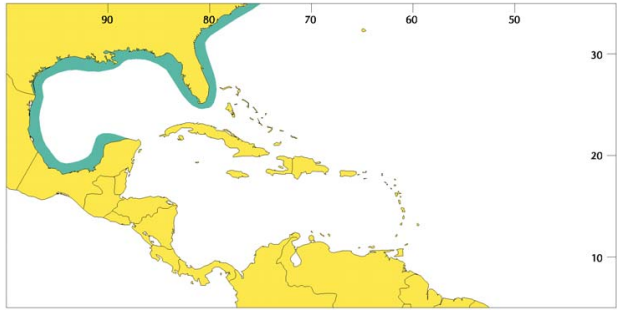
Diagnostic characters: Shell thick, more inflated than in *Mercenaria mercenaria*, ovate-trigonal. Sculpture of irregular lines, more separated than in *M. mercenaria*. Lines never absent in middle of valve. Lunule as long as wide. **Colour:** dull white to grey. Internally sometimes stained with purple.

Size: To 150 mm.

Habitat, biology, and fisheries: Lives from the intertidal to the shallow subtidal (to about 16 m depth), in moderately hard sandy bottoms or in sandy mud. Sometimes in close association with seagrass beds and algae. Rarely found in the surf zone. One of the most commercially exploited bivalve species in the area. Species is harvested by digging in shallow water. Also collected by recreational fishermen by 'treading' (probing with bare feet), and in deeper water by bull rakes and clam tongs. Mechanical harvesting not permitted in Florida. Species is high in protein and virtually fat-free. Consumed in chowders, with pasta, on the half-shell, or in a variety of dishes.

Distribution: Southern New Jersey to Florida to Texas and Yucatán, Mexico, and northern Cuba.

Remarks: This species may form hybrids with individuals of *M. mercenaria* in the southeastern USA.

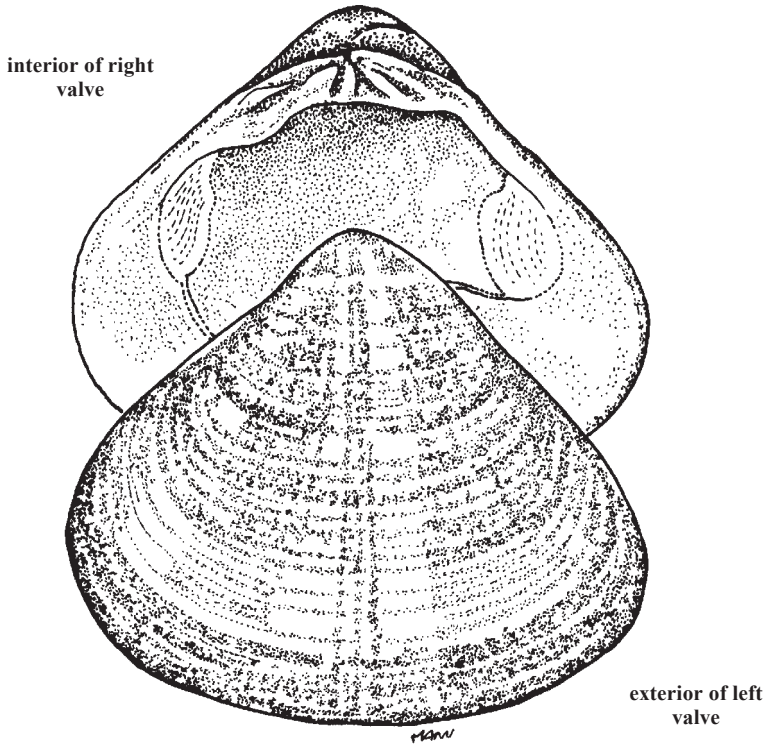


Tivela mactroides (Born, 1778)

TVM

Frequent synonyms / misidentifications: None / *Polymesoda arctata* (Deshayes, 1854); *Polymesoda aequilatera* (Deshayes, 1855).

FAO names: **En** - Trigonal tivala; **Fr** - Tivèle trigone; **Sp** - Tivela triangular.

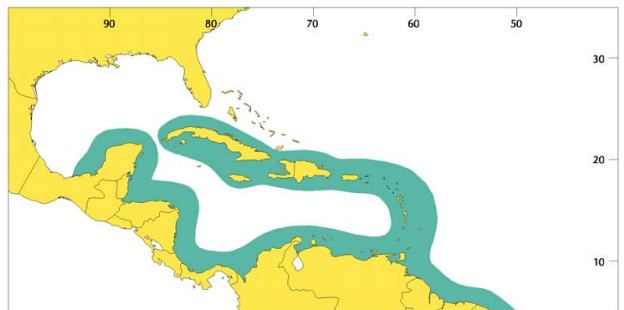


Diagnostic characters: Shell heavy, thick, inflated, triangular. Shell surface umbones central and prominent. Hinge with 3 cardinal teeth, with smaller secondary teeth present. Lateral tooth in left valve large. Lunula large, escutcheon absent. Periostracum like varnish. **Colour:** whitish with brown tinges and rays.

Size: To 38 mm.

Habitat, biology, and fisheries: Lives in sand, from the intertidal to very shallow subtidal. Consumed locally in soups, stews, or on the half-shell.

Distribution: Caribbean to Brazil.



GASTROPODS

by J.H.Leal, The Bailey-Matthews Shell Museum

GENERAL REMARKS

The Gastropoda constitute one of the most speciose and diverse groups of animals, comprising more than half of all named molluscs (at the class rank, Gastropoda is second only to the Insecta in number of species). The widely varied array of body plans and shell shapes in the Gastropoda reflects the diverse paths on which the group radiated since the Cambrian. As briefly discussed below, this diversity is a result of some basic constraints defined early in the evolutionary history of the class.

Gastropods are asymmetrical molluscs that underwent torsion. The body is generally divided into 2 main regions: (1) head-foot and (2) mantle (including shell), mantle cavity, and visceral mass. In most gastropods the muscular foot is the locomotion organ; gastropods mainly crawl, attach, or burrow using the foot. The head includes sense organs (e.g., tentacles and eyes) and in many groups is the site of concentration of nerve ganglia and connectives. The mantle, typical of molluscs, lines the shell internally; its external edge is the site of shell deposition. The space between the head-foot and the mantle proper is the mantle cavity, where the ctenidium (or ctenidia), osphradium, anus, nephridiopore, and external genitalia are located. The visceral mass, located in posterior direction, is the location of the gonads, digestive gland, heart, kidney, and part of the alimentary system.

The Gastropoda are almost universally accepted as a monophyletic group. Gastropods are defined by the presence of characters such as a larval operculum, but mainly by undergoing torsion and displaying associated anatomical conditions, such as an increased concentration of organs in the visceral mass. Torsion (not to be confused with coiling of the shell around a point or an axis) is the rotation of the visceral mass and mantle (including shell) for up to 180° in relation to the head and foot, always in a counterclockwise direction, and most frequently in the late-veliger larval stage. During torsion, the mantle cavity and its organs rotate from a posterior to an anterior position. As a result, the longitudinal nerve cords connecting the visceral to the pleural ganglia in a fully torted gastropod form a figure-eight, and the digestive tract is twisted into a U-shape that loops back into the visceral mass. Torsion moves the mantle cavity, and associated organs such as the adult anus, nephridiopores, and gonopores to a more anterior position. Many of the evolutionary pathways in post-torsional gastropods seem to involve modifications to prevent fouling of the anterior region of the mantle cavity (which includes the ctenidia) and head. That includes the gradual displacement of the anus back in posterior direction in vetigastropods such as keyhole limpets, abalones, and slit and top snails. The tortored condition is found in most shelled gastropods, but gastropods in the Euthyneura (e.g., pulmonates, opisthobranchs) have secondarily reverted to several stages of detorsion.

Coiling is a phenomenon closely linked to torsion, probably a solution to the spatial constraints of the post-torsional anterior 'piling up' of mantle cavity + visceral mass + shell. Coiling in its simplest form is planispiral, where the shell + visceral mass ensemble coils around a point. The most frequent form of coiling in gastropods, however, is helicoidal, with asymmetrical coiling of the shell around a line producing a skewed turbanate coil. In contrast to simpler planispiral coiling, helicoidal coiling provides larger whorl diameters at older, higher parts of the shell, allowing for more internal space for the visceral mass. The trade-off for the spatial advantages offered by helicoidal coiling is a marked loss of symmetry in the gastropod arrangement of internal organs, in particular those of the mantle cavity: as one of the results of right-handed coiling in gastropods, the right-side member of paired organs such as ctenidia and osphradia are reduced or completely absent in most gastropod groups.

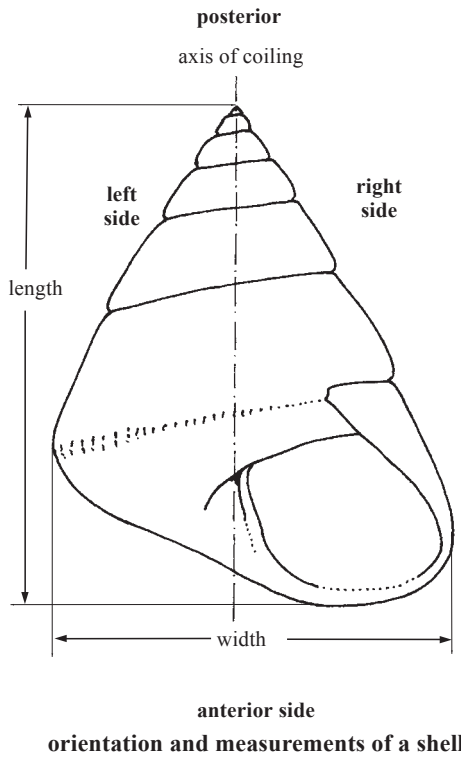
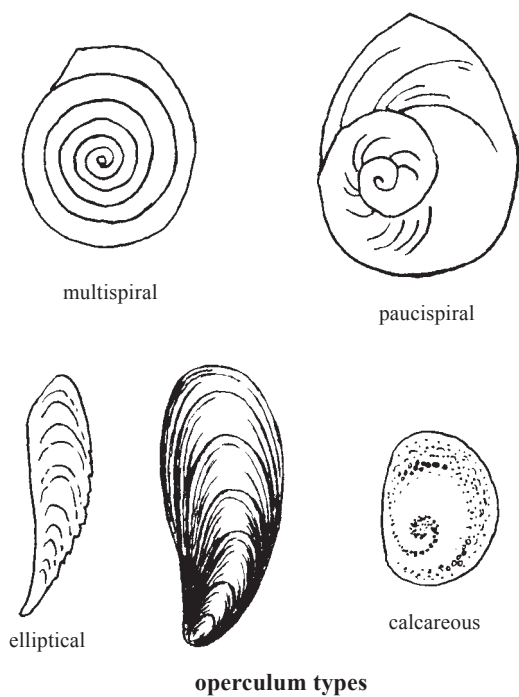
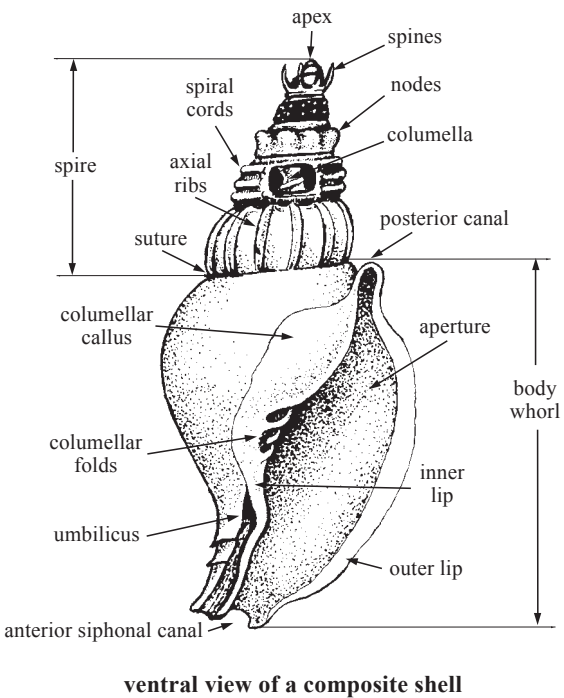
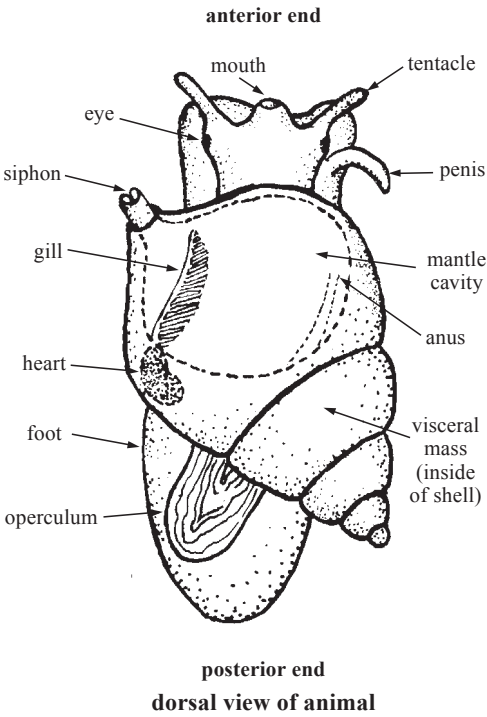
The Gastropoda exhibit extremely diversified food habits. There are predators, scavengers, filter- and deposit-feeders, macro- and micro-herbivores. In addition, in order to reach the food source, some gastropods are able to drill through hard structures (e.g., shells) using the radula.

From the standpoint of reproduction, gastropods may be dioecious or hermaphroditic (simultaneous or protandric), and may perform internal or external fertilization. Most gastropods go through pelagic larval development of varied duration (from a couple of hours to a few months), but some groups are known to have bypassed pelagic development, undergoing intracapsular (direct) development instead.

The types of habitats occupied by gastropods are also extremely diversified; gastropods inhabit both terrestrial and aquatic environments, and in the marine environment, can be found from the bottom of the deepest ocean trenches to the canopies of mangrove forests.

Although showing a lower number of species when compared to other areas of the world's oceans (e.g., Western Central Pacific), Fishing Area 31 includes some of the richest and most diverse marine areas in the Atlantic Ocean, the Caribbean Basin and the Antilles. Within molluscs, gastropods in Fishing Area 31 represent the third class (after bivalves and cephalopods) in catch by weight. At least one genus, *Strombus*, comprised about 1% of the total catch (including fishes, crustaceans, and other molluscs) for the area in 2000.

TECHNICAL TERMS AND MEASUREMENTS



general characteristics of gastropods

GLOSSARY OF TECHNICAL TERMS

Albino - shell lacking normal pigmentation.

Anterior - region situated near the head. In gastropods: in front.

Anterior canal - expansion looking like a groove or a tube and serving to protect the siphon in gastropod shells.

Aperture - opening in gastropod shells.

Apertural - position relative to the aperture of gastropod shells.

Apex - extremity of a gastropod shell opposite to the anterior region; part of the shell built in earlier life.

Apical - situated at or near the apex of a gastropod shell.

Axial - direction forming a plane with main shell axis in gastropods.

Basal - position relative to shell base.

Base - part of the gastropod situated in opposition to the apex.

Bottom of the shell - same as base.

Body whorl - most anterior whorl of the gastropod shell, last and largest whorl.

Callus - thickening of the shell, secondary, smooth, sometimes glazed, usually secreted on the parietal region of the columella.

Cancellate - feature of cross-barred sculpture of some gastropod shells consisting of axial and spiral elements of same intensity crossing at right angles.

Columella - column or pillar located on the centre of a gastropod shell.

Cord - element of gastropod shell sculpture, usually spirally oriented, thicker than line.

Cordlet - narrow cord, thicker than line.

Corrugated - appearance of surfaces forming wrinkles.

Crenulated - appearance of surfaces that are delicately notched or corrugated. Term usually applied to wrinkled shell margin or edge.

Crenulations - notches, or wrinkles that are small and delicate.

Denticles - features of sculpture elements looking like small teeth-like projections. Term usually applied to features seen on the internal part of the aperture.

Depressed - outline of low, pressed-down gastropod shells. Term usually applied to some top shells.

Dorsal - region opposite to the foot in gastropods.

Egg-ribbon - same as ribbon.

Elongate - shell with length significantly larger than width.

Excavated - appearance of a hollow, concave surface.

Fold - ridge spiralling on columella.

Foliated - characteristic of being leaf-like.

Foot - in gastropods, fleshy, sole-like, muscular part of body involved in locomotion.

Furrow - groove in longitudinal direction found on the dorsal region of, among other shells, cowries and Triviidae.

Fusiform - characteristic of being spindle-shaped.

Glassy - surface resembling glass, vitreous, transparent.

Globular - shape resembling a sphere or a ball.

Globose - same as globular.

Granulated - surface covered with minute grains, pustules, or beads.

Growth lines - lines on shell surface indicative of alternating periods of growth and rest; sometimes corresponding to seasonal changes.

Horny - substance that is hardened and proteinaceous; present in or completely forming the gastropod operculum and shell periostracum.

Incised lines - features of shell sculpture represented by cuts or narrow grooves on the shell surface.

Indentation - cut or notch on shell edge or parietal region.

Indented - surface bearing an indentation.

Interspaces - spaces between sculptural features, such as ribs, costae, or cords.

Juvenile - characteristic of being young, immature, not fully grown.

Keyhole - apical orifice in some limpets.

Knob - large nodule, rounded projection.

Knobbed - surface bearing knobs.

Lamella (pl. lamellae) - thin plate or blade-like projection.

Lamellation - same as lamella.

Ligament - structure that is horny and proteinaceous, acting as a spring tending to keep the valves opened in bivalve shells. Usually situated in the region of the hinge, either internally or externally.

Line - sculptural feature narrowly incised on shell surface.

Lip - edges of the outer surface of the aperture in the gastropod shell.

Longitudinal - direction parallel to the largest dimension of the shell or mollusc.

Nacreous - characteristic of being iridescent, like mother-of-pearl.

Nodules - projections that are rounded as tubercles.

Nodulose - surface bearing nodules.

Notch - cut or depression on any margin, canal, or on the gastropod aperture.

Opalescent - characteristic of being whitish, but with nacreous luster.

Operculum - trapdoor or plate which closes the aperture of gastropod shells and isolates the snail from its surrounding environment. Opercula can be horny ('soft', brownish) or calcareous ('hard', usually whitish).

Outer lip - edge of the external part of the aperture away from the shell axis.

Ovate - characteristic of having the form of an egg.

Oval - same as ovate.

Parietal - region of the internal part of the aperture, usually set apart by differences in surface texture and/or coloration.

Parietal shield - parietal region when markedly different from the remainder of the adjacent shell area.

Periphery - region of the outermost part of any given whorl on the gastropod shell. The shell periphery is therefore the greatest circumference of the gastropod shell.

Periostracum - layer of the outside part of the shell. It is horny and sometimes hair-like.

Peristome - aperture rim or periphery.

Plication - same as fold.

Posterior - region away from the siphonal canal, near the apex, in gastropods; in bivalves, the region of the shell sinus, away from the foot.

Posterior canal - canal of small size or notch opposite to the siphonal canal on the aperture of the gastropod shell.

Protoconch - larval shell remaining on the apex of well-preserved gastropod shells.

Radial - structures that are directed away from the apex toward the shell margin, in limpets.

Radiating - same as radial.

Reticulate - feature of shell sculpture consisting of criss-crossed, net-like texture formed by the intersection of lines at right angles.

Reticulated - same as reticulate.

Ribbon - surface consisting of an aligned sequence of egg-cases.

Ribs - structural elements forming a well-defined, narrow ridge in gastropod shells. Term usually applied to those elements forming a plane with (or slightly oblique to) shell axis.

Riblets - diminutive of ribs.

Scales - sculptural elements that are small, raised, and plate-like.

Septum - partition found in the internal side of gastropod shells; characteristic of slipper-shells.

Serrated - resembling tiny saw teeth.

Shoulder - angled region of the whorls of gastropod shells.

Siphon - prolongation of the gastropod mantle used to convey water into the mantle cavity.

Siphonal canal - projection of the anterior region shell in tubular form protecting the anterior siphon.

Snails - common name of gastropods.

Spiral - direction following the coiling of the gastropod shell. Term usually applied as a modifier to sculptural terms such as 'spiral cords'.

Spire - series of successive whorls in a gastropod shell, with exception of the last one.

Spire angle - angle formed by the lines defined by the outermost points on both sides of the spire.

Striation - fine, repeated lines or furrows on shell surface.

Suture - line or region of junction between two adjacent whorls in the gastropod shell.

Synonym - a scientific name applied to a species that has received an earlier name. OBS: Usually, the earlier name is the valid one.

Thread - same as line.

Top of the shell - same as apex.

Turbinate - form that looks top-shaped, tapering evenly from base to apex.

Turreted - form that looks tower-shaped, elongate.

Umbilicus - cavity at base of gastropod shells.

Uncoiled - gastropod shell that lacks coiling.

Varix - axial sculptural element that is more prominent than a costa, and usually more widely spaced; evidence of a growth halt during which a thickened lip develops (plural: varices).

Ventral - region of the animal opposed to the dorsal region; region of the foot in gastropods.

Whorl - a complete turn or coil of the gastropod shell.

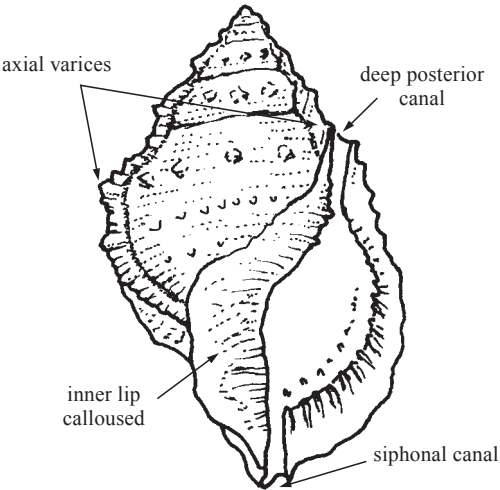
GUIDE TO FAMILIES OCCURRING IN THE AREA

The following guide is intended to facilitate the identification of marine or brackish-water gastropod families regularly exploited or occasionally found in markets of the area. Additionally included are those families that are similar to exploited families but do not contain species that are regularly utilized. The families in this guide represent only a small part of the gastropod fauna occurring in the area, and it is probable that their number will increase once we have better information on the fisheries and utilization of this group of resources.

BURSIDAE

Frog shells

No species of interest to fisheries in the area.

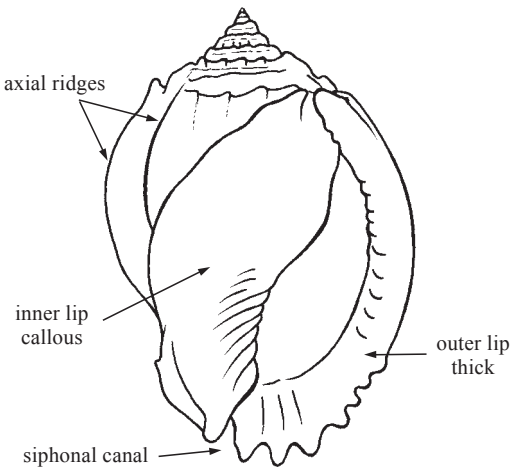


CASSIDAE

p. 113

Helmet and bonnet shells

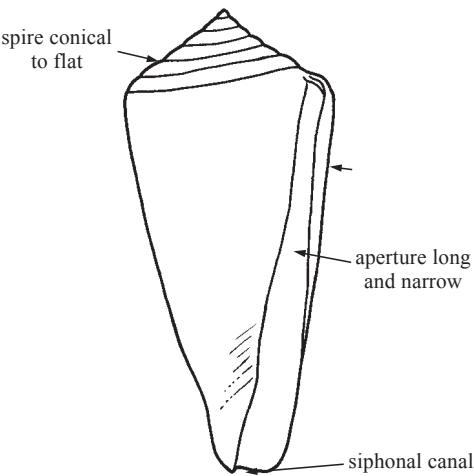
Three species of interest to fisheries in the area.



CONIDAE

Cone shells

No species of interest to fisheries in the area.

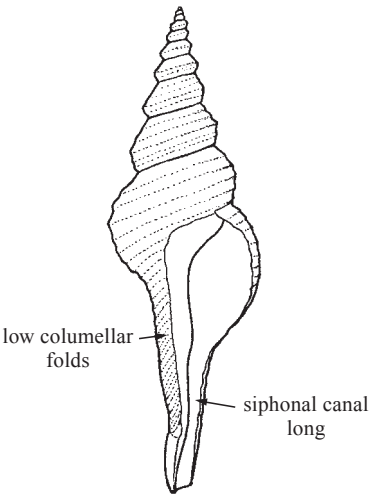


FASCIOLARIIDAE

p. 117

Horse conchs, spindle shells

Two species of interest to fisheries in the area.

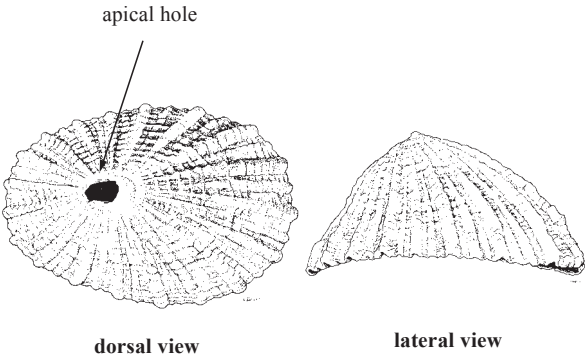


FISSURELLIDAE

p. 120

Keyhole limpets

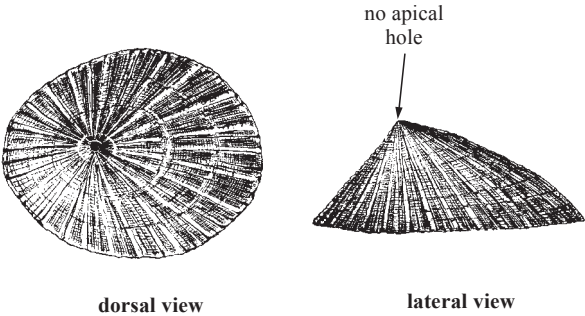
Three species of interest to fisheries in the area.



LOTTIIDAE

Lottiid limpets

No species of interest to fisheries in the area.

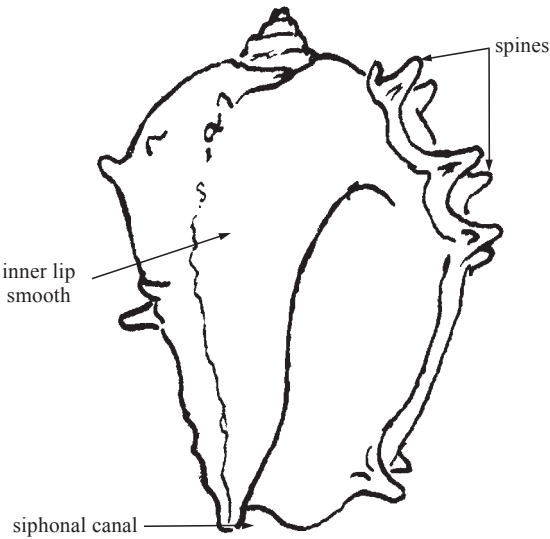


MELONGENIDAE

p. 124

Melongenas

Four species of interest to fisheries in the area.

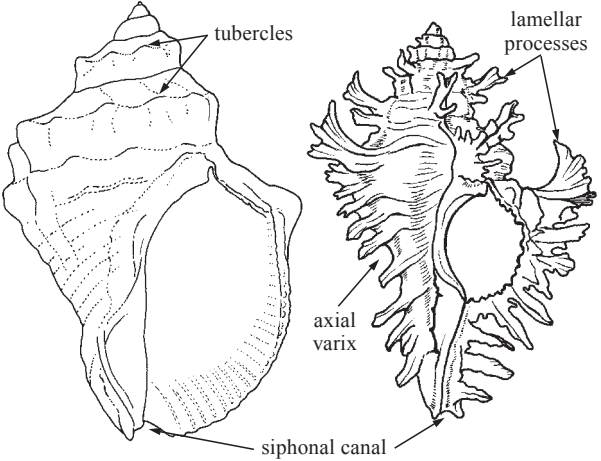


MURICIDAE

p. 128

Purpuras, murex, and rock shells

Three species of interest to fisheries in the area.

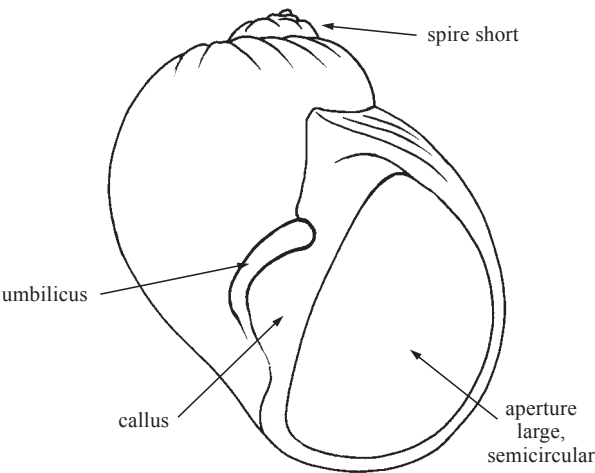


examples showing diversity of shape

NATICIDAE

Moon snails

No species of interest to fisheries in the area.

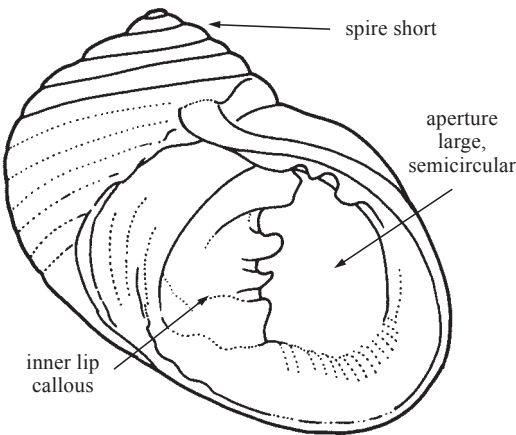


NERITIDAE

p. 133

Nerites

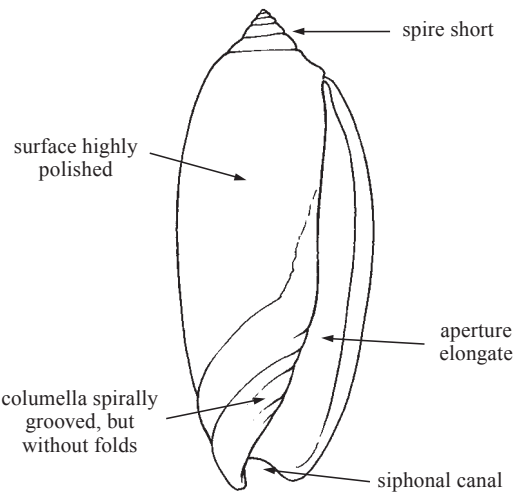
One species of interest to fisheries in the area.



OLIVIDAE

Olive shells

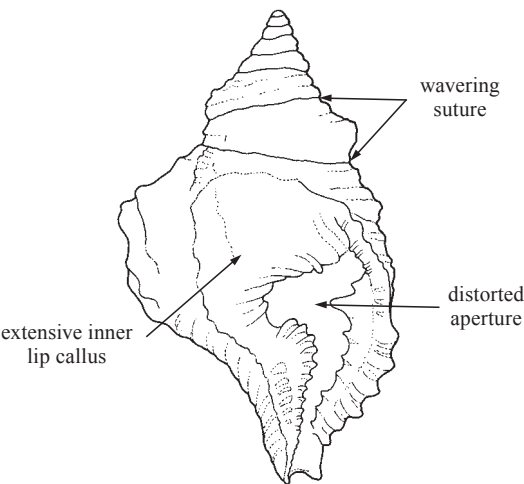
No species of interest to fisheries in the area.



PERSONIDAE

Distorsios

No species of interest to fisheries in the area.

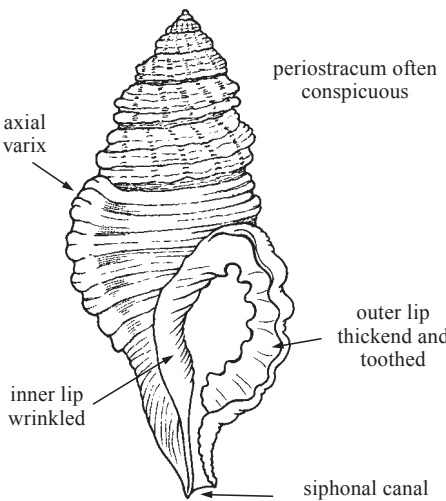


RANELLIDAE

p. 135

Triton shells

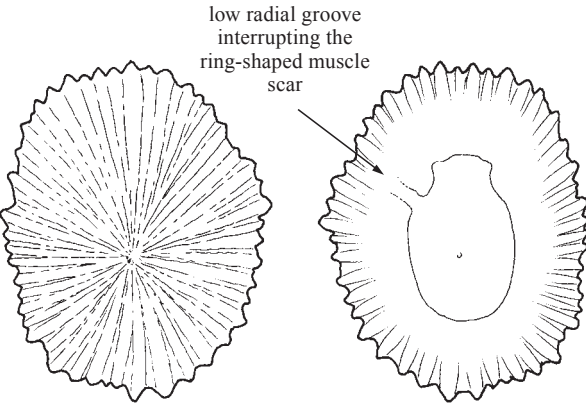
One species of interest to fisheries in the area.



SIPHONARIIDAE

False limpets

No species of interest to fisheries in the area.

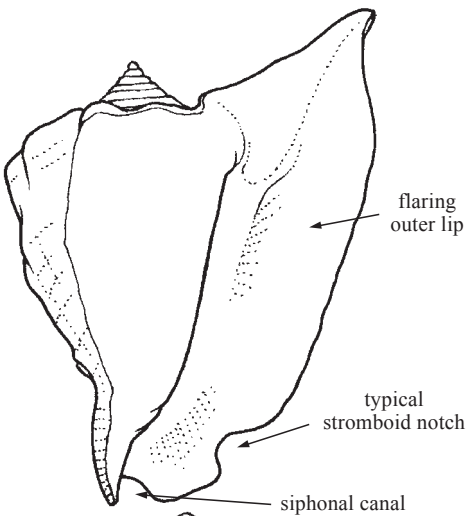


STROMBIDAE

p. 137

Conchs

Three species of interest to fisheries in the area.

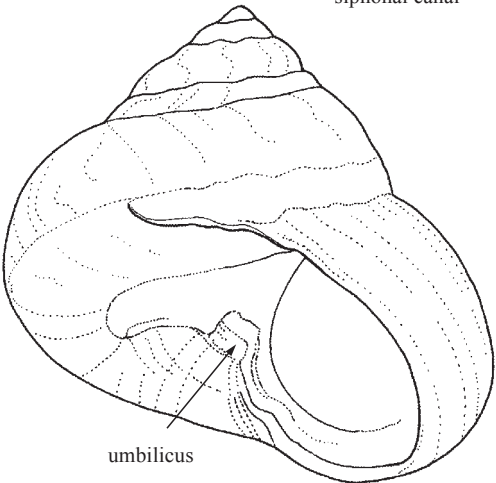


TROCHIDAE

p. 141

Top shells

One species of interest to fisheries in the area.

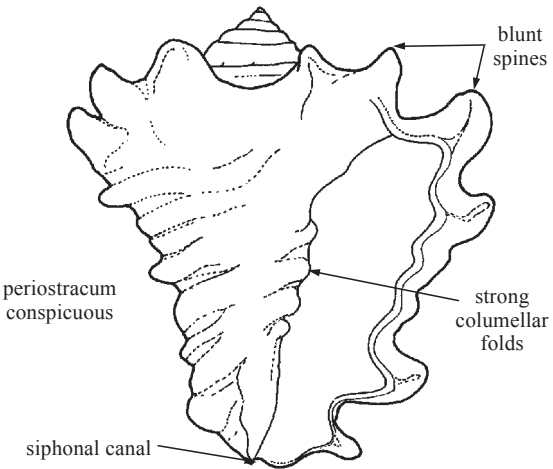


TURBINELLIDAE

p. 143

Vase shells

One species of interest to fisheries in the area.

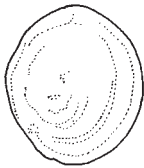
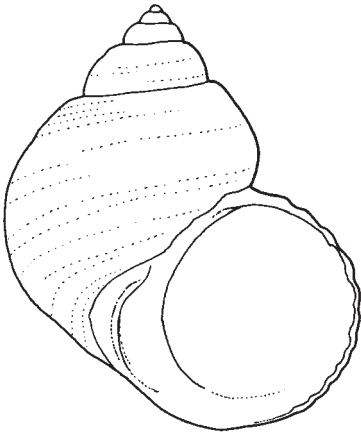


TURBINIDAE

p. 145

Turban shells

One species of interest to fisheries in the area.

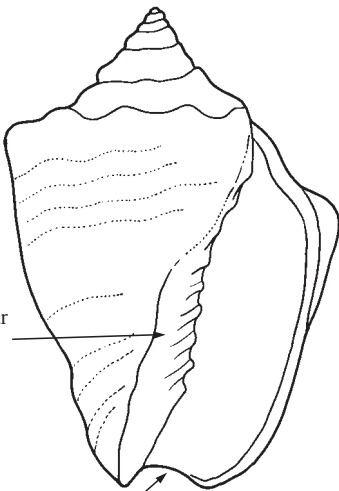


operculum
calcareous

VOLUTIDAE

Volutes


No species of interest to fisheries in the area.






oblique columellar
folds, strongest
anteriorly

siphonal canal



LIST OF FAMILIES AND SPECIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

The symbol  is given when species accounts are included.




CASSIDAE

-  *Cassis flammea* (Linnaeus, 1758).
-  *Cassis madagascariensis* Lamarck, 1822.
-  *Cassis tuberosa* (Linnaeus, 1758).





FASCIOLARIIDAE

-  *Fasciolaria tulipa* (Linnaeus, 1758).
-  *Pleuroploca gigantea* (Kiener, 1840).




FISSURELLIDAE

-  *Diodora listeri* (d'Orbigny, 1842).
-  *Fissurella barbadensis* (Gmelin, 1791).
-  *Fissurella nimbosa* (Linnaeus, 1758).

MELONGENIDAE

-  *Busycon perversum* (Linnaeus, 1758).
-  *Melongena corona* (Gmelin, 1791).
-  *Melongena melongena* (Linnaeus, 1758).
-  *Pugilina morio* (Linnaeus, 1758).

MURICIDAE

-  *Chicoreus brevifrons* (Lamarck, 1822).
-  *Chicoreus pomum* (Gmelin, 1791).
-  *Stramonita haemastoma* (Linnaeus, 1767).




NERITIDAE

-  *Nerita peloronta* Linnaeus, 1758.

RANELLIDAE

-  *Charonia variegata* (Lamarck, 1816).

STROMBIDAE

-  *Strombus costatus* Gmelin, 1791.
-  *Strombus gigas* Linnaeus, 1758.
-  *Strombus pugilis* Linnaeus, 1758.

TROCHIDAE

-  *Cittarium pica* (Linnaeus, 1758).

TURBINELLIDAE

-  *Turbinella angulata* (Lightfoot, 1786).

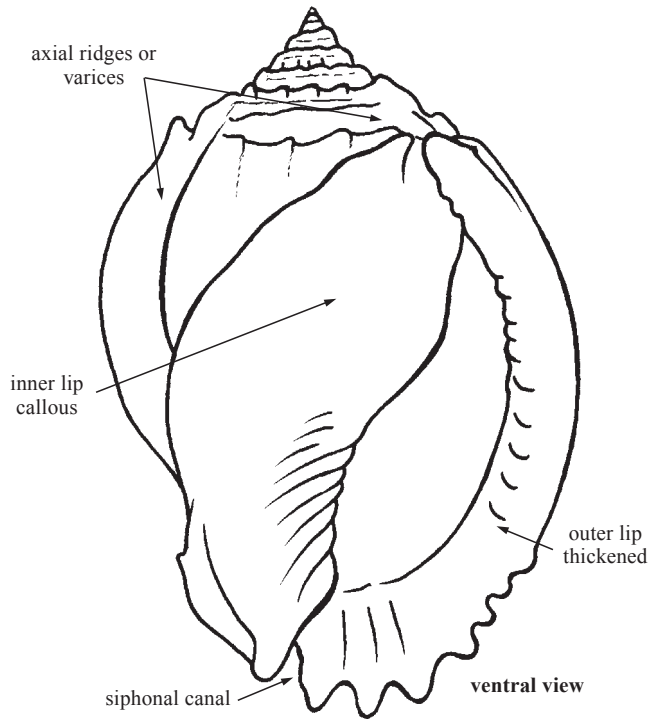
TURBINIDAE

-  *Turbo castanea* Gmelin, 1791.

CASSIDAE

Helmet and bonnet shells

Diagnostic characters: Shell large, thick, heavy, with sculpture usually nodulose, spire usually small. Anterior canal curved dorsally, parietal shield well developed, with thick callus. Varices present.






Habitat, biology, and fisheries: Subtidal, in sandy bottoms. Consumed locally. Shells of the species are sold as souvenirs throughout the area.

Similar families occurring in the area

None.

List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

-  *Cassis flammea* (Linnaeus, 1758).
-  *Cassis madagascariensis* Lamarck, 1822.
-  *Cassis tuberosa* (Linnaeus, 1758).

References

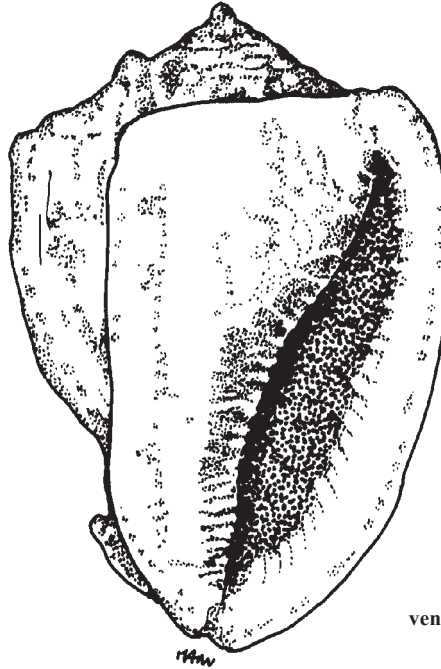
- Abbott, R.T. 1968. The helmet shells of the world (Cassidae). Part 1. *Indo-Pacific Mollusca*, 2(9):7-202.
- Kreipl, K. 1997. *Recent Cassidae*. Verlag Christa Hemmen, Wiesbaden, 151 p.

Cassis flammea (Linnaeus, 1758)

KSF

Frequent synonyms / misidentifications: None / *Cassis tuberosa* (Linnaeus, 1758); *Cassis madagascariensis* Lamarck, 1822

FAO names: **En** - Flame helmet; **Fr** - Casque flamme; **Sp** - Casco flameante.



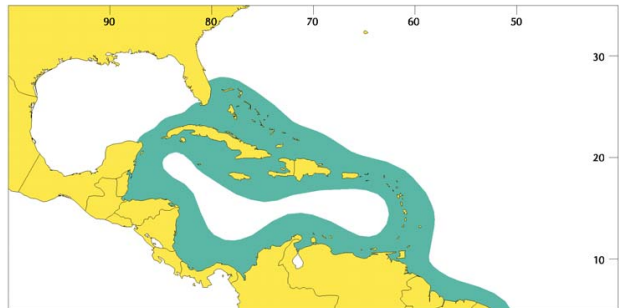
ventral view

Diagnostic characters: Shell large, heavy. Spire short. Shell surface smooth, except for knobby projections on body whorl. Parietal shield large and well defined, oval. Outer lip with inner tooth-like projections. **Colour:** brownish cream with large patch of brown at centre of parietal shield. Outer lip entirely cream or cream-white.

Size: To 75 mm.

Habitat, biology, and fisheries: On sand bottoms near seagrass beds, at shallow subtidal depths. Collected by diving. Shells sold as collectibles or souvenirs in parts of the area.

Distribution: Lower Florida Keys, Caribbean to Brazil, and Bermuda.

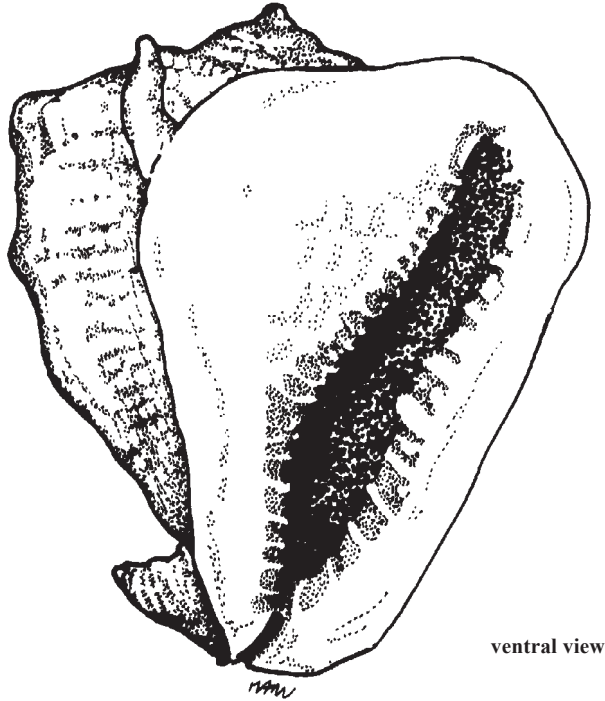


Cassis madagascariensis Lamarck, 1822

KSD

Frequent synonyms / misidentifications: None / *Cassis flammea* (Linnaeus, 1758); *Cassis tuberosa* (Linnaeus, 1758).

FAO names: **En** - Emperor helmet (AFS: Cameo helmet); **Fr** - Casque impérial; **Sp** - Casco imperial.



ventral view

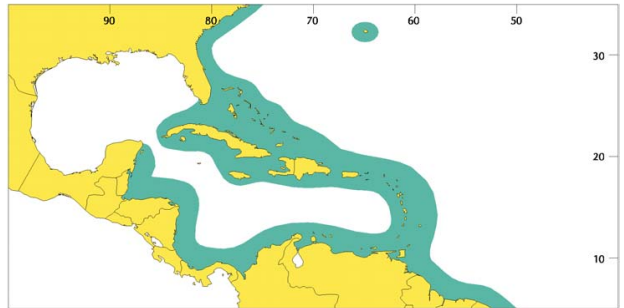
Diagnostic characters: Shell very large, heavy. Spire short. Shell surface with 3 rows of large knobs on body whorl. Parietal shield large and well defined, triangular. Outer lip with inner tooth-like projections. **Colour:** pale cream, parietal shield pale to deep salmon. Outer lip entirely cream or cream white sometimes with light brown between teeth.

Size: To 350 mm.

Habitat, biology, and fisheries: On sand bottoms near seagrass beds, at shallow subtidal depths. Collected by diving. Shells sold as collectibles or souvenirs in parts of area.

Distribution: North Carolina to Florida, Greater Antilles, and Bermuda.

Remarks: Largest species of the family in the Atlantic Ocean.

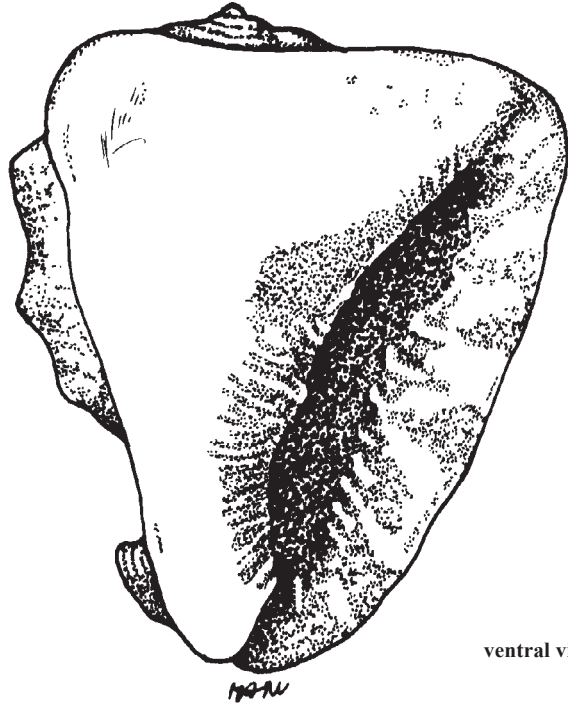


Cassis tuberosa (Linnaeus, 1758)

KST

Frequent synonyms / misidentifications: None / *Cassis flammea* (Linnaeus, 1758); *Cassis madagascariensis* Lamarck, 1822.

FAO names: **En** - King helmet (AFS: Caribbean helmet); **Fr** - Casque royal; **Sp** - Casco real.



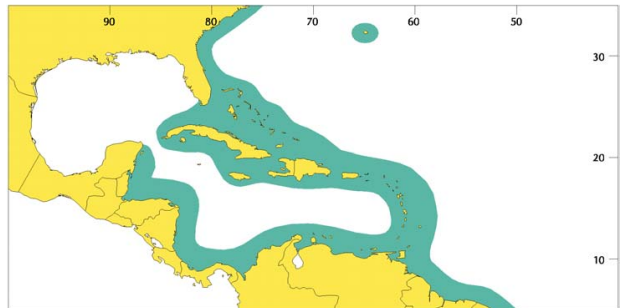
ventral view

Diagnostic characters: Shell very large, heavy. Spire short. Shell surface with fine reticulated sculpture and knobby projections on body whorl. Parietal shield large and well defined, triangular. Outer lip with inner tooth-like projections. **Colour:** brownish cream with large patch of brown at centre of parietal shield. Outer lip entirely cream or cream white with brown between teeth.

Size: To 250 mm.

Habitat, biology, and fisheries: On sand bottoms (sometimes buried) near seagrass beds, at shallow subtidal depths. Collected by diving. Shells sold as collectibles or souvenirs in parts of the area.

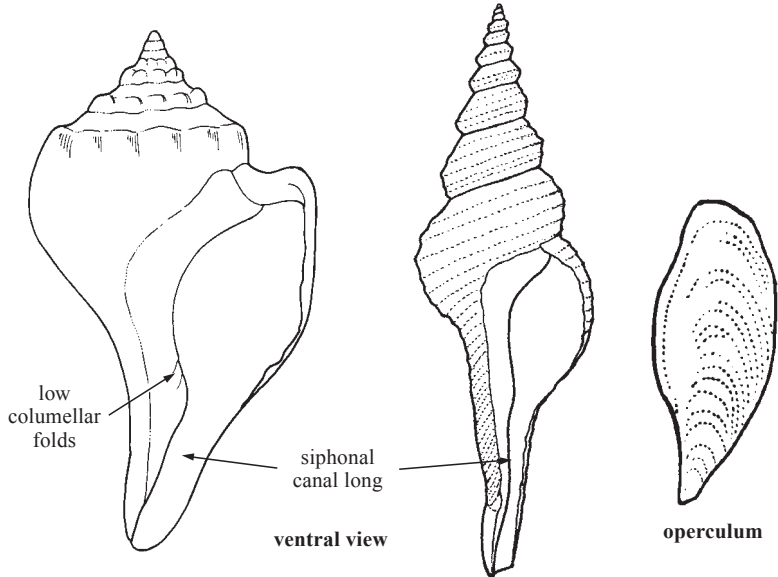
Distribution: North Carolina to Florida, Caribbean to Brazil, and Bermuda.



FASCIOLARIIDAE

Horse conchs (spindle shells, tulips)

Diagnostic characters: Shell large, elongate, spindle-shaped, spire elevated, anterior canal well developed. Columellar folds present. Operculum thick and horny. **Colour:** usually red or orange.



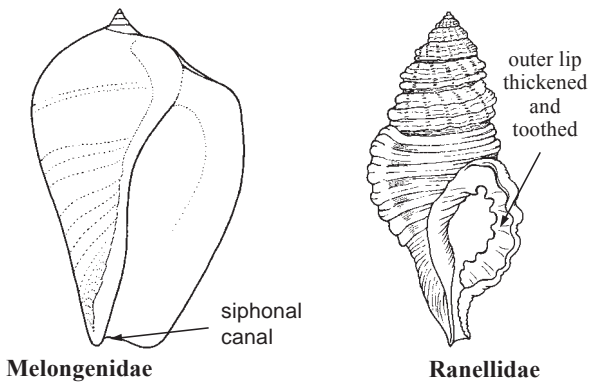
examples showing diversity of shape

Habitat, biology, and fisheries: Subtidal, in sandy bottoms. Soft parts of species of interest to fisheries. Consumed locally.

Similar families occurring in the area

Melongenidae: shell pear-shaped to fusiform, usually with sculpture of spines or nodules on shoulder; periostracum usually thick; parietal shield usually smooth; operculum claw-shaped, heavy, horny.

Ranellidae: shell usually large, heavy, sculpture a combination of strong spiral elements such as cords and axial varices; outer lip internally with strong indentations; periostracum sometimes very well developed, hairy, or fringe-like; operculum heavy, horny.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Fasciolaria tulipa* (Linnaeus, 1758).

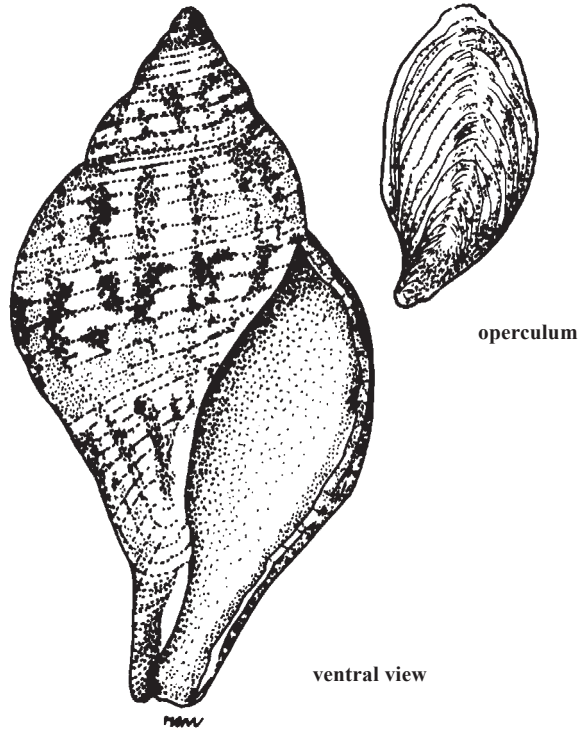
 *Pleuroploca gigantea* (Kiener, 1840).

Fasciolaria tulipa (Linnaeus, 1758)

FST

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - True tulip; **Fr** - Fasciolaire tulipe; **Sp** - Tulipán verdadero.

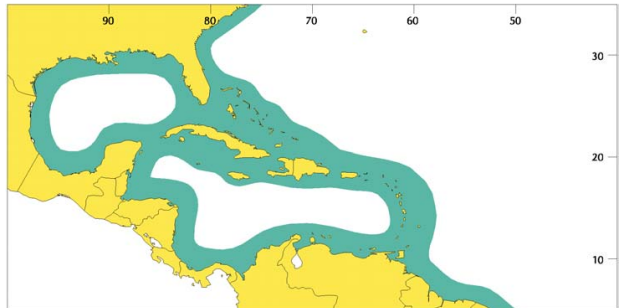


Diagnostic characters: Shell fusiform with about 9 rounded whorls. Surface smooth, except for very fine growth lines. Outer lip thin, with fine denticles on inner edge. Operculum thick, heavy. **Colour:** extremely variable, cream, light brown, to reddish orange with irregular blotches of darker brown, white, or cream. Brown spiral lines present. Living animal is bright orange.

Size: To 200 mm.

Habitat, biology, and fisheries: On seagrass bottoms and sand flats. Collected by divers, consumed locally raw or boiled.

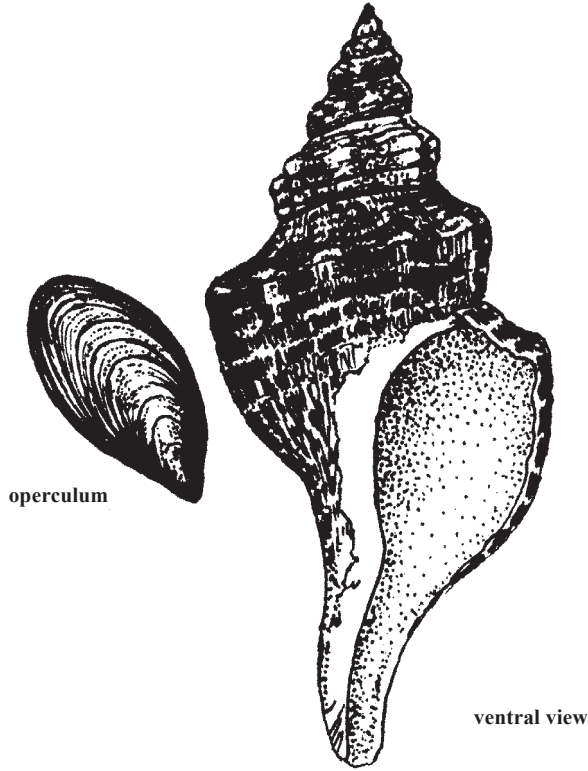
Distribution: North Carolina through Florida to Texas, and Caribbean to Brazil.



***Pleuroploca gigantea* (Kiener, 1840)**

Frequent synonyms / misidentifications: None / *Turbinella angulata* (Lightfoot ,1786).

FAO names: **En** - Florida horse conch (AFS: Horse conch); **Fr** - Pleuroploque géant; **Sp** - Concha gigante.



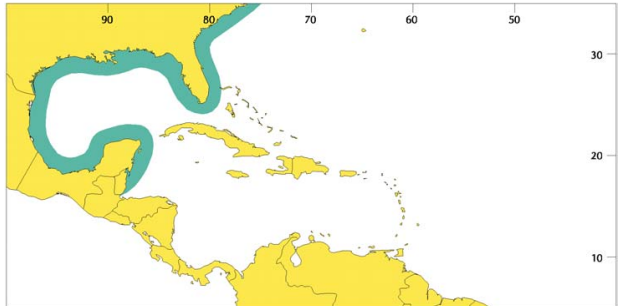
Diagnostic characters: Shell large, with up to 10 whorls. Sculpture of about 5 to 7 spiral cords and weak axial ribs that sometimes form knobs on whorl shoulders. Columella with 3 plications. Periostracum sometimes flaky. **Colour:** shell greyish white to salmon orange, usually orange in younger specimens; periostracum dark brown to light tan.

Size: To 600 mm.

Habitat, biology, and fisheries: Intertidal to shallow subtidal, on sand and mud flats and sea-grass beds. Broad, muscular foot is locally consumed in northwestern Mexico.

Distribution: North Carolina through Florida to Texas and Gulf of Mexico to Yucatán.

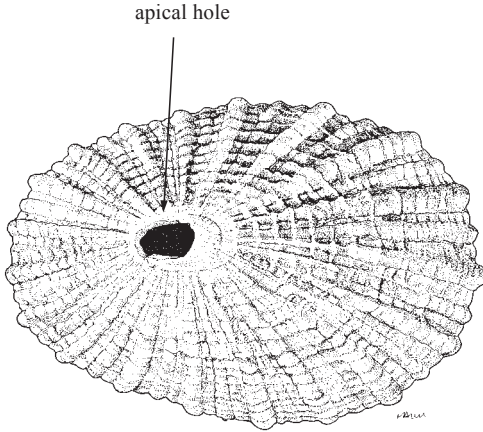
Remarks: This is the largest gastropod in American waters, and the Florida State Shell. A variety lacking nodules known as 'knobless wonder' can be found in southwestern Florida.



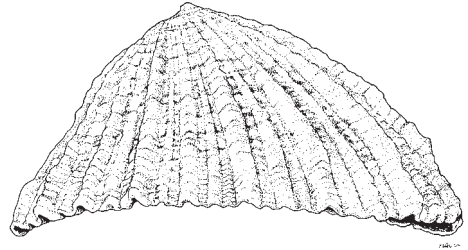
FISSURELLIDAE

Keyhole limpets

Diagnostic characters: Shell conical, usually with apical hole, sometimes with anterior slit. Shell sculpture usually radial, sometimes crossed by concentric elements. Shell internally glossy, porcellanous. Shell muscle (and scar on shell) horseshoe-shaped.



dorsal view



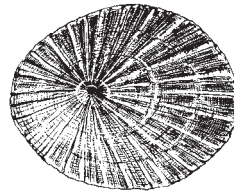
lateral view

Habitat, biology, and fisheries: On rocky coasts or other intertidal or shallow subtidal hard substrates. Consumed locally, boiled.

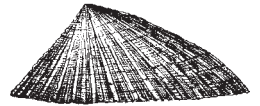
Similar families occurring in the area

Lottiidae: shell conical, sculpture essentially radial; interior with horseshoe-shaped muscle scar; no operculum; a single true gill in the mantle cavity.

Siphonariidae: easily distinguishable from most Fissurellidae by lack of apical hole; differ anatomically by the presence of a single true gill in the mantle cavity.

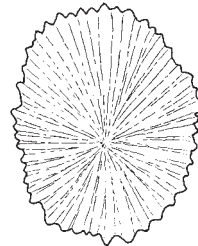


dorsal view

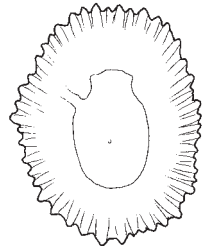


lateral view

Lottiidae




dorsal view



ventral view


Siphonariidae

List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Diodora listeri* (d'Orbigny, 1842).

 *Fissurella barbadensis* (Gmelin, 1791).

 *Fissurella nimbosa* (Linnaeus, 1758).

References

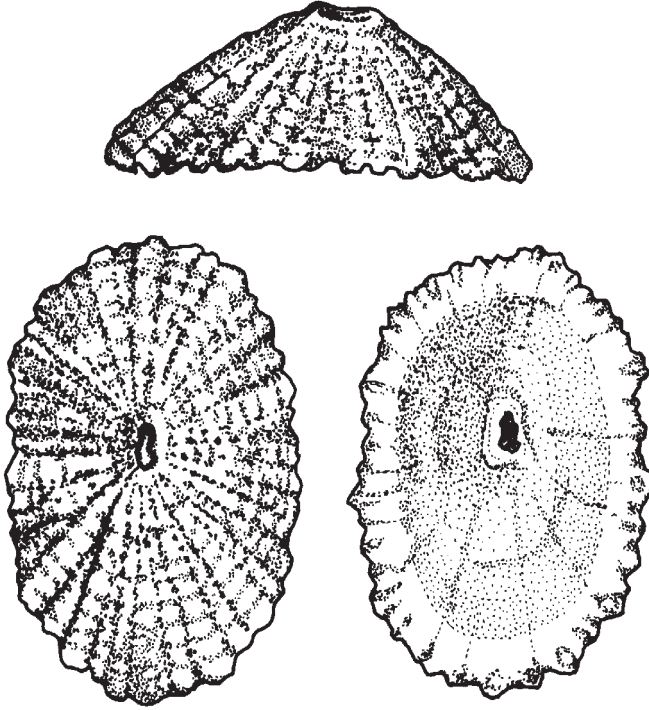
Farfante, I.P. 1943a. The genera *Fissurella*, *Lucapina* and *Lucapinella* in the western Atlantic. *Johnsonia*, 1(10):1-20.
Farfante, I.P. 1943b. The genus *Diodora* in the western Atlantic. *Johnsonia*, 1(11):1-20.

Diodora listeri (d'Orbigny, 1842)

DDL

Frequent synonyms / misidentifications: None / *Diodora cayenensis* (Lamarck, 1822), *Fissurella barbadensis* (Gmelin, 1791).

FAO names: **En** - Lister's keyhole limpet; **Fr** - Fissurelle de Lister; **Sp** - Fisirela de Lister.

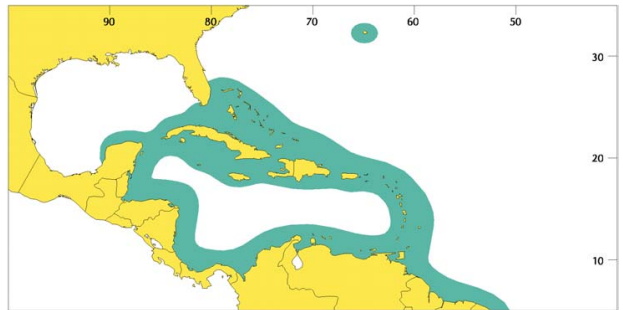


Diagnostic characters: Shell of medium size, elliptical. Sculpture of alternating large and small ribs, with a riblet in the interspaces (total of 3 rib sizes) crossed by distinct concentric cords. Margin crenulated. Orifice keyhole-shaped. Distinguished from *Diodora cayenensis* by much coarser sculpture and alternating large and small radial ribs. **Colour:** cream to grey with darker radial bands.

Size: To 45 mm.

Habitat, biology, and fisheries: On rocky and other hard substrates, present in coral reef environments. Consumed locally, boiled.

Distribution: Southern Florida, Caribbean, to Brazil, and Bermuda.

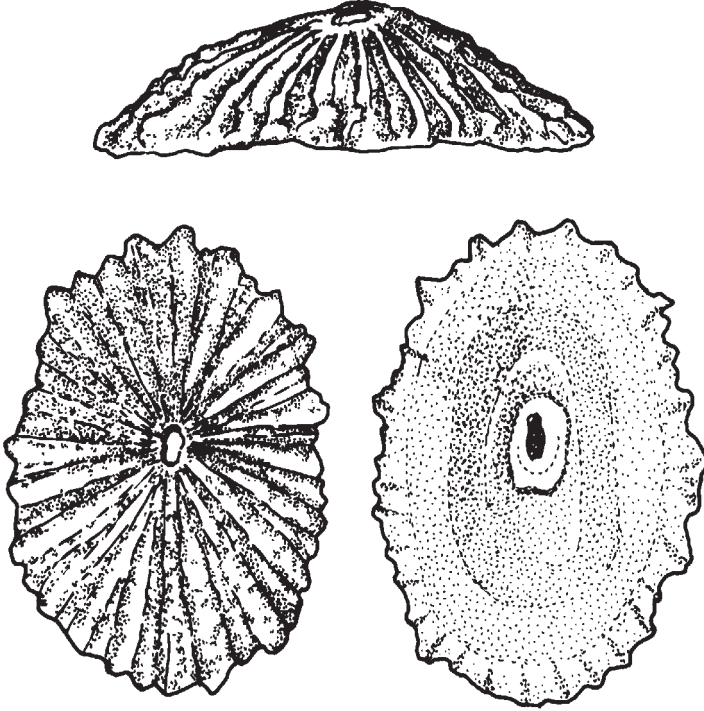


Fissurella barbadensis (Gmelin, 1791)

FSB

Frequent synonyms / misidentifications: None / *Diodora listeri* (d'Orbigny, 1842)

FAO names: **En** - Barbados keyhole limpet; **Fr** - Fissurelle de Barbados; **Sp** - Lapa de Barbados.

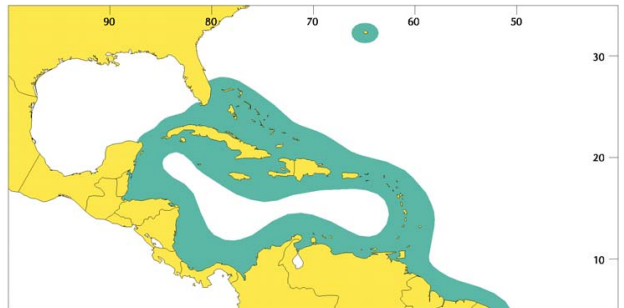


Diagnostic characters: Shell of medium size, elliptical. Sculpture of irregular, coarse, radial ribs. Margin irregular. Orifice almost circular. **Colour:** greyish to pinkish white, usually with purplish blotches and lines between ribs. Internally with green and whitish concentric bands. Border of orifice internally deep green.

Size: To 38 mm.

Habitat, biology, and fisheries: Intertidal on rocky substrates. Consumed locally boiled or in stews.

Distribution: Southern Florida, Caribbean, to Brazil; Bermuda.

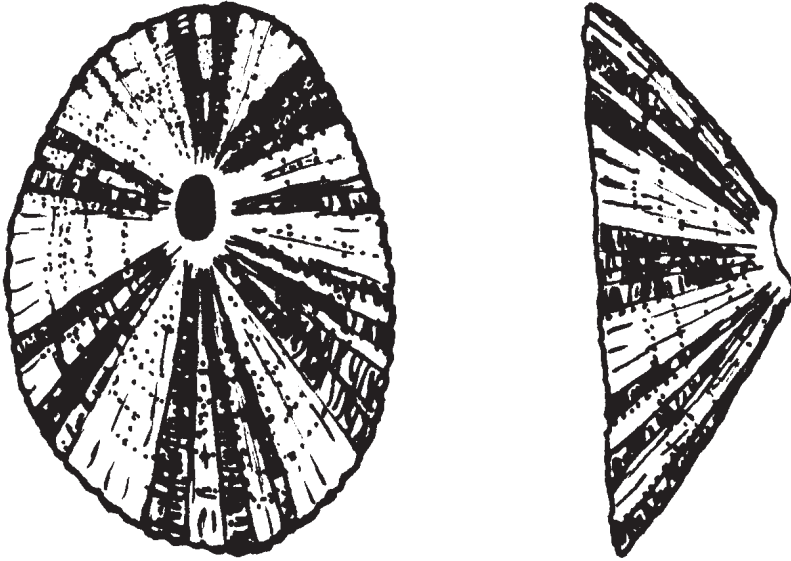


Fissurela nimbosa (Linnaeus, 1758)

FSM

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Rayed keyhole limpet; **Fr** - Fissurelle rayonnante; **Sp** - Lapa radiante.

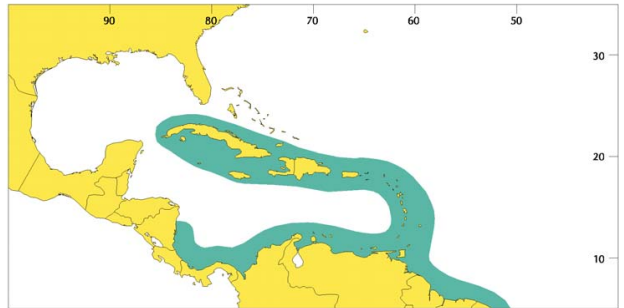


Diagnostic characters: Shell of medium size, elliptical. Sculpture of irregular, radial grooves and narrow, flat ribs, all crossed by fine lines. Margin irregular. Orifice oblong, large, with sides bearing small upward projections. **Colour:** greyish to pinkish white, usually with purplish blotches and lines between ribs. Internally with green and whitish concentric bands. Border of orifice internally deep green.

Size: To 37 mm.

Habitat, biology, and fisheries: On hard substrates. Consumed locally, boiled or in stews.

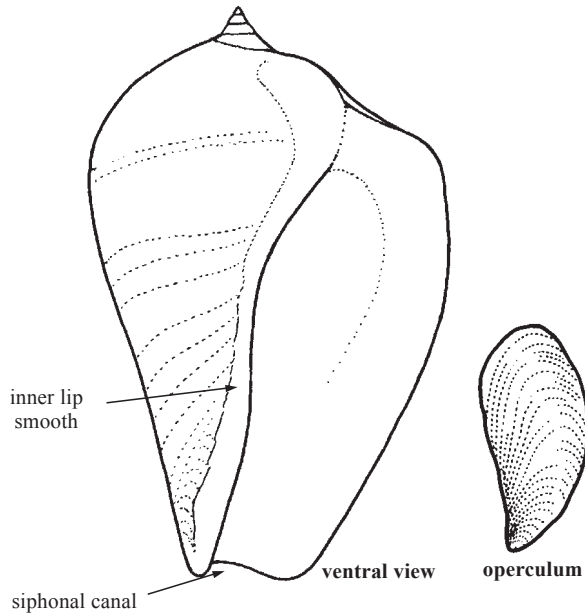
Distribution: Greater Antilles and Caribbean to Brazil.



MELONGENIDAE

Melongenas (whelks, crown conchs)

Diagnostic characters: Shell pear-shaped to fusiform, usually with sculpture of spines or nodules on shoulder. Periostracum usually thick. Parietal shield usually smooth. Operculum claw-shaped, heavy, horny.

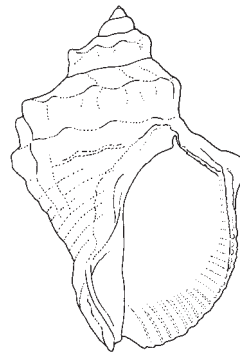


Habitat, biology, and fisheries: Intertidal or shallow subtidal in protected bays, mud flats, or mangrove habitats. Most species of interest to fisheries, consumed locally boiled.

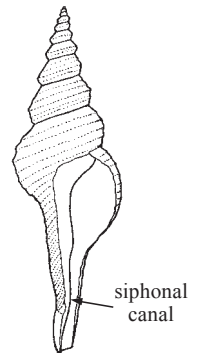
Similar families occurring in the area

Muricidae: shell usually with high spire, shell sculpture with prevailing axial elements such as varices (usually placed at 120° intervals), spines, nodules, lamellae, and others; anterior canal usually well developed; periostracum lacking; operculum thick, horny.

Fascioliariidae: shell large, elongate, spindle-shaped, spire elevated, anterior canal well developed; columellar folds present; operculum thick and horny.




Muricidae




Fascioliariidae


List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Busycon perversum* (Linnaeus, 1758).

Melongena corona (Gmelin, 1791).

 *Melongena melongena* (Linnaeus, 1758).

 *Pugilina morio* (Linnaeus, 1758).

Reference

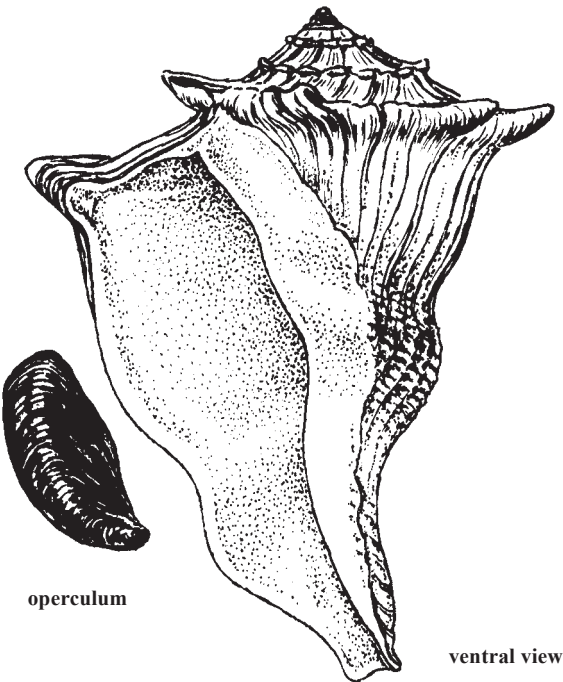
Edwards, A.L. and M.G. Harasewych. 1988. Biology of the Recent species of the subfamily Busyconinae. *J. Shellfish Res.*, 7:467-472.

Busycon perversum (Linnaeus, 1758)

WHX

Frequent synonyms / misidentifications: None / None.

FAO names: En - Perverse whelk; Fr - Busycon peverse; Sp - Busicón peverso.



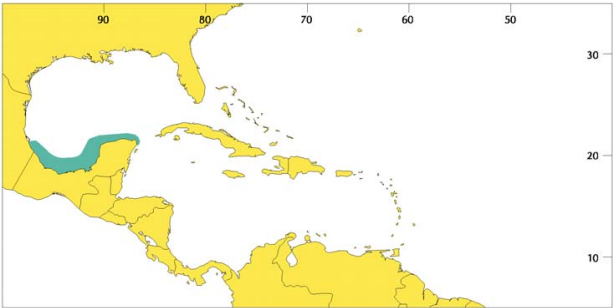
Diagnostic characters: Shell left-handed (or sinistral, coiling to left), heavy, with flattened spire. Shell shoulders with small knobs. **Colour:** tan, shells under 18 cm have axial brown streaks.

Size: To 400 mm.

Habitat, biology, and fisheries: Very common on mud flats and protected bay waters.

Distribution: Campeche to Yucatán, Mexico.

Remarks: May be conspecific with *Busycon sinistrum* Hollister, 1958, from the USA Gulf states and east coast.

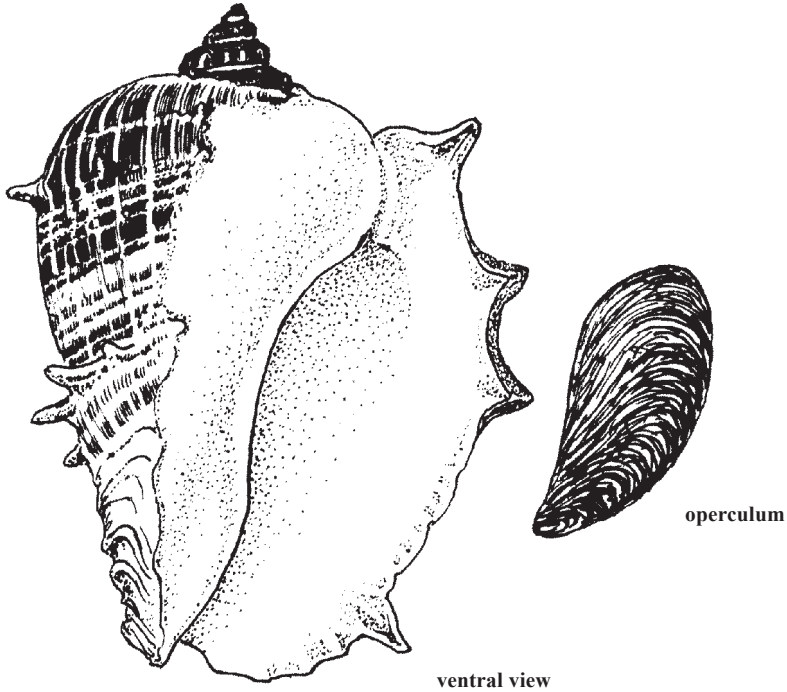


Melongena melongena (Linnaeus, 1758)

NGK

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - West Indian crown conch (AFS: Crown conch); **Fr** - Mélongène des Caraïbes;
Sp - Melongena antillana.

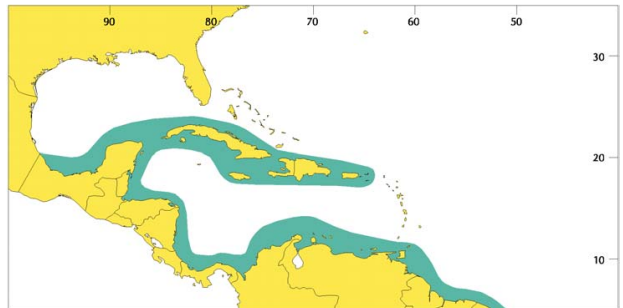


Diagnostic characters: Shell thick, pear-shaped, with large body whorl. Spire short, last few whorls bear single or double rows of spines. Suture deeply channelled. Anterior canal short and broad. Base of shell sometimes with a row of smaller, blunt spines. **Colour:** purplish brown, light grey, or white, with bluish, brownish, or greyish bands.

Size: To 150 mm.

Habitat, biology, and fisheries: Inhabits coastal lagoons, mangroves, river estuaries, and other low-salinity environments. Hand-collected at low tide or by divers. Consumed locally. Shell marketed as ornament or a collectible.

Distribution: Caribbean.

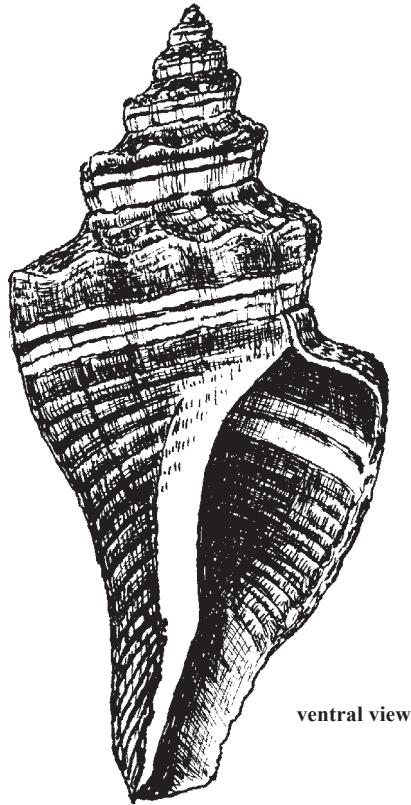


Pugilina morio (Linnaeus, 1758)

UGO

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Giant hairy melongena (AFS: Hairy melongena); **Fr** - Mélongène noir; **Sp** - Melongena negra.



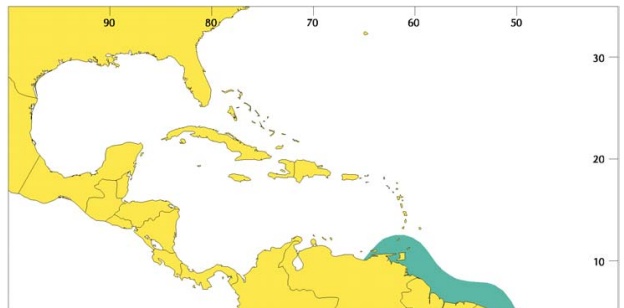
ventral view

Diagnostic characters: Shell fusiform, spire high, anterior canal well developed, shell surface with sculpture of many fine spiral threads. Shoulder angular, with single row of nodules. Periostracum thick and hairy. **Colour:** chocolate brown to black, with a few contrasting white bands, periostracum brownish.

Size: To 160 mm.

Habitat, biology, and fisheries: Lives on mud and other soft substrates in mangrove areas and near river estuaries. Feeds mainly on carrion.

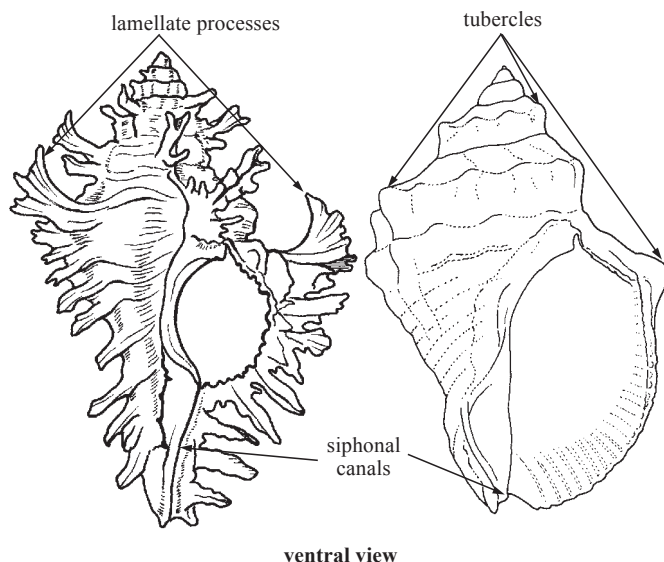
Distribution: Trinidad and Tobago to Brazil, and tropical West Africa.



MURICIDAE

Rock shells (rock snails)

Diagnostic characters: Shell usually with high spire, shell sculpture with prevailing axial elements such as varices (usually placed at 120° intervals), spines, nodules, lamellae, and others. Anterior canal usually well developed. Periostracum lacking. Operculum thick, horny.



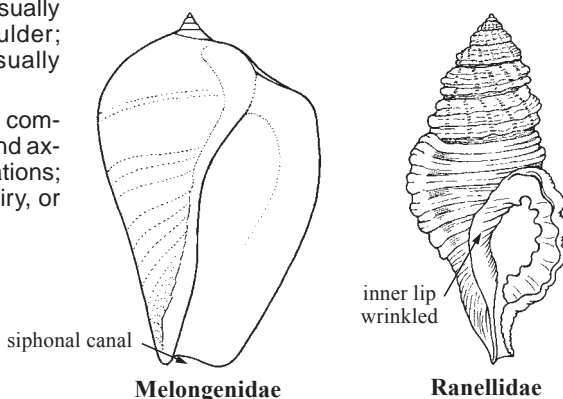
examples showing diversity of shape and sculpture

Habitat, biology, and fisheries: In shallow waters. Active predators, generally feeding on other molluscs and barnacles. Typically, access to the soft parts of the prey is obtained by boring a hole through the shell by means of a softening secretion and then scraping action of the radula. Hand-collected, especially by divers. Marketed and consumed locally. The shell is sold as an ornament.

Similar families occurring in the area

Melongenidae: shell pear-shaped to fusiform, usually with sculpture of spines or nodules on shoulder; periostracum usually thick; parietal shield usually smooth; operculum claw-shaped, heavy, horny.


Ranellidae: shell usually large, heavy, sculpture a combination of strong spiral elements such as cords and axial varices; outer lip internally with strong indentations; periostracum sometimes very well developed, hairy, or fringe-like; operculum heavy, horny.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Chicoreus brevifrons* (Lamarck, 1822).

 *Chicoreus pomum* (Gmelin, 1791).

 *Stramonita haemastoma* (Linnaeus, 1767).

References

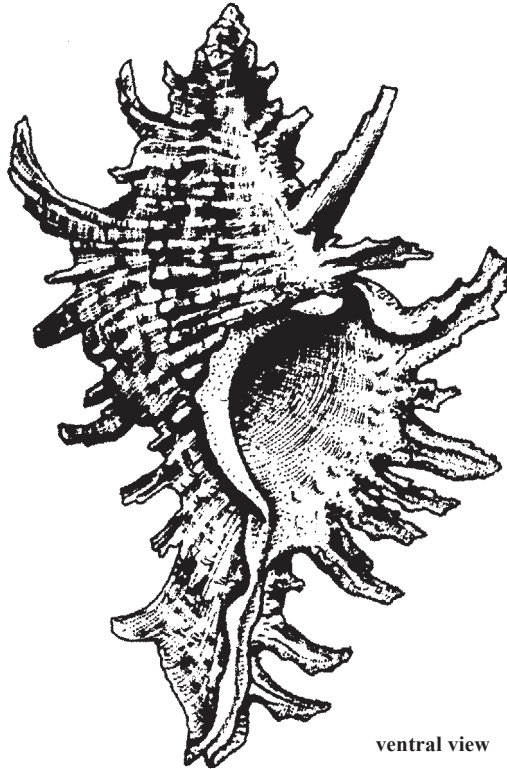
- Houart, R. 1994. *Illustrated catalogue of Recent species of Muricidae named since 1971*. Verlag Crista Hemmen, Wiesbaden, 179 p.
- Kool, S.P. 1987. Significance of radular characters in reconstruction of thaidid phylogeny (Neogastropoda: Muricacea). *The Nautilus*, 101:117-132.
- Radwin, G. and A. D'Attilio. 1976. *Murex shells of the World - An illustrated guide to the Muricidae*. Stanford Univ. Press, 284 p.

Chicoreus brevifrons (Gmelin, 1791)

KSB

Frequent synonyms / misidentifications: *Murex brevifrons* Lamarck, 1822 / *Chicoreus pomum* (Gmelin, 1791); *Chicoreus dilectus* (A. Adams, 1855).

FAO names: **En** - West Indian murex; **Fr** - Rocher antillais; **Sp** - Busano antillano.

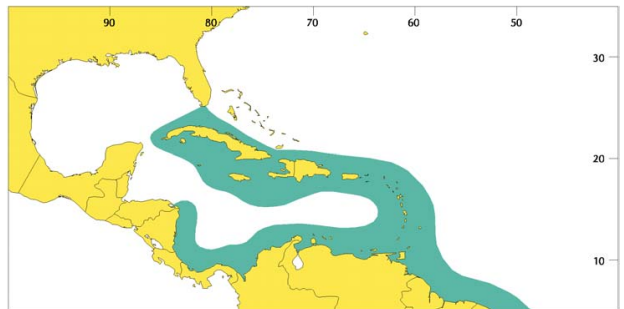


Diagnostic characters: Shell elongate, anterior canal well developed, 3 axial varices present on last whorl, varices with foliated spines, surface sculpture of flat spiral cords and cordlets in the interspaces. **Colour:** variable, with dark and pale spiral bands, aperture whitish.

Size: To 150 mm.

Habitat, biology, and fisheries: On mud flats in protected bays and lagoons, near oyster flats, and mangrove environments. Consumed locally raw or boiled.

Distribution: Caribbean to Brazil.

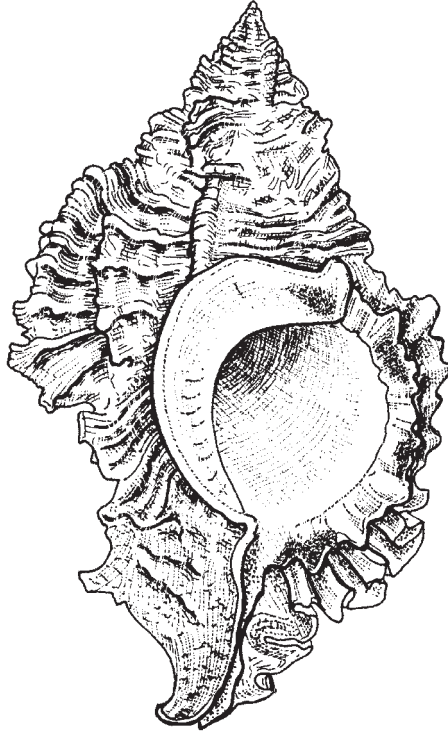


***Chicoreus pomum* (Gmelin, 1791)**

FLO

Frequent synonyms / misidentifications: *Murex pomum* Gmelin, 1791; *Phyllonotus pomum* (Gmelin, 1791) / *Chicoreus oculatus* (Reeve, 1845); *Chicoreus margaritensis* (Abbott, 1958).

FAO names: **En** - Apple murex; **Fr** - Rocher pomme; **Sp** - Busano manzanero.



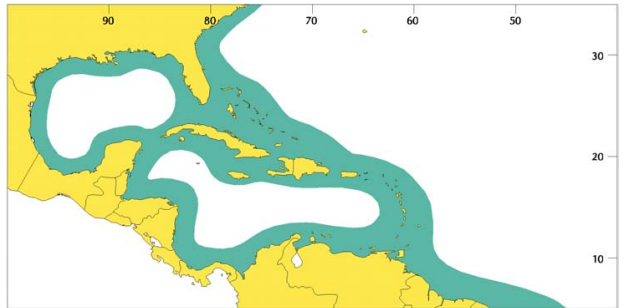
ventral view

Diagnostic characters: Shell heavy, thick, with rough surface. Sculpture of numerous spiral cords and axial ribs, spines absent. Varices strong but spineless. Siphonal canal curved. **Colour:** tan to brown, outer lip with 3 or 4 dark blotches. Aperture glossy, ivory, buff, salmon, or yellow, with dark brown spot on apical end of parietal wall.

Size: To 125 mm.

Habitat, biology, and fisheries: On soft and hard bottoms, along a wide depth range (from 0 to 200 m). Predator feeding on bivalves; performs communal spawning. Consumed locally, raw or boiled.

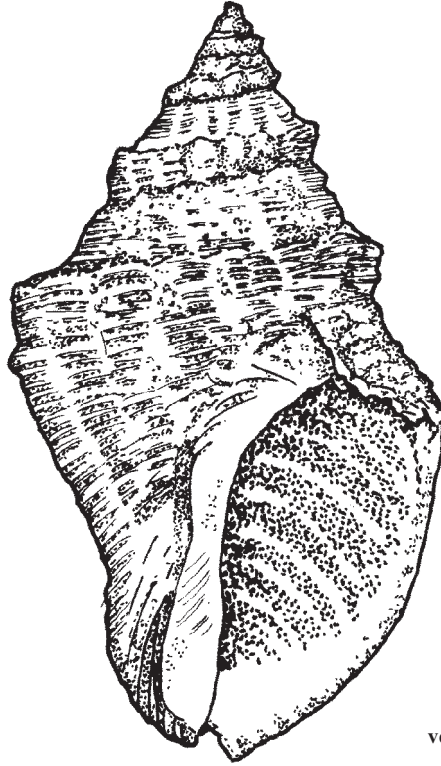
Distribution: North Carolina to Florida and Caribbean to Brazil.



***Stramonita haemastoma* (Linnaeus, 1767)**

Frequent synonyms / misidentifications: *Thais haemastoma* (Linnaeus, 1767) / *Stramonita rustica* (Lamarck, 1822).

FAO names: **En** - Red-mouthed rock shell (AFS: Rock snail); **Fr** - Pourpre haemastoma; **Sp** - Púrpura de boca roja.



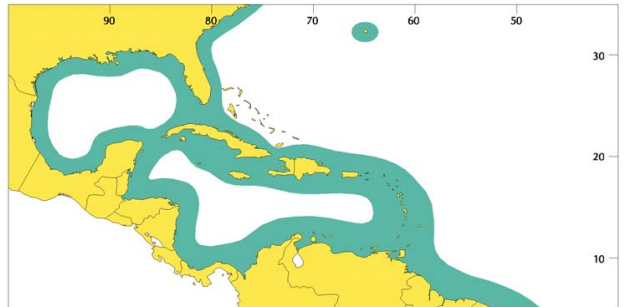
ventral view

Diagnostic characters: Shell solid, elongate. Shell sculpture of fine spiral lines with weak axial growth lines. Last whorls sometimes with nodules on shoulder. **Colour:** variable, light grey, yellowish, or tan, usually mottled or checkered with darker brown, greyish, or orange marks.

Size: To 80 mm.

Habitat, biology, and fisheries: On all kinds of hard substrates, intertidal to subtidal. Active predator on oyster and mussel beds.

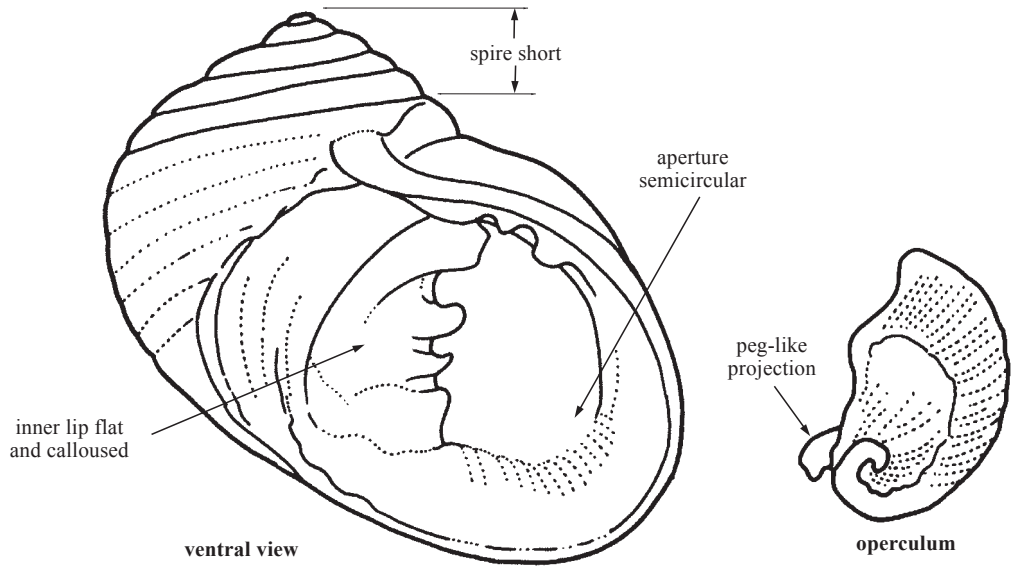
Distribution: North Carolina to Florida, Caribbean to Brazil, Bermuda, and tropical West Africa.



NERITIDAE

Nerites

Diagnostic characters: Shell globose, thick, sculpture usually with strong spiral elements such as cords and threads. Aperture D-shaped, posterior part of outer lip and parietal region usually with strong indentations. Operculum calcareous, with projecting peg on internal edge.



Habitat, biology, and fisheries: Intertidal on rocky coasts. Consumed locally, boiled.

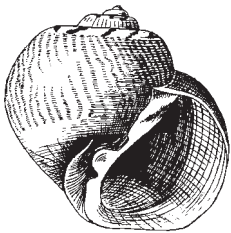
Similar families occurring in the area

Naticidae: shell globular to ovate-conical; outer surface smooth or with reduced sculpture; aperture large, semicircular; siphonal canal absent; umbilicus open or closed, sometimes with an internal rib; operculum corneous or calcified.

List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

 *Nerita peloronta* Linnaeus, 1758.



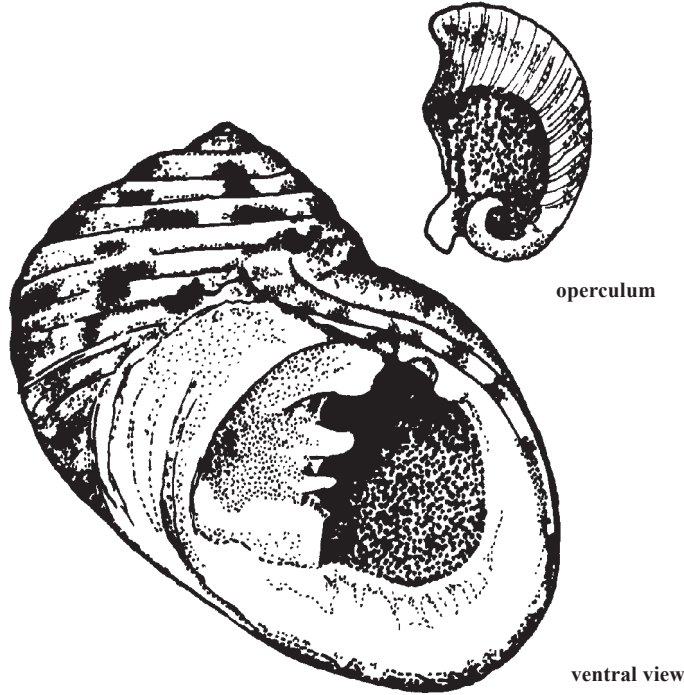
ventral view
Naticidae

Nerita peloronta Linnaeus, 1758

NJE

Frequent synonyms / misidentifications: None / *Nerita tessellata* Gmelin, 1791; *Nerita fulgurans* Gmelin, 1791.

FAO names: **En** - Bleeding tooth; **Fr** - Néríte dent saignant; **Sp** - Nerita diente sangrante.

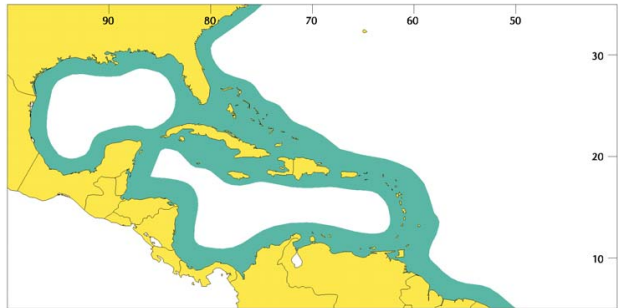


Diagnostic characters: Shell solid, globular, sculpture of strong spiral cords fading out on last whorl. Aperture large, inner lip with 1 to 3 white tooth-like projections, with blood red blotch, outer lip finely crenulated. **Colour:** shell colour yellowish mottled with red and black.

Size: To 40 mm.

Habitat, biology, and fisheries: Inhabits rocky coasts in intertidal zones, usually in high-energy environments. Known to exhibit 'homing' behaviour, moving in search of shelter during the day and foraging at night. Hand-collected, consumed locally, mainly in chowders, stews, and soups.

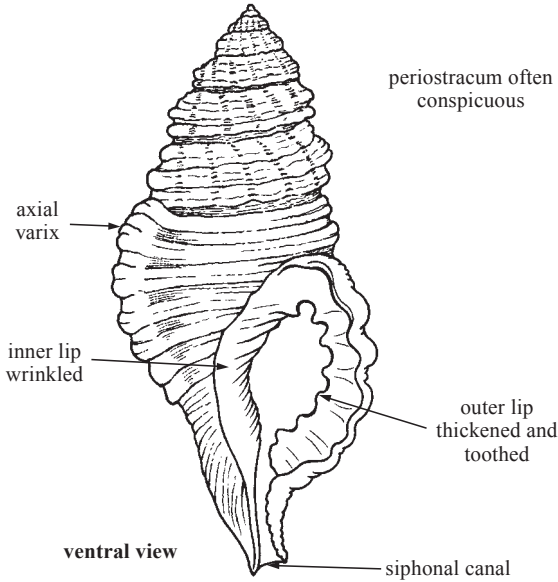
Distribution: North Carolina to Florida and Caribbean to Brazil.



RANELLIDAE

Triton shells

Diagnostic characters: Shell usually large, heavy, sculpture a combination of strong spiral elements such as cords and axial varices. Outer lip internally with strong indentations. Periostracum sometimes very well developed, hairy, or fringe-like. Operculum heavy, horny.



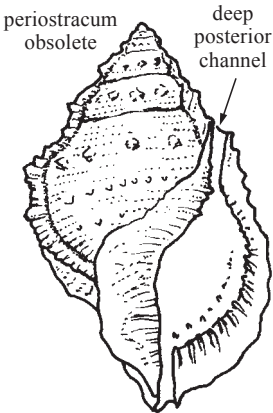
Habitat, biology, and fisheries: Species of interest to fisheries inhabit shallow-water environments. Consumed locally, raw or cooked. Shells marketed as souvenirs, collectibles, or ornaments.

Remarks: Formerly referred to as Cymatiidae.

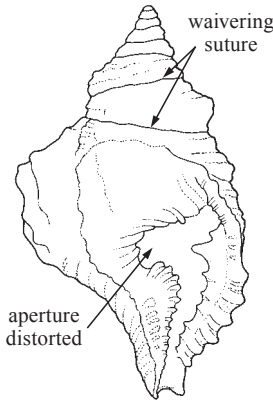
Similar families occurring in the area

Bursidae: periostracum obsolete to absent; aperture with a deep posterior canal.

Personidae: spire whorls irregular, with a wavering suture; aperture distorted; inner lip strongly sinuous, with an extensive, shield-like callus.




ventral view
Bursidae



ventral view
Personidae

List of species of interest to fisheries occurring in the area

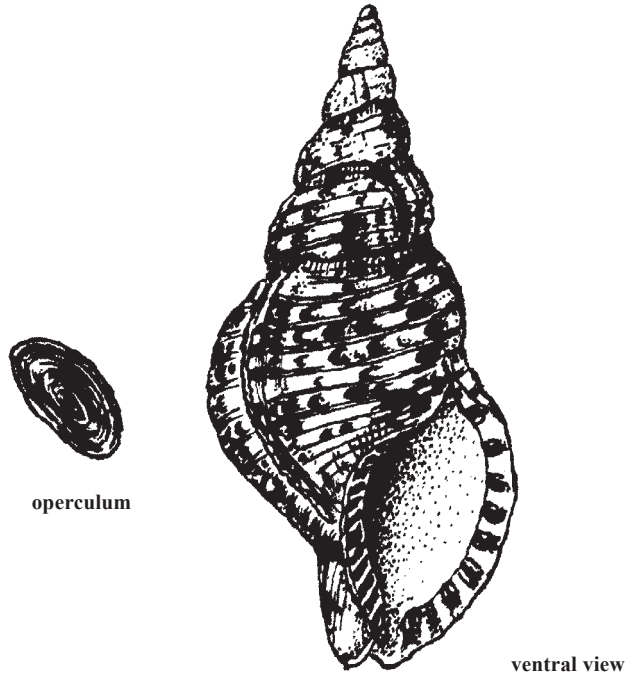
The symbol  is given when species accounts are included.

 *Charonia variegata* (Lamarck, 1816).

***Charonia variegata* (Lamarck, 1816)**

Frequent synonyms / misidentifications: *Charonia tritonis variegata* (Lamarck, 1816) / None.

FAO names: **En** - Atlantic triton's trumpet; **Fr** - Triton de l'Atlantique; **Sp** - Tritón Atlántico.



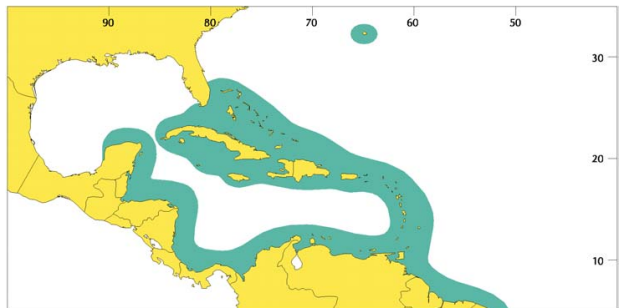
Diagnostic characters: Shell elongate, large, heavy. Spire pointed, elongate. Anterior canal very short. Varices present on last whorls. Parietal region with narrow dark brown inner lip covered by regularly spaced, spirally oriented, white, cord-like plicae. Outer lip internally with pairs of fine white teeth superimposed on square blotches of dark brown colour. **Colour:** cream white with brown markings, usually crescent-shaped.

Size: To 330 mm.

Habitat, biology, and fisheries: Shallow subtidal, collected by divers, consumed locally raw or boiled. Shell sold as collectible or souvenir.

Distribution: Southeastern Florida, Caribbean to Brazil, and Bermuda.

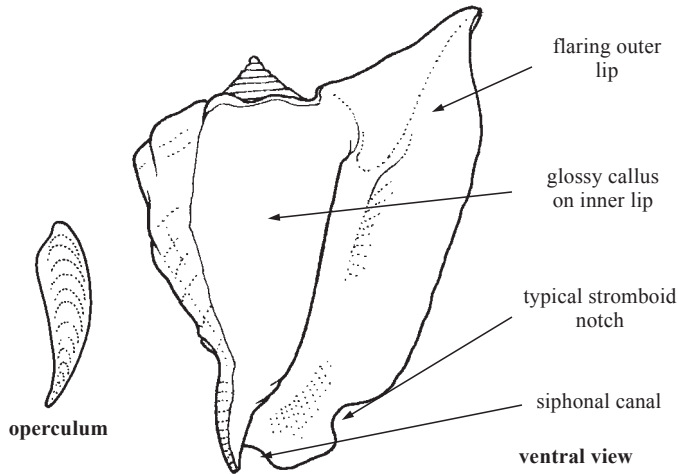
Remarks: Referred to elsewhere as *Charonia tritonis variegata*; however, specific status of the taxon is currently well accepted amongst specialists.



STROMBIDAE

Conchs (stromb conchs)

Diagnostic characters: Shell usually large, thick, heavy, with large last whorl. Shell sculpture consists of a row of spines, nodules, or knobs on shoulder. Aperture with flaring outer lip in mature individuals. Stromboid notch usually well developed, near short, opened anterior canal. Parietal region with heavy, glazed callus. Operculum sickle-shaped, sometimes serrated along outer edge. Foot narrow, elongate, used for leaping. Eyes at the distal end of long stalks.



Habitat, biology, and fisheries: On sandy bottoms, usually in areas of large concentration of brown seaweeds and/or seagrass beds. Most species consumed locally, with at least 1 species (*Strombus gigas*) of great economic importance to fisheries.

Similar families occurring in the area

None.

List of species of interest to fisheries occurring in the area

The symbol 🐚 is given when species accounts are included.

🐚 *Strombus costatus* Gmelin, 1791.

🐚 *Strombus gigas* Linnaeus, 1758.

🐚 *Strombus pugilis* Linnaeus, 1758.

References

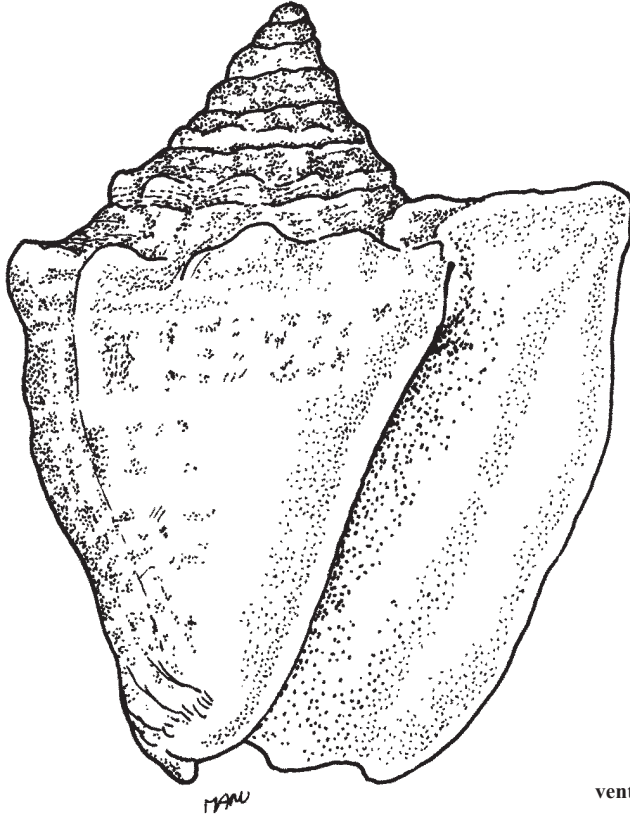
- Appeldoorn, R.S. 1985. Growth, mortality and dispersion of juvenile, laboratory-reared conchs, *Strombus gigas* and *S. costatus*, released at an offshore site. *Bull. Mar. Sci.*, 37:785-793.
- Appeldoorn, R.S. 1988. Age determination, growth, mortality, and age of first reproduction in adult queen conch, *Strombus gigas* L., off Puerto Rico. *Fish. Res.*, 6:363-378.
- Brownell, W.N., C.J. Berg, Jr., and K.C. Haines. 1977. Fisheries and aquaculture of the queen conch, *Strombus gigas*, in the Caribbean. *FAO Fish. Rep.*, 200:59-69.
- Brownell, W.N. and J.M. Stevely. 1981. The biology, fisheries and management of the queen conch, *Strombus gigas*. *Mar. Fish. Rev.*, 43(7):1-12.
- Medley, P.A. and C.H. Ninnes. 1999. A stock assessment for the conch (*Strombus gigas* L.) in the Turks and Caicos Islands. *Bull. Mar. Sci.*, 64(3):399-406.
- Stoner, A.W. 1997. The status of the queen conch, *Strombus gigas*, research in the Caribbean. *Mar. Fish. Rev.*, 59(3):14-22.
- Tewfik, A., H.M. Guzmán, and G. Jácome. Assessment of the queen conch *Strombus gigas* (Gastropoda: Strombidae) population in Cayos Cochinos, Honduras. *Rev. Biol. Trop.*, 46(4):137-150.

Strombus costatus Gmelin, 1791

MBQ

Frequent synonyms / misidentifications: None / *Strombus gigas* Linnaeus, 1758, *Strombus goliath* Schröter, 1805.

FAO names: **En** - Milk conch; **Fr** - Strombe laiteux; **Sp** - Cobo lechoso.



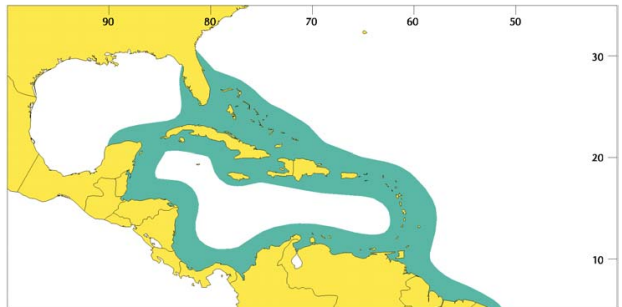
ventral view

Diagnostic characters: Shell of medium size, shape extremely variable, sculpture of projecting nodules on shoulder. Aperture flared in mature specimens, sometimes with very thick lip. **Colour:** internal shell white, sometimes glazed or metallic-like; shell externally cream to brown, frequently flecked with other hues.

Size: To 160 mm.

Habitat, biology, and fisheries: Lives on sand in meadows of seagrass or, less frequently, brown algae. Development includes a long-lasting, planktotrophic stage. Consumed locally and exploited commercially in parts of the area.

Distribution: Southern Florida, southern Gulf of Mexico, Caribbean to Brazil, and Bermuda.

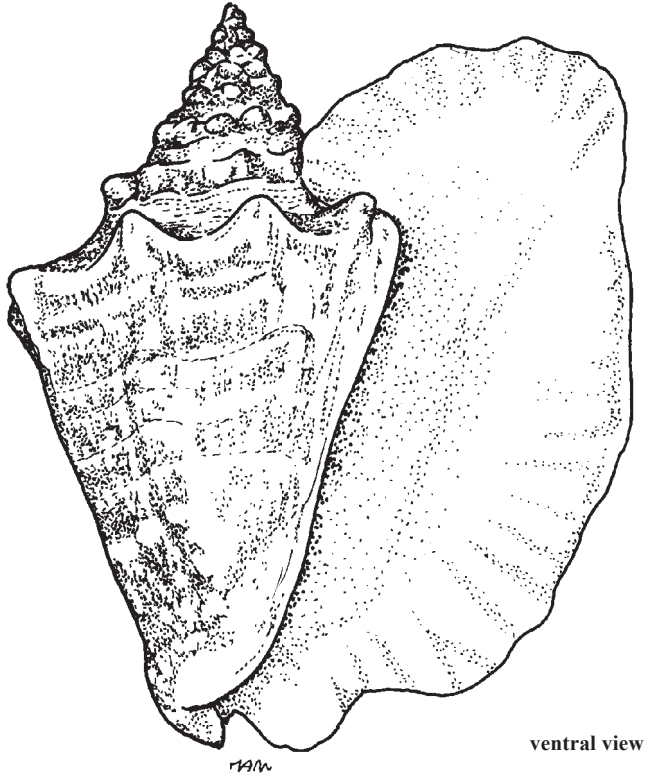


Strombus gigas Linnaeus, 1758

COO

Frequent synonyms / misidentifications: None / *Strombus goliath* Schröter, 1805, *Strombus costatus* Gmelin, 1791.

FAO names: **En** - Pink conch (AFS: Queen conch); **Fr** - Strombe rosé; **Sp** - Cobo rosado.



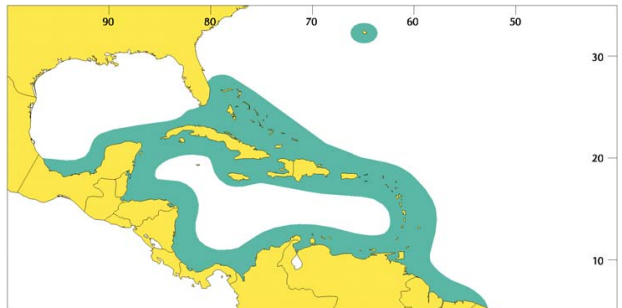
ventral view

Diagnostic characters: Shell large, with relatively large spire, flared outer lip with posterior expansion projecting well beyond spire length. Spire taller than other species in genus. Sculpture of sharp knobs along shoulder. **Colour:** pale tan with thin brown periostracum. Internal shell colour deep pink.

Size: To 300 mm.

Habitat, biology, and fisheries: Lives on sand near seagrass beds, between depths of 2 and 15 m. Unquestionably the more valued and exploited gastropod species in area. The fisheries have grown exponentially in the last 30 years, with resulting declines in population and area closures. The species has been included on appendix 2 of CITES (Convention on the International Trade of Endangered Species). International trade is allowed only from nations in which the populations of the species are not under threat from commercial fishing. Collection/fisheries banned at least in the USA and in the state of Yucatán, Mexico. Stock severely depleted in several Caribbean nations.

Distribution: Southeastern Florida, Caribbean; Bermuda.

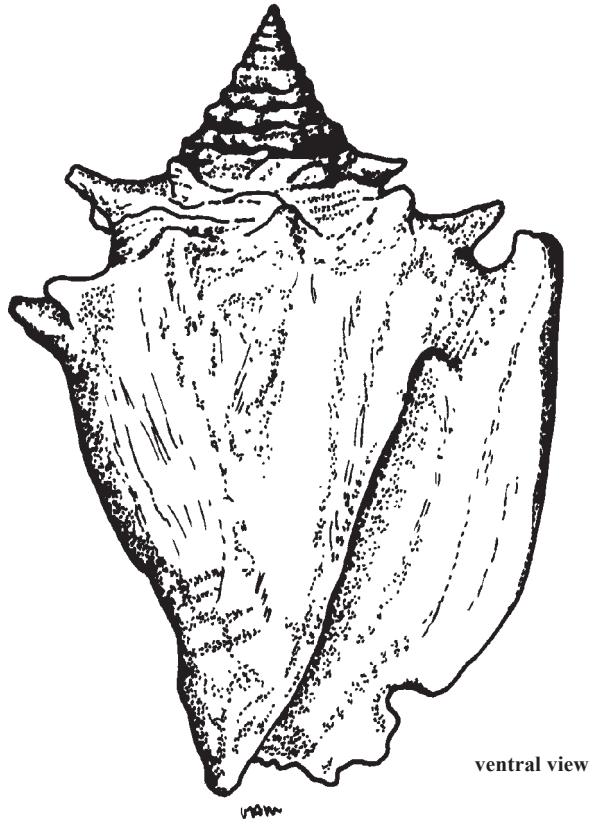


Strombus pugilis Linnaeus, 1758

RXU

Frequent synonyms / misidentifications: None / *Strombus alatus* Gmelin, 1791.

FAO names: **En** - Fighting conch (AFS: West Indian fighting conch); **Fr** - Strombe combattant; **Sp** - Cobo luchador.

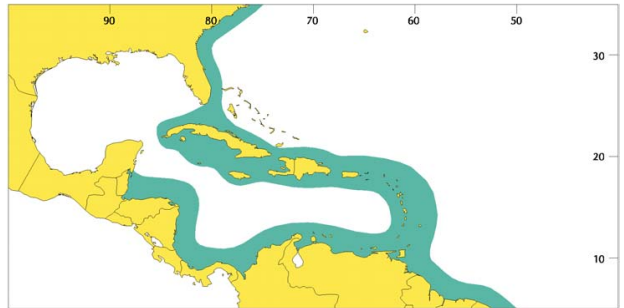


Diagnostic characters: Shell solid, with large last whorl and small, pointed spire. Whorls with single row of nodulose spines on periphery; spines larger on last whorl. Anterior and 'stromboid' notches present. Posterior angle of outer lip distinct, projected in posterior direction. Operculum sickle-shaped, animal with elongate foot used for leaping. **Colour:** variable, from yellowish to light or dark orange, interior of aperture white, anterior end dark purple.

Size: To 130 mm.

Habitat, biology, and fisheries: Lives on sandy bottoms. Development includes a long-lasting, planktotrophic stage. Consumed locally, boiled, exploited commercially in parts of the area.

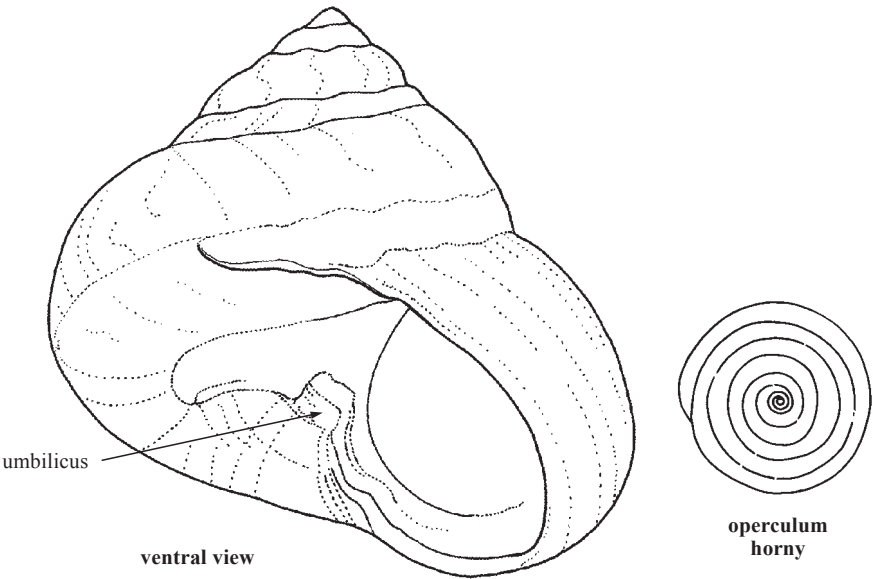
Distribution: Southeastern Florida, Caribbean, Bermuda.



TROCHIDAE

Top shells

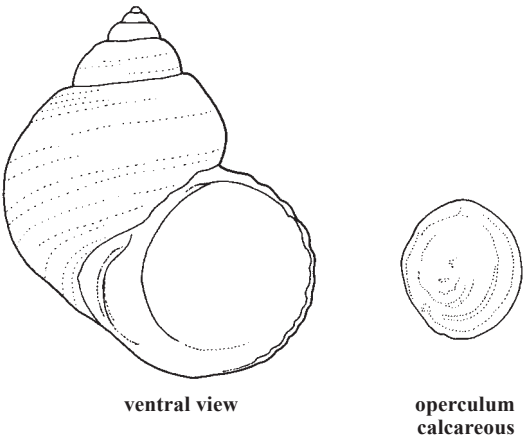
Diagnostic characters: Shell conical to globose, usually with a flattened base, umbilicus present. Aperture usually rounded, siphonal canal lacking. Shell internally nacreous. Operculum horny, multispiral.



Habitat, biology, and fisheries: Species of interest to fisheries live on hard substrates and shell/coral rubble. *Cittarium pica* is an important fisheries resource that is quickly being extirpated due to over exploitation in many parts of the area.


Similar families occurring in the area

Turbinidae: shell heavy, thick, sculpture variable; aperture rounded, internally nacreous, anterior canal lacking; operculum calcified but internally horny.



Turbinidae

List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

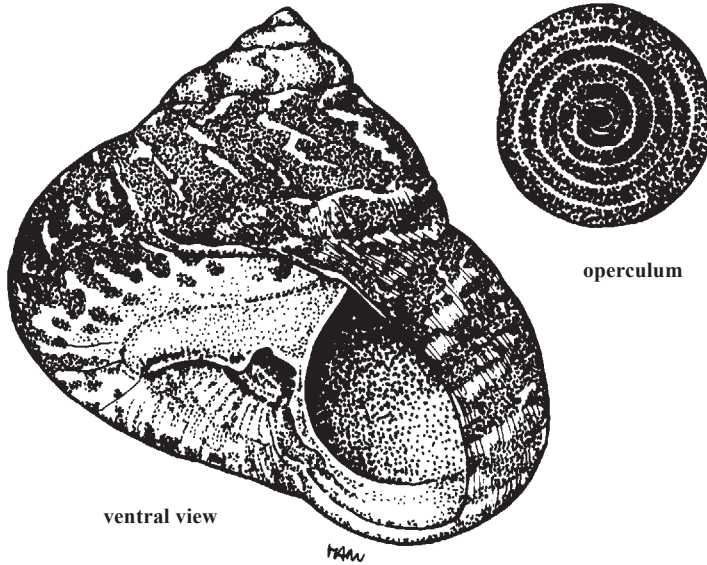
 *Cittarium pica* (Linnaeus, 1758).

Cittarium pica (Linnaeus, 1758)

KUI

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - West Indian top shell; **Fr** - Troque des Antilles; **Sp** - Burgado antillano.

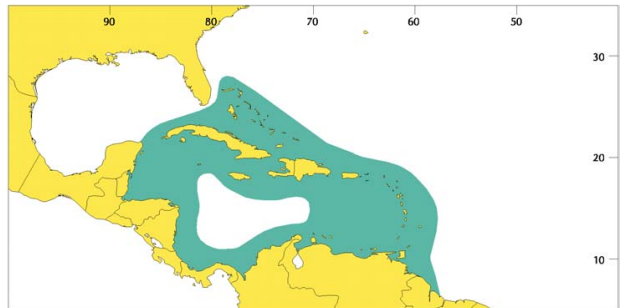


Diagnostic characters: Shell large, heavy, conical, with rounded shoulders. Umbilicus deep and round, operculum multispiral, circular. **Colour:** purple-black on a whitish background; aperture white, internally nacreous; operculum iridescent brown.

Size: To 100 mm.

Habitat, biology, and fisheries: Shallow subtidal, on rocks and shell rubble. Collected by divers. Commercially exploited in entire area of distribution, but stocks have been locally extirpated or are diminishing due to over exploitation.

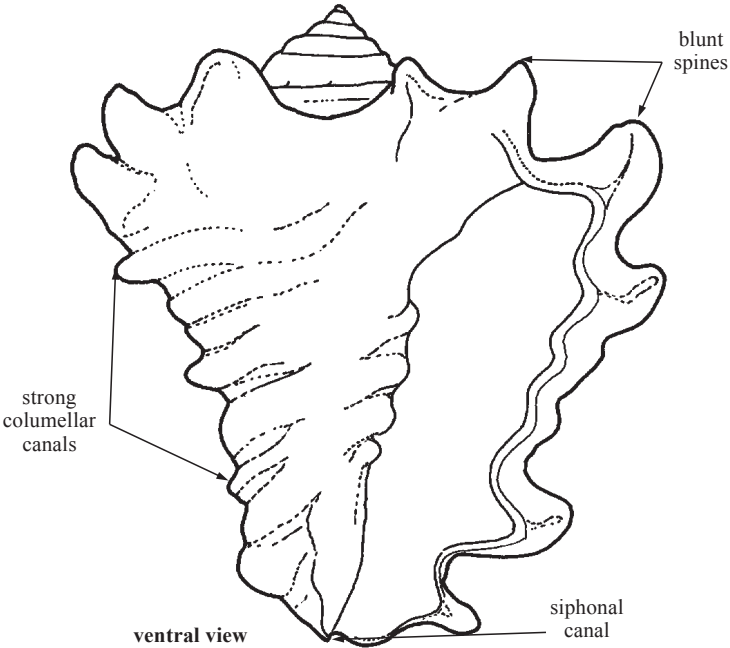
Distribution: Caribbean.



TURBINELLIDAE

Vase shells

Diagnostic characters: Shell very thick and heavy, fusiform. Sculpture of large nodules or blunt spines. Anterior canal and columellar folds well developed. Periostracum conspicuous, thick. Operculum heavy, horny.

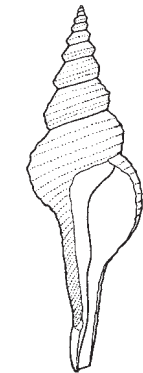


Habitat, biology, and fisheries: Intertidal to shallow subtidal, on rocky bottoms, often in coral reef areas. Consumed locally (mainly foot), boiled or in stews.

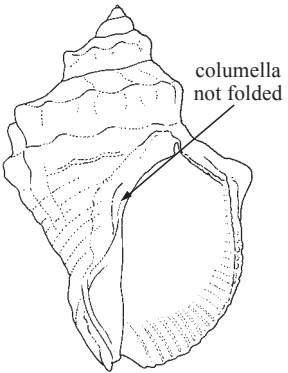
Similar families occurring in the area

Fasciariidae: shell large, elongate, spindle-shaped, spire elevated, anterior canal well developed; columellar folds present; operculum thick and horny.

Muricidae: shell usually with high spire, shell sculpture with prevailing axial elements such as varices (usually placed at 120° intervals), spines, nodules, lamellae, and others; anterior canal usually well developed; periostracum lacking; operculum thick, horny.




ventral view
Fasciariidae



ventral view
Muricidae

List of species of interest to fisheries occurring in the area

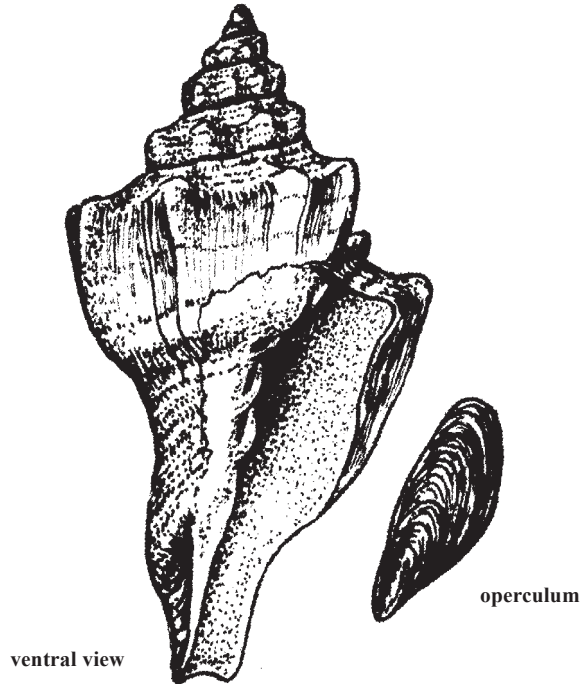
The symbol  is given when species accounts are included.

 *Turbinella angulata* (Lightfoot, 1786).

***Turbinella angulata* (Lightfoot, 1786)**

Frequent synonyms / misidentifications: None / *Pleuroploca gigantea* (Kiener, 1840).

FAO names: **En** - West Indian chank; **Fr** - Chanque antillais; **Sp** - Chanque antillano.



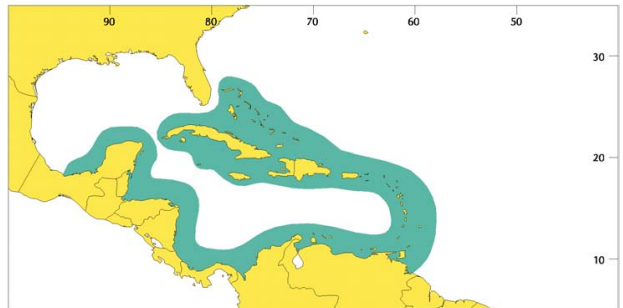
Diagnostic characters: Shell very large, heavy, fusiform. Sculpture of 8 to 10 prominent ribs angled at shoulder, 8 to 10 on last whorl. Columella with 3 strong folds. **Colour:** white, internally tinged with pink or orange.

Size: To 350 mm.

Habitat, biology, and fisheries: Consumed locally, boiled.

Distribution: Caribbean: Bahamas, northern Cuba, and Yucatán to Panama.

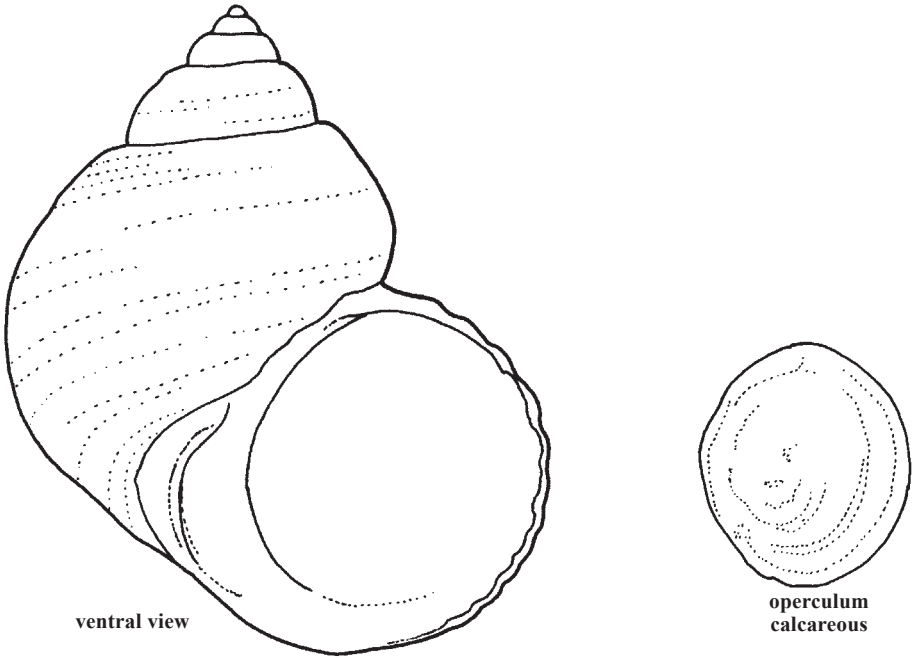
Remarks: This is one of the largest gastropods in the Atlantic Ocean.



TURBINIDAE

Turban shells

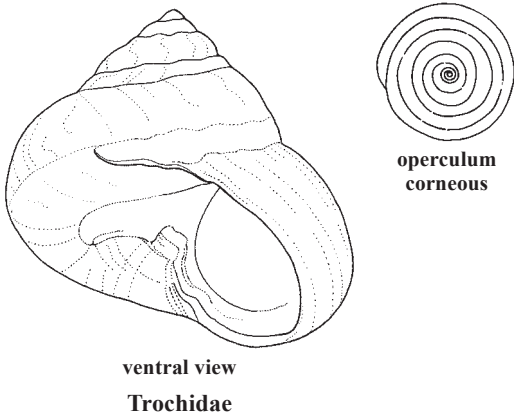
Diagnostic characters: Shell heavy, thick, sculpture variable. Aperture rounded, internally nacreous, anterior canal lacking. Operculum calcified but internally horny.




Habitat, biology, and fisheries: On hard substrates or seagrass beds. Species of interest to fisheries is consumed locally, boiled.



Similar families occurring in the area

Trochidae: shell conical to globose, usually with a flattened base, umbilicus present; aperture usually rounded, siphonal canal lacking; shell internally nacreous; operculum horny, multispiral.



List of species of interest to fisheries occurring in the area

The symbol  is given when species accounts are included.

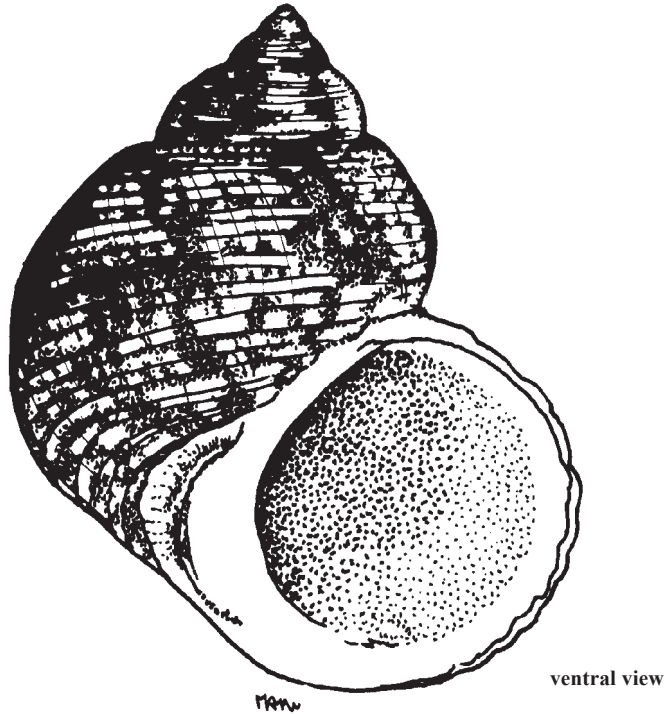
-  *Turbo canaliculatus* Hermann, 1781.
-  *Turbo castanea* Gmelin, 1791.

Turbo canaliculatus Hermann, 1781

UBN

Frequent synonyms / misidentifications: None / *Turbo castanea* Gmelin, 1791; *Cittarium pica* (Linnaeus, 1758).

FAO names: **En** - Channelled turban; **Fr** - Turban canaliculé; **Sp** - Turbante acanalado.

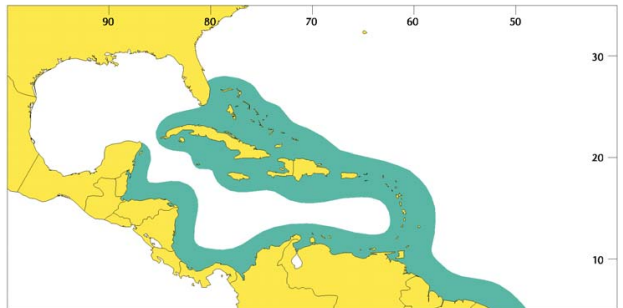


Diagnostic characters: Shell rounded, turbanate, shell base convex, umbilicus small. Sculpture consisting of low, smooth spiral cords (16 to 19 on last whorl). Deep groove present below suture. Operculum circular, smoothish. **Colour:** variable, glossy yellowish to orange to red, with irregular markings.

Size: To 75 mm.

Habitat, biology, and fisheries: On rocks, near seaweeds, in subtidal to 120 m. Consumed locally, boiled, represents a species of potential economic importance.

Distribution: Southeastern Florida and Caribbean to Brazil.

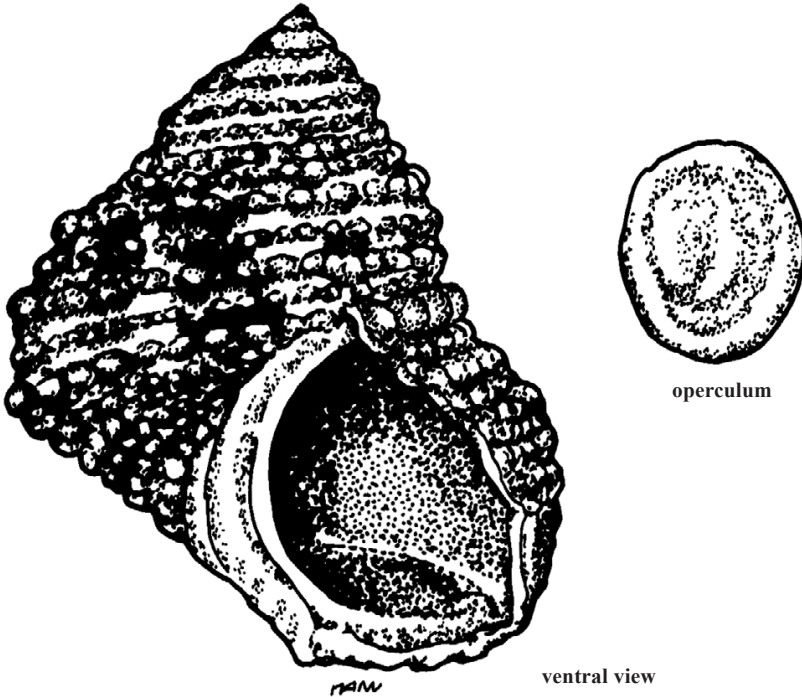


Turbo castanea Gmelin, 1791

UOT

Frequent synonyms / misidentifications: None / *Turbo canaliculatus* Hermann, 1781.

FAO names: En - Chestnut turban; Fr - Turban marron; Sp - Turbante castaña.

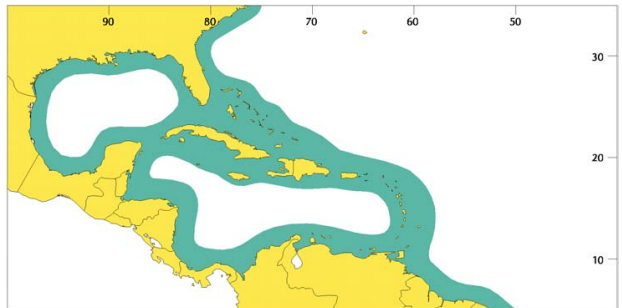


Diagnostic characters: Shell turbanate. Sculpture of spiral rows of beads, sometimes with small spines on whorl shoulders. **Colour:** tan to light brown, with patches of brown, reddish brown, and cream.

Size: To 38 mm.

Habitat, biology, and fisheries: On sand and shell and coral rubble, in shallow subtidal. Consumed locally, boiled, represents a species of potential economic importance.

Distribution: North Carolina through Florida to Texas and Caribbean to Brazil.



CEPHALOPODS

by M. Vecchione, National Marine Fisheries Service, National Museum of Natural History, Washington, D.C., USA

GENERAL REMARKS

The molluscan class Cephalopoda includes (1) decapodiforms, such as squids and cuttlefishes, (2) octopodiforms, including the vampire squid as well as a variety of octopods, and (3) their more distant relatives, the chambered nautilus (Young et al., 1998). The first 2 groups listed above comprise the Neocoleoidea. Cephalopods are characterized by a well-developed head with a circumoral (surrounding the mouth) arrangement of arms that bear suckers and/or hooks (except in *Nautilus*). The mouth has chitinous beak-like jaws; as in other molluscs a chitinous tongue-like radula (band of teeth) is present in most species. The shell is generally reduced, modified, or absent and is enclosed by the mantle in neocoleoids. An external shell occurs only in *Nautilus* (restricted to Indo-Pacific), although a shell-like egg case is found in female argonauts. The size of adult cephalopods ranges from about 2 cm to approximately 20 m in total length.

Cephalopods are soft-bodied animals; their primary skeletal features include a cartilaginous cranium and, in most forms, a rigid structure in the mantle composed of chitin (the gladius or "pen"), calcium carbonate (cuttlebone and ram's-horn shell), or cartilage (fin supports in finned octopods). One pair of gills is present except in *Nautilus*, which has two pairs. The central nervous system is highly developed, with a large brain modified from the molluscan circumesophageal nerve ring. The highly developed eyes of most neocoleoids have a lens to focus images on the retina, a visual system often compared with that of vertebrates.

Coloration is variable depending on group and habitat; most species have numerous chromatophores (pigment sacs controlled by neuromuscular action) and iridocytes (shiny, reflective platelets) in the skin. Rapid changes in colour patterns and skin texture are an integral part of their behaviour. While shallow-living cephalopods are able to conceal themselves by chromatophore-produced colour patterns and texture changes, many deep-sea forms camouflage themselves by producing bioluminescent light from photophores (light-producing organs) which eliminates their silhouettes against the downwelling light in the dimly-lit mid depths.

Water is taken into the mantle (body) cavity for respiration, through the opening between the mantle and head. Contraction of mantle muscles expels the water from the mantle cavity through the funnel (a small ventral tube, sometimes called a siphon) for propulsion and elimination of waste products, in addition to completion of the respiratory cycle. Most neocoleoids can produce ink, which is also expelled through the funnel. The ink may take the form of a mucoid "pseudomorph", to decoy predators, or a cloud, which has been compared with a smoke screen.

Locomotion is achieved by (1) drawing water into the mantle cavity followed by its jet-like expulsion through the funnel, and by (2) flapping or undulation of fins on the mantle, as well as by (3) crawling along the bottom on the arms (mostly octopods). Fins also provide balance and steering during jetting.

The sexes are separate, eggs are heavily yolked, and development is direct, without true metamorphic stages. Cephalopod eggs may vary in size from about 1.7 cm long in some *Octopus* species to 0.8 mm long in *Argonauta*, which are also octopods. Eggs have one or more layers of protective coatings and generally are laid as egg masses. Egg masses may be benthic or pelagic, varying among major taxonomic groups. Time of embryonic development also varies widely, from a few days to many months, depending on the species and temperature conditions. Hatching may occur synchronously from a single clutch or be extended over a period of 2 to 3 weeks. Hatchlings from benthic eggs may be either benthic, and morphologically similar to the older stages, or planktonic. Pelagic hatchlings are planktonic and, in some species, very different from more developed conspecifics. The term "paralarva" has been adopted for early stages of cephalopods which differ morphologically and ecologically from older stages.

Cephalopods occur in all marine habitats of the world, though none are found at salinities less than about 17.5 parts per thousand. The range of depths extends from intertidal to over 5 000 m. Many species of oceanic cephalopods undergo diel vertical migrations, wherein they occur at depths of about 400 to 1 000 m during the day, then ascend into the uppermost 200 m or so during the night. Abundance of cephalopods varies (depending on group, habitat, and season) from isolated territorial individuals (primarily benthic octopods and sepioids) through small schools with a few dozen individuals to huge schools with millions of oceanic squids.

The total number of living species of cephalopods currently recognized is fewer than 1 000; about 109 species in 31 families occur in the Western Central Atlantic Ocean and adjacent areas (Caribbean Sea and Gulf of Mexico). Both decapods and octopods are common in these waters. These major groups are easily distinguished by external characteristics. The squids have an elongate body with lateral fins, and eight arms with stalked suckers in two or more rows, plus two longer tentacles which have an organized cluster (tentacular club) of two to many rows of suckers (or hooks) at the distal end. Decapod suckers bear chitinous rings which are sometimes modified into hooks. The octopods have a short, sac-like body generally with no lateral fins (some deep-sea octopods have a pair of paddle-like fins), and eight arms only (no tentacles) which have unstalked suckers without chitinous rings along the length of the arms. Sepioid decapods (bobtail squids) also have a short, sac like body, but have fins and an arm crown similar to that of the squids, with two tentacles in addition to eight arms. The status of the systematics of cephalopods is rapidly changing, as research has in-

creased substantially in the past 25 years. However, phylogenetic relationships among families within the major groups remain uncertain.

Many, though not all, cephalopod species exhibit external sexual dimorphism, either in structural or size differences. Males of many forms possess a modified arm (hectocotylus) for mating. The hectocotylus may consist of modified suckers, papillae, membranes, ridges and grooves, flaps, etc., but in all cases it functions to transfer the spermatophores (sperm packets) from the male to an implantation site on the female. The spermatophores may be implanted inside the mantle cavity, around the mantle opening on the neck, in a pocket under the eye, around the mouth, etc. The males of some species also exhibit modifications to other arms, in addition to the hectocotylus. Females of some species also develop modified structures (e.g., arm-tip photophores) when mature. The mode of reproduction and egg-laying is unknown for many forms, especially oceanic and deep-sea species.

The life expectancy appears to be about 1 to 2 years in most neocoleoids, but larger species of squids and octopods (e.g., giant squid - *Architeuthis* spp. and the giant octopus *Enteroctopus dofleinii*) and those in cold habitats may live somewhat longer. Conversely, small oceanic species such as pyroteuthids may complete their life cycles in less than 6 months. Some species die after spawning, but this phenomenon is not universal.

Cephalopods are active predators that feed upon shrimps, crabs, fishes, other cephalopods, and, in the case of octopods, on other molluscs. In turn, cephalopods are major food items in the diets of toothed whales, seals, pelagic birds (penguins, petrels, albatrosses, etc.), and both benthic and pelagic fishes (e.g., sea basses, lancetfishes, tunas, and billfishes).

Cephalopods are extremely important as food for human consumption, and well over 3 million t are caught each year. Fishing pressure on cephalopods has increased as stocks of finfishes have been depleted worldwide. Cephalopod fisheries are especially intense in Japan, the Orient and in the Mediterranean/Eastern Atlantic waters. Fishing techniques include small traps (octopods), wiers, lures and jigs (some cuttlefishes and squids), lampara nets (nearshore squids), and midwater and otter trawls (squids and octopods). Certain species of squids are attracted to light, then jigged or seined. Occasionally cuttlefishes and octopods are caught in hand-nets or are speared. The total commercial catch of cephalopods in the Western Central Atlantic varied during 1993 to 1998 between 19 000 and 31 000 t, mostly landed in Mexico.

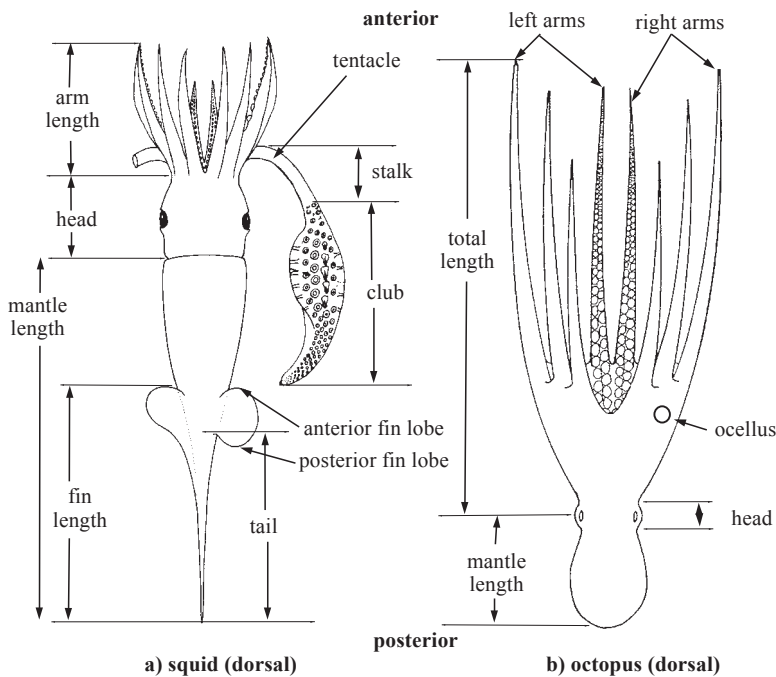
Cephalopods are also important experimental animals in biomedical research with direct application to man. Because of the highly developed brain and sensory organs, cephalopods are valuable in behavioural and comparative neuroanatomical studies. In addition, some cephalopods possess extremely large single nerve axons and these are used extensively in all aspects of neurophysiological research.

The bites of cephalopods, especially octopuses, can be painful at the least, poisonous or secondarily infected, or, rarely, lethal (several human deaths have been recorded in Australia due to blue-ringed octopus, *Hapalochlaena*). Cephalopods must therefore be handled carefully.

Preparation of the accounts that follow have relied heavily on the cephalopod pages of the Tree-of-Life project on the World Wide Web (Young, Vecchione, and Mangold, <http://tolweb.org/tree/eukaryotes/animals/mollusca/cephalopoda/cephalopoda.html>). Readers can find additional information about all extant cephalopod families at that URL web site. Comments by Michael J. Sweeney were very helpful in polishing a draft of this presentation.

In the presentation of family accounts, Decapodiformes are listed first, followed by Octopodiformes, which is divided into cirrate octopods, incirrate octopods, and vampire squids. Because phylogenetic relationships are unresolved among families of either decapods or incirrate octopods (Young and Vecchione, 1996), families are presented in alphabetical order within these groups. Keys are provided to local genera for all families. Details of species are included for the speciose and commercially important families Loliginidae, Ommastrephidae, and Octopodidae. Genera (in some cases subfamilies) are in alphabetical order within families and, for families of commercial interest, species alphabetical within genera.

TECHNICAL TERMS AND MEASUREMENTS



Abdominal septum - median septum traversing the posterior mantle cavity parallel to the body axis. It extends from the posterior visceral mass to the ventral mantle wall. The ventral mantle artery runs along the anterior end of this septum.

Aboral - away from or opposite the mouth.

Accessory nidamental glands - glands of unknown function consisting of tubules containing symbiotic bacteria. Found in sepioids and loliginid squids.

Adult - a female that has mature eggs (these are frequently stored in the oviducts), or a male that has produced spermatophores (these are stored in Needham's sac).

Afferent blood vessel - vein carrying blood toward an organ.

Anal flaps (= anal valves) - small flaps on the lateral sides of the anus (Fig. 1).

Anal pads - ovoid pads of unknown function, apparently glandular, located on both sides of the anus in some sepioids.

Anus - opening of the digestive tract, just inside the funnel, through which undigested remains of food, as well as ink, are expelled.

Anterior - toward the arm tips.

Antitragus - knob that projects inward from the posterior surface of the central depression in the funnel locking apparatus of some squids.

Arm - one of the circumoral appendages of cephalopods. In decapodiforms each member of the fourth pair of arms is modified to form a tentacle. The second pair of arms is modified in vampire squids and has been lost in octopods.

Armature - the grappling structures of the arms and tentacles, including both suckers and hooks.

Beak - one of the 2 chitinous jaws of cephalopods. The dorsal beak inserts within the lower beak to tear tissue with a scissors-like cutting action.

Brachial - pertaining to the arms.

Brachial crown - the combination of arms and tentacles that surround the mouth.

Brachial pillar - a very narrow and elongate anterior region of the head between the eyes and the base of the brachial crown. A brachial pillar is especially well developed in many young cranchiid squid.

Brain - medial portion of the central nervous system. It includes the subesophageal and supraesophageal masses but generally does not include the large optic lobes.

Branchial - pertaining to the gills.

Brooding - incubation of eggs by the parent. A characteristic feature of incirrate octopods but also found in some squid (e.g., Gonatidae).

Buccal - pertaining to the mouth.

Buccal connective - muscular membrane that runs from the buccal support to the base of the adjacent arm (Fig. 2).

Buccal crown - umbrella-like structure that surrounds the mouth and is surrounded by the brachial crown. It consists of buccal supports and the buccal membrane. The buccal crown is present in most decapodiforms but absent from all octopodiforms.

Buccal lappet - see buccal support.

Buccal mass - muscular bulb at the beginning of the digestive system that contains the mouth, beaks, radula and various glands.

Buccal membrane - the muscular membrane that connects the buccal supports and together with the supports, forms the buccal crown. The pigmentation of the buccal membrane often differs from that of the adjacent oral surfaces of the arms (Fig. 2).

Buccal suckers - small but normal suckers that are present on the oral surface of the buccal supports of some decapodiforms (bathyteuthid families, some loliginids and some sepiids) (Fig. 2).

Buccal support (= buccal lappet) - one of 6 to 8, large muscular flaps of the buccal crown that surround the mouth. The supports are connected by the buccal membrane. The buccal supports are thought to be homologous with the inner ring of tentacles that surround the mouth of nautilids.

Caecum - region of the digestive tract of all cephalopods between the stomach and intestine.

Calcareous - composed of calcium carbonate (CaCO_3).

Calimus - the conical papilla of the end-organ of the hectocotylus in many incirrate octopods. It is located at the distal termination of the sperm groove and usually lies adjacent to the last arm sucker (Fig. 3).

Carpal sucker - suckers in the locking apparatus at the base of the club.

Carpal knobs - muscular bumps that replace some suckers on the carpal region of the club.

Carpus - the proximal "wrist" area of the tentacular club (Fig. 4).

Chitin - a horny polysaccharide substance (fingernail-like) that forms the sucker rings, hooks and beaks of most cephalopods.

Cartilaginous tubercles - rigid cartilaginous spines, with one or several cusps, in the skin of certain squids and octopods (Fig. 5).

Chromatophore - in general: a pigment cell. In cephalopods the chromatophore is an organ composed of numerous cells including one containing pigment granules that is surrounded by many slender muscle cells. Under nervous control, the muscles rapidly expand and flatten the pigment cell which spreads the pigment over a relatively broad area.

Cirri - muscular, finger-like structures that arise laterally on the oral surfaces of the arms of some octopodiforms. Cirri are homologous with trabeculae of decapodiforms.

Club-fixing apparatus - arrangement of suckers and matching knobs on the carpal region of the tentacular club that permits the 2 clubs to be locked together.

Coelom - an internal body cavity of mesodermal origin that is lined by an epithelium. Cephalopods have two coeloms, the visceropericardial coelom and the nephridial coelom.

Chorion - a tough secreted membrane that surrounds the egg.

Collar - muscular structure extending from the nuchal cartilage to the funnel that forms a one-way valve that lets water enter the mantle cavity but closes as the mantle contracts thereby forcing exhalent water out through the funnel.

Conus of gladius - cone-shaped structure at the posterior end of the gladius (Fig. 6).

Conus field - the sides of the conus that continue along the vanes of the gladius.

Cornea - smooth, thin, turgid, transparent skin without muscles that covers the eyes to protect the eye lenses of incirrate octopods and some decapodiforms.

Counterillumination - the production of bioluminescent light by an animal to conceal its silhouette against the downwelling light.

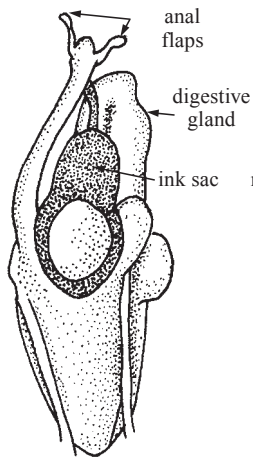


Fig. 1

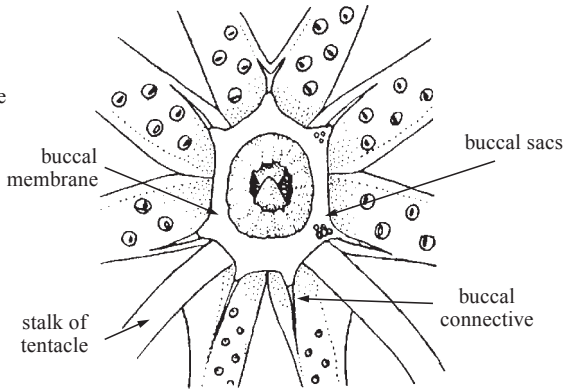


Fig. 2 diagram of oral surface of brachial crown and buccal membrane of a squid

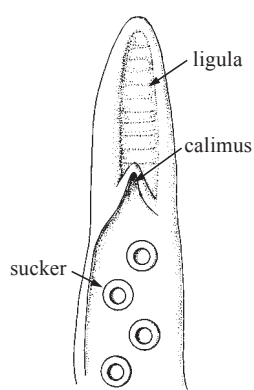


Fig. 3 hectocotylus of an octopus

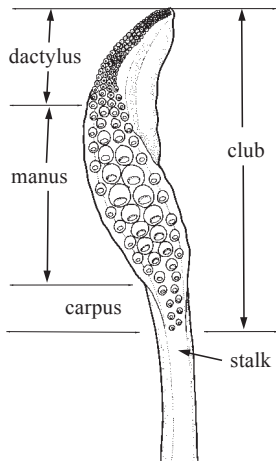


Fig. 4 distal end of tentacle of a squid

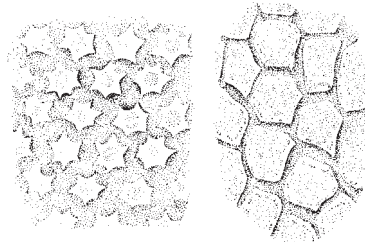


Fig. 5 cartilaginous scales

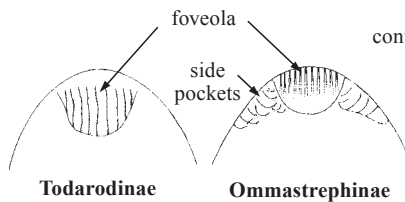


Fig. 7

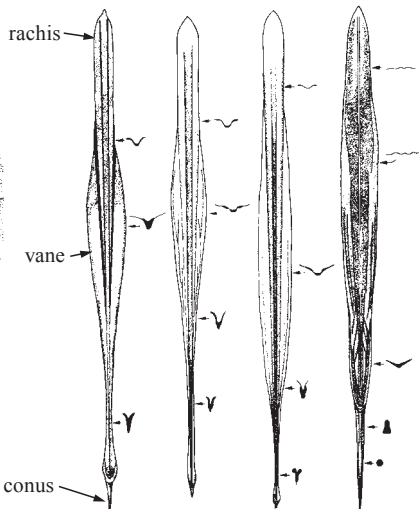


Fig. 6 gladiuses



Fig. 8 funnel locking cartilage

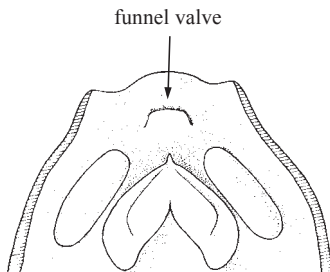


Fig. 9 funnel organ

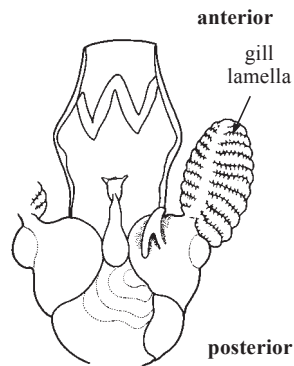


Fig. 10 gill

Crop - expansion (i.e. a broadening or a side pocket) of the esophagus for storing food.

Dactylus - the distal section of the tentacular club of squid, often characterized by suckers of reduced size.

Decapodiformes - higher-level taxon (superorder) including bobtail squid, ram's horn squid, and cuttlefish.

Diel vertical migration - vertical migration of animals in response to changes in downwelling light.

Digestive gland - primary organ in cephalopods that secretes digestive enzymes. It is also important in absorption and excretion (Fig. 1).

Distal - situated away from the point of origin or attachment. For example, the arm tip is the distal end of arm.

Dorsal - toward the uppermost surface of a cephalopod, opposite the ventral surface where the funnel is located.

Efferent vein - a vein carrying blood away from an organ.

Egg mass - a large number of eggs encapsulated in a gelatinous matrix or a large number of such structures that are attached together. The egg mass of an oceanic squid can be a large, fragile gelatinous ball or tube carrying many thousands of eggs. In contrast, the egg mass of a neritic squid (lolidinid) can be composed of very tough capsules each carrying several hundred eggs with many capsules attached together at their bases and to the substrate to form an egg mass.

Epithelial pigmentation - The pigmentation that is contained in epithelial cells which are unable to change their shape. Colour in most cephalopods, however, is due to pigment granules that are contained in specialized organs, the chromatophores, that can change shape rapidly under nervous control. See chromatophores.

Esophagus - the portion of the digestive tract between the buccal mass and the stomach. Often a portion of the esophagus is expanded to form a crop for food storage.

Fin angle - the angle between the longitudinal axis of the mantle and the posterior border of one fin.

Fins - the pair of muscular flaps used in swimming and located along the dorsolateral surface of the mantle, usually in its posterior half.

Fin lobe - the portion of a fin that extends anteriorly from the fin's anterior point of attachment and/or posteriorly from the fin's posterior point of attachment. This is often called the "free" lobe.

Foveola - transverse membranous fold of skin that forms a pocket in the funnel groove of ommastrephid squids (Fig. 7).

Funnel (= siphon) - the ventral, muscular tube through which water is expelled from the mantle cavity. The funnel is thought to have evolved from the molluscan foot.

Funnel groove - the depression in the ventral surface of the head into which the funnel fits.

Funnel locking apparatus - the funnel component (generally cartilagenous) of a structure that "locks" the ventrolateral mantle to the funnel. This lock, depending on its form, can either restrict all movement between the funnel and mantle or allow just anterior-posterior slipping. See Mantle locking apparatus (Fig. 8).

Funnel organ - the glandular structures on the internal dorsal and ventral surfaces of the funnel (Fig. 9).

Funnel valve - semicircular muscular flap extending from and continuous with the posterodorsal funnel wall. The funnel valve apparently acts as a one-way valve to prevent inspiration of water through the funnel when mantle expansion draws in water to pass over the gills for respiration.

Gill - paired organs for the exchange of respiratory gases with sea water.

Gill lamella - gill leaflet that extends perpendicular to the axis of the gill and contains the respiratory epithelium (Fig. 10).

Gladius - the chitinous remnant of the shell in many decapodiforms and *Vampyroteuthis*. It is generally feather-shaped and lies in the dorsal midline of the body along the full length of the mantle. The gladius lies within the shell sac which secretes it.

Hatchling - young cephalopod that has just hatched from the egg.

Hectocotylus - the modified arm in males used for transferring spermatophores to the female. In cirrillates the hectocotylus is one member of the ventrolateral arm pair while in decapodiforms frequently one or both members of the ventral arm pair are modified. Many species of coleoid cephalopods lack a hectocotylus (Figs 3, 11).

Hook - horny structure that looks like a single claw and is derived from the inner sucker ring in some decapodiforms. Hooks may be found on the arms and/or tentacular clubs of squid (Fig. 12).

Ink sac - organ composed of a gland that secretes ink, a sac that stores ink and a duct that connects it to the intestine. The ink sac generally appears black from the outside although it may be covered by silvery tissue in some species (Fig. 1).

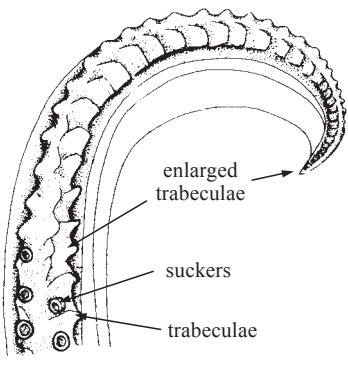


Fig. 11 hectocotylized arm of a squid

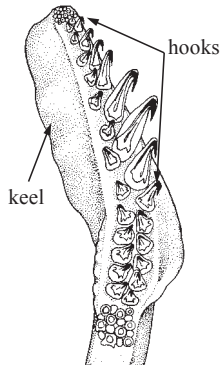


Fig. 12 tentacular club of an onychoteuthid squid

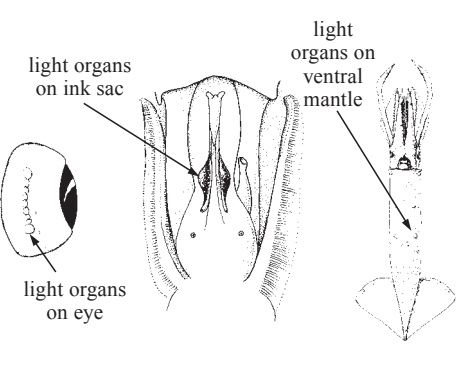


Fig. 13 examples of photophores

Integument - skin.

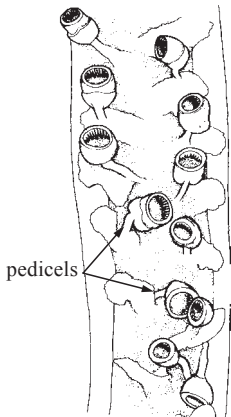


Fig. 14 detail of arm

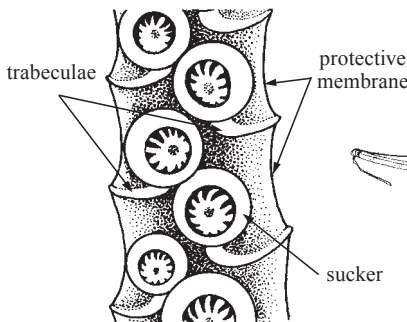


Fig. 15 detail of arm

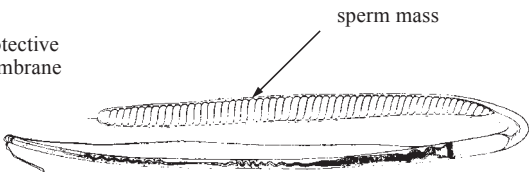


Fig. 16 spermatophore

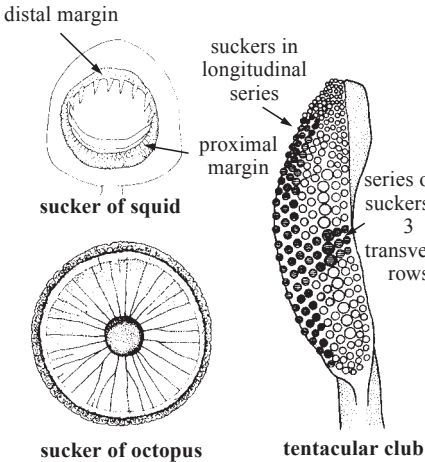


Fig. 17 suckers and how they are counted

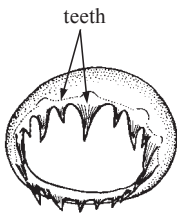


Fig. 18 sucker ring

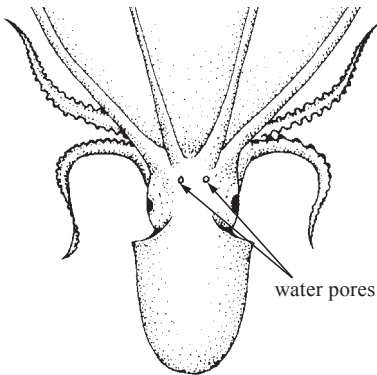


Fig. 19 dorsal view

Intestine - distal region of the alimentary canal between the stomach/caecum complex and the anus.

Juvenile - life history stage between the paralarval and subadult stages.

Keel - flap of tissue on the dorsal-aboral region of the arms and tentacular clubs in Decapodiformes (= swimming membrane).

Lateral - away from the midline.

Lateral ridge - muscular structure along the lateral region of the mantle of some octopods.

Light organ - see Photophore (Fig. 13).

Ligula - the portion of the sucker-free end-organ of the hectocotylus of many incirrate octopods that is generally elongate and grooved. The ligula in octopodids is often spatulate in shape with transverse ridges (Fig. 3).

Mantle - the fleshy, usually muscular, tube-like or sac-like body wall that covers the visceral region and encloses a space called the mantle cavity.

Mantle cavity - space enclosed by the mantle. In cephalopods the mantle cavity contains the visceral sac, gills, anus, openings of the gonoducts, nephridial pores and various muscles and septa.

Mantle locking apparatus - the mantle component (usually fibrous) of the structure that "locks" the mantle to the funnel. See Funnel locking apparatus.

Mantle length (ML) - the standard measure of length in coleoid cephalopods. In decapodiforms ML is measured along the dorsal midline from the mantle margin to the posterior tip of the body, excluding long tails. In octopodiforms ML is measured from a line joining the midpoint of the eyes (rather than the anterior mantle margin since the latter is obscured by the head/mantle fusion) to the posterior-most area of the mantle.

Manus - the central, usually expanded, region of the tentacular club.

Mature - in cephalopods this term refers to sexual maturity which is determined for females by the presence of ova (mature eggs) free in the coelom or oviducts, and for males by the presence of spermatophores in Needham's sac. See Adult.

Medial - toward the midline.

ML - abbreviation for Mantle Length, the standard length measurement for cephalopods.

Neck - the region separating the posterior end of the cephalic cartilage and the collar. Only those cephalopods with elongate heads (e.g., chiroteuthids) have distinct necks.

Needham's sac - the large storage sac for spermatophores that is an expanded region of the genital duct at the base of the penis in males.

Nominal species - a species that is based on a morphological type. A properly named species but not necessarily a valid species.

Nidamental glands - large glandular structures found in most decapodiforms and nautilids that lie in and open directly into the mantle cavity. The glands are composed of numerous lamellae that are involved in secretion of egg cases or the jelly of egg masses.

Nuchal cartilage - see Nuchal-locking apparatus.

Nuchal crest - prominent transverse ridge in most decapodiforms that extends across the dorsal and along the lateral surfaces of the head at its posterior end.

Nuchal folds - fixed folds of the head integument that adjoin the nuchal crest posteriorly and are perpendicular to it. The function of the folds is uncertain.

Nuchal locking apparatus - a cartilagenous locking structure in decapodiforms located mid dorsally just posterior to the head. It is composed of the nuchal cartilage, which also forms an attachment site for collar and head retractor muscles, and a cartilage on the mantle that underlies the gladius. The apparatus keeps the head and mantle aligned dorsally during mantle contractions.

Nuchal region - the posterodorsal region of the head and the area immediately posterior to it.

Ocellus - false eye spot found in pairs (ocelli) on some octopods between the eyes and the bases of the dorsolateral and ventrolateral arms. May enclose an iridescent ring.

Ocular photophore - photophore that lies on the eyeball.

Oral - toward or on the side of the mouth.

Oviduct - female gonoduct. The oviduct conducts eggs from the visceropericardial coelom, that holds the ovary, to the exterior and is often used to store eggs. In some argonautoid octopods eggs are fertilized and undergo either partial (*Argonauta*) or complete (*Ocythoe*) embryonic development within the oviduct.

Oviducal gland - gland surrounding the end of the primary oviduct and responsible for secreting some of the external coatings over spawned eggs.

Paralarva - first free-living life history stage for those cephalopods found in the plankton that differ in both morphology and vertical distribution from older juveniles.

Pedicel - decapodiform sucker stalk. On some hectocotyli, suckers may be lost and the pedicels elongated into papillae or expanded into flaps or ridges (Fig. 14).

Penis - the long, muscular end of the male gonoduct that assists in transferring spermatophores to the female. Apparently, in species with a hectocotylus, the penis transfers spermatophores to the hectocotylus which in turn transfers them to the female. In species without a hectocotylus, the penis is often greatly elongate, capable of extending beyond the mantle cavity and can, apparently, transfer spermatophores directly to the female.

Photophore - organ that produces bioluminescence or 'living light' (Fig. 13).

Posterior - toward the closed end of the mantle and tail, away from the head and arms.

Primary conus - a conus on the gladius that is not formed by the infolding of the vanes.

Protective membranes - membranes, generally supported by trabeculae, that form lateral borders to the oral surfaces of the arms and tentacular clubs (Fig. 15).

Proximal - situated toward the point of origin or attachment. For example, the proximal end of the arm is the basal end of the arm.

Pseudomorph - a mass of ink and mucous that roughly has the dimensions of the cephalopod that secreted it.

Radula - a toothed ribbon that lies in the buccal mass and that aids in movement of food into the esophagus.

Rhachis - the central axis of the gladius which is usually thickened (Fig. 6).

Rostrum (gladius) - section of the gladius that extends posteriorly or posterodorsally from the conus. A rostrum on the gladius is found only in the Onychoteuthidae, Ancistrocheiridae, Lampadioteuthinae and Vampyroteuthidae.

Secondary conus - a conical region at the posterior end of the gladius that is formed by a inrolling and fusion of the vanes. The ventral line of fusion is usually apparent. The secondary conus may be rather short or over half the gladius length.

Secondary web - web that extends from each arm to the primary web in some cirrate octopods. Separation of the arm from the primary web seems to be associated with feeding and/or defense (bell and balloon postures) but the function is not well understood.

Sepioid gills - gills of some cirrate octopods that look superficially like gills of sepioids.

Shell sac - the sac that secretes the shell in the Coleoidea. The sac is composed of ectodermal epithelium that invaginates during embryonic development to form an internal sac.

Side pockets - pockets formed by small membranous folds of integument lateral to the foveola in the funnel groove in ommastrephid and thysanoteuthid squids (Fig. 7).

Siphuncle - the tube-like extension of the body wall, coelom and an external covering tube that penetrates the phragmocone and regulates gas exchange into the phragmocone chambers.

Sperm mass - the coiled rope of sperm that lies within the spermatophore (Fig. 16).

Spermatophore - a packet of sperm that is formed by the male and passed to the female during mating. In most coleoids, this packet is very complex and contains a "rope" of sperm (= sperm mass), an ejaculatory apparatus and a cement body. Except for the sperm, the entire structure is non-cellular and consists of a complex architecture of secreted material (Fig. 16).

Stalk of tentacle - region of the tentacle proximal to the club.

Stalked eyes - eyes that extend from the head on stalks. Two types exist: (1) stalked eyes in which the optic lobe is adjacent to the eye and separated from the brain by a long optic stalk and (2) stalked eyes in which the optic lobe remains adjacent to the brain and long optic nerves extend from the lobe to the eye. The former type is found exclusively in the Cranchiidae.

Stomach - a muscular organ of the digestive system where primary digestion occurs. The stomach is generally lined with cuticular ridges to aid in grinding food, and is supplied with digestive enzymes from the digestive gland. The stomach may be greatly expandable in size and serve as a storage area until food can be fully processed.

Subadult - stage at which all of the characters that typically define the species are present. The Subadult Stage follows the Juvenile Stage and precedes the Adult Stage. A Subadult Stage is defined in cephalopods because the adult phase often is temporally abbreviated.

Subequal - nearly equal. Generally refers to the length of the arms when these appear to be approximately the same length. Arm lengths cannot be measured very accurately due to variation in their states of contraction.

Sucker - muscular suction-cup on the arms and tentacles and occasionally on the buccal supports. Suckers of decapodiforms contain horny rings that often bear teeth or sometimes form hooks (Fig. 17).

Sucker rings - suckers of decapodiforms have 2 types of hard, horny rings. One, the inner ring, lies around the inner walls of the acetabulum and often bears teeth. The other, the outer ring, is composed of numerous platelets and lies on the surface of the infundibulum.

Sucker series - the longitudinal rows of suckers on the arms or tentacles. Series (= longitudinal rows) contrasts with rows (= transverse rows) in describing sucker arrangement (Fig. 17).

Sucker stalk - the structure between the sucker and the arm. In octopods it is a cylindrical structure about the same width as the sucker and in decapodiforms it is constricted into a conical pillar (= pedicel).

Sucker teeth - teeth on the inner, horny sucker rings of some decapodiforms (Fig. 18).

Tail - posterior narrow extension of the body posterior to the fins. The end of the fins and the beginning of the tail often overlap. An operational definition for point of demarcation for the purposes of measurement is: The point where a hypothetical line, continuous with the broad posterior edge of the fin, crosses the midline of the body.

Tentacles - modified fourth pair of arms in decapodiforms that are capable of considerable extension and contraction. Each tentacle consist of a proximal stalk usually devoid of suckers, and a distal club armed with suckers and occasionally hooks.

Tentacular club - the terminal, usually expanded part of the tentacle which bears suckers and/or hooks.

Tentacle pocket - an invagination of the anteroventral area of the head between the bases of the ventrolateral and ventral arms of sepioids and loliginids into which the tentacles can be (at least partially) withdrawn.

Terminal pad of tentacular club - a small, distinct pad or circlet of suckers at the tip of the club.

Terminal fins - fins with more than 50% of their length posterior to the muscular mantle. These fins, therefore, are at the "terminal" or posterior end of the body and are generally supported by an elongate secondary conus of the gladius.

Trabeculae - muscular cones or flaps that support the protective membranes on the arms and tentacular clubs in decapodiforms. These are thought to be homologous with the cirri of the octopodiforms.

Tragus - particular inward projecting knob on the medial surface of the central depression in the funnel locking apparatus of some squids.

Truncate teeth - teeth on the inner horny of rings of decapodiform suckers that do not terminate in a point but rather a broad, flat tip.

Vane (= wing; lateral field) - broad, lateral portion of the gladius that arises from the rachis.

Ventral - toward the lower surface of the animal (i.e., the side on which the funnel is located).

Vesicular tissue - tissues found in some decapodiforms that contain numerous vesicles filled with water that usually contains ammonium chloride. The vesicles may be concentrated in certain structures (e.g., the ventral arms) or scattered throughout the animal. The light solution in the vesicles provide buoyant lift.

Water pores - one or 2 pairs of pores in the integument of the head that communicate with extensive spaces at the bases of arms on some pelagic argonautoid octopods (Fig. 19).

Web - muscular membrane that extends between the arms of many octopodiforms but is reduced or absent in most decapodiforms.

KEY TO FAMILIES OCCURRING IN THE AREA

- 1a. Suckers stalked with chitinous rings; usually 10 circumoral appendages (8 arms and 2 ventrolateral tentacles) although tentacles may be lost in some species (Decapodiformes) → 2
- 1b. Suckers without stalks (although bases sometimes constricted in finned octopods and *Vampyroteuthis*) and without chitinous rings; 8 arms but no ventrolateral tentacles
. (Octopodiformes) → 26
- 2a. Internal shell rudimentary or coiled and chambered; posterior mantle blunt → 3
- 2b. Internal shell (gladius) extending the full length of the mantle and pen-shaped or feather-shaped; posterior mantle usually pointed (not in *Bathothauma*, *Bathyteuthis*, or *Pickfordiateuthis*) → 4

- 3a. Shell calcified, coiled, chambered (Fig. 20) **Spirulidae**
- 3b. Shell chitinous and rudimentary or absent (Fig. 21) **Sepiolidae**

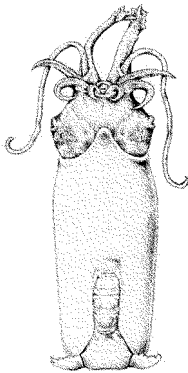


Fig. 20 Spirulidae

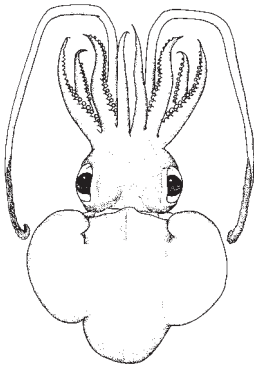


Fig. 21 Sepiolidae

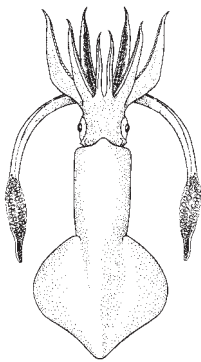


Fig. 22 Loliginidae

- 4a. Eye covered by a transparent membrane (cornea) (Fig. 22) **Loliginidae**
- 4b. Eye without cornea; lens in open contact with seawater → 5
- 5a. Funnel free from mantle; a funnel-mantle locking apparatus present → 6
- 5b. Funnel fused to mantle on each side; no funnel-mantle locking apparatus present → 25
- 6a. Funnel-mantle locking apparatus a simple, straight groove and ridge (the classification "simple and straight" includes some locking apparatuses that show considerable variation; for example, in the Octopoteuthidae and the Histioteuthidae the central groove is fairly broad and may curve slightly; the homogeneity of this classification becomes apparent when this type of locking cartilage is contrasted with the more highly specialized types) → 7
- 6b. Funnel-mantle locking apparatus not a simple, straight groove and ridge → 20
- 7a. Arms with hooks. → 8
- 7b. Arms without hooks. → 11
- 8a. Tentacles and clubs absent in adults although present in paralarvae or occasionally juveniles (*Taningia*) but, when present, always with rudimentary clubs armed with few suckers (Fig. 23) **Octopoteuthidae**
- 8b. Tentacles present; fully developed clubs present → 9

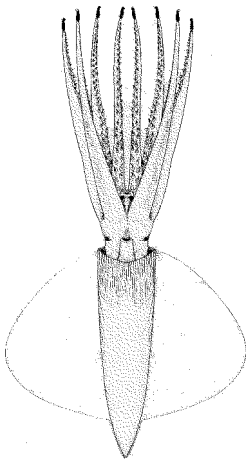


Fig. 23 Octopoteuthidae

- 9a. Photophores on viscera but not on mantle or surface of head or arms (Fig. 24) **Pyroteuthidae**
- 9b. Photophores on mantle and surface of head and arms but not on viscera. → **10**
- 10a. Photophores on tentacles but not on eyeballs (Fig. 25) **Ancistrocheiridae**
- 10b. Photophores on ventral eyeballs but not on tentacles (Fig. 26) **Enoploteuthidae**

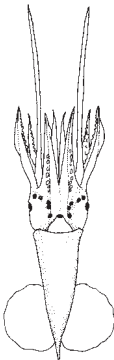


Fig. 24 **Pyroteuthidae**

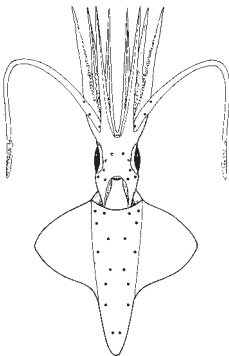


Fig. 25 **Ancistrocheiridae**

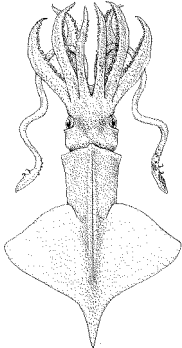


Fig. 26 **Enoploteuthidae**

- 11a. Buccal membrane connectives attach to the ventral sides of ventral arms. → **12**
- 11b. Buccal membrane connectives attach to the dorsal sides of ventral arms (this character is difficult to detect in some histioteuthids which have secondary modifications to the buccal membrane connectives) → **16**

- 12a. Hooks present on tentacular clubs (tentacles and clubs are lost in mature animals) (Fig. 27) **Onychoteuthidae**
- 12b. Hooks lacking on tentacular clubs → **13**

- 13a. Cartilaginous scales present on mantle (may be minute); tentacular clubs with 4 longitudinal series of suckers → **14**
- 13b. Cartilaginous scales lacking; tentacular clubs with more than 4 longitudinal series of suckers on some areas → **15**

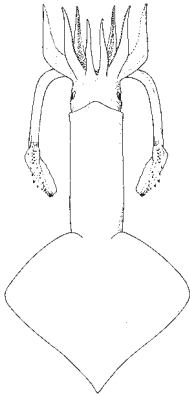


Fig. 27 **Onychoteuthidae**

- 14a. Tentacles present; with numerous, laterally compressed suckers (Fig. 28) **Pholidoteuthidae**
- 14b. Tentacles lost in adults; tentacles in juveniles small and weak, with few (about 6) poorly differentiated suckers (Fig. 29) **Lepidoteuthidae**

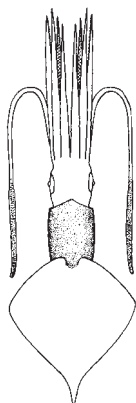


Fig. 28 Pholidoteuthidae



Fig. 29 Lepidoteuthidae

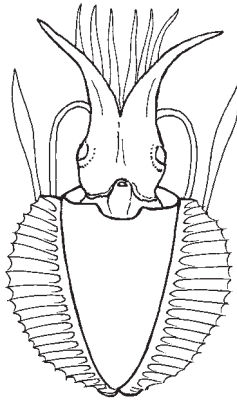


Fig. 30 Ctenopterygidae

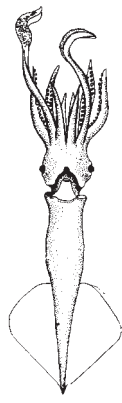


Fig. 31 Brachiooteuthidae

- 15a. Fins nearly as long as the mantle, supported by strong, transverse, muscular ribs; minute suckers present on oral surface of buccal membrane (Fig. 30). **Ctenopterygidae**
- 15b. Fins less than half the mantle length and without supporting ribs; no suckers on buccal lappets (Fig. 31) **Brachiooteuthidae**

- 16a. Row of photophores on ventral surface of eye; buccal membrane with 8 separate lappets (Fig. 32). **Lycoteuthidae**
- 16b. No photophores on eyes; buccal membrane with 7 lappets or less → 17

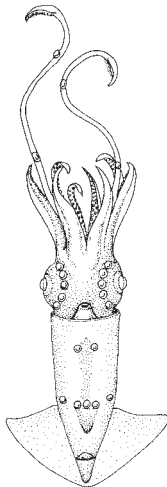


Fig. 32 Lycoteuthidae

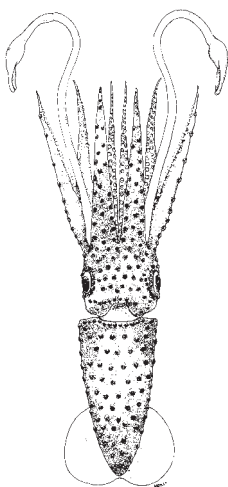


Fig. 33 Histiooteuthidae

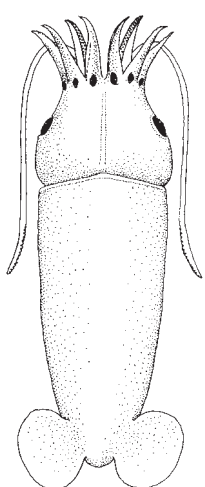


Fig. 34 Bathyteuthidae

- 17a. Surface of mantle, head and arms covered with numerous photophores, usually large and distinct (Fig. 33). **Histiooteuthidae**
- 17b. Surface of mantle and head without photophores (arms may have a few photophores) → 18

- 18a. Minute suckers present on oral surface of buccal membrane (Fig. 34) **Bathyteuthidae**
- 18b. No suckers on oral surface of buccal membrane → 19

- 19a. Posterior borders of fins convex; carpal knobs in a single dorsal row or absent; adults not gigantic (Fig. 35)Neoteuthidae
- 19b. Posterior borders of fins concave; carpal knobs in a cluster alternating with carpal suckers; attains gigantic size (Fig. 36)Architeuthidae

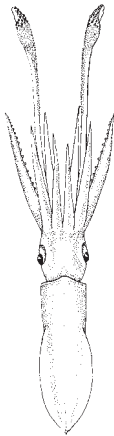


Fig. 35 Neoteuthidae

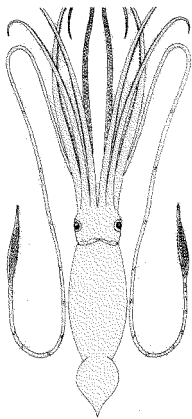


Fig. 36 Architeuthidae

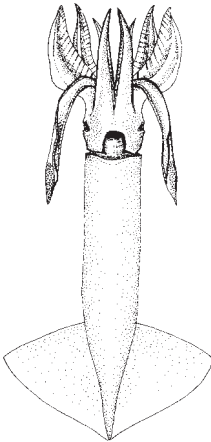


Fig. 37 Ommastrephidae

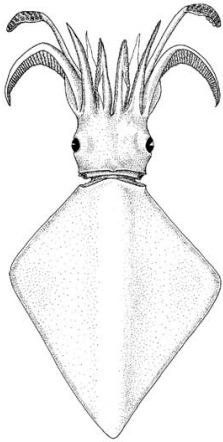


Fig. 38 Thysanoteuthidae

- 20a. Funnel locking apparatus with a longitudinal and a transverse groove→ 21
- 20b. Funnel locking apparatus oval, triangular or oval with inward projecting knobs→ 22

- 21a. Funnel locking cartilage T-shaped, with a longitudinal groove crossed by a transverse groove at its posterior end; fins less than 60% of mantle length (Fig. 37)Ommastrephidae
- 21b. Funnel locking cartilage shaped like a sideways T, with a longitudinal groove from which a shorter groove branches medially; fins more than 80% of mantle length (Fig. 38)Thysanoteuthidae

- 22a. Funnel locking cartilage oval with posterior shelf or 1 or 2 knobs directed toward the centre of the concavity→ 23
- 22b. Funnel locking cartilage oval or subtriangular, without shelf or knobs.→ 24

- 23a. Club with suckers in 4 series (Fig. 39)Chiroteuthidae
- 23b. Club with many (more than 15) series of minute suckers (Fig. 40)Mastigoteuthidae

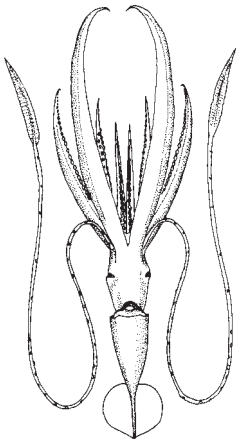


Fig. 39 Chiroteuthidae

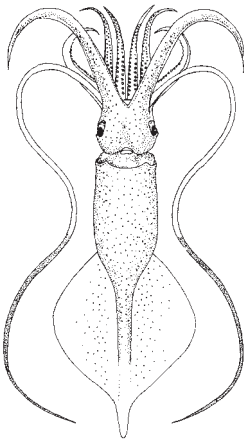


Fig. 40 Mastigoteuthidae

- 24a. Suckers on arms in 4 to 6 series; tail extremely long, greater than the mantle length (Fig. 41). **Joubiniteuthidae**
- 24b. Suckers on arms in 2 series; tail short (less than half the mantle length) or absent (Fig. 42) **Cycloteuthidae**

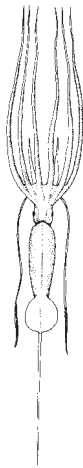


Fig. 41 Joubiniteuthidae

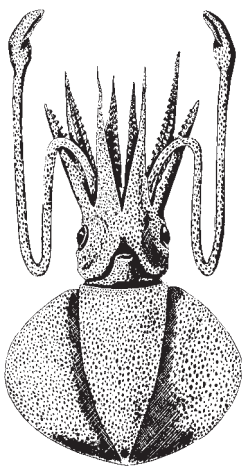


Fig. 42 Cycloteuthidae

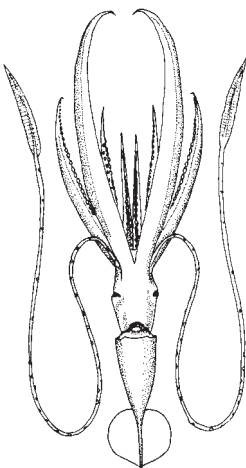


Fig. 43 Chiroteuthidae



Fig. 44 Cranchiidae

- 25a. Mantle free from head dorsally, articulates with head by ridge and groove *Grimalditeuthis* (Fig. 43) **Chiroteuthidae**
- 25b. Mantle fused dorsally with head (Fig. 44) **Cranchiidae**

- 26a. Fins present; cirri on arms → 27
- 26b. Fins and cirri absent → 30

- 27a. Filamentous appendages present in pouches between bases of dorsal and dorsolateral arms; light organ present at base of each fin; colour dark maroon to black (Fig. 45). **Vampyroteuthidae**
- 27b. Both filaments and fin light organs at bases of fins absent; colour variable to dark maroon, never black → 28

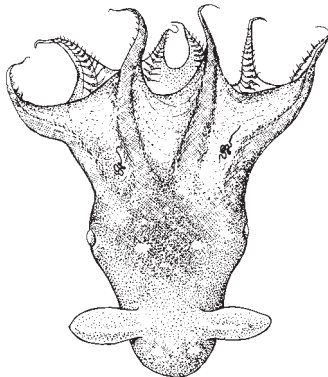


Fig. 45 Vampyroteuthidae

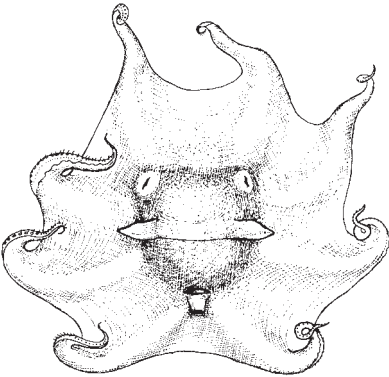


Fig. 46 Opisthoteuthidae

- 28a. Web attaches directly to arms (Fig. 46) **Opisthoteuthidae**
- 28b. Contractile intermediate membrane (secondary web) present between each arm and the primary web → 29

- 29a. Shell (cartilaginous fin support) simple, U-shaped (Fig. 47) **Stauroteuthidae**
- 29b. Shell more complex, with expanded fin-attachment areas (Fig. 48) **Cirroteuthidae**

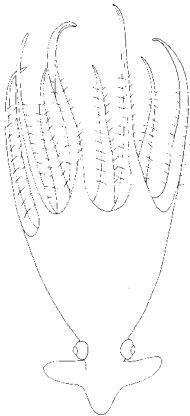


Fig. 47 Stauroteuthidae

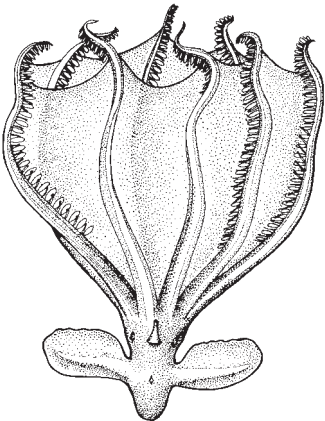


Fig. 48 Cirroteuthidae

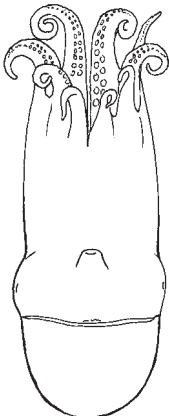


Fig. 49 Alloposidae

- 30a. Muscle tissue of body gelatinous → 31
- 30b. Muscle tissue of body firm (may be covered by gelatinous subdermal layer). → 34
- 31a. Suckers biserial distal to edge of web (Fig. 49) **Alloposidae**
- 31b. Suckers uniserial along entire length of arms → 32
- 32a. Digestive gland very elongate, spindle-shaped, pointed at one end (Fig. 50) **Vitreledonellidae**
- 32b. Digestive gland oblong, not pointed at end → 33
- 33a. Eyes tubular (Fig. 51). **Amphitreteidae**
- 33b. Eyes, though not necessarily round, not tubular **Bolitaenidae**

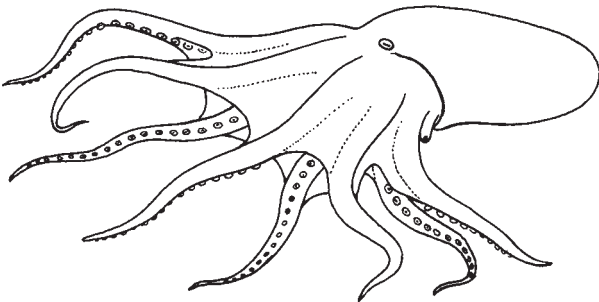


Fig. 50 Vitreledonellidae

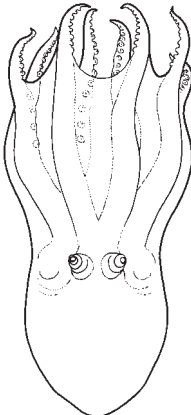


Fig. 51 Amphitreteidae

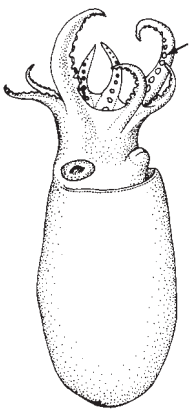


Fig. 52 Bolitaenidae

- 34a.** Funnel locking apparatus absent; water pores on head absent; males not very much smaller than females, with left or right ventrolateral arm hectocotylized (never in pocket), with spoon-shaped, non-filamentous tip; females without dorsal arm flaps or permanent reticulate sculpturing of ventral mantle (Fig. 53) **Octopodidae**
- 34b.** Funnel locking apparatus present; dwarf males very much smaller than females, hectocotylus (left ventrolateral arm) temporarily coiled in sac below eye, with extremely long filamentous tip → **35**
- 35a.** Water pores present on head at bases of both dorsal and ventral arms; dorsal and dorsolateral arms of female joined by very deep, thin web (Fig. 54) **Tremoctopodidae**
- 35b.** Dorsal water pores absent; web, when present, not as above → **36**

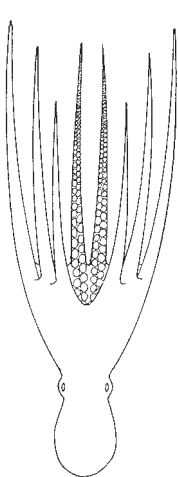


Fig. 53 Octopodidae

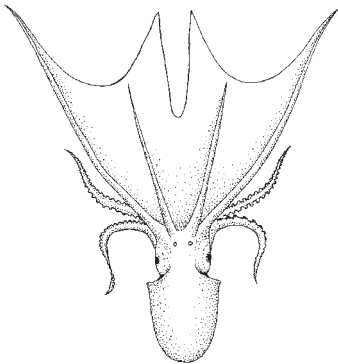


Fig. 54 Tremoctopodidae

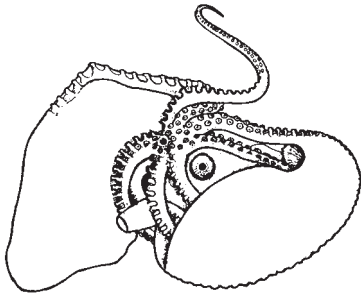


Fig. 55 Argonautidae

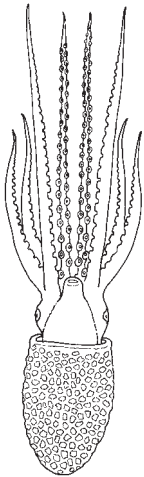


Fig. 56 Ocythoidae

- 36a.** Dorsal arms of females with broad, membraneous flap that secretes and holds a thin, shell-like egg case; males with hectocotylus in non-stalked sac beneath eye (Fig. 55) . **Argonautidae**
- 36b.** Females with permanent reticulate sculpturing of ventral mantle; dorsal arms of females lacking broad, membraneous flap; no shell-like egg case; males with hectocotylus in stalked sac beneath eye (Fig. 56) **Ocythoidae**

ANCISTROCHEIRIDAE

Sharpear enope squid

Diagnostic characters: To 25 cm mantle length. Funnel-mantle locking apparatus a simple, straight groove and ridge. **Arms with hooks.** **Tentacular clubs with hooks in 2 series on manus;** suckers absent from manus; dactylus reduced. Mantle with fleshy tail. **Photophores on head and mantle in 2 distinct size classes.** Generally 22 large photophores on ventral surface of mantle arranged in fixed pattern of twos and fours. Large photophores on head, funnel, bases of dorsolateral arms and tentacular stalk. Numerous very small photophores on fins, mantle, funnel, head and ventral arms. No photophores on eyeballs or viscera. Buccal membrane pigmented; buccal-membrane connectives attach dorsally to the ventral arms. Nuchal folds present on head. The photophores have a distinctive arrangement and appearance. **Colour:** not distinctive.

Habitat, biology, and fisheries: This mesopelagic squid occupies tropical and subtropical waters of the world's oceans.

Remarks: Until recently, this family was considered to be a subfamily of the Enoploteuthidae. Although only a single species is recognized in the family, differences in paralarval morphology between Atlantic and Pacific specimens suggests that more than 1 species exists (Young, et al., 1992).

Similar families occurring in the area

Octopoteuthidae: lacks tentacles beyond the paralarval stage; has buccal membrane connectives attached ventrally to the ventral arms.

Enoploteuthidae: has photophores on the ventral surface of the eyeball; lacks distinctive large photophores of this family.

Thysanoteuthidae: has a complex funnel locking apparatus; lacks arm hooks and large photophores on head and mantle.

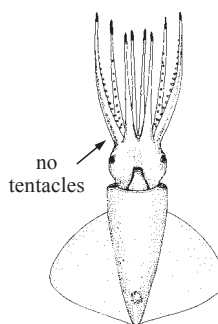
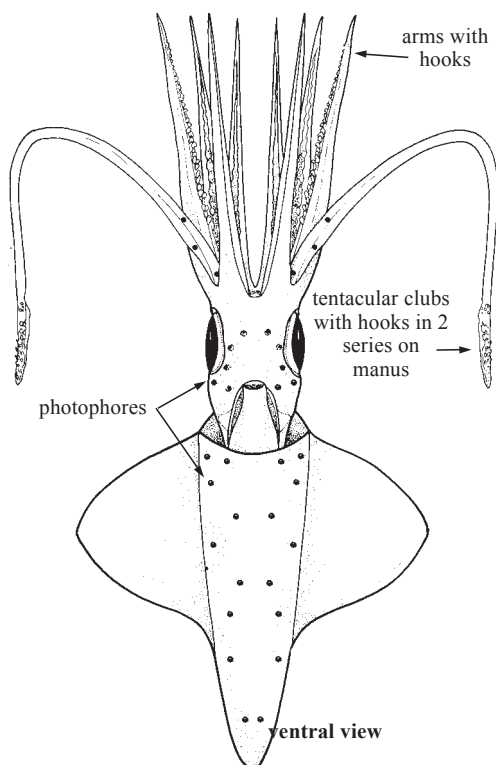
Cycloteuthidae: has buccal membrane connectives attached ventrally to the ventral arms; has a complex funnel locking apparatus; lacks arm hooks and large photophores on head and mantle.

List of species occurring in the area

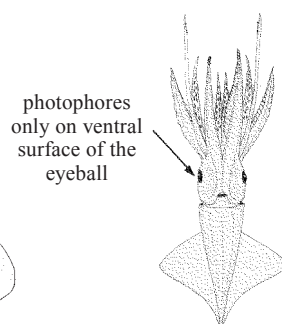
Ancistrocheirus lesueurii (Orbigny, 1842).

References

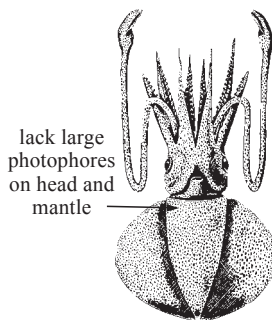
Young, R.E., K. Mangold, and M. Vecchione. 1992. The enoploteuthid group of families. In "Larval and Juvenile Cephalopods. A Manual for Their Identification, edited by M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke, and S.V. Boletzky. *Smithson. Contr. Zool.*, 12:91-112.



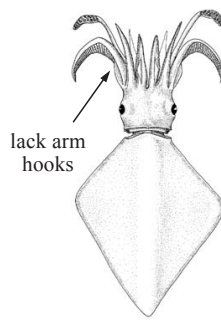
Octopoteuthidae



Enoploteuthidae



Cycloteuthidae



Thysanoteuthidae

ARCHITEUTHIDAE

Giant squids

Diagnostic characters: The largest cephalopods. Known specimens attain mantle lengths up to 5 m and total lengths up to 18 m; most records, however, are in the 6 to 12 m total length range. **Tentacular clubs elongate, narrow, with suckers in four longitudinal series except for carpal region. Manus with enlarged suckers along medial 2 series. Carpal region with dense cluster of suckers, 6 or 7 irregular series;** suckers paired with interspersed hemispherical knobs. Alternating pairs of suckers and knobs distributed along nearly entire length of tentacle, becoming more closely-set from proximal to distal. **Fins proportionally small, ovoid, without free anterior or posterior lobes;** posterior edges of fins concave. Arms with suckers in 2 series. Buccal connectives attach to dorsal borders of ventral arms. No photophores. **Colour:** not distinctive.

Habitat, biology, and fisheries: Until the 1980s, captures of specimens in fishing nets were very rare. Recent increase in deep-water commercial trawling on continental slopes and seamounts has resulted in capture of numerous specimens, some in very good condition. The flesh contains ammonium ions and therefore has a bitter taste.

Remarks: The huge size of these animals has resulted in numerous myths and mysteries, both concerning their dimensions and their antagonistic, violent behaviour towards ships, sailors and fishermen. Twenty nominal species have been described in the family, but the systematics of the group is so poorly known that the actual number of valid species is uncertain. Many, if not most, species of *Architeuthis* have been described from a single specimen that was discovered stranded on shore, floating on the surface, or taken from the stomach of a sperm whale. Nesis (1987) stated that only 3 are likely to be valid.

Similar families occurring in the area

Neoteuthidae: the posterior borders of the fins are convex rather than concave; carpal knobs are in a single row or absent rather than in a cluster, alternating with carpal suckers.

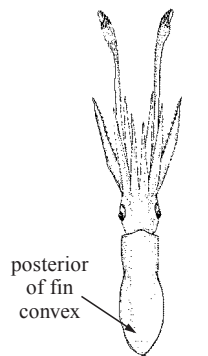
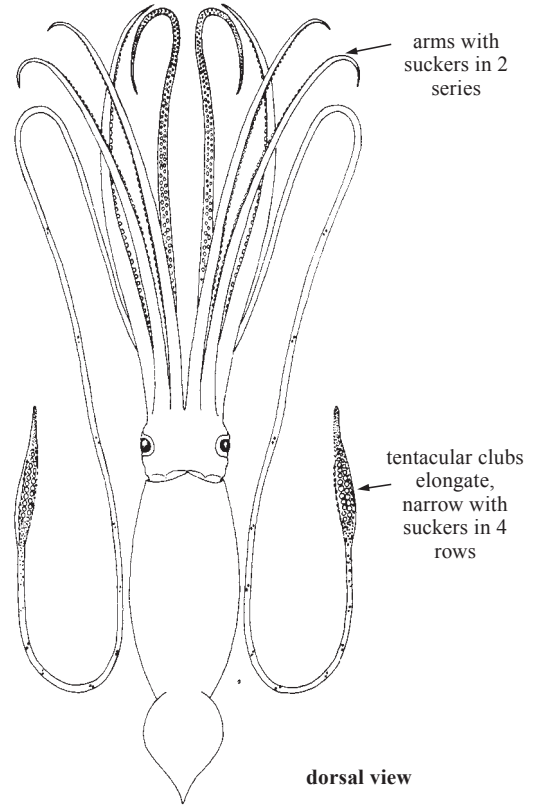
Brachyoteuthidae: have buccal membrane connectives attaching to the ventral, rather than dorsal, sides of the ventral arms; neither of these families attain gigantic size.

List of species occurring in the area

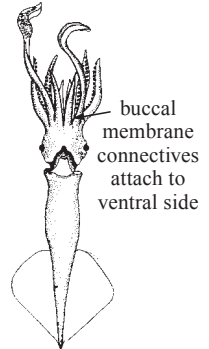
Architeuthis dux Steenstrup, 1857.

Reference

Nesis, K.N. 1987. *Cephalopods of the World. Squids, Cuttlefishes, Octopuses, and Allies*. Neptune, New Jersey, TFH Publications, 351 p.



Neoteuthidae



Brachyoteuthidae

BATHYTEUTHIDAE

Deepsea squids

Diagnostic characters: Small (less than 80 mm mantle length) and compact. **Arms short, joined by a low, fleshy web.** Dorsal 6 arms with 2 series of suckers proximally, increasing to 4 series of irregularly placed suckers distally in adults. Dorsal 3 pairs of arms with a single, simple photophore embedded in the subcutaneous aboral tissue at the bases. Tentacular club short, unexpanded, with 8 to 10 series of numerous, minute suckers. Buccal connectives attach to dorsal border of ventral arms; **oral surfaces of buccal lappets bear minute suckers.** Eyes semitubular, anteriorly directed. **Fins small, separate, round with anterior and posterior lobes.** The funnel is embedded in head tissue. **Colour:** deep reddish maroon pigmentation.

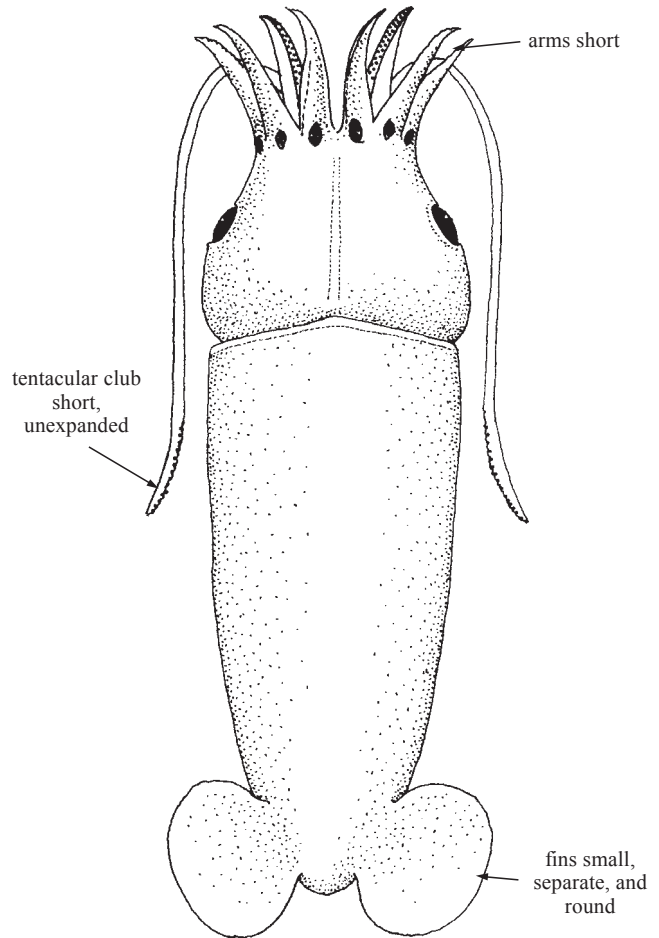
Habitat, biology, and fisheries: Deep sea, occupying the lower mesopelagic to bathypelagic depth zones throughout the world's oceans.

Similar families occurring in the area

None, there are no other deepsea squids with suckers on oral surfaces of buccal lappets.

List of species occurring in the area

Bathyteuthis abyssicola Hoyle, 1885



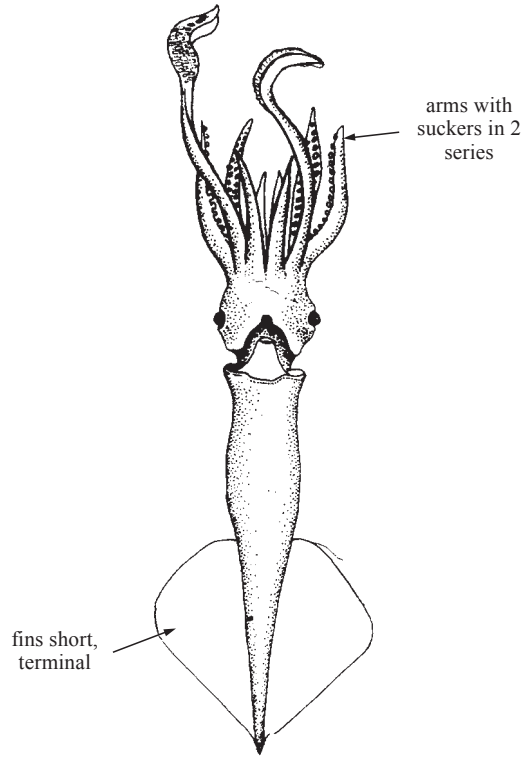
BRACHIOTEUTHIDAE

Arm squids

Diagnostic characters: Small- to medium-sized squids (ca. 15 cm mantle length). The mantle is muscular but generally thin. **Dactylus region of tentacular clubs with 4 sucker series but the proximal part of the manus is greatly expanded and carries numerous small suckers in many series.** Arm suckers in 2 series. Digestive gland located well posterior to cephalic cartilage. Fins short, terminal, with free anterior lobes. Straight groove in funnel locking cartilage. Buccal connectives attach to the ventral margins of ventral arms. Photophores known only on eyes where a single ventral photophore may be present. **Colour:** not distinctive.

Habitat, biology, and fisheries: Little is known about the biology of brachioteuthids although Roper and Vecchione (1996) describe an aggregation observed from a submersible near the ocean floor at a depth of about 800 m.

Remarks: While only 2 genera are presently recognized in this family, many species exist, most of which are undescribed.



Similar families occurring in the area

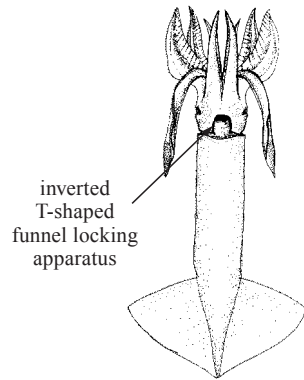
Ommastrephidae and Loliginidae: Ommastrephidae has T-shaped funnel locking apparatus; in Loliginidae the eye lens is covered by a cornea; neither of those families have numerous series of suckers in the carpal region of the tentacular clubs, a character shared with the Architeuthidae and the Neoteuthidae; in Neoteuthidae, the posterior edges of the fins are convex whereas in architeuthids the digestive gland abuts the cephalic cartilage.

List of species occurring in the area

Brachioteuthis sp.

References

Roper, C.F.E. and M. Vecchione. 1997. *In-situ* observations test hypotheses of functional morphology in *Mastigoteuthis*. *Vie et Milieu*, 47:87-93.



Ommastrephidae

CHIOTEUTHIDAE

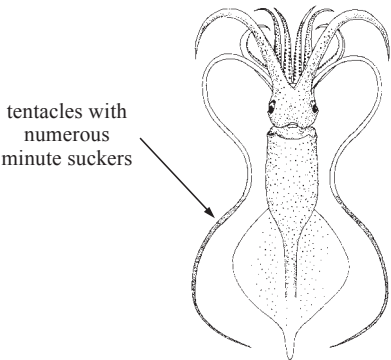
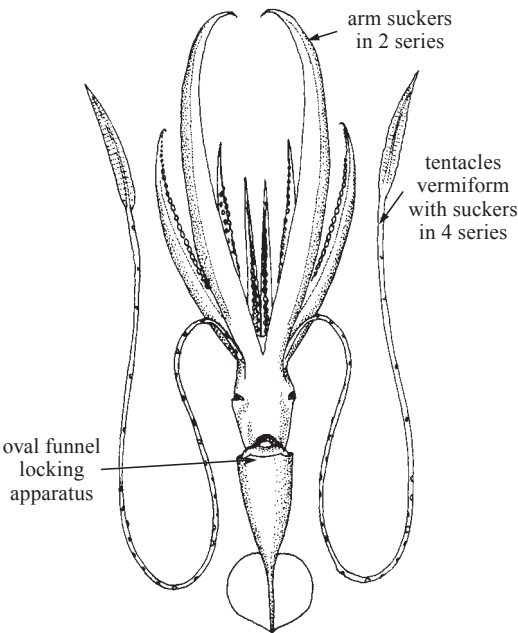
Chiroteuthids

Diagnostic characters: Small to medium in size (up to 78 cm mantle length), gelatinous. **Funnel locking apparatus oval, generally with 1 or 2 knobs directed toward the centre of the concavity.** Neck elongate. **Ventral arms generally elongate.** Tentacle suckers usually in 4 series (suckers absent in *Grimalditeuthis*; suckers in 6 series in an undescribed genus). Arm suckers in 2 series. Numerous chambers in the arms, head and mantle filled with a light-weight fluid, ammonium chloride, that provides near-neutral buoyancy for the squids. **Most species have extremely long, slender tentacles.** **Colour:** not distinctive.

Habitat, biology, and fisheries: Slow moving, deepsea squids usually with elongate necks and slender bodies. Considerable morphological differences exist among genera, 3 of which in the past were placed in separate families. However, they all share a very distinctive paralarva, known as the doratopsis stage, with an elongate neck and brachial pillar. The presence of a doratopsis paralarva is the only character that is unique to the family.

Similar families occurring in the area

Mastigoteuthidae: tentacles have very numerous minute suckers in more than 6 series; necks are not elongate.



Mastigoteuthidae

Key to the genera of Chiroteuthidae occurring in the area

- 1a. Funnel fused to mantle; tentacle clubs lack suckers *Grimalditeuthis*
- 1b. Funnel locks to mantle with cartilaginous apparatus; tentacle clubs with suckers → 2
- 2a. Arms subequal in length in adults (ventral arms much longer in young); tentacular club small, compact, and with or without keel; low protective membranes along both borders *Planctoteuthis*
- 2b. Ventral arms greatly elongate and thickened; adult tentacular clubs elongate, without keel, protective membranes form 2 or 3 distinct regions. *Chiroteuthis*

List of species occurring in the area

Chroteuthis capensis Voss, 1967.

Chroteuthis joubini Voss, 1967.

Chroteuthis veranyi (Ferussac, 1835).

Grimalditeuthis bomplandi (Verany, 1839).

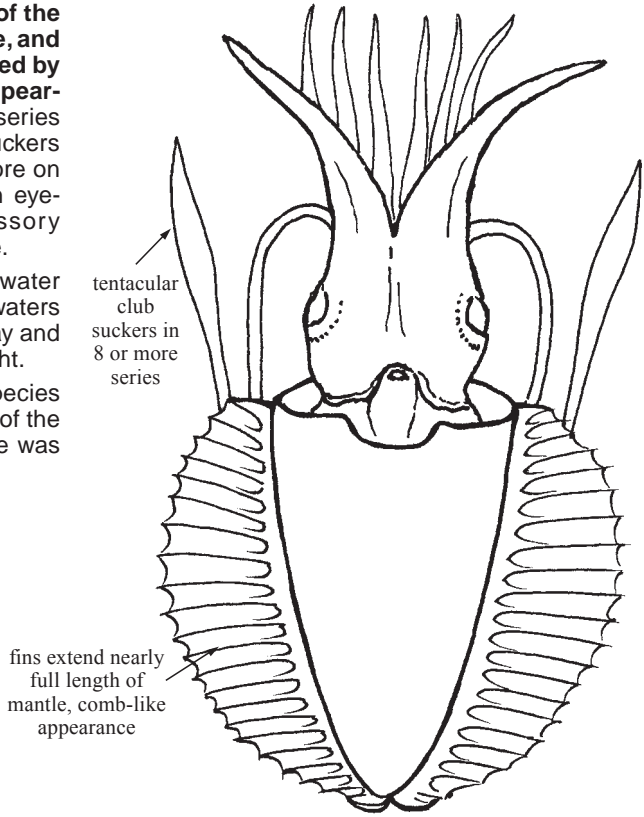
Planctoteuthis danae (Joubin, 1931).

CTENOPTERYGIDAE**Combfin squids**

Diagnostic characters: Small, muscular. Fins extend nearly the full length of the mantle, attach to lateral walls of mantle, and have slender muscle bundles connected by membranes, producing a comb-like appearance. Dorsal 6 arms with up to 6 suckers series at some point on arms. Tentacular-club suckers in 8 or more series. Large oval photophore on viscera. Large photogenetic patches on eyeball. Mature females with an accessory nidamental gland. **Colour:** not distinctive.

Habitat, biology, and fisheries: Midwater squids occupying tropical to subtropical waters at depths of 500 to 1 000 m during the day and migrating into near-surface waters at night.

Remarks: A number of undescribed species are present in this genus. Little is known of the biology of any species. The genus name was formerly spelled *Ctenopteryx*.

**Similar families occurring in the area**

None, no other family has comb-like muscle bundles in fins.

List of species occurring in the area

Ctenopteryx sicula (Verany, 1851).

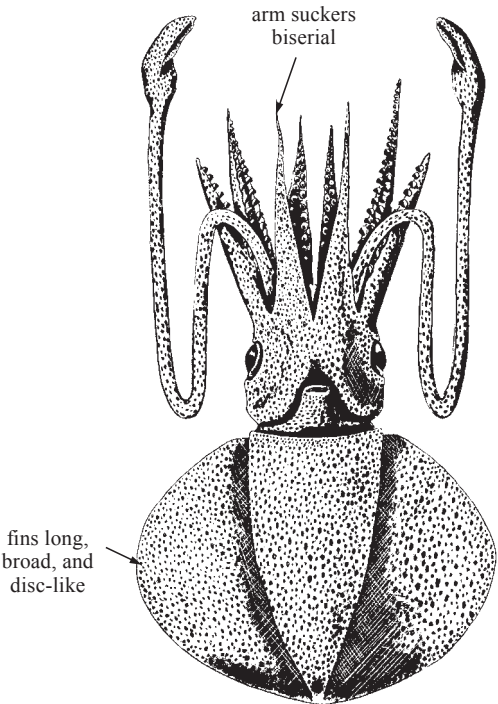
CYCLOTEUTHIDAE

Cycloteuthids

Diagnostic characters: Moderately-sized, the largest reaches about 60 cm mantle length. Fins long, broad, and disc-like. **Funnel component of funnel/mantle locking apparatus subtriangular**; mantle component does not reach anterior mantle margin. Arm suckers biserial. Tentacle club suckers tetraserial. Buccal connectives attach to ventral borders of ventral arms. **Colour:** not distinctive.

Habitat, biology, and fisheries: Mesopelagic squids with a cosmopolitan distribution in tropical and subtropical waters. Very little is known about the biology of any species in the family.

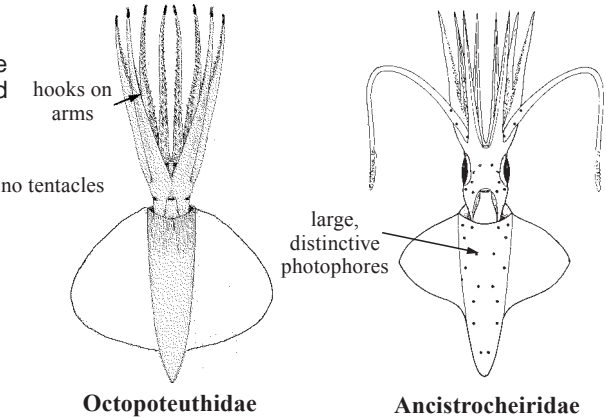
Remarks: The family contains 2 rather dissimilar genera.



Similar families occurring in the area

Octopoteuthidae: lacks tentacles and has hooks rather than suckers on the arms.

Ancistrocheiridae: has large, distinctive photophores on the ventral surfaces of the head and mantle.



Key to the genera of Cycloteuthidae occurring in the area

- 1a. Mantle and fins drawn out into a slender tail *Cycloteuthis*
- 1b. No tail; large, oval (disc-like) combined fins extend virtually full length of mantle *Discoteuthis*

List of species occurring in the area

- Cycloteuthis sirventi* Joubin, 1919.
- Discoteuthis discus* Young and Roper, 1969.
- Discoteuthis laciniosa* Young and Roper, 1969.

CRANCHIIDAE

Bathyscaphoid squids

Diagnostic characters: Small (about 100 mm mantle length in *Helicocranchia*) to large (about 2 000 mm mantle length in *Mesonychoteuthis*) squids that possess a large buoyancy chamber and, hence, the common name 'bathyscaphoid squid'; they often appear to have bloated bodies and short arms. Mantle is generally thin but muscular. **Head fused to mantle at nuchal cartilage. Funnel fused to mantle; locking apparatus absent.** Digestive gland well posterior to cephalic cartilage. Funnel retractor muscles form broad, horizontal membrane dividing mantle cavity into ventral and dorsal chambers; large buoyancy chamber present in area of viscera, extending full length of mantle. Buccal connectives attach to ventral borders of ventral arms.

Habitat, biology, and fisheries: Several species have been observed in deep water from submersibles to exhibit a peculiar posture (cock- atoo posture) with the arms and tentacles folded back over the head (Vecchione and Roper, 1991). Cranchiid paralarvae are common in near-surface waters and many remain in this habitat until reaching a rather large size (ca. 50 to 100 mm mantle length). Most species occupy progressively deeper waters as they grow larger (ontogenetic descent).

Remarks: This family contains 13 genera with approximately 60 species, many of which are poorly described or undescribed.

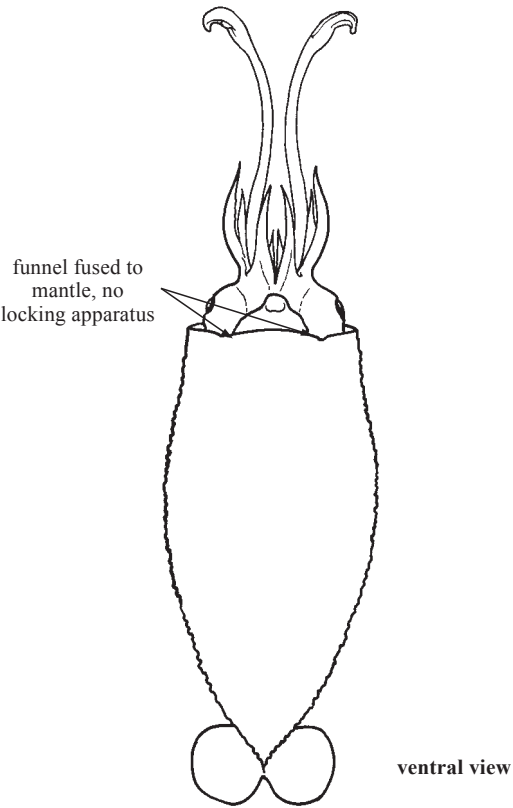
Similar families occurring in the area

None, no other family has both head and funnel fused to mantle.

Key to the genera of Cranchiidae occurring in the area

(modified from Voss, 1980)

- 1a. Ventral surface of mantle with 1 or 2 cartilaginous strips extending posteriorly from anterior apex of funnel-mantle fusion; funnel fused to head laterally; eyes with 4 or more small round to oval photophore (Subfamily Cranchiinae) → 2
- 1b. Ventral surface of mantle without cartilaginous strips; funnel free from head laterally; eyes with 1 (usually large) photophore, or 2 or 3 markedly dissimilar-sized photophores with the largest usually crescent-shaped (Subfamily Taoniinae) → 4
- 2a. Ventral mantle with 2 pairs of cartilaginous strips in inverted V-shaped pattern extending posteriorly from anterior apex of funnel-mantle fusion; funnel valve present; dorsal pad of funnel organ with 3 longitudinal triangular flaps; gladius with short conus → 3
- 2b. Ventral mantle with 1 cartilaginous strip extending posteriorly from each anterior apex of funnel-mantle fusions; funnel valve absent; dorsal pad of funnel organ with 3 to 7 narrow papillae; gladius with long, slender conus *Leachia*



- 3a. Mantle covered with cartilaginous tubercles; brachial end-organs (possibly a photophore) present on all arms in near-mature and mature females; suckers in 4 series on midportion of hectocotylized right ventral arm in males *Cranchia*
- 3b. Mantle without cartilaginous tubercles except on ventral cartilaginous strips and sometimes on dorsal median line; brachial end-organs present on ventrolateral arms in near-mature and mature females; suckers in 2 series on midportion of hectocotylized right ventral arm in males *Liocranchia*
- 4a. Eyes with 1 (usually large) photophore; fins small, paddle-shaped, subterminal → 5
- 4b. Eyes with 1 large and 1 or 2 small photophores; fins not paddle-shaped, short to long, combined fins round to spear-head-shaped, terminal or terminal-lateral → 6
- 5a. Fins fused posteriorly, insert on short rostrum of gladius which projects dorsally free of end of mantle; eyes small to medium-sized *Helicocranchia*
- 5b. Fins widely separated posteriorly; insert on lateral expanded ends of transverse extensions of posterior gladius; eyes large to huge *Bathothauma*
- 6a. Gladial conus short; fins short (less than 25% mantle length), oval to round; digestive gland long, narrow, spindle-shaped → 7
- 6b. Gladial conus medium to long, narrow, or needle-like to filiform; fins medium to long (30 to 60% mantle length), narrow, spear-point-shaped to ovate; digestive gland stout, spindle-shaped or rounded → 8
- 7a. Posterior fin insertion anterior to tip of gladius; no tubercles on funnel-mantle fusion cartilages; dorsal pad of funnel organ with large triangular lobe on each lateral arm; eyes with small round anterior photophore indented into median anterior margin of large, round posterior photophore *Sandalops*
- 7b. Posterior fin inserts at tip of gladius; 2 small tubercles present at anterior end of funnel-mantle fusion cartilages; dorsal pad of funnel organ with large, spatulate papilla on each lateral arm; eyes with small crescent-shaped photophore lying within concavity of large, crescent-shaped posterior photophore *Liguriella*
- 8a. Anterior-fin insertions on lateral margins of gladius → 9
- 8b. Anterior-fin insertions on mantle musculature → 10
- 9a. Tentacular club with hooded hooks; marginal suckers of manus lost or greatly reduced in size; ventral arms longest in juveniles, approximately equal in length to ventrolateral arms in adults *Galiteuthis*
- 9b. Tentacular club without hooks (enlarged suckers with 1 or 2 large, hook-like central teeth on distal margin); marginal suckers of manus not lost or greatly reduced in size; ventrolateral arms longest in juveniles, longer or equal in length to dorsolateral arms in adults *Taonius*
- 10a. Funnel valve present; dorsal pad of funnel organ with triangular flap on each lateral arm; eyes with 2 photophores; carpal suckers in 2 series on tentacular stalk → 11
- 10b. Funnel valve absent; dorsal pad of funnel organ with long spatulate papilla on each lateral arm; eyes with 3 photophores; carpal suckers in 4 zigzag series on tentacular stalk . . . *Teuthowenia*
- 11a. Photophores absent on ventral surface of stout, spindle-shaped digestive gland; digestive-gland ducts fused into long, single duct *Egea*
- 11b. Large compound photophore present on ventral surface of rounded digestive gland; 2 short digestive-gland ducts separate *Megalocranchia*

List of species occurring in the area

- Bathothauma lyromma* Chun, 1906.
Cranchia scabra Leach, 1817.
Egea inermis Joubin, 1933.
Galiteuthis armata Joubin, 1898.
Helicocranchia papillata (Voss, 1960).
Helicocranchia pfefferi Massy, 1907.
Leachia atlantica (Degner, 1925).
Leachia cyclura LeSueur, 1821.
Leachia lemur (Berry, 1920).
Liguriella podophtalma Issel, 1908.
Liocranchia reinhardti (Steenstrup, 1856).
Megalocranchia sp.
Sandalops melancholicus Chun, 1906.
Taonius pavo (LeSueur, 1821).
Teuthowenia micalops (Prosch, 1847).

References

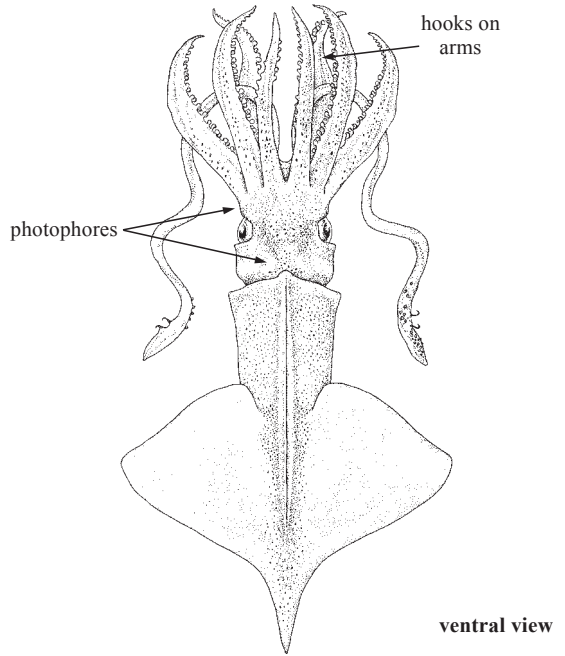
- Vecchione, M. and C.F.E. Roper. 1991. Cephalopods observed from submersibles in the western North Atlantic. *Bull Mar. Sci.*, 49:433-445.
- Voss, N. A. 1980. A generic revision of the Cranchiidae (Cephalopoda: Oegopsida). *Bull. Mar. Sci.*, 30:365-412.

ENOPLOTEUTHIDAE

Enope squids

Diagnostic characters: Squid in this family are small, 3 to 13 cm mantle length. Hooks present on all arms. Tentacle clubs with 1 or 2 series of hooks on manus; armature on manus in 2 or 3 series. Photophores present on mantle, funnel, head, eyeballs, and arms; on eyeballs in single line; anterior and posterior-most photophores generally largest; photophores absent from tentacles, viscera, and most of fins. Tail with vesicles, broad and extends well beyond conus of gladius. Nidamental glands absent. **Colour:** colourful array of photophores, distributed primarily over the ventral surfaces of the head, arms, funnel, and mantle.

Habitat, biology, and fisheries: All open-ocean species occupy the upper mesopelagic. In the regions where the mesopelagic zone intersects the slopes of land masses (i.e., the mesopelagic boundary zone) some species may occur at shallower depths. Many species are known to undergo extensive daily vertical migrations and this habit may be characteristic of all species in the family.



Similar families occurring in the area

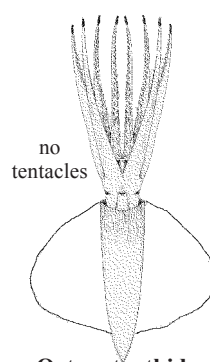
Octopoteuthidae: lacks tentacles and, together with Pyroteuthidae and Lycoteuthidae, possesses visceral photophores.

Pyroteuthidae: lacks photophores on mantle or surface of head or arms.

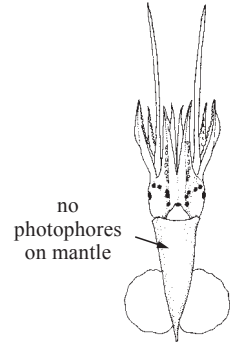
Lycoteuthidae and **Onychoteuthidae:** has suckers rather than hooks on arms.

Ancistrocheiridae: has photophores on tentacles but not on eyeballs.

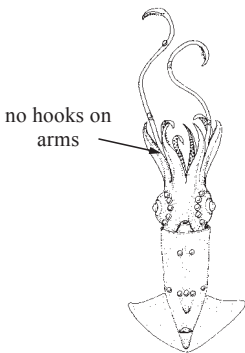
Histioteuthidae: has normal suckers rather than hooks on arms.



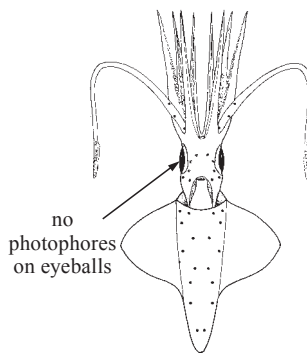
Octopoteuthidae



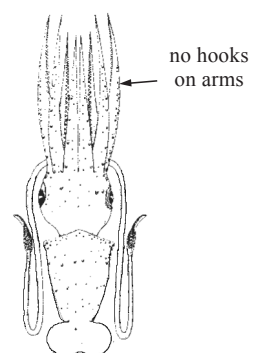
Pyroteuthidae



Lycoteuthidae



Ancistrocheiridae



Histioteuthidae

Key to the genera of Enoploteuthidae occurring in the area

- 1a. Posterior-fin insertion anterior to tail *Enoploteuthis*
- 1b. Fins extend along lateral sides of tail → 2
- 2a. One to 3 large, dark photophores at tips of ventral arms *Abraliopsis*
- 2b. No large dark photophores at tips of ventral arms *Abralia*

List of species occurring in the area

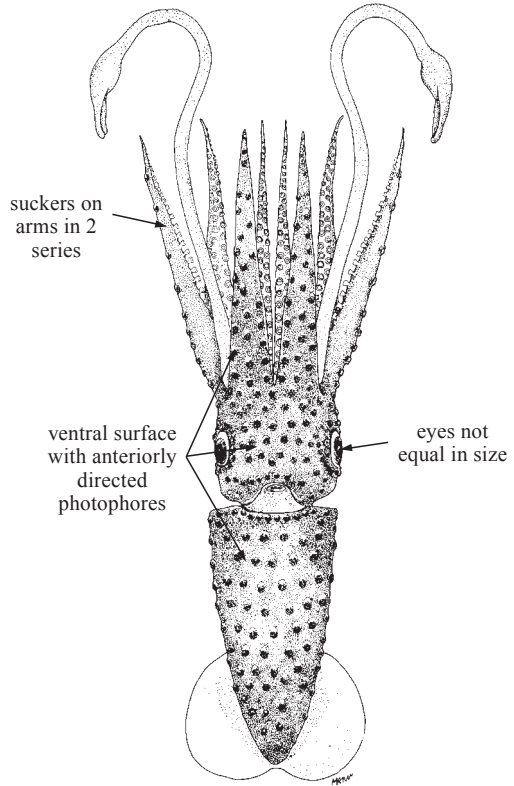
- Abralia grimpei* Voss, 1959.
- Abralia redfieldi* Voss, 1955.
- Abralia veranyi* (Rüppell, 1844).
- Abraliopsis atlantica* Nesis, 1982.
- Abraliopsis hoylei pfefferi* Joubin, 1896.
- Enoploteuthis anapsis* Roper, 1964.
- Enoploteuthis leptura* (Leach, 1817).

HISTIOTEUTHIDAE

Strawberry squids

Diagnostic characters: Weakly-muscled species of moderate size (up to 28 cm mantle length). In general they have comparatively long, thick arms and short mantles with small, rounded fins. **Ventral surfaces of mantle, head, and arms with anteriorly directed photophores with red colour filters.** Suckers on club in 4 or more irregular series. **Left eye larger than right eye.** Suckers on arms in 2 series. Buccal connectives attach to dorsal borders of ventral arms. **Colour:** red, with very distinctive photophores.

Habitat, biology, and fisheries: Ranges from epipelagic to bathypelagic and from subarctic to subantarctic. Some species appear to be found most frequently near continental slopes and islands. Histioteuthids comprise an important component of the diet of many oceanic toothed whales.

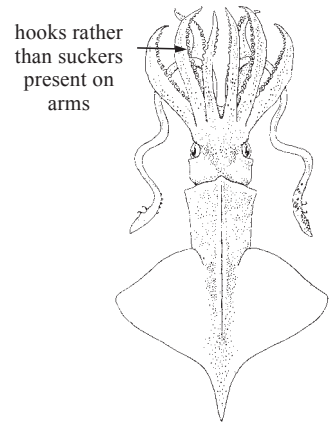


Similar families occurring in the area

Enoploteuthidae: have hooks rather than normal suckers on arms.

List of species occurring in the area

- Histioteuthis bonnellii* (Ferussac, 1834).
- Histioteuthis celetaria* (Voss, 1960).
- Histioteuthis corona* (Voss and Voss, 1962).
- Histioteuthis dofleini* (Pfeffer, 1912).
- Histioteuthis meleagroteuthis* (Chun, 1910).
- Histioteuthis reversa* (Verrill, 1880).



Enoploteuthidae

JOUBINITEUTHIDAE

Joubiniteuthids

Diagnostic characters: Dorsal 6 arms extremely long (greater than 2 times mantle length) with suckers in 6 series and joined by low web. Ventral arms short (length 1/3 or less than length of other arms) with suckers in 4 series. Tentacles much thinner than arms; tentacular club laterally compressed; bears suckers in 5 to 12 series. Tail long (longer than the mantle) and slender. Funnel locking apparatus with oval depression. Photophores absent. **Colour:** not distinctive.

Habitat, biology, and fisheries: Meso- to bathypelagic squids found circumglobally in tropical and subtropical regions. Little is known about the biology of this squid.

Remarks: This family contains a single species.

Similar families occurring in the area

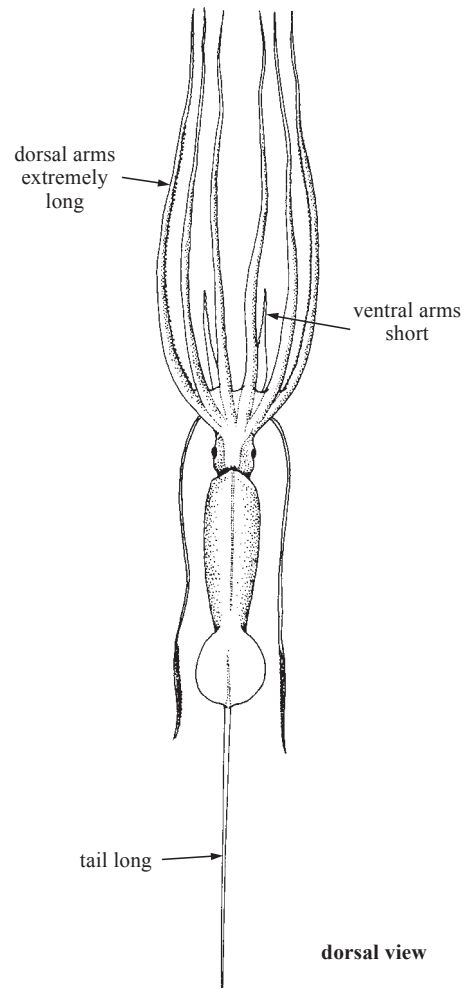
Squids of undetermined family (possibly Magnapinnidae) have recently been videotaped on at least 2 occasions in the deep water (greater than 1 000 m) of the Gulf of Mexico (Vecchione et al., 2001). These unidentified squid have extremely long arms and could be confused with joubiniteuthids (e.g., Norman, 2000). However, the fins are very large and all arms are extremely long and the tentacles are practically indistinguishable from the arms, making the undetermined squid appear to have 10 identical arms.

List of species occurring in the area

Joubiniteuthis portieri (Joubin, 1916).

References

- Normin, M. 2000. *Cephalopods. A World Guide*. Hackenheim, Germany, Conchbooks, 320 pp.
- Vecchione, M., C.F.E. Roper, E.A. Widder, and T.M. Frank. in press. *In-situ* observations on three species of large-finned deep-sea squids. *Bull. Mar. Sci.*
- Vecchione, M., R.E. Young, A. Guerra, D.J. Lindsay, D.A. Clague, J.M. Bernhard, W.W. Sager, A.F. Gonzalez, F.J. Rocha, and M. Segonzac. 2001. Worldwide Observations of remarkable deep-sea squids. *Science*, 294:2505-2506.



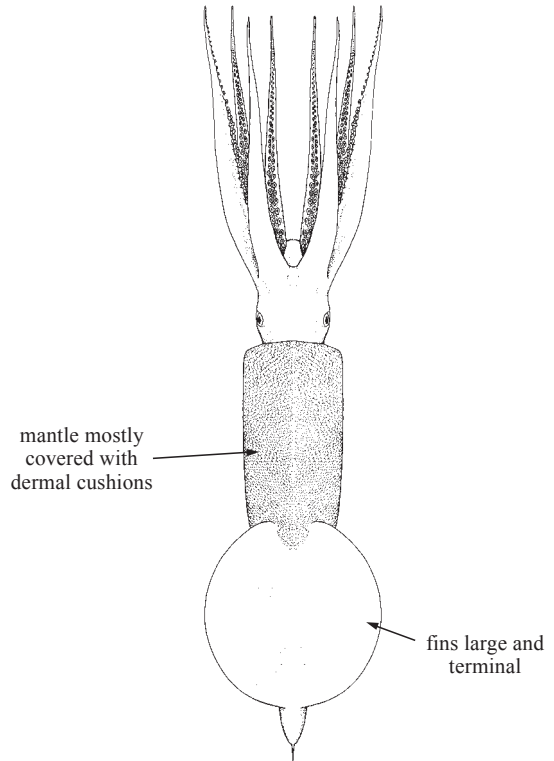
LEPIDOTEUTHIDAE

Scaled squids

Diagnostic characters: Medium-sized squid (100 cm mantle length) whose tentacles fail to grow much beyond the paralarval stage and are lost in subadults. **Mantle mostly covered with dermal cushions (= 'scales').** Tentacles absent in subadults and adults, greatly reduced in juveniles. Arm suckers present; hooks absent. Fins large, terminal. Photophores absent. **Colour:** not distinctive.

Habitat, biology, and fisheries: This squid is rarely captured and little is known of its biology.

Remarks: This family contains a single species.



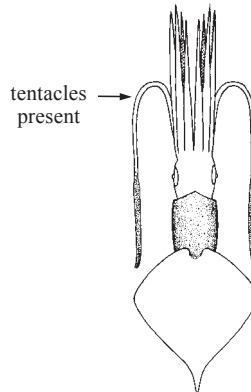
Similar families occurring in the area

Pholidoteuthidae: tentacles present.

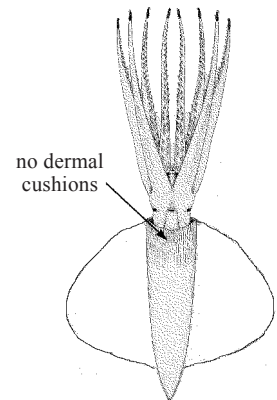
Octopoteuthidae: lacks dermal cushions.

List of species occurring in the area

Lepidoteuthis grimaldii Joubin, 1895.



Pholidoteuthidae



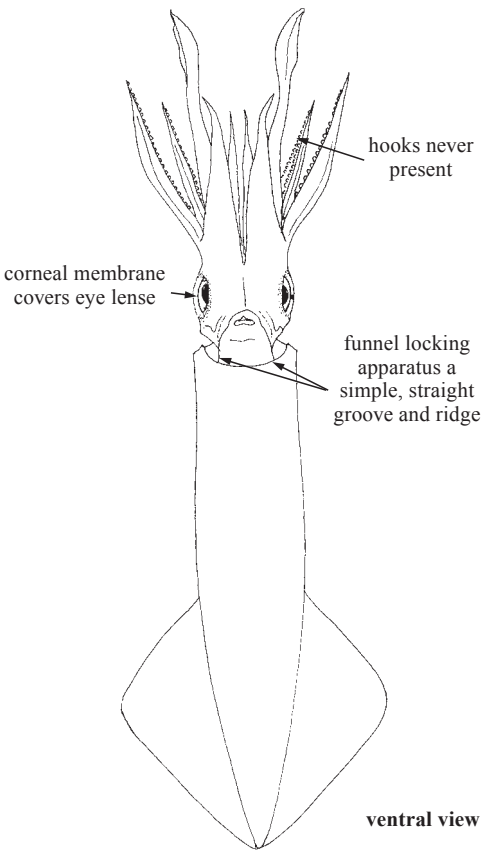
Octopoteuthidae

LOLIGINIDAE

Inshore squids

Diagnostic characters: **Transparent skin (corneal membrane) covers eye lens.** Funnel locking apparatus a simple, straight groove and ridge. Fins attach to lateral regions of mantle. Arms with suckers in 2 series. Tentacular club with suckers usually in 4 series (2 series in at least manal region of *Pickfordiateuthis* clubs). Hooks never present. Buccal connectives attach to ventral margins of ventral arms. Seven buccal lappets possess small suckers (except in *Pickfordiateuthis* and *Sepioteuthis*). Usually the left arm of the ventral pair is hectocotylized in males; structure of the modified portion of the hectocotylus is useful in most species as a diagnostic character. **Eggs spawned in finger-like egg masses attached to substrate.** **Colour:** usually reddish brown, darker dorsally, but quite variable depending on behaviour.

Habitat, biology, and fisheries: Loliginids are small to medium-sized squids (to about 40 cm mantle length) occurring along the coastal margins and continental shelf, primarily in warm to temperate waters worldwide. They form one of the major groups of commercially utilized cephalopods. Various species occur from very shallow water in bays and estuaries, over grass flats and coral reefs, to water as deep as 400 m (during seasonal off-shore migrations). Eggs usually are attached to hard surfaces in large, finger-like masses ('sea-mops'); paralarvae resemble the adults. Certain species support extensive fisheries in several parts of the world, as the flesh is of excellent quality. The cephalopod fisheries of Venezuela (ca. 1 500 to 7 000 t per year in 1993 to 1998; FAO) is dominated by loliginid squid, primarily *Loligo plei* (Arocha, 1989).



Similar families occurring in the area

Other squid families which include commercial-sized species that present potential interest to fisheries (Ommastrephidae, Thysanoteuthidae, Onychoteuthidae) all lack suckers on the buccal lappets and have eye lenses open to the sea, not covered by a transparent corneal membrane. The funnel locking apparatus is not straight in Ommastrephidae and Thysanoteuthidae. Hooks are found on the arms or tentacular clubs in Onychoteuthidae, Enoploteuthidae, Pyroteuthidae, Ancistrocheiridae, Octopoteuthidae. The mantle in Lepidoteuthidae and Pholidoteuthidae is covered with small integumentary scales. Brachioteuthidae, Architeuthidae, Neoteuthidae, and Joubiniteuthidae can all be distinguished by more than 4 rows of suckers on the proximal tentacular clubs. Chiroteuthidae and Mastigoteuthidae generally have greatly enlarged ventral arms, modified to hold the worm-like tentacles. The mantle is fused to the funnel and head in Cranchiidae.

Key to the genera of Loliginidae occurring in the area

- 1a. Suckers in 2 rows on proximal tentacular clubs; fins not joined posteriorly, with rounded posterior lobes *Pickfordiateuthis*
- 1b. Suckers in 4 rows on proximal tentacular clubs; fins extend to posterior end of mantle, without rounded posterior lobes → 2
- 2a. Fins in adults occupy more than 85% mantle length, broadly elliptical; buccal supports without suckers *Sepioteuthis*
- 2b. Fins in adults occupy less than 70% mantle length, round or rhomboidal; buccal lobes with small suckers → 3


- 3a. Fins in adults wider than long, round or auriform, not rhomboidal; mantle short, stout, broadly rounded posteriorly *Lolliguncula*
- 3b. Fins in adults rhomboidal, longer than broad, not round; mantle elongate, pointed posteriorly *Loligo*










Key to the species of *Loligo* in the area

(modified from Cohen, 1976)

- 1a. Left ventral arm hectocotylized (mature males) → 2
- 1b. Left ventral arm not hectocotylized → 6
- 2a. Hectocotylus extends to tip of arm; diameter of distal suckers of dorsal row less than 1/2 that of their ventral counterparts → 3
- 2b. Hectocotylus does not extend to tip of arm; diameter of distal suckers of dorsal row equal or nearly equal to that of their ventral counterparts → 4
- 3a. Hectocotylus occupies less than 1/2 of arm (26 to 50% of arm length; 52 to 69% of total number of suckers on arm); suckers on ventral buccal lappets *Loligo plei*
- 3b. Hectocotylus occupies greater than 1/2 of arm (57 to 62% of arm length; 77 to 89% of total number of suckers on arm); no suckers on ventral buccal lappets *Loligo roperi*
- 4a. Eye unusually large (diameter of externally visible eyeball 15 to 21% of mantle length; lens diameter 6 to 8% of mantle length) *Loligo ocula*
- 4b. Eye not unusually large (diameter of externally visible eyeball 8 to 18% of mantle length; lens diameter 2 to 6% of mantle length) → 5
- 5a. Bases of at least some modified suckers of hectocotylus narrowly triangular; sucker rings on ventral arms with blunt teeth *Loligo pealeii*
- 5b. Bases of modified suckers of hectocotylus broad; sucker rings on ventral arms with sharp teeth *Loligo surinamensis*
- 6a. No suckers on ventral buccal lappets; total number of suckers for all buccal lappets less than 7; less than 25 transverse rows of suckers on tentacular club *Loligo roperi*
- 6b. Suckers present on ventral buccal lappets; total number of suckers for all buccal lappets greater than 15; greater than 26 transverse rows of suckers on tentacular club → 7
- 7a. Ratio of greatest width of vane of gladius to greatest width of free rachis 1.5 to 2.4; lateral margin of vane usually thickened; fin length less than 1/2 mantle length in specimens less than 95 mm mantle length, often less than 1/2 mantle length in specimens less than 190 mm mantle length *Loligo plei*
- 7b. Ratio of greatest width of vane of gladius to greatest width of free rachis 2.4 to 3.7; lateral margin of vane usually thin although often slightly darkened; fin length greater than 1/2 mantle length in specimens greater than 55 mm mantle length → 4

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Loligo ocula* Cohen, 1976.
-  *Loligo pealeii* LeSueur, 1821.
-  *Loligo plei* Blainville, 1823.
-  *Loligo roperi* Cohen, 1976.
-  *Loligo surinamensis* Voss, 1974.
-  *Lolliguncula brevis* (Blainville, 1823).
-  *Pickfordiateuthis bayeri* Roper and Vecchione, 2001.
-  *Pickfordiateuthis pulchella* Voss, 1953.
-  *Sepioteuthis sepioidea* (Blainville, 1823).

References

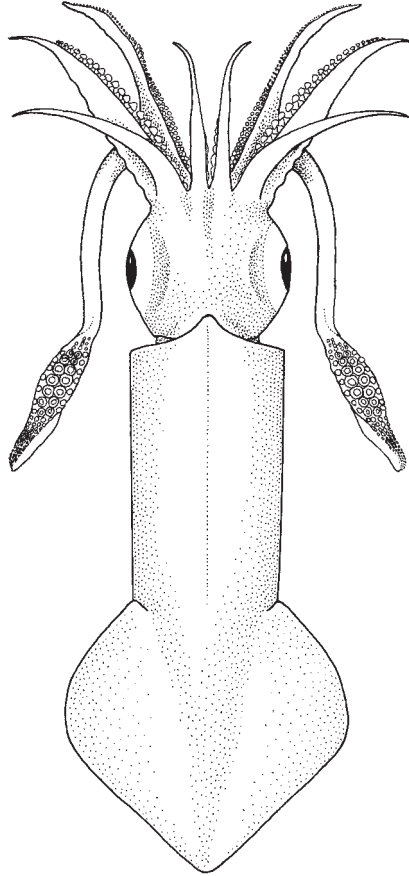
- Arocha, F. 1989. Cephalopod resources of Venezuela. *Mar. Fish. Rev.*, 51:47-51.
- Brakoniecki, T.F. 1996. A revision of the genus *Pickfordiateuthis* Voss, 1953 (Cephalopoda: Myopsida). *Bull. Mar. Sci.*, 58:9-28.
- Cohen, A. 1976. The systematics and distribution of *Loligo* (Cephalopods: Myopsida) in the western North Atlantic, with description of two new species. *Malacologia*, 15: 299-367.

Loligo ocula Cohen, 1976

OJL

Frequent synonyms / misidentifications: None / *Loligo pealeii* LeSueur, 1821.

FAO names: **En** - Bigeye inshore squid; **Fr** - Calmar à gros yeux; **Sp** - Calamar ojigrande.



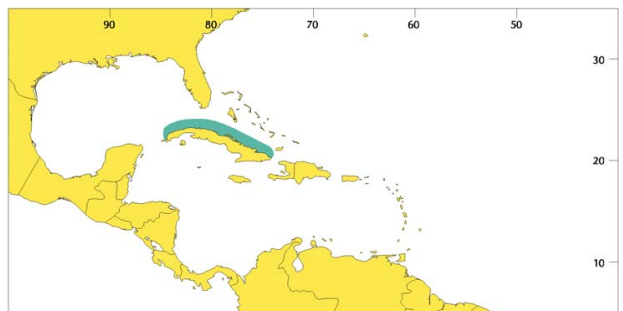
Diagnostic characters: Eyes very large; visible part 15 to 21% mantle length. Left ventral arm hectocotylized; modified in distal 1/3 to 1/4 but not to tip; the 10 to 12 suckers in dorsal row less than 1/2 diameter of ventral counterparts; the 2 to 5 suckers proximal to reduced suckers are enlarged; all modified suckers on swollen, triangular bases. Mantle bluntly pointed; fin length 45 to 55% mantle length.

Size: To 13 cm mantle length.

Habitat, biology, and fisheries: A demersal species in depths of 250 to 360 m. Its biology is unknown.

Distribution: Western Atlantic, Caribbean Sea around Cuba.

Remarks: This small loliginid is only known from the original description, but because it is easily confused with *Loligo pealeii* may be more widespread than current records indicate.



Loligo pealeii LeSueur, 1821

SQL

Frequent synonyms / misidentifications: None / *Loligo plei* Blainville, 1823.

FAO names: **En** - Longfin inshore squid; **Fr** - Calmar totam; **Sp** - Calamar comun.

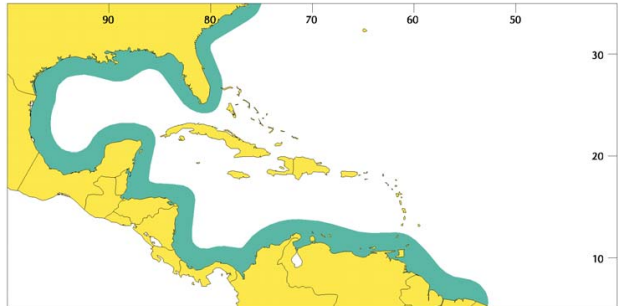
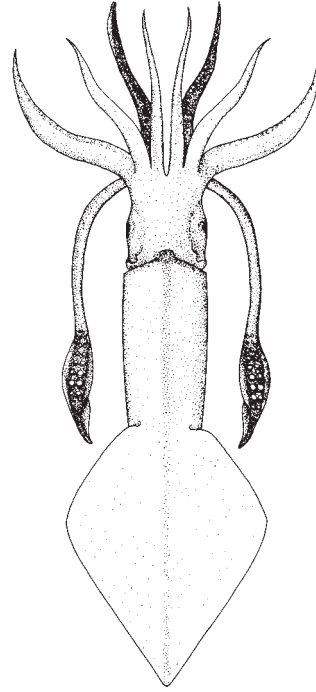
Diagnostic characters: Mantle long, moderately slender, cylindrical, the posterior end bluntly pointed; fins rhomboid, their sides nearly straight. **Gladius long, rather wide, feather-shaped, ratio of greatest width of vane of gladius to greatest width of rachis 2.7 to 3.7 in females, 2.4 to 2.9 in males; edge of vane curved (sometimes straight in males), thin, rarely ribbed.** Eyes not unusually large, diameter of externally visible eyeball 8 to 18% mantle length, and diameter of dissected lens 2 to 6% mantle length. Left ventral arm of mature males hectocotylized by modification of the distal third to fourth of arm, but the **modification does not extend to arm tip**; fewer than 12 of the suckers in dorsal row usually smaller than half the size of their counterparts in the ventral row; bases or pedicels of some of the modified suckers rounded, narrowly triangular. **Colour:** reddish brown, darker and more vivid dorsally, lighter, less pigmented ventrally.

Size: Maximum: 47 cm mantle length (male); males grow larger than females; sizes in Western Central Atlantic are considerably smaller than in northern waters - males: 30 cm maximum, less than 20 cm average; females: less than 13 cm mantle length.

Habitat, biology, and fisheries: Few data are available on biology of populations in the Western Central Atlantic. Optimum temperatures 10 to 14°C, minimum 8°C. North of Cape Hatteras there is a summer inshore-northerly spawning migration to shallow coastal and shelf waters, followed by an offshore-southerly retreat in autumn and winter to continental slope waters; restricted in summer to surface and shallow water, but from 28 to 366 m depth in winter (peak concentrations at 100 to 193 m); adults are found on the bottom during the day but leave the bottom at night, dispersing into the water column, and may appear at the surface (in summer or warm water). Eggs are laid in gelatinous finger-like strands, many of which are attached together in large masses ("sea mops") to a solid substrate (rock, shells, shipwrecks) at depths from a few to 250 m; planktonic paralarvae and juveniles are abundant in surface waters. Food includes crustaceans (e.g. euphausiids), fishes, and squids. Fished primarily north of Cape Hatteras. Caught principally by otter trawls and inshore trapnets. Catches occur in the northern Gulf of Mexico, Yucatán, Colombia and Venezuela. Reliable statistics are unavailable because catch is not separated by species.

Distribution: Western Atlantic continental shelf and upper slope waters from Nova Scotia to Venezuela, including the Gulf of Mexico and the Caribbean Sea. Not occurring around islands, except as rare strays at islands close to continental shelf or slope.

Remarks: Utilized as food and for bait. Medical research conducted on giant nerve fibres.



Loligo plei Blainville, 1823

OJO

Frequent synonyms / misidentifications: *Doryteuthis plei* (Blainville, 1823) / *Loligo pealeii* LeSueur, 1821.

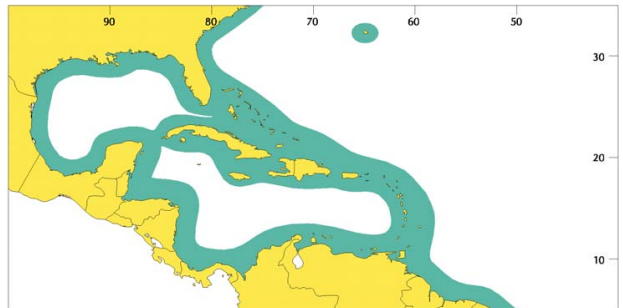
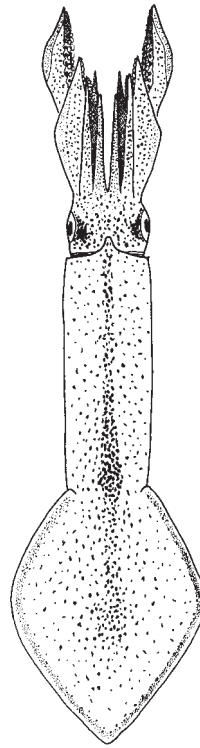
FAO names: **En** - Slender inshore squid; **Fr** - Calmar flèche; **Sp** - Calamar flecha.

Diagnostic characters: Mantle long, slender, cylindrical, the posterior end acutely pointed; fins rhomboid, their sides fairly straight. **Left ventral (fourth) arm hectocotylized in mature males by a modification of distal 1/2 to 1/4 of arm that extends to arm tip; 1/2 to 3/4 of suckers (42 to 82) in dorsal row much smaller than half the size of their ventral counterparts; modified (small) suckers on small, narrow, triangular pedicels. Gladius slender, feather-shaped; ratio of greatest width of vane of gladius to greatest width of rachis 1.5 to 2.4; edge of vane straight (often slightly curved in females), thick, and ribbed or rod-like (especially mature males).** Suckers on ventral buccal lappets. Eye not unusually large; diameter of externally visible eyeball 14 to 19% mantle length, diameter of dissected lens 2 to 7% mantle length. **Colour:** dark reddish brown dorsally, darkest along dorsal midline of mantle; lighter, more yellowish background colour ventrally with reddish brown overlay; often with reddish brown longitudinal stripes on anterior ventrolateral mantle of males.

Size: Males to 35 cm, females to 22 cm mantle length.

Habitat, biology, and fisheries: Occurs from the surface to 366 m depth, mostly shallower than 200 m; apparently concentrates near the bottom during the day and disperses into the water column at night, when it can be dipnetted at the surface. Matures over a broad range of sizes depending on season and locality: males 3.8 to 35 cm, females 4.2 to 20.3 cm mantle length, whereas they can remain immature up to 14 cm (males) and 9 cm (females); immature and mature specimens across a broad range of sizes maybe caught in the same net-haul. Gravid specimens are found the year round; all may not die after spawning. Eggs are laid in gelatinous, finger-like strands attached together and cemented to a hard substrate (rock, coral, shell) in large masses ("sea mops"). Feeds on crustaceans, small fishes, and probably squids. Comprises most of cephalopod fishery in Venezuela (Arocha, 1989). A small fishery occurs in Yucatán, and probably *Loligo plei* is caught throughout its range of occurrence, but separate statistics are not kept where it may co-occur with *Loligo pealeii*. In the Bahamian and Caribbean Islands undoubtedly it is the most frequently captured commercial species of Loliginidae. Principle gear includes otter trawls and dipnets. Used as food and bait.

Distribution: Western Atlantic, Gulf of Mexico, Caribbean Sea in continental shelf and upper slope waters from Cape Hatteras (36°N), (very rarely to southern New England) to Fortaleza, Brazil (4°S); and Bermuda, Bahamian and Caribbean Islands.

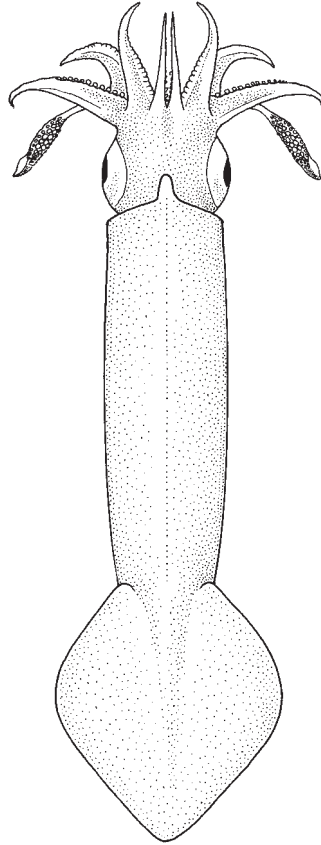


Loligo roperi Cohen, 1976

OJR

Frequent synonyms / misidentifications: None / *Loligo plei* Blainville, 1823.

FAO names: **En** - Island inshore squid; **Fr** - Calmar créole; **Sp** - Calamar insular.



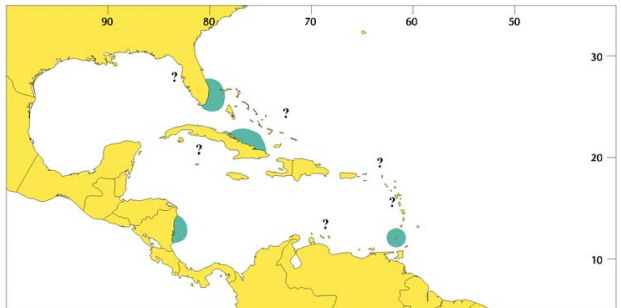
Diagnostic characters: A small species with long, slender mantle; fin length 33 to 39% mantle length. Tentacles short, 14 to 21% mantle length, clubs with less than 25 transverse rows of suckers. **Left ventral arm hectocotylized for more than 50% of arm length**; modification extends to arm tip; 80% of suckers in dorsal series modified to minute size, set on broadly triangular bases.

Size: To 7.2 cm mantle length.

Habitat, biology, and fisheries: Apparently associated with islands. Maturity is attained at 4.3 cm mantle length.

Distribution: Caribbean Sea; Gulf of Mexico.

Remarks: This small loliginid is very seldom reported, but because it is easily confused with *Loligo plei* may be more widespread than current records indicate.

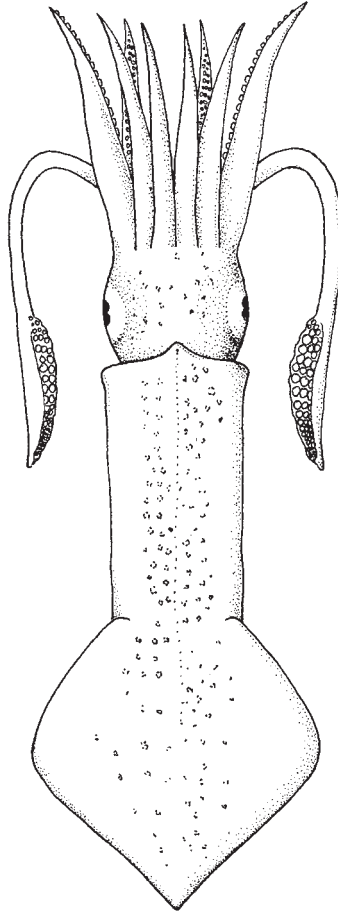


Loligo surinamensis Voss, 1974

OJM

Frequent synonyms / misidentifications: None / *Loligo pealeii* LeSueur, 1821.

FAO names: **En** - Surinam inshore squid; **Fr** - Calmar du Surinam; **Sp** - Calamar Surinamés.



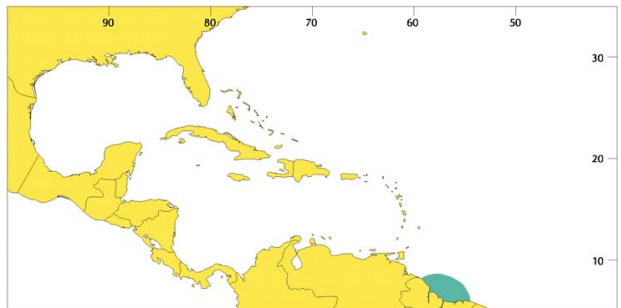
Diagnostic characters: Mantle moderately broad, about 25% mantle length; rhomboidal fins, length ca. 50% mantle length. Arms relatively long, about 45% mantle length. Left ventral arm of males hectocotylized beginning at twenty-second to twenty-fourth dorsal sucker pair; suckers at arm tip unmodified; modified suckers reduced in size and set on enlarged, transversely flattened bases. **Sucker rings on unmodified ventral arms with sharply pointed teeth.** **Colour:** not distinctive.

Size: To 12 cm mantle length.

Habitat, biology, and fisheries: Apparently a shallow neritic species; known depth range 27 to 37 m.

Distribution: Southern Caribbean Sea.

Remarks: Because this squid is easily confused with *Loligo pealeii*, its range may be more extensive than indicated by limited published reports.



***Lolliguncula brevis* (Blainville, 1823)**

IUB

Frequent synonyms / misidentifications: None / *Loligo* spp.

FAO names: **En** - Western Atlantic brief squid; **Fr** - Calmar doigtier commun; **Sp** - Calamar dedal.

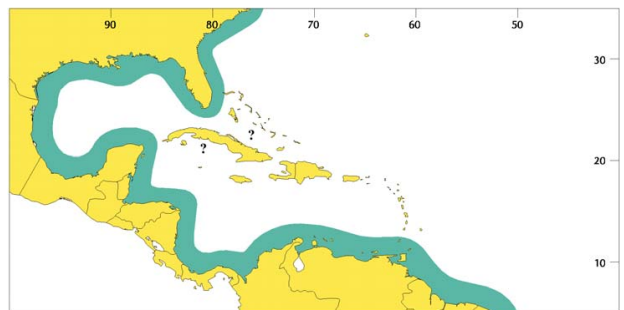
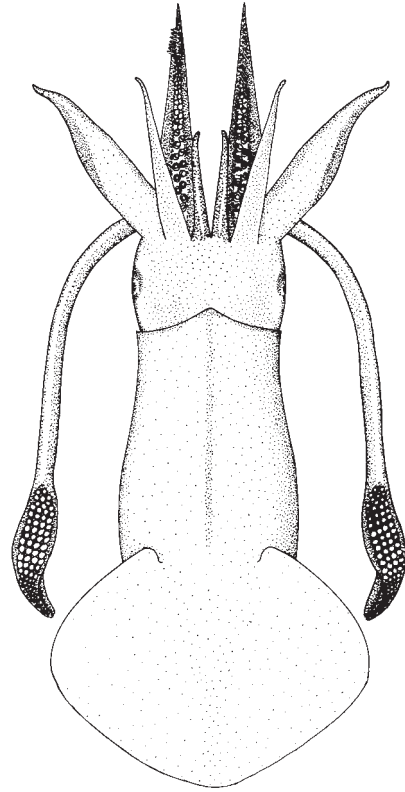
Diagnostic characters: Mantle stout, bluntly rounded posteriorly, widest in midportion. **Fins short (50 to 55 % mantle length), broad, wider than long (fin width 75% mantle length), very rounded.** Modified portion of hectocotylized (left ventral) arm occupies distal third of arm and extends to arm tip; about 24 suckers in dorsal row modified, the proximal 1 to 3 greatly reduced in diameter, the remaining pedicels distally greatly enlarged into long, slightly flattened papillae that gradually diminish in size distally; no large, puffy, glandular enlargement of basal area of arm between sucker rows.

Colour: dark reddish brown to brownish yellow with chromatophores over nearly entire animal; chromatophores most dense on ventral surface of mantle and head, except in very large specimens, in which the opposite occurs.

Size: Females 11 cm; males 8.5 cm mantle length.

Habitat, biology, and fisheries: Entirely coastal and generally limited to very shallow water of less than 18 m depth. Occurs in bays and estuaries and is associated with low salinity water, although it is not excluded from coastal salinities; normal salinity range 17 to 30‰. Temperatures of captures range from 15° to 32°C. Small eggs are laid in elongate, terminally rounded, gelatinous capsules attached to the bottom in shallow waters. Food consists of small crustaceans and fishes. Currently no specific commercial fisheries exists in spite of the great abundance of this species in several areas. Apparently a high potential for a sustained fishery exists in the northern and eastern Gulf of Mexico. Caught sometimes in large quantities as bycatch in otter-trawl fisheries for shrimps and fishes.

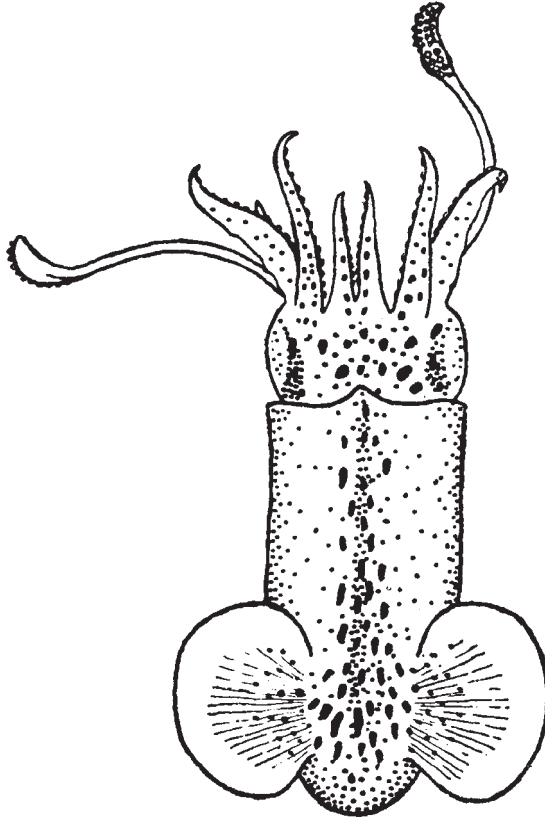
Distribution: Western Atlantic from New Jersey and Delaware Bay, southward to Rio de Janeiro, Brazil; Gulf of Mexico, Caribbean mainland and coast of northeastern South America (about 40°N to 23°S); excluded from the Bahamas and Caribbean Islands except Cuba and Curaçao.



Pickfordiateuthis pulchella Voss, 1953

Frequent synonyms / misidentifications: None / None.

FAO names: En - Grass squid.



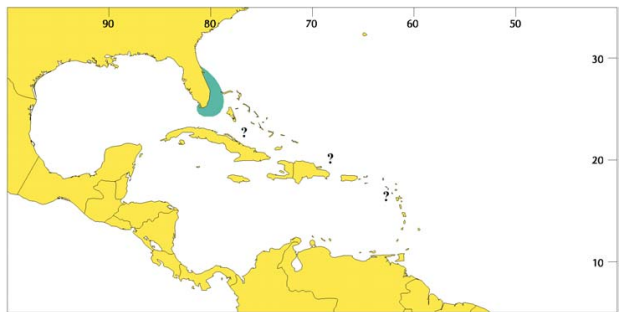
Diagnostic characters: Mantle short, bluntly pointed posteriorly. **Fins large, elliptical to round, not connected posteriorly; sepiolid-like. Manus of tentacular clubs with suckers in 2 series.** Buccal membrane lacking suckers. **Colour:** not distinctive.

Size: To 22 mm mantle length.

Habitat, biology, and fisheries: Shallow tropical waters on patch reefs and seagrass beds.

Distribution: Tropical western Atlantic Ocean off Florida.

Remarks: *Pickfordiateuthis pulchella* was considered to comprise the monospecific family Pickfordiateuthidae until Brakoniecki (1996) described a second species from the eastern Pacific and sub-merged the family into the older family of myopsid squids, Loliginidae. At least 2 other species of *Pickfordiateuthis* are known from the western Central Atlantic. One was designated by Brakoniecki (1996) as *Pickfordiateuthis* species A. A second, more elongate species *Pickfordiateuthis bayeri*, was recently described by Roper and Vecchione. It seems likely that other species will be discovered in the vicinity of the Caribbean Islands.



Sepioteuthis sepioidea (Blainville, 1823)

UHS

Frequent synonyms / misidentifications: None / *Sepia* sp.

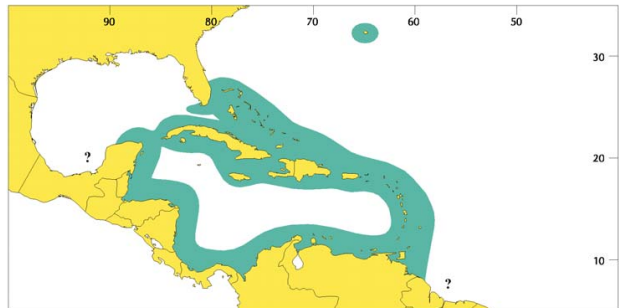
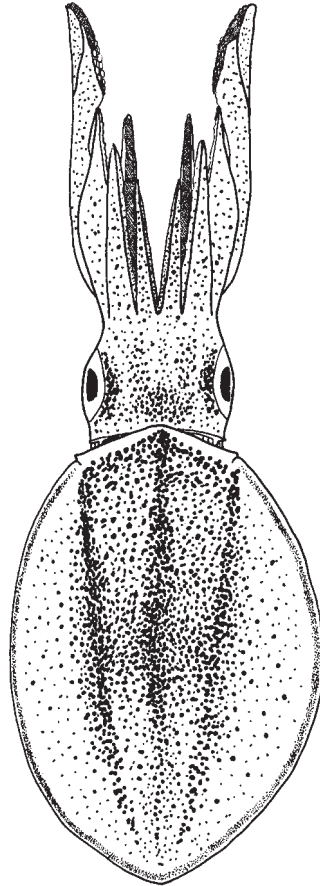
FAO names: **En** - Caribbean reef squid; **Fr** - Calmar ris; **Sp** - Calamar de arrecife.

Diagnostic characters: Mantle broad, relatively stout, tapered to a blunt posterior end, widest at anterior opening. **Fins occupy nearly entire length of mantle (90% in adults, 75% in juveniles)** and are elliptical to weakly rhomboidal, their width about 65% mantle length. **Buccal lappets without suckers;** modified portion of hectocotylized (left ventral) arm occupies distal fourth of arm length and is characterized by a sudden reduction in size of 1 or 2 pairs of suckers, the complete absence of suckers in both rows from the remaining distal portion of the arm, and the increase in size of the pedicels into large, fleshy papillae. **Colour:** quite varied in life from translucent with iridescent sheen, through greenish brown to deep reddish brown, depending on location and situation; may show "eye-spots", bands, or stripes on mantle, these sometimes outlined in white.

Size: To 20 cm mantle length.

Habitat, biology, and fisheries: A truly tropical species that is limited in distribution by the distribution of coral reefs (primarily) and grass flats (*Thalassia testudinum*). It occurs at depths of 0 to 20 m, mostly 3 to 7 m. As shallow coral reefs are absent from most of the Gulf of Mexico, *Sepia sepioidea* also appears to be excluded from the Gulf. Occurs in schools of 4 to 50 individuals of about equal size that cruise around the reefs, about the reef flats, or through/in grass beds behind the reefs. Specimens are mature at about 9 cm mantle length (hectocotylus visible on males at 3 cm mantle length). Eggs are very yolky and large, about 5 to 6 mm long; only 3 or 4 eggs are laid in each large, gelatinous capsule, several of which are attached together at their bases; these small clusters are laid under rocks or in conch shells (*Strombus gigas*); breeding apparently occurs year round. Feeds on fishes and shrimps. Presently not fished commercially but other species of *Sepioteuthis* in the Indo Pacific are fished extensively and are of excellent quality for eating.

Distribution: Tropical western Atlantic from Cape Canaveral, Florida, Bermuda and the Bahamas, Florida Keys, Caribbean Islands, Campeche, and Yucatán to Venezuela.

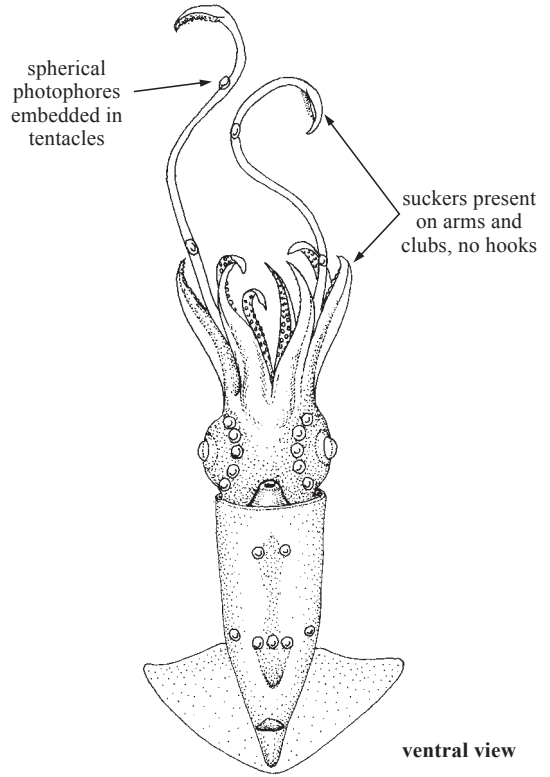


LYCOTEUTHIDAE

Lycoteuthids

Diagnostic characters: Mostly small, muscular squids. Suckers present on arms and clubs, hooks absent. **Four or 5 oval photophores on ventral surface of eyeball.** **Visceral photophores:** anal, branchial, and postero-abdominal organs. **Spherical photophores embedded in tentacles.** **Colour:** not distinctive.

Habitat, biology, and fisheries: Occupying mesopelagic depths during the day and migrating into near-surface waters at night. They are tropical and subtropical in distribution but are not known from the North Pacific. They possess a large variety of luminous organs. Strong sexual dimorphism in general morphology occurs in some species.



Similar families occurring in the area

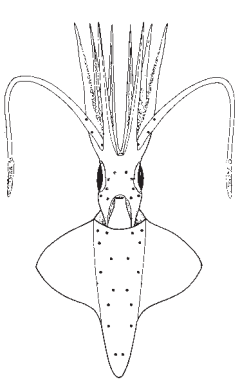
Ancistrocheiridae: lack photophores on the eyeballs and have large photophores on the ventral surfaces of the head and mantle.

Octopoteuthidae: lack tentacles.

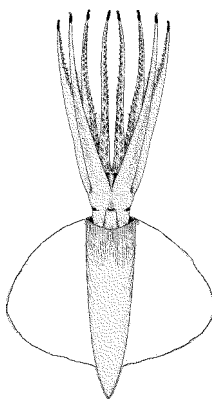
Pyroteuthidae: have hooks on arms.

Onychoteuthidae: have hooks on tentacular clubs.

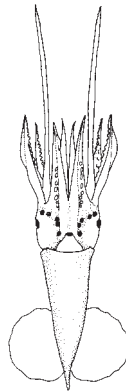
Enoploteuthidae: have hooks on arms; have photophores on ventral surfaces of head and mantle.



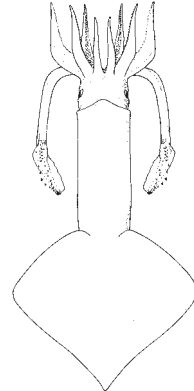
Ancistrocheiridae



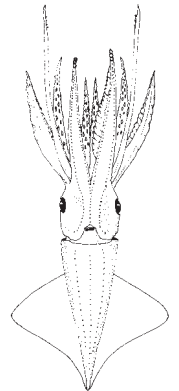
Octopoteuthidae



Pyroteuthidae



Onychoteuthidae



Enoploteuthidae

Key to the genera of Lycoteuthidae occurring in the area

- 1a. Terminal posterior photophore located between fins *Selenoteuthis*
- 1b. No terminal posterior photophore located between fins *Lycoteuthis*

List of species occurring in the area

- Lycoteuthis lorigera* (Steenstrup, 1875).
- Lycoteuthis springeri* (Voss, 1956).
- Selenoteuthis scintillans* Voss, 1959.

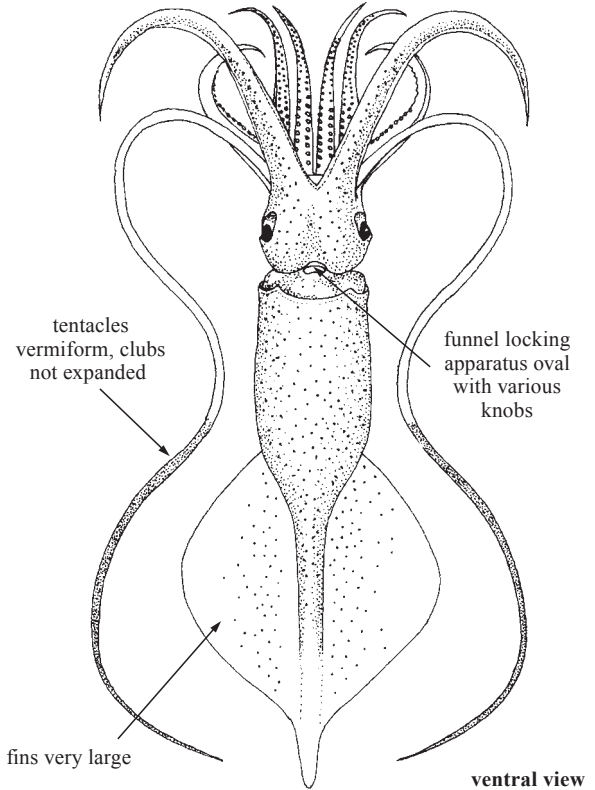
MASTIGOTEUTHIDAE

Whiplash squid

Diagnostic characters: Ventral arms elongate. Tentacles vermiform; clubs not expanded or slightly expanded; moderate in length to very elongate with minute suckers in many series. Funnel locking apparatus oval with various knobs (tragus, antitragus) affecting the shape of the depression in the funnel component in different species. Fins very large and positioned mostly posterior to the muscular part of the mantle. **Colour:** reddish; much of the red pigment is not in chromatophore organs but dispersed in other integumental cells.

Habitat, biology, and fisheries: Deep water pelagic or benthopelagic squids that are morphologically distinctive. Several species observed from submersibles were drifting just above the ocean floor and dangling tentacles very close to the bottom, presumably to capture copepods and other small plankters of the epibenthic zooplankton (Roper and Vecchione, 1997; Vecchione et al., in press).

Remarks: These squids are weakly muscled and have elongate fourth arms. Tentacles have a characteristic appearance but are often lost in capture. They are elongate and whip-like with tentacular clubs that are covered with thousands of extremely small suckers that, depending on the species, may be invisible to the naked eye.



Similar families occurring in the area

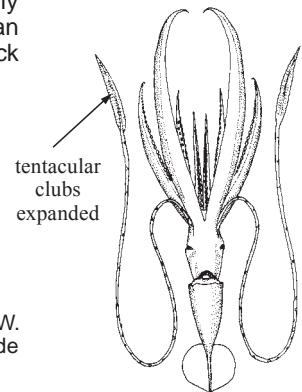
Chiroteuthidae: have elongate necks, and expanded tentacular clubs, usually with broad protective membranes, on which the suckers are not in more than 4 series; their fins are not as large as those of mastigoteuthids and they lack the red background pigmentation found in the skin of mastigoteuthids.

List of species occurring in the area

- Mastigoteuthis agassizi* Verrill, 1881.
- Mastigoteuthis hjorti* Chun, 1913.
- Mastigoteuthis magna* Joubin, 1913.

Reference

Vecchione, M., R.E. Young, A. Guerra, D.J.Lindsay, D.A. Clague, J.M. Bernhard, W.W. Sager, A.F. Gonzalez, F.J. Rocha, and M. Segonzac. 2001. Worldwide Observations of remarkable deep-sea squids. *Science*, 294:2505-2506.

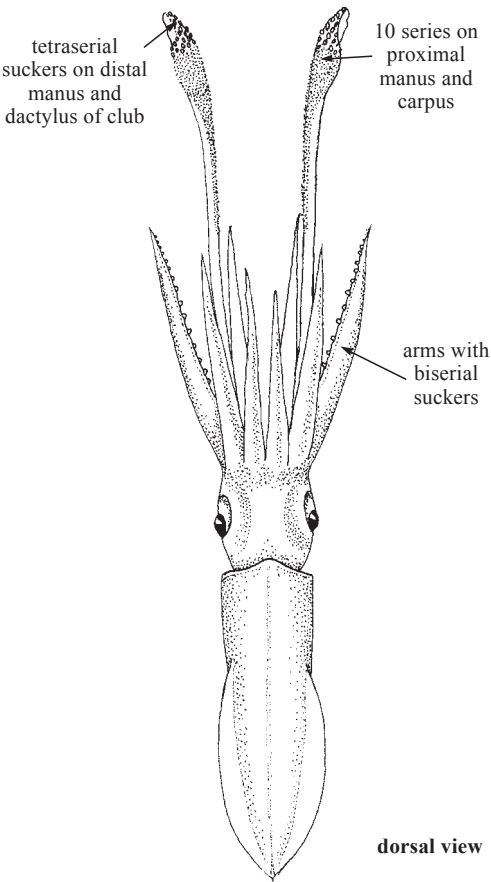


NEOTEUTHIDAE

New squid

Diagnostic characters: Weakly muscled species of small to moderate size (up to 27 cm mantle length). **Tetraserial suckers on distal manus and dactylus of tentacular club, greater than 10 series on the proximal manus and carpus;** carpal knobs in a single row or absent. Arms with biserial suckers. **Anterior fin lobes absent; posterior fin lobes free** (i.e., posterior edge of fin convex); fins attach laterally on mantle muscle. Buccal connectives attach to dorsal margins of ventral arms. Photophores absent. **Colour:** not distinctive.

Habitat, biology, and fisheries: Little is known about the biology of this group.



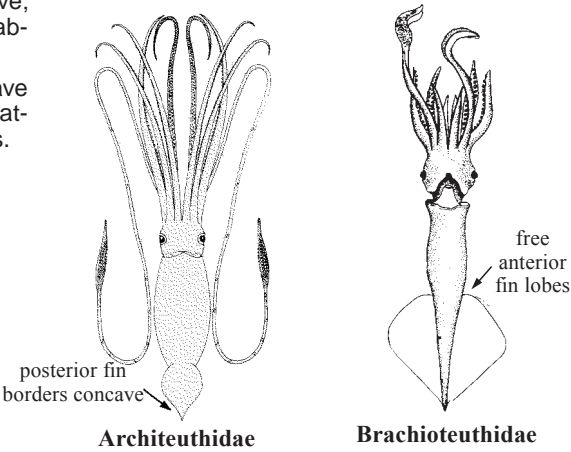
Similar families occurring in the area

Architeuthidae: posterior borders of fins are concave; carpal knobs in a cluster rather than a single row, or absent.

Brachyteuthidae: free anterior fin lobes and concave posterior fin borders; buccal membrane connectives attach to ventral, rather than dorsal, sides of ventral arms.

List of species occurring in the area

Neoteuthis thielei Naef, 1921.



OCTOPOTEUTHIDAE

Eight-armed squids

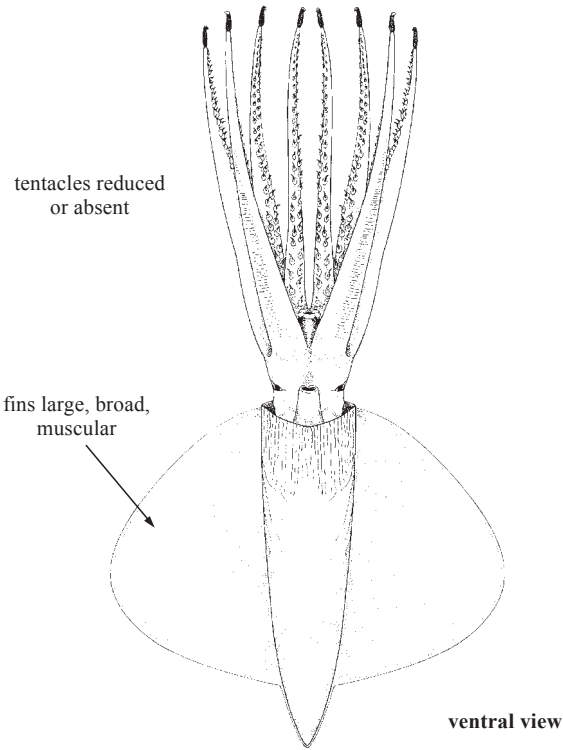
Diagnostic characters: Some reach a large size (160 cm mantle length). The mantle is broad and weakly muscled. **Tentacles reduced or absent in subadults and absent in adults. Arms with hooks in 2 series**, replaced by suckers near arm tips. **Fins large, broad, muscular; fused to one another along dorsal mantle midline; length nearly equals mantle length.** Some or all arms terminate in photophores. Mature males lack a hectocotylus but have a large penis that can extend well beyond the mantle opening.

Habitat, biology, and fisheries: Large muscular fins apparently provide most of the force for swimming (Vecchione et al., in press).

Remarks: Arm tips of *Octopoteuthis* are frequently lost during capture.

Similar families occurring in the area

Other families of large-finned squids (Ancistrocheiridae, Cycloteuthidae, Magnapinnidae, Thysanoteuthidae) have tentacles. Lepidoteuthids lack tentacles but have scales.



Key to the genera of Octopoteuthidae occurring in the area

- 1a. Dorsolateral arm tips with very large oval photophores; remaining arm tips without large photophores (Fig. 1) *Taningia*
- 1b. All arm tips with slender photophores; dorsolateral arm-tip photophores not particularly enlarged *Octopoteuthis*

List of species occurring in the area

- Octopoteuthis danae* Joubin, 1931.
- Octopoteuthis megaptera* (Verrill, 1885).
- Octopoteuthis sicula* Ruppell, 1844.
- Taningia danae* Joubin, 1931.

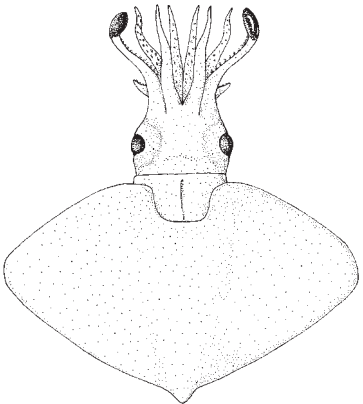


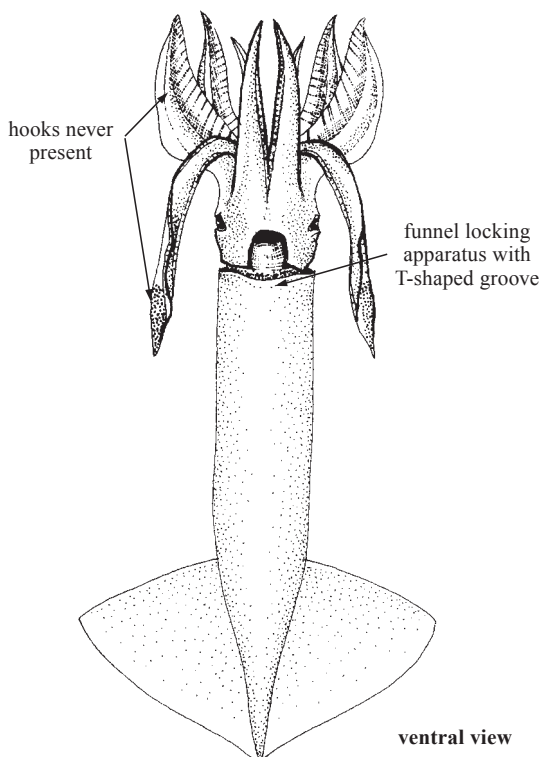
Fig. 1 *Taningia danae*

OMMASTREPHIDAE

Flying squids

Diagnostic characters: Medium- to large-sized squids. **Funnel locking apparatus with a T-shaped groove.** **Paralarvae with fused tentacles.** Arms with biserial suckers. Four rows of suckers on tentacular clubs (club dactylus with 8 sucker series in *Illex*). Hooks never present on arms or clubs. One of the ventral pair of arms usually hectocotylized in males. Buccal connectives attach to dorsal borders of ventral arms. Gladius distinctive, slender.

Habitat, biology, and fisheries: Oceanic and neritic. This is one of the most widely distributed and conspicuous families of squids in the world. Most species are exploited commercially. *Todarodes pacificus* makes up the bulk of the squid landings in Japan (up to 600 000 t annually) and may comprise at least 1/2 the annual world catch of cephalopods. In various parts of the Western Central Atlantic, 6 species of ommastrephids currently are fished commercially or for bait, or have a potential for exploitation. Ommastrephids are powerful swimmers and some species form large schools. Some neritic species exhibit strong seasonal migrations, wherein they occur in huge numbers in inshore waters where they are accessible to fisheries activities. The large size of most species (commonly 30 to 50 cm total length and up to 120 cm total length) and the heavily muscled structure, make them ideal for human consumption.



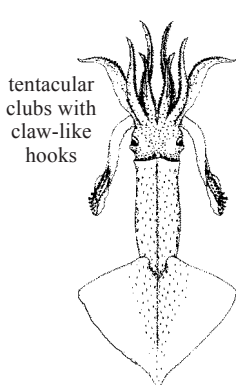
Similar families occurring in the area

Onychoteuthidae: tentacular clubs with claw-like hooks; funnel locking apparatus a simple, straight groove.

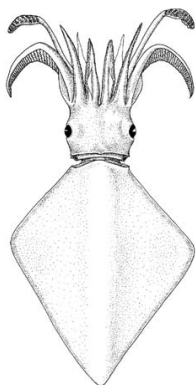
Thysanoteuthidae: funnel locking apparatus a long, narrow longitudinal groove with a short broad transverse groove at midlevel; fins broad, rhomboidal, extending nearly full length of mantle.

Lepidoteuthidae: distinct "scales" on surface of mantle; funnel locking apparatus a simple, straight groove.

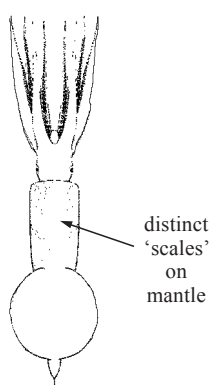
Loliginidae: eyes covered with a transparent corneal membrane; funnel locking apparatus a simple, straight groove; small suckers on buccal lappets.



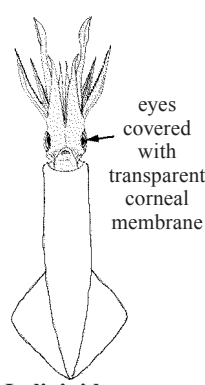
Onychoteuthidae



Thysanoteuthidae



Lepidoteuthidae



Loliginidae

Key to the genera of Ommastrephidae occurring in the area

- 1a. Suckers on tip (dactylus) of tentacular clubs in 8 rows *Illex*
- 1b. Suckers on tip of tentacular clubs in 4 rows → 2

- 2a. Mantle drawn out posteriorly as a pointed tail; foveola present in funnel groove but side pockets absent; a long, thin strip of luminous tissue along ventral midline of viscera posterior to heart *Ornithoteuthis*
- 2b. Mantle with bluntly pointed terminus, not drawn out into a pointed tail; foveola and side pockets present. No strip of luminous tissue along ventral midline of viscera posterior to heart. → 3

- 3a. Nineteen large round light organs on ventral surface of mantle, 3 pairs along ventral arms . *Hyaloteuthis*
- 3b. No large round light organs on ventral surface of mantle → 4

- 4a. Large subcutaneous patch of consolidated luminescent granules on anterodorsal surface of mantle; 0 to 2 small suckers on the tentacular stalk proximal to the first smooth carpal knob *Sthenoteuthis*
- 4b. Golden stripe of luminous tissue along ventral midline of mantle; no subcutaneous patch of consolidated luminescent granules on anterodorsal surface of mantle; 4 to 6 small suckers on the tentacular stalk proximal to the first smooth carpal knob *Ommastrephes*

Key to the species of *Illex* in the area

- 1a. Distal enlarged manal sucker rings notched, forming 7 or 8 broad, flat teeth; base of hectocotylized arm devoid of suckers for about 13% of total arm length; trabeculae on hectocotylus midsection modified into papillose, fringed flaps *Illex coindetii*
- 1b. Distal enlarged manal sucker rings smooth, toothless, rarely with 1 or 2 notches; base of hectocotylized arm devoid of suckers for about 4 to 6% of total arm length; trabeculae on hectocotylus midsection not modified. → 2

- 2a. Lower beak jaw edge straight, short; wing long, wide; lateral wall short, blunt; rostral width narrow *Illex illecebrosus*
- 2b. Lower beak jaw edge curved, long; wing short, narrow; lateral wall long, pointed; rostral width wide *Illex oxygonius*

List of species occurring in the area

The symbol 🦑 is given when species accounts are included.

Subfamily Illicinae

- 🦑 *Illex coindetii* (Vérany, 1839).
- 🦑 *Illex illecebrosus* (LeSueur, 1821).
- 🦑 *Illex oxygonius* Roper, Lu and Mangold, 1969.

Subfamily Ommastrephinae

- 🦑 *Hyaloteuthis pelagica* (Bosc, 1802).
- 🦑 *Ommastrephes bartramii* (LeSueur, 1821).
- 🦑 *Ornithoteuthis antillarum* Adam, 1957.
- 🦑 *Sthenoteuthis pteropus* (Steenstrup, 1855).

Reference

Zeccini, F., M. Vecchione, and C.F.E. Roper. 1996. A quantitative comparison of hectocotylus morphology between Mediterranean and western Atlantic populations of the squid *Illex coindetii* (Cephalopoda: Ommastrephidae). *Proc. Biol. Soc. Wash.*, 109:591-599.

Hyaloteuthis pelagica* (Bosc, 1802)*HQI**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Glassy flying squid; **Fr** - Encornet vitreux; **Sp** - Pota estrellada.

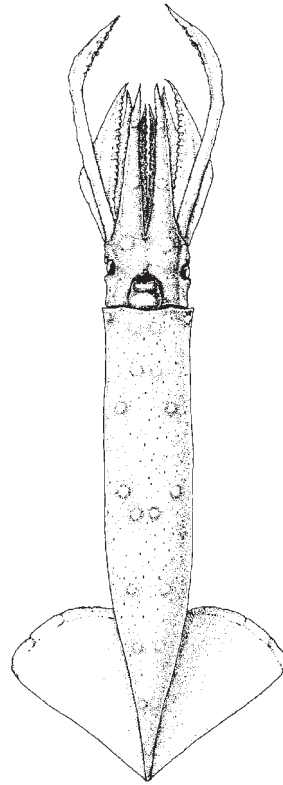
Diagnostic characters: Suckers on tip of tentacular clubs in 4 rows. Mantle with bluntly pointed terminus, not drawn out into a pointed tail; foveola and side pockets present. **Nineteen large round light organs on ventral surface of mantle, 3 pairs along ventral arms.** **Colour:** not distinctive.

Size: Mantle length to 9 cm. The smallest ommastrephid in size at maturity.

Habitat, biology, and fisheries: Epipelagic and upper mesopelagic, but not usually caught at the surface.

Distribution: All tropical and subtropical oceans.

Remarks: Only a single species is recognized worldwide.



Illex coindetii (Vérany, 1839)

SQM

Frequent synonyms / misidentifications: *Illex illecebrosus coindetii* Pfeffer, 1912 / *Illex illecebrosus* (Le-Sueur, 1821).

FAO names: **En** - Broadtail shortfin squid; **Fr** - Encornet rouge; **Sp** - Pota voladora.

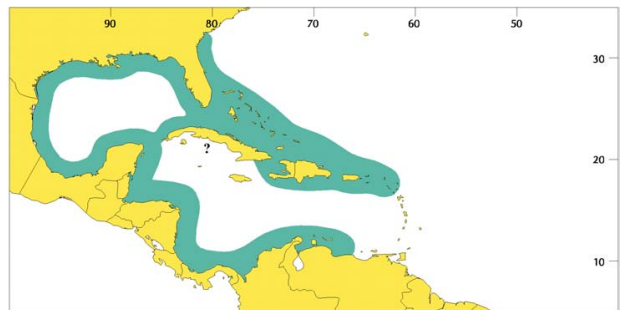
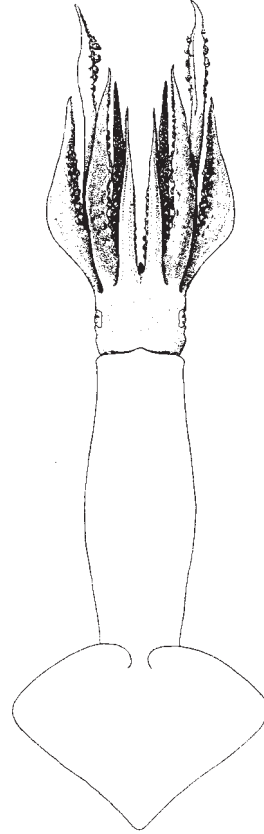
Diagnostic characters: **Suckers on tip (dactylus) of tentacular club in 8 rows. Distal enlarged manal sucker rings on tentacular club notched, forming 7 or 8 broad, flat teeth.** Mantle widest at anterior end (except in fully ripe females), moderately long and narrow; fin angle broad, exceeding 50°; fin width greater than fin length. Head large and robust, especially in males; length about equal to width. **Arms very long**, especially in males where second and third arms are very robust. Hectocotylized arm longer than the opposite ventral arm in males; base of hectocotylized arm devoid of suckers for ca. 13% of total arm length; **trabeculae on hectocotylus midsection modified into papillose, fringed flaps**; 1 or 2 knobs on dorsal row of lamellae on modified arm tip. **Colour:** reddish to reddish brown, more vivid dorsally; paler, more yellowish ventrally.

Size: Maximum mantle length: males 18 cm; females 23 cm.

Habitat, biology, and fisheries: A neritic species that inhabits nearshore waters of the continental shelf. Apparent preference for sandy or silty bottoms; vertical range from a few metres to 1 000 m with major abundance at 200 to 600 m in the western Atlantic. Apparently associated with the bottom during the day (when captures by trawl are most frequent), disperses into the water column at night. Bottom temperatures at capture sites in the western Atlantic range from 8° to 13°C. Spawning grounds, season, eggs, and larvae are unknown. Prey presumed to be crustaceans (euphausiids) and fishes. Commercially exploited in the eastern Atlantic and Mediterranean, mainly with bottom trawls. Potential seems high for fisheries in the Gulf of Mexico and Caribbean Sea.

Distribution: Western North Atlantic from 37°N southward through the Gulf of Mexico and Caribbean Sea; eastern Atlantic from the North Sea southward along the European Atlantic coast, Mediterranean Sea, and the African coast to 14°S. It has not been recorded from east of the Antilles chain or from south of about 9°N in the western Atlantic (lack of collections limits knowledge of its southern range).

Remarks: Zecchini et al. (1996) compared hectocotylus morphology between Mediterranean and western Atlantic populations; in spite of some minor differences, they concluded that the two populations are conspecific.



***Illex illecebrosus* (LeSueur, 1821)**

SQI

Frequent synonyms / misidentifications: *Ommastrephes illecebrosus* Verrill, 1880 / *Illex coindetii* (Vérane, 1839); *Illex oxygonius* Rober, Lu, and Mangold, 1769.

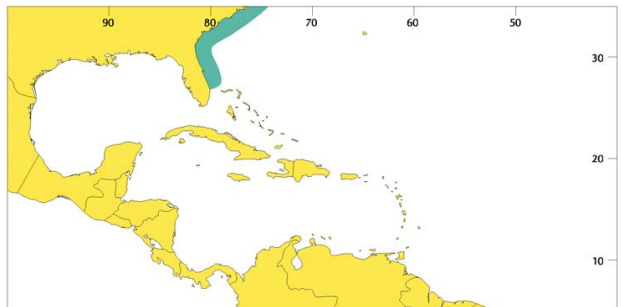
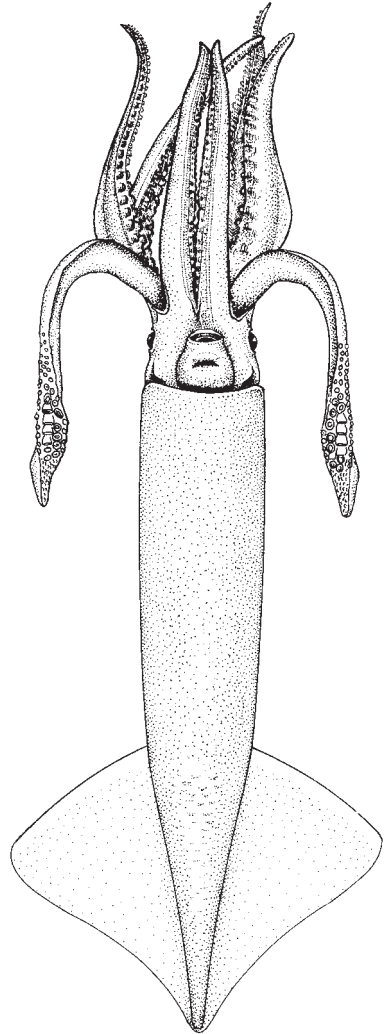
FAO names: **En** - Northern shortfin squid; **Fr** - Encornet rouge nordique; **Sp** - Pota norteña.

Diagnostic characters: **Suckers on tip (dactylus) of tentacular clubs in 8 rows.** **Distal enlarged manal sucker rings smooth, toothless,** rarely with 1 or 2 notches. Hectocotylized arm (in males) usually shorter than the opposite ventral arm, its modified portion straight and very short, about 22% of arm length; base of hectocotylized arm devoid of suckers for about 4 to 6% of total arm length; **trabeculae on hectocotylus midsection not modified into papillose, fringed flaps;** 1 or 2 knobs on dorsal row of lamellae on modified arm tip. **Lower beak jaw edge straight, short; wing long, wide; lateral wall short, blunt; rostral width narrow.** Mantle robust, widest at midpoint between anterior end and beginning of fins; tail not sharply pointed; fin angle moderate, 40° to 50°, mostly 45°; fin width greater than fin length. Head small, short and narrow; arms relatively short, of about equal length in both sexes. **Colour:** reddish brown to deep purple, paler on ventral surfaces, more intense on head, arms, and dorsal surfaces of mantle and fins; purplish stripe along dorsal midline of mantle.

Habitat, biology, and fisheries: Inhabits inshore waters in summer and retreats to deeper, offshore waters of the continental shelf and slope in autumn and winter. Occurs in temperatures of 0° to 15°C, optimum 7° to 13°, so it is restricted to northern waters. Vertical range extensive depending on size, season, and time of day, but tends to congregate on or near the bottom during the day and disperse into the water column at night. Has been caught from the surface to about 1 000 m depth. Spawning grounds and season are unknown, but recent data indicate a late autumn-early winter spawning in offshore slope water near the inshore edge of the Gulf Stream. An inshore summer migration is associated with intensive feeding, primarily on small fishes and euphasids. Fishing occurs in offshore waters during autumn and winter off the Middle-Atlantic states of the USA; from New England northward to Labrador, fishing takes place in inshore waters during the summer and early autumn. Caught primarily by otter trawl. In Newfoundland it is captured by hand jigging or by squid jigging machines with lights at night. The species has historically been utilized primarily as fish bait. However, it is of good quality for human consumption and recent years have seen greater demand on the species as a source of food, particularly in eastern Europe and Japan. Marketed both fresh and frozen.

Size: Maximum mantle length: males 27 cm; females 31 cm.

Distribution: East coast of North America from Labrador to central Florida; greatest abundance in northern portion of range.



Illex oxygonius Roper, Lu and Mangold, 1969

IXO

Frequent synonyms/misidentifications: None / *Illex illecebrosus* (LeSueur, 1821); *Illex coindetii* (Vérany, 1839).

FAO names: En - Sharptail shortfin squid; Fr - Encornet rouge à pointe; Sp - Pota puntiaguda.

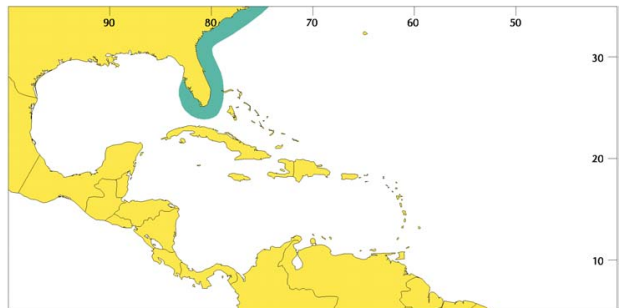
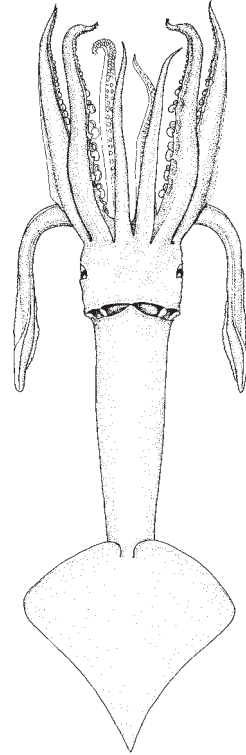
Diagnostic characters: Suckers on tip (dactylus) of tentacular clubs in 8 rows. Distal enlarged manal sucker rings smooth, toothless, rarely with 1 or 2 notches. Hectocotylized arm (in males) longer than the opposite ventral arm; modified portion curved, about 29% of arm length; base of hectocotylized arm devoid of suckers for ca. 4 to 6% of total arm length; trabeculae on hectocotylus midsection not modified; 3 knobs on dorsal row of lamellae on modified arm tip. Lower beak jaw edge curved, long; wing short, narrow; lateral wall long, pointed; rostral width wide. Mantle widest at anterior end; long, narrow, drawn out to a pointed tail posteriorly; males with a sharp, distinct, triangular dorsal lobe at mantle opening; fin angle acute, 25° to 35° (very occasionally to 40°); fin width equal to or slightly greater than fin length; head medium-sized, wider than long; arms moderately long and robust, especially the second and third in males. **Colour:** reddish to reddish brown, more vivid dorsally; paler, more yellowish ventrally.

Habitat, biology, and fisheries: A neritic species taken from 50 to 550 m in bottom trawls at temperatures of 6° to 13°C; associated with the bottom during the day and disperses into the water column at night. Spawning grounds, season, eggs, and larvae are unknown at present. Food unknown, but presumed to be crustaceans and fishes. Abundance and distribution currently unknown; if concentrations are found, the species would be of commercial use because of its close resemblance to the other currently utilized species of the genus: *I. illecebrosus* and *I. coindetii*.

Size: Maximum mantle length: males 23 cm, females 21 cm.

Distribution: Western Atlantic from Chesapeake Bight south to Florida Current and southeastern Gulf of Mexico.

Remarks: This species can be distinguished from congenors based on a combination of morphological characters. However, no character unique to the species is known. Its known geographic range is in the area of overlap between those of *I. illecebrosus* and *I. coindetii*. It remains possible that *I. oxygonius* is a hybrid of *I. illecebrosus* and *I. coindetii*.



***Ommastrephes bartramii* (LeSueur, 1821)**

OFJ

Frequent synonyms / misidentifications: *Ommastrephes caroli* (Furtado, 1887); *Sthenoteuthis bartramii* (LeSueur, 1821) / *Sthenoteuthis pteropus* (Steenstrup, 1855); *Ommastrephes pteropus* (Steenstrup, 1855).

FAO names: **En** - Neon flying squid; **Fr** - Encornet volant; **Sp** - Pota saltadora.

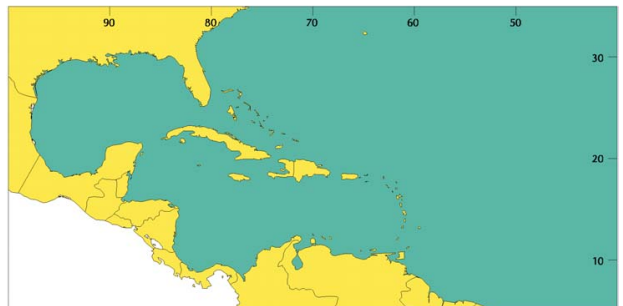
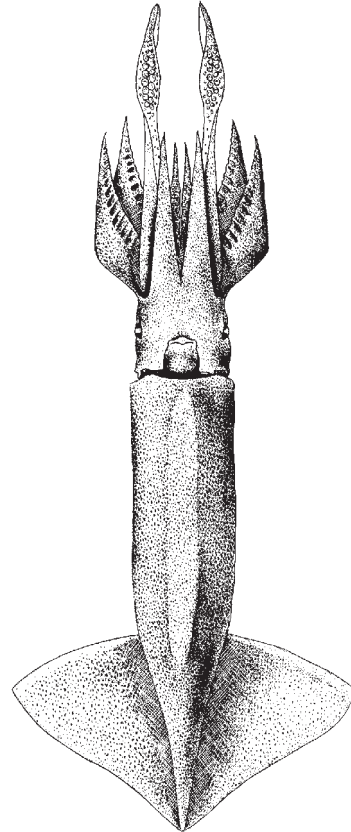
Diagnostic characters: **Suckers on tip of tentacular clubs in 4 rows.** Mantle with bluntly pointed terminus, not drawn out into a pointed tail; foveola and side pockets present. No large round light organs on ventral surface of mantle. Golden stripe of luminous tissue along ventral midline of mantle; no subcutaneous patch of consolidated luminescent granules on anterodorsal surface of mantle. Numerous, closely-packed, small, very irregularly shaped, often interconnected light organs embedded under the skin in muscle of mantle ventrally; similar light organs occur in patches on ventral surface of head. **Four to 6 small suckers on the tentacular stalk proximal to the first smooth knob of the fixing apparatus.** **Colour:** deep maroon overall, slightly lighter ventrally, darker along dorsal midline of mantle.

Habitat, biology, and fisheries: Oceanic, it occurs near the surface at night and is dispersed throughout the water column to about 1 500 m both day and night. It occurs in schools of similarly-sized animals that congregate around a night light; as the size of individuals increases, their number in the school decreases; very large individuals around 50 cm mantle length apparently are solitary. Spawning areas and seasons in the Atlantic are unknown. The neon flying squid feeds on small oceanic fishes and squids. Readily captured on squid jigs, so jigging machines used at night with electric lamps in the open ocean should be effective and more efficient than hand jigging or dip netting.

Size: Maximum mantle length: females 60 cm, males somewhat smaller.

Distribution: Worldwide, in tropical and temperate waters, but the distributional limits in the Atlantic are unknown. Abundant in north and south transition zones in the Pacific and in the southern Indian Ocean.

Remarks: A very powerful swimmer, *O. bartramii* has been observed during daytime to leap from the water and to glide for some distance over the surface, thus receiving the name 'flying squid'. The flesh is of excellent quality for human consumption, either fresh or frozen.



Ornithoteuthis antillarum Adam, 1957

OKA

Frequent synonyms / misidentifications: None / *Ommastrephes bartramii* (LeSueur, 1821); *Illex oxygonius* Roper, Lu, and Mangold, 1969.

FAO names: **En** - Atlantic bird squid; **Fr** - Encornet oiseau; **Sp** - Pota pájara.

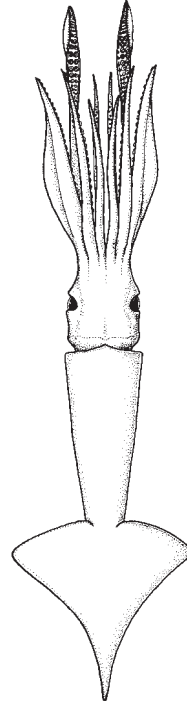
Diagnostic characters: **Suckers on tip of tentacular clubs in 4 rows. Mantle drawn out posteriorly as a pointed tail; foveola of funnel groove with 7 to 22 very indistinct folds, no side pockets. A long, thin strip of luminous tissue along ventral midline of viscera posterior to heart.** No external light organs; discrete light organs on the ink sac and rectum. No distinct fixing apparatus on tentacular club. **Colour:** purplish maroon, darkest on dorsal surface.

Habitat, biology, and fisheries: May inhabit continental shelf and slope waters or be associated with islands. Specimens have been captured in bottom fishing with trawls during the day at 585 to 1 100 m (mostly 640 to 825 m); night-time captures were made in large midwater trawls at 100 to 600 m over very deep water and by dip net at the surface in the open ocean. Not currently fished commercially; too few data are available on distribution, abundance, and biology to allow prediction of fishing potential. The species is edible.

Size: Maximum mantle length up to 20 cm.

Distribution: Tropical and subtropical western Atlantic and Caribbean Sea; West Africa and Morocco in the eastern Atlantic.

Remarks: The species is infrequently caught but its rarity in collections undoubtedly is a reflection of the animal's rapid, powerful swimming ability. It has been seen frequently from submersibles at 600 to 1 000 m depth (Vecchione and Roper, 1991).



***Sthenoteuthis pteropus* (Steenstrup, 1855)**

OFE

Frequent synonyms / misidentifications: *Ommastrephes pteropus* Steenstrup, 1855 / *Ommastrephes bartramii* (LeSueur, 1821); *Illex* spp.

FAO names: **En** - Orangeback flying squid; **Fr** - Encornet dos orange; **Sp** - Pota naranja.

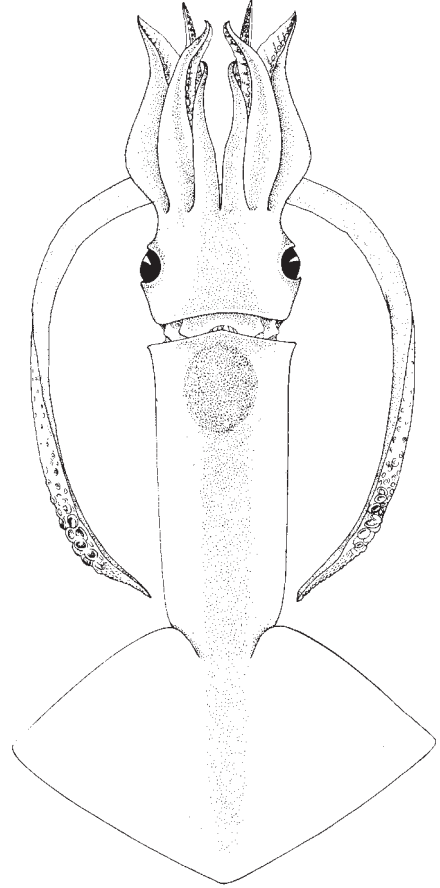
Diagnostic characters: **Suckers on tip of tentacular clubs in 4 rows.** Mantle with bluntly pointed terminus, not drawn out into a pointed tail; foveola and side pockets present. No strip of luminous tissue along ventral midline of viscera posterior to heart. No large round light organs on ventral surface of mantle. **Large subcutaneous patch of consolidated luminescent granules present on anterodorsal surface of mantle.** Small, individual scattered light organs (like short grains of rice) embedded in muscle of ventral surface of mantle, head and fourth arms. **Zero to 2 small suckers on the tentacular stalk proximal to the first smooth knob of the fixing apparatus.** **Colour:** very dark maroon overall, slightly lighter ventrally; dorsal midline darkest.

Habitat, biology, and fisheries: This very abundant, strong-swimming, near-surface, oceanic squid is a dominant species at the surface during dark (moonless) nights, but is distributed over a broad vertical range day and night to about 1 500 m; during periods of bright moonlight or rough seas it does not appear at the surface. With such extensive vertical and geographic ranges, the species tolerates a broad range of temperature conditions. When at the surface, it forms schools of up to about 50 similarly-sized individuals, the size of the school diminishing with increased size of individuals. The species is an important predator on fishes, cephalopods, and crustaceans. Extent and location of spawning areas are unknown. Although *Sthenoteuthis pteropus* is considered to be very abundant, no assessment of actual population size has been made. It is currently not fished commercially in the Western Central Atlantic. It congregates at night lights where it can be dip netted and caught by machine jigging or hand jigs. *S. pteropus* aggregates along the northeastern coast of Venezuela where it is fished at night by tuna baitboats (Arocha, 1989).

Size: Maximum mantle length: females 37 cm, males somewhat smaller.

Distribution: Pan-Atlantic in tropical and temperate waters; limits of distribution unknown.

Remarks: The vernacular name, orangeback flying squid, supposedly derives from the luminescent glow emitted by its dorsal patch of light organs.



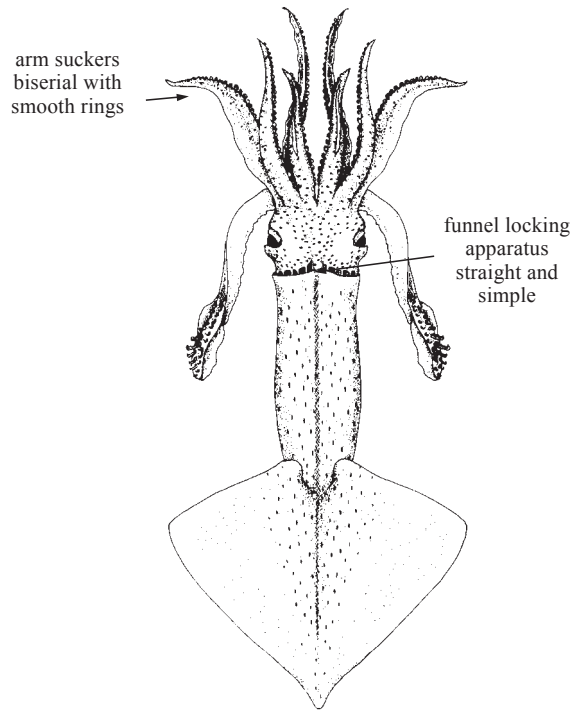
ONYCHOTEUTHIDAE

Hooked squids

Diagnostic characters: Small (ca. 15 cm mantle length) to large (ca. 150 cm mantle length), muscular squids. **Tentacle clubs with 2 rows of strong hooks** (with or without marginal suckers) on manus, **well-defined discoidal locking apparatus on the carpus**. Arm suckers biserial with smooth rings. Neck often with numerous nuchal folds. Buccal connectives attach to ventral side of ventral arms. Funnel locking apparatus straight and simple.

Habitat, biology, and fisheries: Some species are common in the open ocean (e.g., *Onychoteuthis* spp.); others live near the ocean floor along continental or island slopes (e.g., *Moroteuthis* spp.).

Remarks: Morphological characters of squids currently considered to be *Onykia banksii* are quite variable and it is likely that this “species” actually comprises a species-complex. It is also possible that some species of *Onykia* are young stages of *Moroteuthis* spp. (Kubodera et al., 1998).



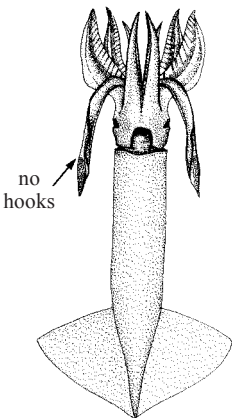
Similar families occurring in the area

Ommastrephidae: funnel locking apparatus T-shaped; tentacular clubs usually with 4, exceptionally with 8 (*Illex*) rows of suckers at tips, no hooks; buccal connectives attached to dorsal borders of ventral arms.

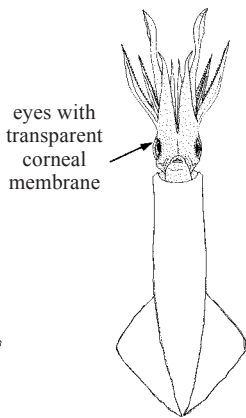
Loliginidae: eyes covered with a transparent corneal membrane; tentacular clubs with no hooks.

Enoploteuthidae and Ancistrocheiridae: hooks on arms; photophores on surfaces of head and mantle.

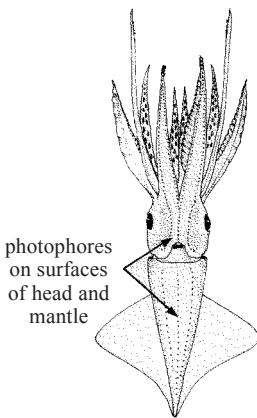
Pyroteuthidae: hooks on arms; photophores on tentacles.



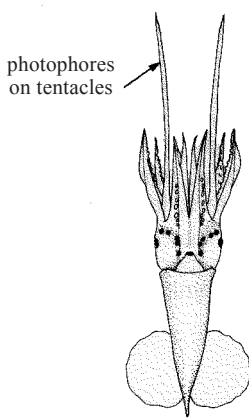
Ommastrephidae



Loliginidae



Enoploteuthidae



Pyroteuthidae

Key to the genera of Onychoteuthidae occurring in the area

- 1a.

Mantle short, cylindrical; dorsal nuchal folds absent; marginal suckers present lateral to hooks on manus of tentacular clubs; no photophores

Onykia
- 1b.

Mantle slender, tapering posteriorly, acutely pointed; dorsal nuchal folds present; no marginal suckers on manus; photogenic patch present on ventral surface of eyeball

→ 2
- 2a.

Intestinal photophores present; gladius visible along dorsal midline of mantle.

Onychoteuthus
- 2b.

No intestinal photophores; gladius not visible through dorsal mantle muscles.

Ancistroteuthis

List of species occurring in the area

- Ancistroteuthis lichtensteinii Ferussac, 1835.
- Onychoteuthis banksii (Leach, 1817).
- Onykia carriboea LeSueur, 1821.

References

Kubodera, T., U. Piakowski, T. Okutani, and M. R. Clarke. 1998. Taxonomy and zoogeography of the family Onychoteuthidae. In Systematics and Biogeography of Cephalopods, edited by N. A. Voss, M. Vecchione, R.B. Toll, and M.J. Sweeney. *Smithson. Contr. Zool.*, 586:277-291.

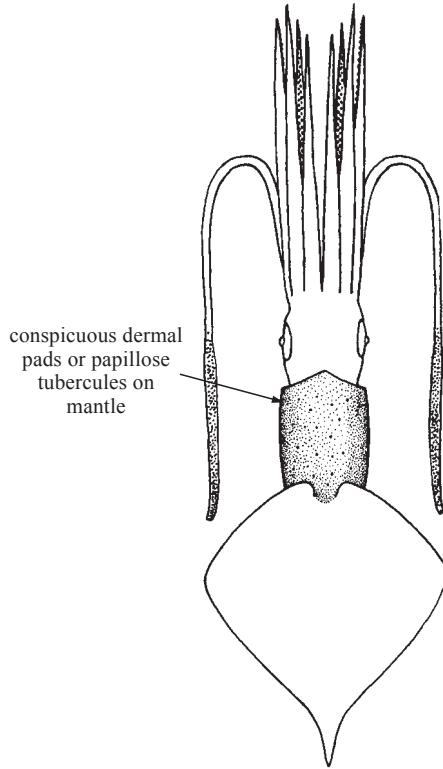
PHOLIDOTEUTHIDAE

Scaled squids

Diagnostic characters: The 2 species are large (*Pholidoteuthis boschmai*: 72 cm mantle length; *Pholidoteuthis adami*: 78 cm mantle length) but moderate to somewhat weakly-muscled squids. **Conspicuous dermal pads or papillose tubercles present on mantle.** **Tentacular clubs long, slender, only slightly expanded;** locking apparatus absent; **club suckers in 4 series, with unusual elongate apertures.** **Colour:** not distinctive.

Habitat, biology, and fisheries: In the Gulf of Mexico, *Pholidoteuthis adami* has been reported to be common (Voss, 1956) and is it fairly common in the slope water of the western North Atlantic to at least New England (Vecchione, 2001). *Pholidoteuthis boschmai* is thought to be cosmopolitan in tropical and temperate seas.

Remarks: Currently considered to be monotypic. However, the 2 species are so different from each other that generic separation is probably warranted. The species are quite different in morphology; their status as possible separate genera is currently unresolved.



Similar families occurring in the area

Lepidoteuthidae: lack tentacles.

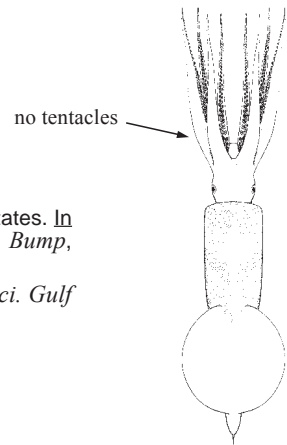
List of species occurring in the area

Pholidoteuthis adami Voss, 1956.

Pholidoteuthis boschmai Adam, 1950.

References

- Vecchione, M. 2001. Cephalopods of the continental slope east of the United States. In *Island in the Stream. Oceanography and Fisheries of the Charleston Bump*, edited by G. Sedberry. American Fisheries Society Symp. 25: 153-160.
- Voss, G.L. 1956. A review of the cephalopods of the Gulf of Mexico. *Bull. Mar. Sci. Gulf Cari.*, 6: 85-178.



Lepidoteuthidae

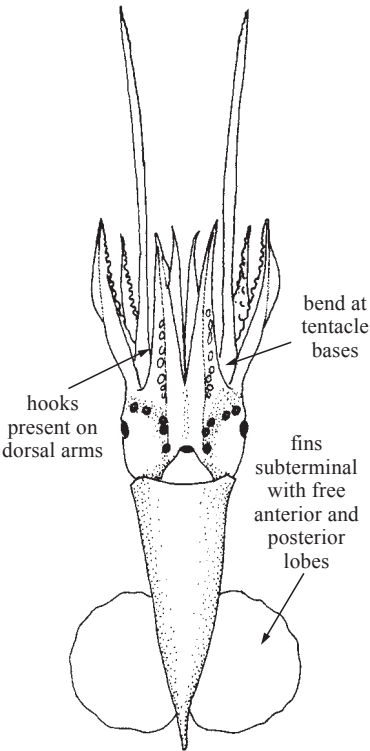
PYROTEUTHIDAE

Fire squids

Diagnostic characters: Small (23 to 50 mm mantle length) and muscular. **Hooks present on dorsal 3 arm pairs.** **Permanent constriction and bend near bases of tentacles.** **Photophores present on viscera, eyeballs and tentacles but absent from mantle, funnel, head surface and arms.** **Tail formed from strongly pointed conus of gladius, without fleshy extension beyond gladius.** **Fins subterminal with free anterior and posterior lobes.** **Colour:** not distinctive.

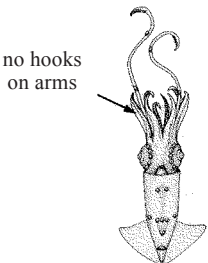
Habitat, biology, and fisheries: Occur in mesopelagic depths during the day and migrate into near-surface waters (0 to 200 m) at night. They are among the more common squids found in the midwaters of the open ocean. They are most easily recognized by the sharply pointed "tail" and fins that are separate, each with a nearly circular outline. They also have large buccal membranes with unusual attachments to the four dorsal arms and peculiar tentacle bases. The latter, presumably, increase the degree of the retraction (i.e., shortening) of the tentacles. Oviducts may be reduced or absent on 1 side (unique in the Oegopsida).

Remarks: This family was formerly considered to be a subfamily of the Enoploteuthidae.

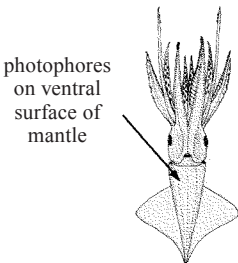


Similar families occurring in the area

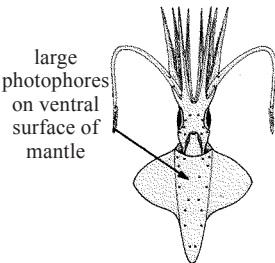
- Lycoteuthidae: have suckers (no hooks) on the arms and tentacles.
- Enoploteuthidae: have photophores on the ventral surfaces of the head and mantle.
- Ancistrocheiridae: lack photophores on the eyeballs and have large photophores on the ventral surfaces of the head and mantle.
- Octopoteuthidae: lack tentacles; none of these families have free posterior fin lobes.



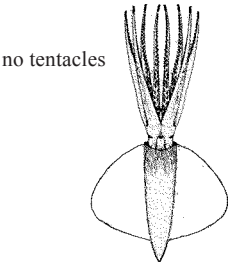
Lycoteuthidae



Enoploteuthidae



Ancistrocheiridae



Octopoteuthidae

Key to the genera of Pyroteuthidae occurring in the area

- 1a. Hooks present on tentacular clubs; 12 photophores, none of which are lidded, on eyeballs; 10 visceral photophores; 6 to 8 photophores on tentacular stalks; right ventral arm hectocotylized in males, without a tooth plate; both oviducts present in females although the right may be reduced *Pyroteuthis*
- 1b. Hooks absent on tentacular clubs; 14 or 15 photophores, 1 lidded, on eyeballs; 8 visceral photophores; 4 photophores on tentacular stalks; left ventral arm hectocotylized in males, with a tooth plate; only the right oviduct developed in females *Pterygioteuthis*

List of species occurring in the area

- Pterygioteuthis gemmata* Chun, 1908.
- Pterygioteuthis giardi* Fischer, 1896.
- Pyroteuthis margaritifera* (Ruppel, 1844).

SEPIOLIDAE

Bobtail squids

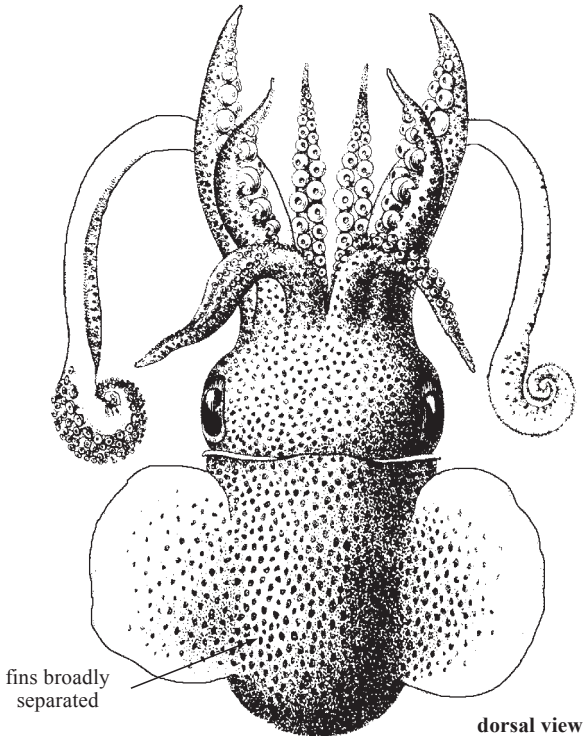
Diagnostic characters: These are small (ca. 1 to 10 cm mantle length), broad cephalopods. **Mantle short, rounded posteriorly. Fins broadly separated posteriorly, with free anterior and posterior lobes.** Gladius rudimentary or absent. Median mantle septum with strong adductor muscles present. **Eye lenses covered by cornea;** ventral eyelid present. Protective membranes absent on arms. One or both dorsal arms hectocotylized; 1 dorsolateral arm may also be modified. Lateral funnel adductor present between head and funnel at funnel locking apparatus. **Colour:** not distinctive.

Habitat, biology, and fisheries: Species of the Rossinae are benthic while those of the Heteroteuthinae are pelagic.

Remarks: This family is divided into 3 subfamilies, of which only 2 are found in the Western Central Atlantic Ocean.

Similar families occurring in the area

None, no other squid has short, rounded mantle with free anterior and posterior fin lobes and gladius rudimentary or absent.



Key to the genera of Sepioidae occurring in the area

- 1a. Anterior ventral edge of mantle extended, forming extensive ventral shield covering funnel from below; dorsal 6 arms joined by deep web (Subfamily Heteroteuthinae) → 2
- 1b. Anterior ventral edge of mantle not extended to form ventral shield, not covering funnel; dorsal and dorsolateral arms not joined by deep web (may be a shallow web) (Subfamily Rossiinae) → 3
- 2a. Suckers on distal arms with long, thick stalks (much thicker than suckers themselves); fins insert on midlateral mantle and extend beyond anterior edge of mantle *Nectoteuthis*
- 2b. Distal arm suckers on normal, thin stalks; fins insert on posterior half of mantle, not extending to anterior edge of mantle *Heteroteuthis*
- 3a. A pair of photophores present on ink sac; tentacular club suckers in 5 to 8 series; size of suckers greatly increasing on middle region of lateral arms *Semirossia*
- 3b. No photophores on ink sac; tentacular club suckers in 6 to 50 series; no greatly enlarged suckers on middle regions of lateral arms → 4
- 4a. Tentacular club expanded, not bent; club suckers in 6 to 12 (rarely to 16) series; no anal pads on sides of rectum *Rossia*
- 4b. Tentacular club narrow, often twisted and spiral; club suckers in 25 to 50 series; anal pads located on both sides of rectum *Austrorossia*

List of species occurring in the area**Subfamily Heteroteuthinae**

Heteroteuthis dispar (Rüppell, 1844).

Nectoteuthis pourtalesi Verrill, 1883.

Subfamily Rossiinae

Austrorossia antillensis Voss, 1956.

Rossia bullisi Voss, 1956.

Rossia tortugaensis Voss, 1956.

Semirossia equalis (Voss, 1956).

Semirossia tenera (Verrill, 1880).

SPIRULIDAE

Ram's horn squids

Diagnostic characters: A small (45 mm mantle length), muscular species. **Internal shell curved ventrally in open coil;** each coil round in cross-section and possessing transverse septa with a siphuncle. Arms with suckers in 4 series. Both ventral arms hectocotylized in males. Tentacular clubs with suckers in 16 series; not divided into manus and dactylus. Eyes without cornea. **Fins separate, terminal, and lie in a plane nearly transverse to body axis.** Large photophore at posterior end of body. **Colour:** not distinctive.

Habitat, biology, and fisheries: Found in mesopelagic waters of the tropical open ocean. The intact mantle is covered with regularly aligned collagen fibers that produce a silvery sheen. *Spirula* carries an unusual internal shell that is calcareous and has the shape of a horn coiled in a single plane without the coils touching one another (open planispiral). The direction of coiling is opposite that of nautilids. The shell, which retains the phragmacone and siphuncle of its distant ancestors, is used as a buoyancy device. The posterior position of the shell apparently causes the animal to generally orient vertically with the head downward. The large photophore posterior to the shell therefore would be directed upward, a very unusual situation in cephalopods and other oceanic animals.

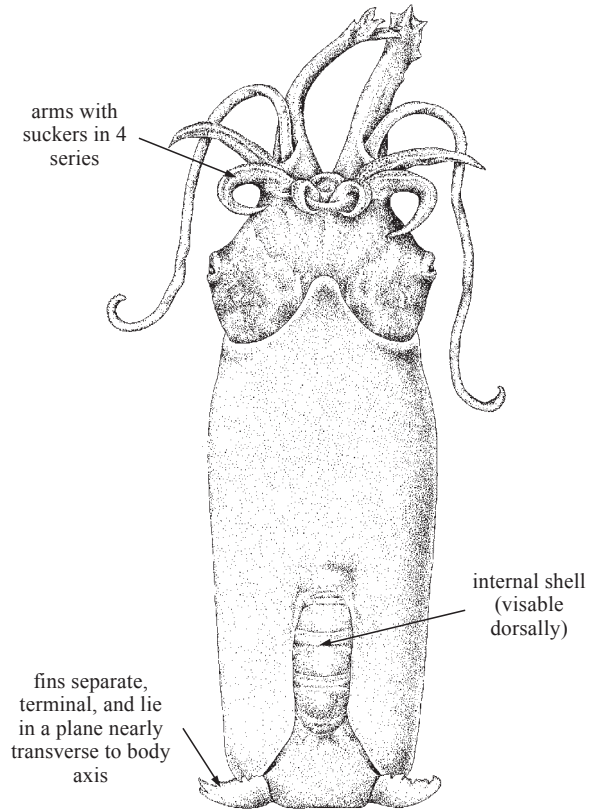
Remarks: Only a single species is known in this peculiar family.

Similar families occurring in the area

None, no other family has a shell curved ventrally in an open coil.

List of species occurring in the area

Spirula spirula (Linnaeus, 1758).



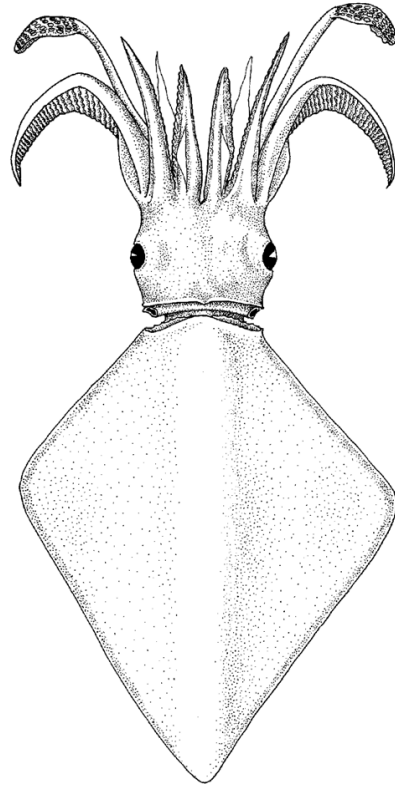
THYSANOTEUTHIDAE

Rhomboid squids

Diagnostic characters: A large, muscular squid (100 cm mantle length). **Funnel locking apparatus with grooves arranged like sidewise T (i.e., a longitudinal groove with a short lateral groove extending at approximately a right angle from the middle).** Nuchal (dorsal head-mantle) locking apparatus with two mantle hook-like knobs and opposing nuchal knobs and pits. **Fin length equals mantle length;** fins insert on sides of mantle rather than gladius. Gladius vanes project anteriorly. Tentacle clubs with four series of suckers. Arm suckers in two series. Buccal connectives attach to ventral margins of ventral arms. Photophores absent. **Colour:** not distinctive.

Habitat, biology, and fisheries: Found throughout tropical and subtropical regions of the world's oceans. It occupies near-surface waters during the night and midwaters during the day. It is often found in male plus female pairs or in small schools. It is fished commercially in the Sea of Japan and off Okinawa.

Remarks: *Thysanoteuthis rhombus* is the only species recognized in the family.



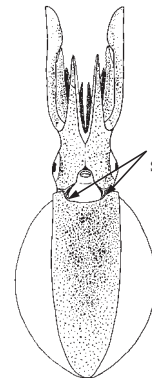
Similar families occurring in the area

Sepioteuthis sepioidea (Loliginidae): eye lens covered with clear corneal membrane (eye lens open to the sea, no covering of skin in *T. rhombus*); funnel locking apparatus simple and straight.

Other families also have species with fins extending the entire length of the mantle (e.g., Mastigoteuthidae, Ancistrocheiridae, Cycloteuthidae); all can easily be eliminated, however, by the distinctive funnel locking apparatus peculiar to the Thysanoteuthidae.

List of species occurring in the area

Thysanoteuthis rhombus Troschel, 1857.



funnel
locking
apparatus
simple and
straight

Sepioteuthis sepioidea

ALLOPOSIDAE

Diagnostic characters: Gelatinous pelagic octopods, which grow to large size. Body short, broad. Head wide; the eyes are large and the short arms are connected by a deep web. **The funnel is embedded in head tissue.** Males are much smaller than females but are relatively large (ca. 30 cm total length) compared with some other families of pelagic octopods. Females of *Haliphron atlanticus* (= *Alloposus mollis*) are very large, reaching 40 cm mantle length or a total length up to 2 m. Funnel locking apparatus with lateral folds on the funnel and corresponding grooves on the mantle. **Arm suckers mostly in 2 series but grade to single series near mouth.** Hectocotylus with papillate lateral fringes from base to spermatophore reservoir; open spermatophore groove. Water pores absent. **Colour:** not distinctive.

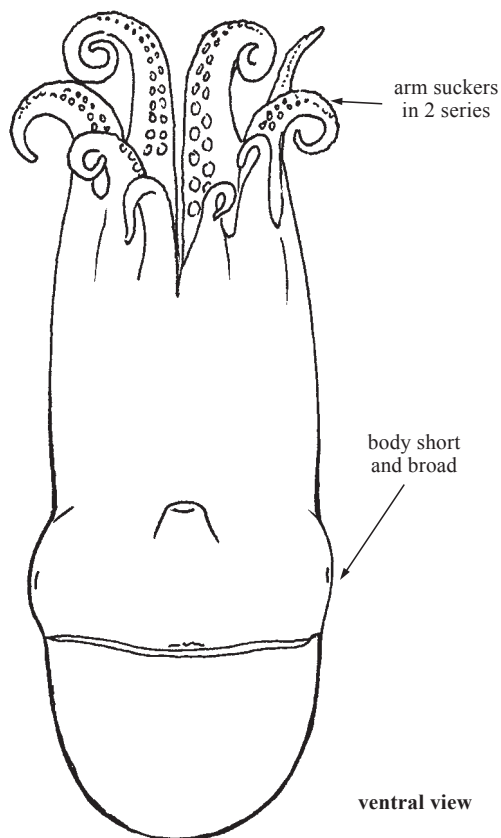
Habitat, biology, and fisheries: The hectocotylus develops in an inconspicuous sac in front of the right eye which gives the male the appearance of having only 7 arms. The hectocotylus detaches at mating. Females brood their eggs, which are attached to the oral side of the arm bases near the mouth.

Similar families occurring in the area

Other families of gelatinous, pelagic, incirrate octopods (Amphitretidae, Bolitaenidae, and Vitreledonellidae) have arm suckers in a single series. Cirrate octopods (Cirroteuthidae, Opisthoteuthidae, Stauroteuthidae) also have gelatinous muscle consistency, but possess fins as well as uniserial suckers which alternate with pairs of cirri.

List of species occurring in the area

Haliphron atlanticus Steenstrup, 1861.



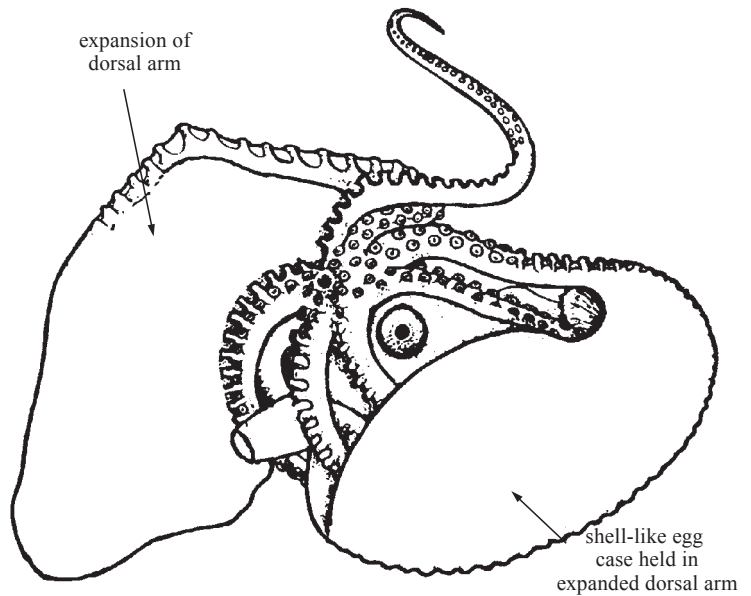
ARGONAUTIDAE

Paper nautilus

Diagnostic characters: Muscular, pelagic octopods, rather than true nautilus. Funnel-mantle locking apparatus consists of a knob and pit. Water pores absent. Mature females produce an external shell-like egg case. Females with flag-like expansion of the web of the dorsal arms that contain "shell"-secreting glands. Hectocotylus develops in a sac beneath the eye; lacks a lateral papillate fringe. **Colour:** not distinctive.

Habitat, biology, and fisheries:

The dorsal arms of females are modified with large, flag-like membranes that expand over the thin calcareous "shell" that functions as a brood chamber and in which they reside; the membranes are responsible for its secretion. The "shell" is not homologous with the true molluscan shell as it is formed by the dorsal arms of the female rather than the internal shell sac as in other coleoid cephalopods. These brood chambers may reach 30 cm diameter. Eyes are very large and intrabrachial webs very small. Males are dwarfs. The hectocotylus can detach after its release from the subocular pouch in which it forms; it is sometimes found within the mantle cavity of the female, where it appears similar to a parasitic worm. Argonauts live in tropical and subtropical surface waters of all oceans and seas. Sometimes they are found in large swarms, but only rarely are they encountered nearshore. In the open ocean argonauts are commonly found attached to jellyfish which they seem to use as a source of food and protection (Heeger, et al., 1992). Males have been reported living within salps (Banas et al., 1982).

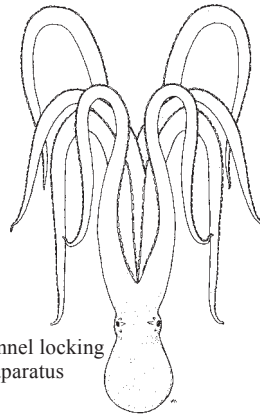


Similar families occurring in the area

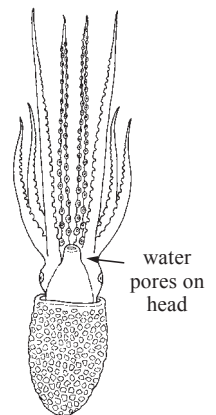
No other cephalopods produce a shell-like egg case.

Octopodidae: lack a funnel locking apparatus and males are not dwarves, nor do their hectocotyls develop in a sac.

Ocythoidae and Tremoctopodidae: have water pores on their heads; whereas male argonautids are usually hectocotylized on the left side, males of the latter 2 families are usually hectocotylized on the right; the hectocotylus pouch in ocythoids is stalked, and female tremoctopodids have an extensive web connecting the dorsal and dorsolateral arms.



Octopodidae



Ocythoididae

List of species occurring in the area

Argonauta argo Linnaeus, 1758.

Argonauta hians Lightfoot, 1786.

References

- Banas, P.T., D.E. Smith, and D. C. Biggs. 1982. An association between a pelagic octopod, *Argonauta* sp. Linnaeus 1758, and aggregate salps. *Fish. Bull. U.S.*, 80:648-650.
- Heeger, T., U. Piatkowski, and H. Möller. 1992. Predation on jellyfish by the cephalopod *Argonauta argo*. *Mar. Ecol. Prog. Ser.*, 88:293-296.

BOLITAENIDAE

Bolitaenids

Diagnostic characters: Gelatinous bodies of rather small size (about 85 mm mantle length in the largest species) and numerous chromatophores. The mantle aperture is wide. **Arms short; length less than mantle length.** Suckers in a single series. **Eyes laterally compressed.** Long axis of digestive gland parallels body axis. Stomach posterior to digestive gland. Lateral teeth of radula multicuspid (=ctenoglossan). Third right arm in *Bolitaena* hectocotylized (*Japetella* apparently lacks hectocotylization although some sexual dimorphism of arms occurs). **Mature females with a circular light organ surrounding the mouth.** **Colour:** not distinctive.

Habitat, biology, and fisheries: The large light organ that develops around the mouth in females at maturity presumably functions in attracting a male in the dark waters at depths of 1 000 m or more. This is the only luminescent organ known in incirrate octopods. Bolitaenids brood their embryos until hatching. During brooding, the eggs are held by suckers near the mouth where they are well covered by the arms and web. Common meso- to bathypelagic octopods that are broadly distributed, mostly in tropical to temperate latitudes of all oceans.

Remarks: Two, probably monotypic, genera are present in this family. The genus *Bolitaena* was described nearly 30 years before a species name, *Bolitaena microcotyla*, was appended in 1886, in a brief description. *Eledonella pygmaea*, which appears to be synonymous with *B. microcotyla*, was described by Verrill in 1884. The proper name, therefore, is *Bolitaena pygmaea*.

Similar families occurring in the area

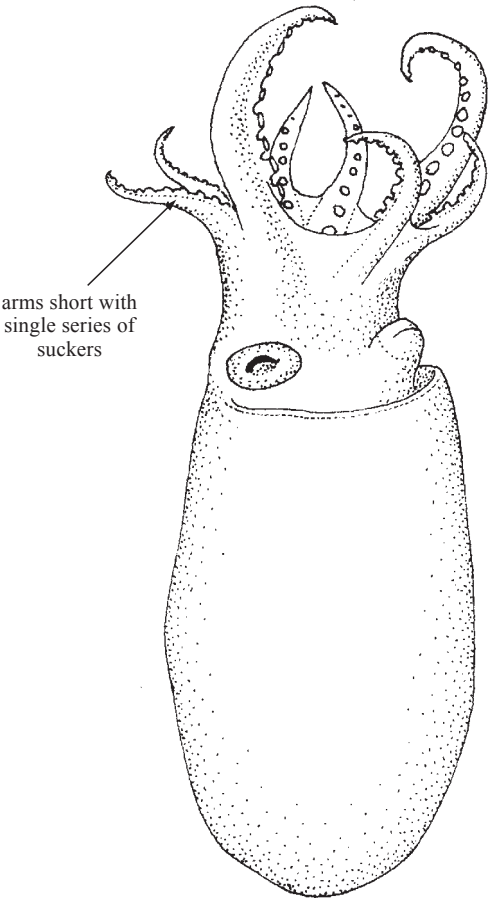
In the other gelatinous pelagic octopod families (Vitreledonellidae, Amphitretidae, and Alloposidae) the arms are longer than the mantle length. Additionally, amphitretids have tubular eyes and vitreledonellids have a greatly elongate, spindle-shaped digestive gland. The distal-most suckers on the arms of alloposids are in 2 series.

Key to the genera of Bolitaenidae occurring in the area

- 1a. Eyes well removed from brain on long optic stalks; left ventrolateral arm hectocotylized in males, with an elongate ligula *Bolitaena*
- 1b. Eyes adjacent to brain in young animals but slightly removed in older animals (optic stalks short); hectocotylus unknown *Japetella*

List of species occurring in the area

- Bolitaena pygmaea* (Verrill, 1884).
- Japetella diaphana* Hoyle, 1885.



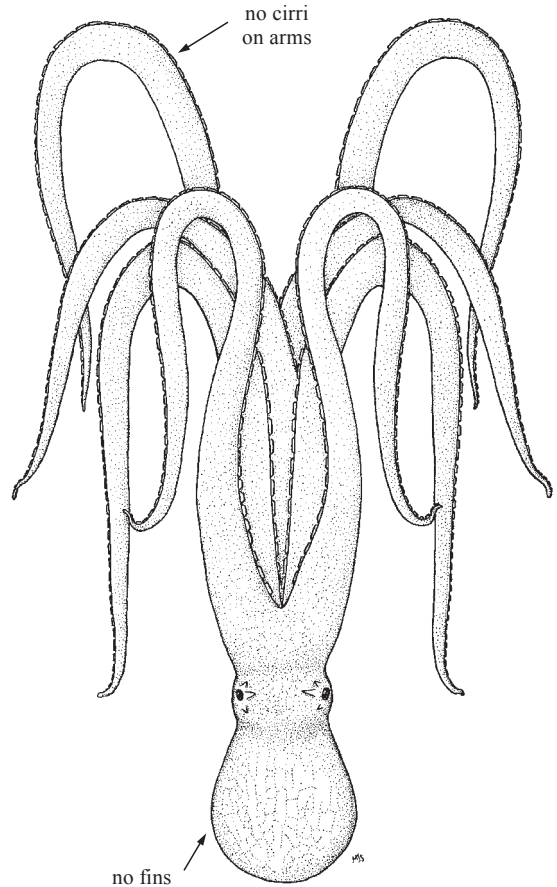
OCTOPODIDAE

Benthic octopods

Diagnostic characters: No fins; no cirri on arms. Muscle tissue of mantle and arms firm (not gelatinous, but may be covered by gelatinous subdermal layer). **Funnel locking apparatus absent.** Water pores on head absent. Stomach and caecum posterior to digestive gland. Lateral radula teeth (if present) simple, with single cusp. Mature males not very much smaller than females; with **left or right ventrolateral arm hectocotylized (not detachable; never in pocket), formed by an open sperm groove (running along ventral side of the arm) and spoon-shaped, non-filamentous tip.** Females without dorsal arm flaps or permanent reticulate sculpturing of ventral mantle. **Colour:** not distinctive.

Habitat, biology, and fisheries: The family Octopodidae is extremely rich in species. These octopods occur in all oceans and nearly all benthic marine habitats. Most lay eggs in large numbers strung together in strands and attached to a hard substrate, hidden from view of potential predators. Hatchlings either settle immediately to the bottom to take up the habitat of the adult (species with large eggs relative to adult size), or as paralarvae are planktonic for a period, during which time they drift about with the currents before settling out into the adult habitat (small-egg species). The inshore species that support current fisheries or show a potential for fisheries occur from ca. 1 to 50 m depth on sand, mud, grass flat, coral reef or reef-rubble habitats, depending on the species. Fishing activity ranges from the subsistence level using hooked poles or spears to the commercial level using trawl nets, multiple baited lines, or clay pots.

Remarks: The taxonomy of this family is the most problematic of all cephalopods. Although there is no doubt that it is a very speciose group, many species are poorly characterized. Some species currently recognized probably are synonymous with older descriptions whereas undescribed species undoubtedly exist. The genera are not well defined and subfamilies, based largely on shared-loss character states which are easily convergent, are controversial. The morphological plasticity of skin structures, colour patterns, relative arm lengths, etc. make of these characters, which are valuable when observing live animals, very difficult to use for identification of preserved octopods, which may have been fixed in various states of relaxation. Furthermore, confident identification of octopodid species often requires examination of both mature males, for hectocotylus morphology, and mature females, for egg size. For a more complete review of the species of Atlantic Octopodinae (shallow-water octopods with biserial suckers and an ink sac), see Mangold (1998) and Voss and Toll (1998).



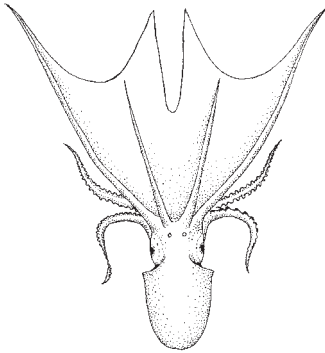
Similar families occurring in the area

Families of muscular pelagic octopods (Ocythoidae, Tremoctopodidae, Argonautidae): have a funnel locking apparatus and males are dwarves whose hectocotyli develop in sacs.

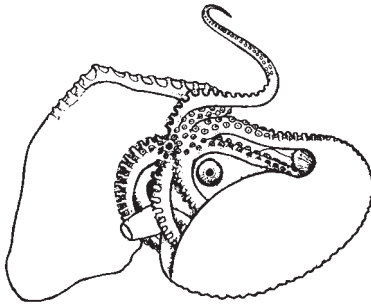
Tremoctopodidae: have water pores on both dorsal and ventral sides their heads; females have an extensive web connecting the dorsal and dorsolateral arms.

Argonautidae: females have flaps on the dorsal arms which secrete and hold a shell-like egg case.

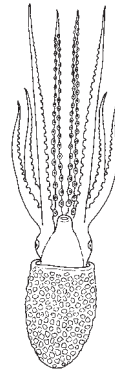
Ocythoidae: have water pores on ventral head; females have permanent reticulate sculpturing on the ventral mantle.



Tremoctopodidae



Argonautidae



Ocythoidae

Provisional key to genera and species groups occurring in the area

- 1a. Suckers in 1 series (may form zig-zag pattern when arms are contracted); star-shaped cartilaginous tubercles permanently visible on dorsal surfaces of mantle, head, arms, and 2 pairs of large supraocular cirri; funnel organ with 4 separate parts (III-shaped) *Tetracheledone*
- 1b. Suckers in 2 series; structures on dorsal surfaces of mantle, head, arms (when present) not star-shaped cartilaginous tubercles; funnel organ either V- or W-shaped → 2
- 2a. Ink sac absent → 3
- 2b. Ink sac present → 4
- 3a. Ligula of hectocotylus long (13 to 40% hectocotylized arm length), broad; arms short (1.5 to 3 times mantle length); erectile supraocular cirri present (may be difficult to see when not erect); erectile skin papillae present over dorsal surfaces of mantle, head and arms (may be difficult to see when not erect) *Bathypolypus*
- 3b. Ligula of hectocotylus short (4 to 15% hectocotylized arm length), narrow; arms long (2.5 to 6 times mantle length); erectile supraocular cirri absent; skin smooth *Benthooctopus*
- 4a. Ocellus (eye spot) present bilaterally between eye and bases of lateral arms . ocellate *Octopus* group
- 4b. No ocelli between eye and bases of lateral arms (an eye spot may be present on mantle) → 5
- 5a. Gill lamellae 12 to 14 per outer demibranch *Scaevargus*
- 5b. Gill lamellae 4 to 11 per outer demibranch → 6
- 6a. Funnel organ V shaped; mantle opening narrow, tightly surrounding funnel *Pterooctopus*
- 6b. Funnel organ W shaped; mantle opening wide → 7

- 7a.** Dorsal arms clearly longer than lateral or ventral arms → **8**
- 7b.** Dorsal arms shortest or subequal with other arms → **9**
- 8a.** Pair of dark ocelli present on dorsal mantle; arms extremely long, easily autotomized; ventral arms longer than lateral; dorsal arms not particularly stouter than other arms; 7 gill lamellae per outer demibranch *Euaxocephalus*
- 8b.** Colour pattern typically with many white spots but no ocelli on mantle; arms not easily autotomized; lateral arms longer than ventral; dorsal arms stouter than other arms; 10 or 11 gill lamellae per outer demibranch *Octopus (Callistocephalus?) macropus* group
- 9a.** Ventral arms longer than lateral arms; dark stripe along dorsal side of each arm . . . *Octopus burryi*
- 9b.** Lateral arms longer than ventral arms; no dark stripe along dorsal surface of each arm → **10**
- 10a.** Gill lamellae 4 to 8 per outer demibranch → **11**
- 10b.** Gill lamellae 9 to 11 per outer demibranch → **13**
- 11a.** Both dorsolateral and ventrolateral arms much longer and stouter than ventral or dorsal arms; medium-sized adults (10 to 12 cm mantle length) *Octopus briareus*
- 11b.** Dorsolateral arms not longer or only slightly longer and stouter than ventral arms; small adults (3 to 5 cm mantle length) → **12**
- 12a.** Wide dark transverse bands on light background over head, mantle, and arms (difficult to see in some states of preservation) *Octopus zonatus*
- 12b.** Colour variable but lacking dramatic banding pattern *Octopus joubini* group
- 13a.** Non-hectocotylied ventrolateral arms distinctly longer than dorsolateral arms; 11 gill lamellae per outer demibranch *Octopus (Macrotritopus?) defilippi* group
- 13b.** Ventrolateral arms only slightly longer than dorsolateral arms; 9 to 11 gill lamellae per outer demibranch *Octopus cf. vulgaris* group

Key to the species of ocellate *Octopus* in the area


- 1a.** Gill lamellae 5 to 9 per outer demibranch; ligula length 3 to 5% of hectocotylied arm length; egg length 1.6 to 1.8 mm; small animals (mantle length to 7 cm) *Octopus filiosus*
- 1b.** Gill lamellae 9 to 11 per outer demibranch; ligula length 1.4 to 1.9% of hectocotylied arm length; egg length ca. 17 mm; large animals (mantle length to 20 cm) *Octopus maya*

Key to the species of *Pteroctopus* in the area


- 1a.** Right ventrolateral arm of males hectocotylied; ventral arms shorter than other arms, which are subequal in length; 9 gill lamellae per outer demibranch *Pteroctopus schmidtii*
- 1b.** Left ventrolateral arm of males hectocotylied; all arms subequal in length; 9 or 10 gill lamellae per outer demibranch *Pteroctopus tetracirrhus*

List of species occurring in the area

Note: The species groups may contain 1 or more species in the area, the correct name[s] of which have not yet been resolved.


The symbol  is given when species accounts are included.

Subfamily Bathypolypodinae

 *Bathypolypus arcticus* (Prosch, 1847).

 *Benthoctopus januarii* (Hoyle, 1885).

Subfamily Eledoninae

 *Tetracheledone spinicirrus* Voss, 1955.

Subfamily Octopodinae

 *Euaxoctopus pillsburyae* Voss, 1975.

 *Octopus briareus* Robson, 1929.

 *Octopus burryi* Voss, 1950.

 *Octopus (Macrotritopus?) defilippi* group.

 *Octopus (Macrotritopus?) defilippi* Verany, 1851.


 *Macrotritopus* spp.

 *Octopus joubini* group.


 *Octopus joubini* Robson, 1929.


 ? *Octopus mercatoris* Adam, 1937 (?="large-egg *Octopus joubini* form").

 *Octopus (Callistoctopus?) macropus* group.

 *Octopus (Callistoctopus?) bermudensis* (Hoyle, 1885).

 *Octopus (Callistoctopus?) macropus* Risso, 1826.


 *Octopus* cf *vulgaris* group.

 *Octopus americanus* Orbigny, 1842 in de la Sagra, 1838-1857:Atlas [1842].


 *Octopus carolinensis* Verrill, 1884.

 *Octopus occidentalis* Steenstrup in Hoyle, 1886.


 *Octopus zonatus* Voss, 1968.


 Ocellate *Octopus* group.

 *Octopus filiosus* Howell, 1868.

 *Octopus maya* Voss and Solis Ramirez, 1966.

 *Pteroctopus schmidtii* (Joubin, 1933).

 *Pteroctopus tetracirrus* (Chiaie, 1830).

 *Scaeurus unicirrus* (Chiaie, 1839-1841).

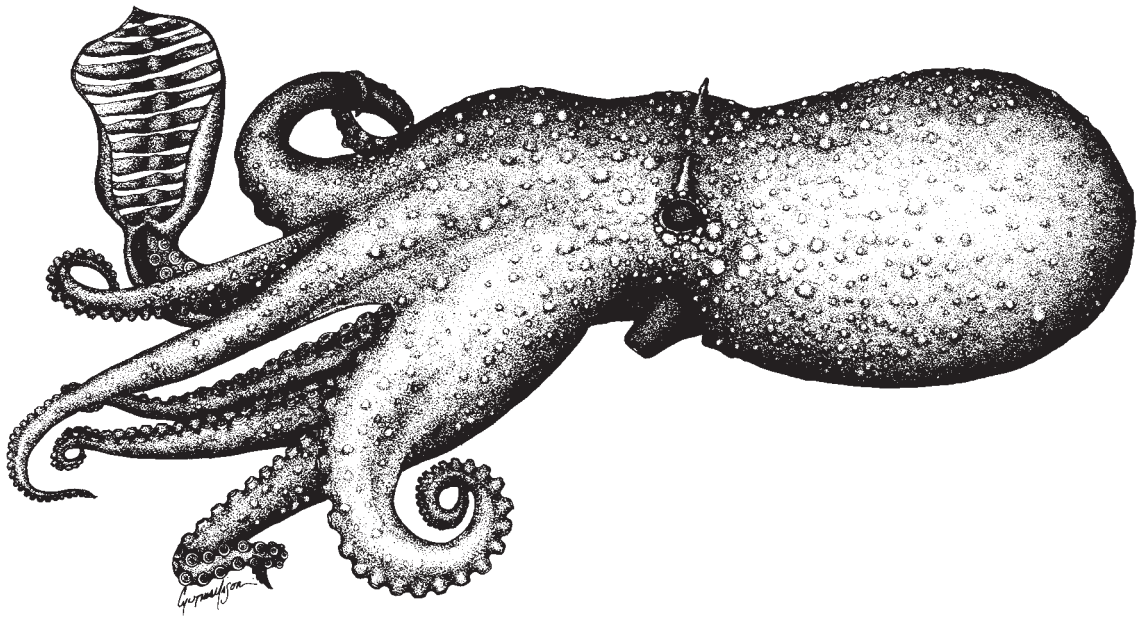
References

- Forsyth, J. and R.B. Toll. 1992. A clarification of the western Atlantic Ocean pygmy octopus complex: The identity and life history of *Octopus joubini* (Cephalopoda: Octopodinae). *Bull. Mar. Sci.*, 49:88-97.
- Hanlon, R.T., R.F. Hixon, and J.W. Forsythe. 1980. The "Macrotritopus problem" solved: *Octopus defilippi* raised from a wild-caught, pelagic macrotritopus. *Bull. Am. Malac. U.*, 1979:70.
- Mangold, K. 1998. The Octopodinae for the eastern Atlantic Ocean and the Mediterranean Sea. In *Systematics and Biogeography of Cephalopods*, edited by N. A. Voss, M. Vecchione, R. B. Toll, and M. J. Sweeney. *Smithson. Contr. Zool.*, 586:521-528.
- Norman, M. 2000. *Cephalopods. A World Guide*. Hackenheim, Germany, Conchbooks, 320 p.
- Roper, C.R.E., M.J. Sweeney, and C.E. Nauen. 1984. Cephalopods of the world. An annotated and illustrated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, 125(3):277 p.
- Solis-Ramirez, M. 1997. *Octopus maya*: Biology and fishery in Mexico. In *Proceedings of the Workshop on the Fishery and Market Potential of Octopus in California*, edited by M.A. Lang and F.G. Hochberg. Smithsonian Institution, Washington, D.C., pp. 105-113.
- Sweeney, M.J. and C.F.E. Roper. 1998. Classification, type localities, and type repositories of Recent cephalopods. In *Systematics and Biogeography of Cephalopods*, edited by N. A. Voss, M. Vecchione, R.B. Toll, and M.J. Sweeney. *Smithson. Contr. Zool.*, 586:561-599.

Bathypolypus arcticus (Prosch, 1847)

Frequent synonyms / misidentifications: *Octopus bairdii* Verrill, 1881, *Bathypolypus lentus* (Verrill, 1880) / *Octopus* sp.

FAO names: **En** - Spoonarm octopod; **Fr** - Poulpe boreal; **Sp** - Pulpito violáceo.



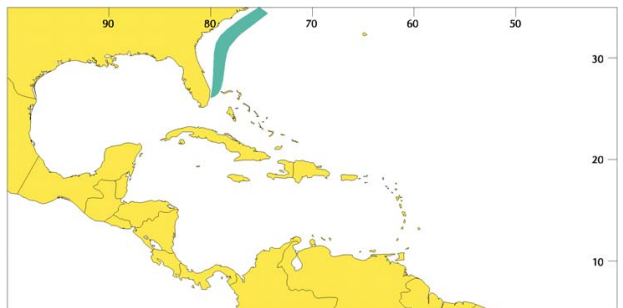
Diagnostic characters: Suckers in 2 series. Funnel organ W-shaped. Ink sac absent. **Ligula of hectocotylus long (13 to 40% hectocotylized arm length), broad; arms short (1.5 to 3 times mantle length); erectile supraocular cirri present** (may be difficult to see when not erect); **erectile skin papillae present over dorsal surfaces of mantle, head and arms** (not star-shaped cartilaginous tubercles; may be difficult to see when not erect). Gill filaments 7 or 8 per outer demibranch. **Colour:** not distinctive.

Size: To 10 cm mantle length.

Habitat, biology, and fisheries: Although found in shallow Arctic and boreal waters, in the Western Central Atlantic, this is a continental-slope species. Lives on muddy bottoms in cold water. Slow-moving and slow-growing, potentially living for several years. Females lay 10 to 110 large eggs which hatch as benthic young.

Distribution: Greenland and Spitsbergen to Florida Straits and British Isles.

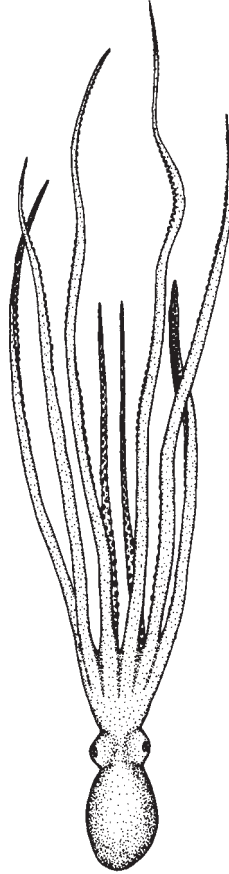
Remarks: Controversy exists over whether *B. arcticus* is a distinct species from *Bathypolypus bairdii* (Verrill). If the species are separate, then the latter name is correct for the species in the current area.



Benthoctopus januarii (Hoyle, 1885)

Frequent synonyms / misidentifications: None / *Octopus* sp.

FAO names: **En** - January octopod; **Fr** - Poulpe filamenteux; **Sp** - Pulpo filamentoso.



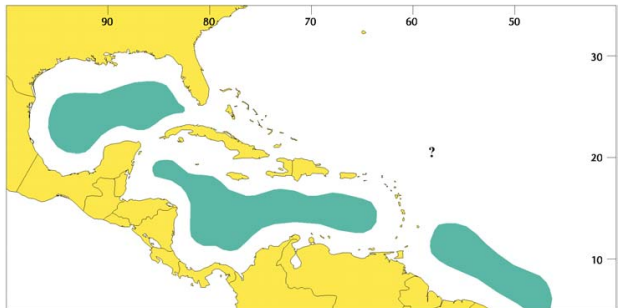
Diagnostic characters: Suckers in 2 series. Ink sac absent. **Ligula of hectocotylus short (4 to 15% hectocotylized arm length), narrow; arms long (2.5 to 6 times mantle length). Erectile supraocular cirri absent; skin smooth.** Gill filaments 7 or 8 per outer demibranch. **Colour:** not distinctive.

Size: To 7 cm mantle length.

Habitat, biology, and fisheries: A deep-living species occurring between 400 and 750 m depth, perhaps deeper, on mud bottoms.

Distribution: Gulf of Mexico, Caribbean Sea, tropical Atlantic Ocean south to 10°S.

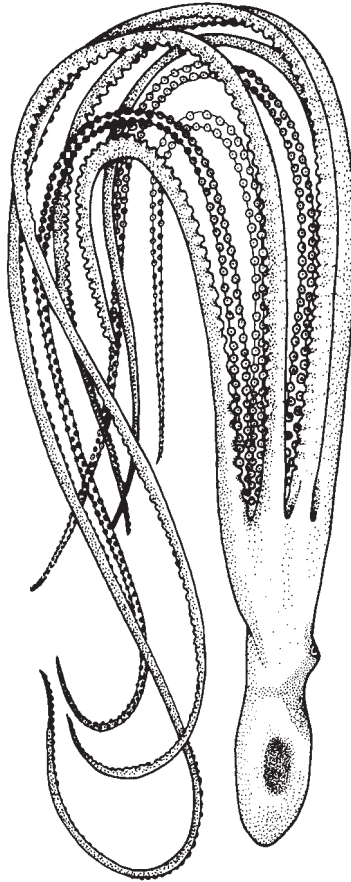
Remarks: Taxonomy of the genus *Benthoctopus* is particularly confused. Many species have been described, including almost all bathyal and abyssal octopods with biserial suckers. Because of the likelihood of convergent evolutionary loss of character states in the deep-sea benthos, relationships among these forms lumped together as *Benthoctopus* are uncertain. Furthermore, many of the species are poorly characterized and their type specimens are either in poor condition or missing.



Euaxoctopus pillsburyae Voss, 1975

Frequent synonyms / misidentifications: None / *Macrotritopus defilippi* Verany, 1851.

FAO names: En - Map octopod; Fr - Poulpe lierre; Sp - Pulpo lampazo.

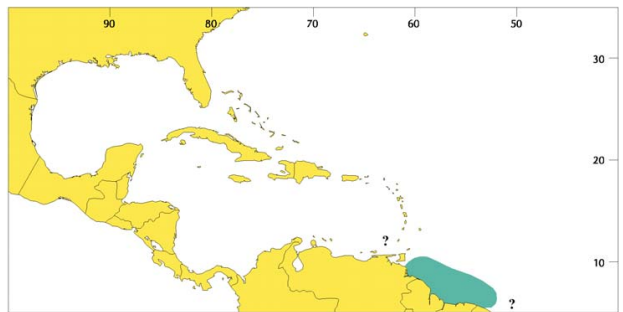


Diagnostic characters: Suckers in 2 series. Funnel organ W-shaped. Ink sac present. **Pair of dark 'eye spots' present on dorsolateral mantle**; no ocelli between eye and bases of lateral arms. **Arms extremely long** (about 90% of total length), easily autotomized; **ventral arms longer than lateral**; dorsal arms usually longest but not particularly stouter than other arms. Seven gill lamellae per outer demibranch. **Colour:** not distinctive.

Size: About 3 cm mantle length, total length to 20 cm.

Habitat, biology, and fisheries: Found at depths of 20 to 60 m on continental shelf.

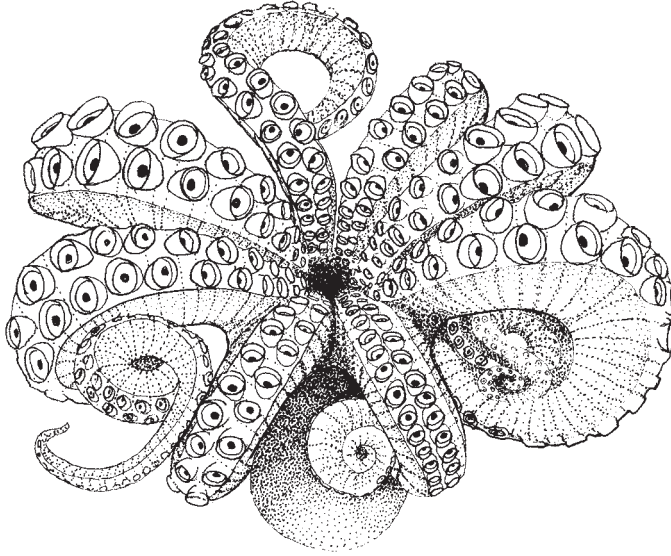
Distribution: Southern Caribbean Sea and coast of Guyanas.



***Octopus briareus* Robson, 1929**

Frequent synonyms / misidentifications: None / *Octopus vulgaris* (Cuvier, 1797), *Octopus burryi* Voss, 1850.

FAO names: **En** - Caribbean reef octopus; **Fr** - Poulpe ris; **Sp** - Pulpo de arricife.



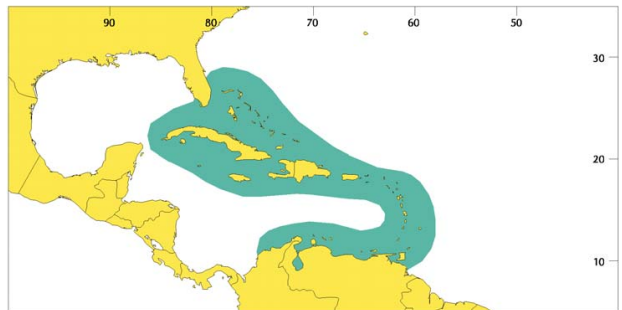
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Funnel organ W-shaped. Ink sac present. No ocelli between eye and bases of lateral arms. Gill lamellae 6 to 8 per outer demibranch. Mantle opening wide. **Dorsal arms shortest; both dorsolateral and ventrolateral arms much longer and stouter than ventral or dorsal arms.** Medium-sized adults (10 to 12 cm mantle length). **Colour:** not distinctive.

Size: To 12 cm mantle length. Total length to 100 cm.

Habitat, biology, and fisheries: Occurs in very shallow, warm waters of coral reefs, rocky and sandy bottom and grass flats. Life span about 1 year; spawning season December to March; males die after mating, females die after brooding eggs (about 500 in small clusters). Hatchlings are large, benthic. Adults feed on crabs, shrimps, and molluscs. No large-scale commercial fisheries, but extensive local and subsistence fisheries throughout its range. Caught from holes by hooks on poles; speared over open bottom; trapped in clay pots. Used fresh for food and for bait.

Distribution: Warm waters of the western North Atlantic; southeastern USA, southern Gulf of Mexico, the Bahamas, Caribbean Islands and northern South America to Guyanas.

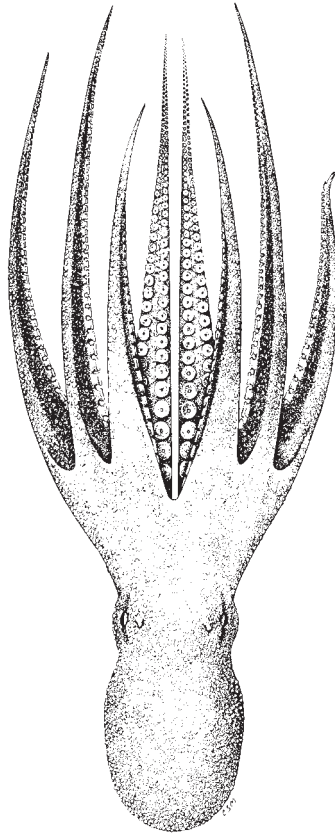
Remarks: This large-eyed, shallow-water octopod emerges at night to feed using its long arms and deep webs to enclose coral heads and areas of rubble. During the day this species hides in holes in corals, rocks, or sponges.



***Octopus burryi* Voss, 1950**

Frequent synonyms / misidentifications: *Octopus vincenti* Pickford, 1955 / *Octopus vulgaris* Cuvier, 1797, *Octopus briareus* Robson, 1929.

FAO names: **En** - Caribbean armstripe octopod; **Fr** - Poulpe à rayures bleues; **Sp** - Pulpo granuloso.



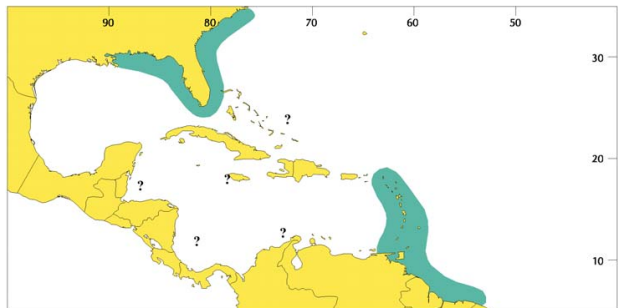
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Ink sac present. No ocelli between eye and bases of lateral arms. **Gill lamellae 8 to 11 per outer demibranch.** Funnel organ W-shaped. Mantle opening wide. **Dorsal arms shortest; ventral arms longer than lateral arms.** Dark stripe present along entire length of dorsal side of each arm. **Colour:** not distinctive.

Size: To 8 cm mantle length. Total length to 23 cm.

Habitat, biology, and fisheries: A continental-shelf species, associated with bottoms of sand, seagrass, seaweed, broken coral, and shells at depths of 10 to 200 m. It emerges mainly at dusk and dawn to feed.

Distribution: Cape Hatteras to northern Brazil. A similar, possibly identical species is found in tropical waters off west Africa.

Remarks: Live and well-fixed animals are most easily recognized by the stripe of dark brown or purple along the dorsal side of the arms at the bases of the suckers.

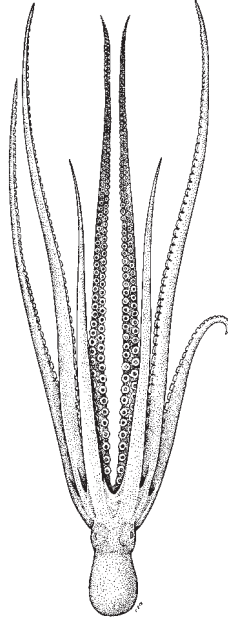


Octopus (Macrotritopus?) defilippi group

Nominal species included locally: *Octopus (Macrotritopus?) defilippi* Verany, 1851, *Macrotritopus* spp.

Frequent synonyms/misidentifications: See remarks below / *Euaxoctopus pillsburyae* Voss, 1975.

FAO names: **En** - Atlantic longarm octopod; **Fr** - Poulpe à longs bras; **Sp** - Pulpito patilargo.



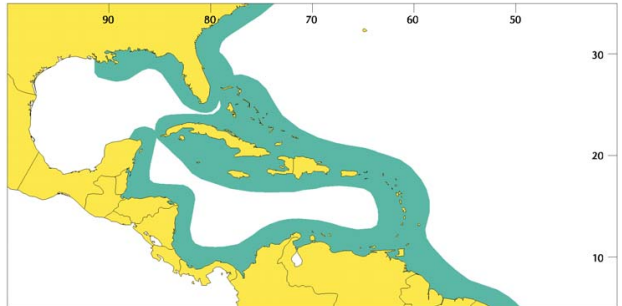
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Ink sac present. No ocelli between eye and bases of lateral arms. **Eleven gill lamellae per outer demibranch.** Funnel organ W-shaped. Mantle opening wide. **Dorsal arms shortest; lateral arms longer than ventral arms; non-hectocotylied ventrolateral arms distinctly longer than dorsolateral arms.** **Colour:** not distinctive.

Size: To 9 cm mantle length. Total length to about 40 cm.

Habitat, biology, and fisheries: Found on sandy to muddy bottoms, usually from 6 to 60 m depth but occasionally reported to 200 m. The very long arms can be autotomized. Females lay over 10 000 small eggs which hatch into planktonic paralarvae with distinctive elongate ventrolateral arms.

Distribution: In Western Central Atlantic Ocean, from Florida to Brazil, including Gulf of Mexico, Caribbean Sea, and Bahama Islands.

Remarks: *Octopus defilippi* Verany, 1851 was originally described from the Mediterranean Sea. Hanlon et al. (1980) showed that the unusual paralarvae, originally described as the genus *Macrotritopus* Grimpe, developed in the Caribbean into the species referred to *Octopus defilippi*. Voss and Toll (1998) and Voight (1998) refer to this species and its synonyms as *Macrotritopus defilippi*, with the annotation that Toll (MS) will place *O. defilippi* into the synonymy of *Macrotritopus*. This nomenclatural action has not yet been published. They further noted that the synonymy of the Caribbean species with the original Mediterranean species is not established. In the same publication as Voss and Toll (1998), Mangold (1998) and Sweeney and Roper (1998) list the species as *Octopus defilippi*. Other authors (e.g., Norman, 2000) refer to the Caribbean species as *Octopus 'defilippi'*.

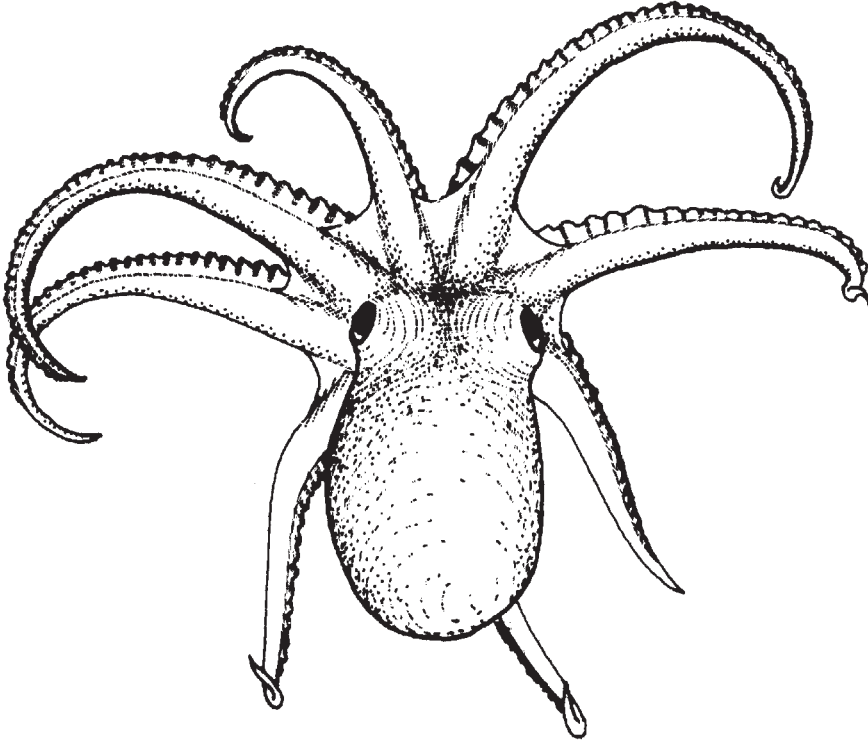


***Octopus joubini* group**

Nominal species included locally: *Octopus joubini* Robson, 1929, *Octopus mercatoris* Adam, 1937 (? = "large-egg *Octopus joubini* form")

Frequent synonyms / misidentifications: See remarks below / *Octopus vulgaris* group.

FAO names: En - Atlantic pygmy octopod; Fr - Poulpe pigmé; Sp - Pulpo pigmeo.



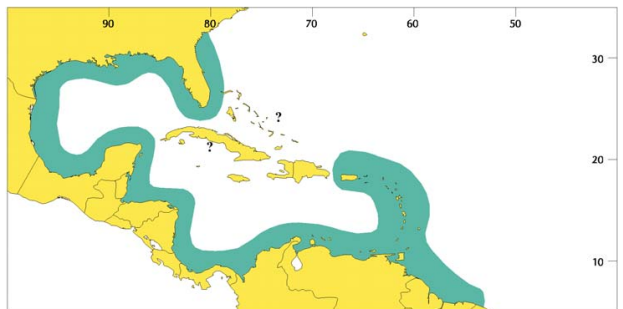
Diagnostic characters: Suckers in 2 series; structures on dorsal surfaces of mantle, head, arms (when present) not star-shaped cartilaginous tubercles. Ink sac present. No ocelli between eye and bases of lateral arms. **Gill lamellae 4 to 7 per outer demibranch.** Funnel organ W-shaped. **Arms subequal in length.** **Colour:** variable but lacking dramatic banding pattern.

Size: To 6 cm mantle length. Total length to 15 cm.

Habitat, biology, and fisheries: The 'large-egg' form (see remarks below) occurs in shallow water on sandy, coral and rubble bottoms to depths of about 80 m. Frequently hides in empty bivalve shells.

Distribution: Tropical western Atlantic and adjacent waters from Florida to the Guyanas.

Remarks: Two pygmy species with very similar adult morphology are present sympatrically in the area. The primary difference between the species is relative egg size, and therefore paralarval ecology. Although the name *Octopus joubini* has been widely used for the large-egg form, Forsythe and Toll (1992) argued that the name properly belongs to the small-egg form. According to Voss and Toll (1998), the large-egg form, for which the biology is much better known, may be attributable to *Octopus mercatoris*, but this has not yet been firmly established.

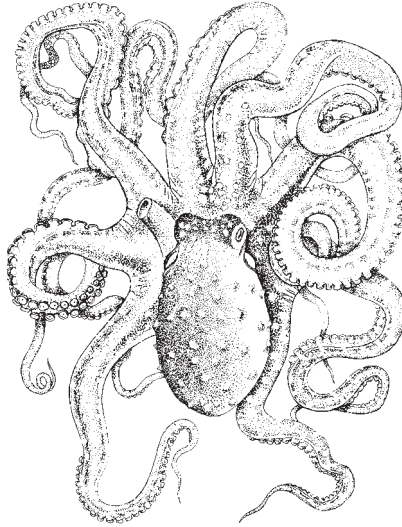


***Octopus (Callistoctopus?) macropus* group**

Nominal species included locally: *Octopus (Callistoctopus?) bermudensis* (Hoyle, 1885), *Octopus (Callistoctopus?) macropus* Risso, 1826.

Frequent synonyms / misidentifications: See remarks below / *Octopus vulgaris* Cuvier, 1797.

FAO names: **En** - Atlantic white-spotted octopod; **Fr** - Poulpe tacheté; **Sp** - Pulpo manchado.



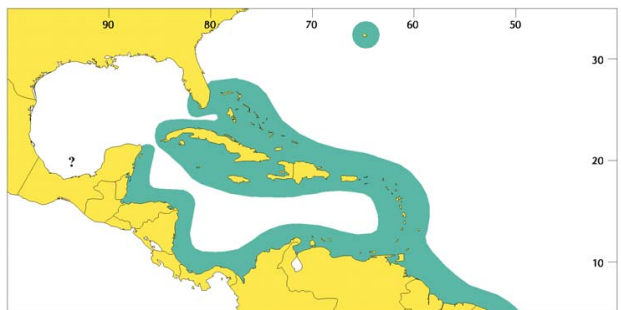
Diagnostic characters: Suckers in 2 series; structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Funnel organ W-shaped. Ink sac present. **Dorsal arms clearly longer and stouter than lateral or ventral arms; lateral arms longer than ventral;** arms not easily autotomized. No ocelli between eye and bases of lateral arms. Gill lamellae 10 or 11 per outer demibranch. Mantle opening wide. **Colour:** typically with many white spots but no 'eye spots' on mantle.

Size: To 13 cm mantle length. Total length to 93 cm. Weight to 2 kg.

Habitat, biology, and fisheries: Found on sand and rubble bottoms; capable of burying in sand. Active at night. Feeds on crustaceans, molluscs, and occasionally fishes. Spawning season in western Atlantic from winter to early spring; hatchlings planktonic.

Distribution: In tropical western Atlantic region, throughout the Caribbean and northern coasts of South America; Bermuda. See remarks below.

Remarks: Whereas *Octopus macropus* was once reported to be distributed widely around the world (e.g., Roper et al., 1983), such widespread reports are now considered to represent a species complex. As with several other *Octopus* species groups in the Western Central Atlantic, *O. macropus* was originally described from the Mediterranean Sea; whether the western Atlantic form is conspecific has not yet been firmly established. A very similar species, *Octopus bermudensis*, was described from Bermuda but, as noted by Voss and Toll (1998), the status of this species in the the synonymy of *O. macropus* is not certain. Voss and Toll (1998) and Voight (1998) listed *O. macropus* and its presumed synonyms as belonging to the genus *Callistoctopus*, but in the same publication Mangold (1998) and Sweeney and Roper (1998) retained these white-spotted octopods within the genus *Octopus*. Voss and Toll (1998:461) stated that "Toll (MS) will place *O. macropus* and *O. bermudensis* into *Callistoctopus*." That nomenclatural action has not yet been published.

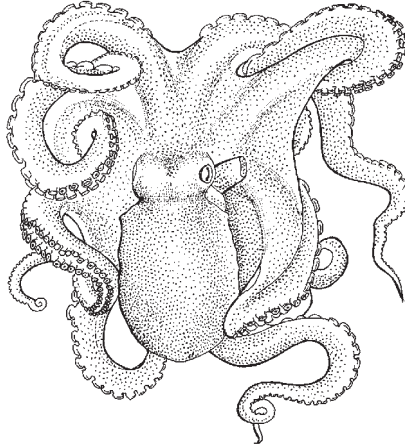


***Octopus cf. vulgaris* group**

Nominal species included locally: *Octopus americanus* Orbigny, 1842 in de la Sagra, 1838-1857:Atlas [1842], *Octopus carolinensis* Verrill, 1884, *Octopus occidentalis* Steenstrup in Hoyle, 1886.

Frequent synonyms / misidentifications: See remarks below / *Octopus briareus* Robson, 1929; *Octopus burryi* Voss, 1950.

FAO names: **En** - Common octopus; **Fr** - Pieuvre; **Sp** - Pulpo común.



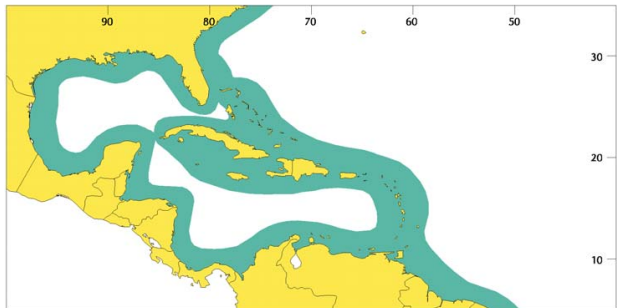
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms (when present) not star-shaped cartilaginous tubercles. Funnel organ W-shaped. Ink sac present. No ocelli between eye and bases of lateral arms. **Gill lamellae 9 to 11 per outer demibranch.** Mantle opening wide. **Dorsal arms shortest; lateral arms longer than ventral arms; ventrolateral arms only slightly longer than dorsolateral arms.** Character states to distinguish among western Atlantic species in this group await publication of redescrptions (see remarks below). **Colour:** not distinctive.

Size: To 20 cm mantle length. Total length to 1 m. Weight to 10 kg.

Habitat, biology, and fisheries: Continental shelf species found in a variety of habitats, including reefs, rocks and grass beds to depths of 200 m. Although the biology of Mediterranean *Octopus vulgaris* is quite well known, details of the biology of the western Atlantic species await resolution of the species status of the various nominal groups.

Distribution: In western Atlantic Ocean from Connecticut to southern Brazil (very rare north of Cape Hatteras), including Caribbean Sea and Gulf of Mexico.

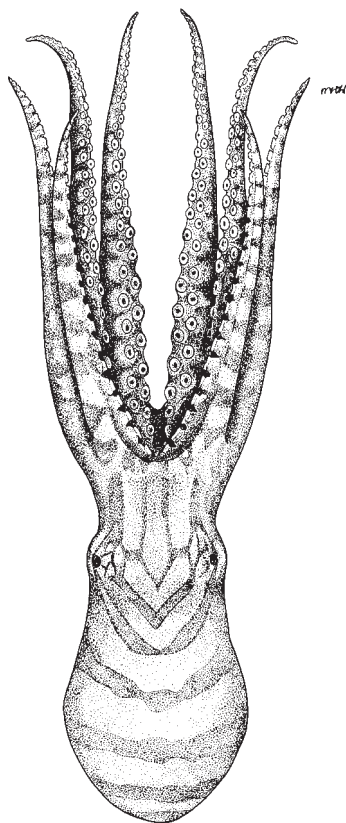
Remarks: Although *Octopus vulgaris* has been reported to be widely distributed around the world (e.g., Roper et al., 1983), cephalopod systematists have long known that these reports represent a species complex. Unfortunately, the relationships among the various populations within this complex have not yet been resolved. Norman (2000) stated that the common octopus in the western Atlantic Ocean is the most likely of the many populations worldwide to be closest to the true Mediterranean *O. vulgaris*. Voss and Toll (1998) considered *O. carolinensis* to be distinct from *O. vulgaris*, and *O. occidentalis* tentatively to be distinct. They stated that R. Toll is redescrbing *O. carolinensis*, but the redescription has not yet been published. Although Voss and Toll (1998) considered *O. americanus* Baker in Denys de Montfort (but not *O. vulgaris americanus* Orbigny) to be *nomen dubium*, they stated that (p. 460) "If the western Atlantic Ocean 'form' of *O. vulgaris* is later shown to be a distinct species...the name *O. americanus* is available pursuant to selection of a neotype..." However, the name *americanus* Baker in Denys de Montfort is not a Linnaean binomial (M.J. Sweeney, personal communication). Therefore, if the western Atlantic *O. 'vulgaris'* is indeed distinct at the species level from Mediterranean *O. vulgaris*, then *O. americanus* Orbigny is an available name for the western Atlantic species.



Octopus zonatus Voss, 1968

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Atlantic banded octopus; **Fr** - Poulpe zèbre; **Sp** - Pulpo acebrado.



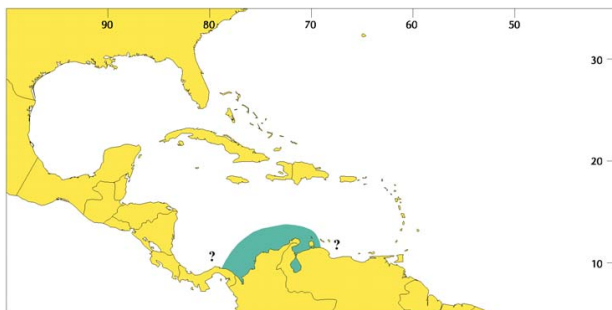
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms (when present) not star-shaped cartilaginous tubercles. Ink sac present. No ocelli between eye and bases of lateral arms. Funnel organ W-shaped. Arms subequal in length. Gill lamellae 6 or 7 per outer demibranch. Small adult size. **Colour:** wide dark transverse bands on light background over head, mantle, and arms (difficult to see in some states of preservation).

Size: To 3 cm mantle length.

Habitat, biology, and fisheries: Found in 30 to 75 m depth.

Distribution: Southern part of the Caribbean Sea.

Remarks: This species is the only banded octopod known from the western Atlantic Ocean.

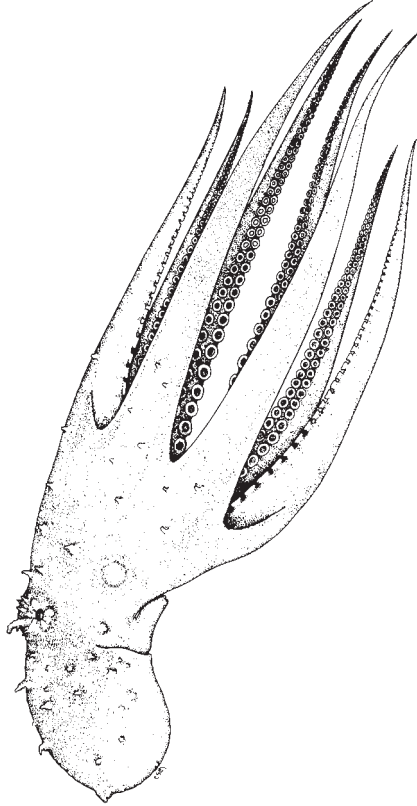


Ocellate <i>Octopus</i> group

Nominal species included locally: *Octopus filusus* Howell, 1868; *Octopus maya* Voss and Solis Ramirez, 1966.

Frequent synonyms / misidentifications: *Octopus hummelincki* Adam, 1936; *Octopus rugosus* Robson, 1929 / *Octopus maya* Voss and Solis Ramirez, 1966, *Octopus joubini* Robson, 1929.

FAO names: **En** - Bumblebee two-spot octopus; **Fr** - Poulpe bourdon; **Sp** - Pulpo abejorro.



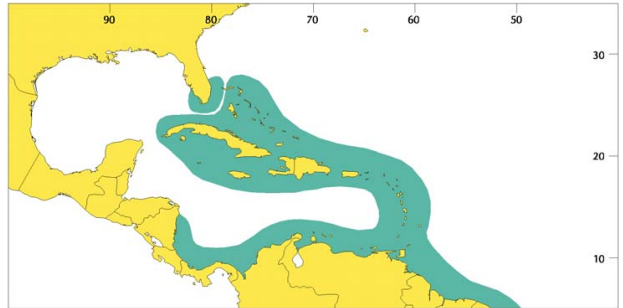
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Funnel organ W-shaped. Ink sac present. **Ocellus (“eye spot”) present on both sides between eye and bases of lateral arms; includes iridescent blue ring in the form of an unbroken chain. Gill lamellae 5 to 9 per outer demibranch.** Ligula length 3 to 5% of hectocotylized arm length. Egg length 1.6 to 1.8 mm. Small adult size.

Size: To 7 cm mantle length.

Habitat, biology, and fisheries: Occurs from very shallow waters, where it is associated with coral reefs, to 200 m depth on sand and gravel bottom. Often found among calcareous algae and shell rubble. Common on reefs in Haiti.

Distribution: Tropical western Atlantic Ocean, from Florida through the Bahama Islands and Caribbean Sea to the coast of Brazil.

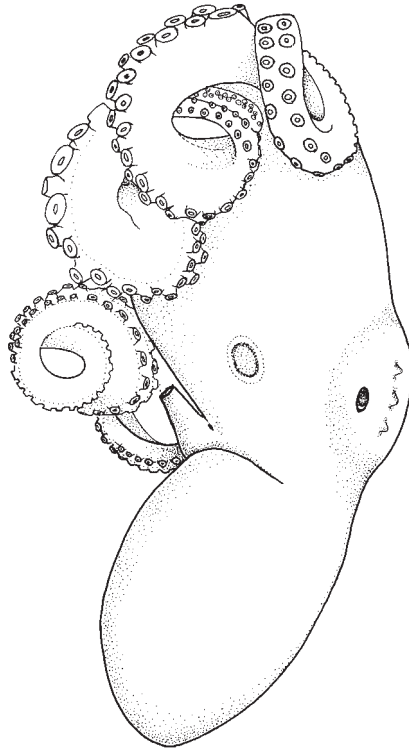
Remarks: This species is generally known by the junior synonym, *Octopus hummelincki* Adam, 1936.



Octopus maya Voss and Solis Ramirez, 1966

Frequent synonyms / misidentifications: None / *Octopus vulgaris* group.

FAO names: En - Mexican four-eyed octopus; Fr - Poulpe mexicain; Sp - Pulpo mexicano.

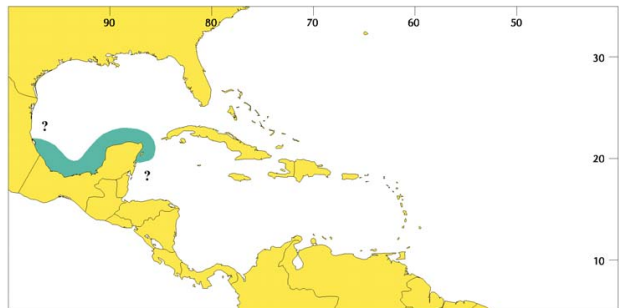


Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Funnel organ W-shaped. Ink sac present. **Ocellus ('eye spot') present on both sides between eye and bases of lateral arms; iridescent blue or blue-green ring within ocellus present only in juveniles.** Gill lamellae 9 or 10 per outer demibranch. Ligula length 1.4 to 1.9% of hectocotylized arm length; egg length ca. 17 mm. Large adult size. **Colour:** not distinctive.

Size: To 25 cm mantle length. Total length to 130 cm. Weight to 5 kg.

Habitat, biology, and fisheries: Occurs in shallow water from 1 to 50 m depth, on grassy bottom. Spawning season November and December; 1 500 to 2 000 large eggs deposited in festoons in rocky holes and empty shells; female broods the clutch; the young hatch in 50 to 65 days, large hatchlings settle immediately on the bottom; life span 1 to 2 years. Feeds on crabs (e.g. stone crab *Menippe mercenaria*), bivalve molluscs and fishes; preyed upon by grouper (Serranidae) and other fishes. Commercially fished off Campeche and Yucatán, Mexico, from June to December from small drifting boats with dipnets and 25 to 35 nylon or cotton lines trailed along the bottom, baited with crabs. Occasionally artificial lures soaked in fish oil are used, as are empty conch shells (*Strombus gigas*) and clay pots into which octopuses crawl for shelter or to lay eggs. Hooking and spearing are done in shallow water. Utilized as food and bait. May be overfished (Solis-Ramirez, 1997).

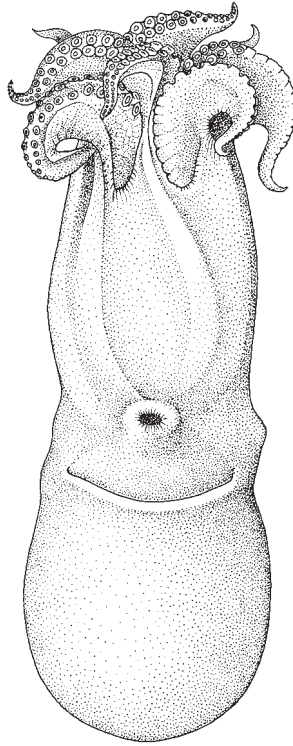
Distribution: Southern Gulf of Mexico



Pteroctopus schmidtii (Joubin, 1933)

Frequent synonyms/misidentifications: *Danoctopus schmidtii* Joubin, 1933 / None.

FAO names: **En** - Dana octopod; **Fr** - Poulpe dana; **Sp** - Pulpito monedero.



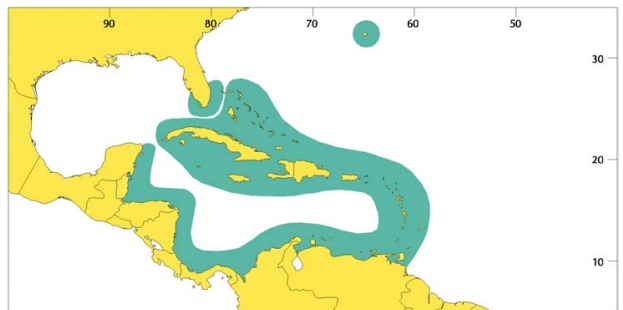
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Ink sac present. No ocelli between eye and bases of lateral arms. Nine gill lamellae per outer demibranch. **Funnel organ VV-shaped.** Mantle opening narrow. **Funnel almost entirely buried in tissue of head.** Prominent subcutaneous layer of semigelatinous tissue covers muscular mantle and arms. Ventral arms shorter than other arms, which are subequal in length. **Right ventrolateral arm of males hectocotylized.** **Colour:** not distinctive.

Size: To 4 cm mantle length.

Habitat, biology, and fisheries: A deep-water species found at depths of 300 to 1 200 m.

Distribution: Scattered records: Bermuda, Dry Tortugas, Caribbean Sea, occasionally found on the continental slope north of Cape Hatteras.

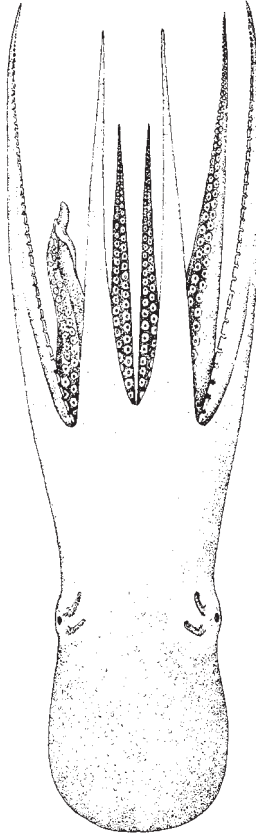
Remarks: Only immature specimens are known; may be juveniles of another named species, possibly *Pteroctopus tetracirrhus*. The 2 species differ on the side of hectocotylization and were therefore placed in separate genera, but Voss and Toll (1998) indicated that this may not be a reliable character. They reported that Toll (MS) considers *Danoctopus* to be a junior synonym of *Pteroctopus*, but Voss and Toll (1998) provisionally retained the two species as distinct. Sweeney and Roper (1998) omitted this species as well as the genus *Danoctopus*.



***Pteroctopus tetracirrhus* (Chiaie, 1830)**

Frequent synonyms / misidentifications: *Scaeurus tetracirrhus* (Chiaie, 1830) / None.

FAO names: **En** - Fourhorn octopod; **Fr** - Poulpe à quatre cornes; **Sp** - Pulpo cuatro cuernos.



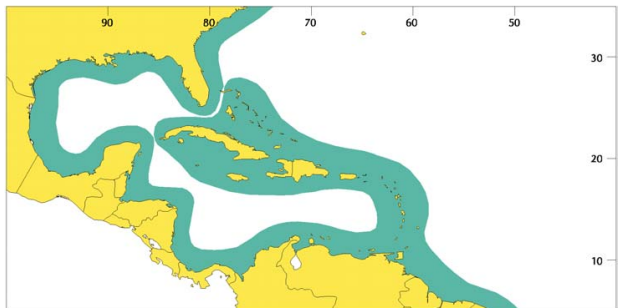
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Ink sac present. No ocelli between eye and bases of lateral arms. Gill lamellae 9 or 10 per outer demibranch. **Funnel organ VV-shaped.** Mantle opening narrow, tightly surrounding funnel. Prominent subcutaneous layer of semigelatinous tissue covers muscular mantle and arms. All arms subequal in length. **Left ventrolateral arm of males hectocotyized.** **Colour:** not distinctive.

Size: Females 13 cm mantle length; males 11 cm mantle length. Total length to 28 cm.

Habitat, biology, and fisheries: Usually found at depths of 100 to 750 m on mud bottoms.

Distribution: In western Atlantic Ocean and adjacent waters from Cape Hatteras to Uruguay. Also found in Mediterranean Sea, west coast of Africa, Azores, Cape Verde Islands.

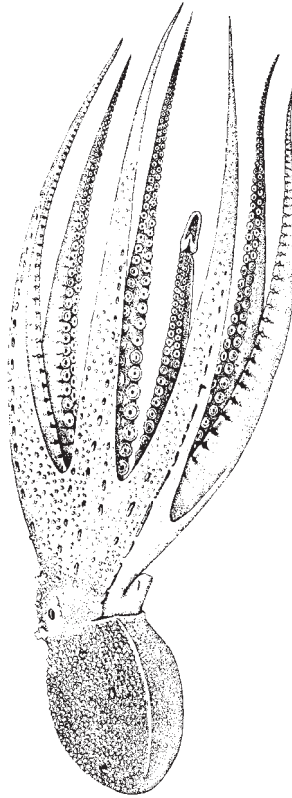
Remarks: This is another species originally described from Mediterranean waters for which the species status of the western Atlantic form has been questioned because it differs somewhat in morphometrics from those of the type locality. See also remarks under *Pteroctopus schmidtii*.



***Scaeurus unicirrhus* (Chiaie, 1839-1841)**

Frequent synonyms / misidentifications: *Octopus cocco* Vérany, 1846 / *Octopus vulgaris* Cuvier, 1797.

FAO names: **En** - Atlantic warty octopod; **Fr** - Poulpe licorne; **Sp** - Pulpo unicornio.



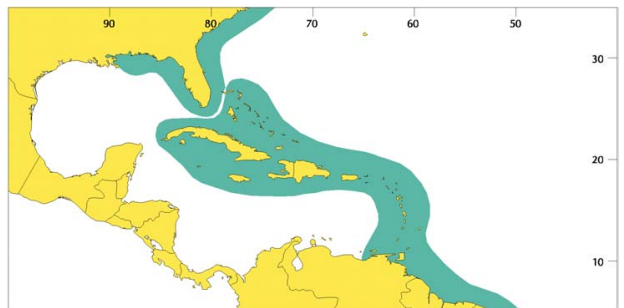
Diagnostic characters: Suckers in 2 series. Structures on dorsal surfaces of mantle, head, arms not star-shaped cartilaginous tubercles. Ink sac present. No ocelli between eye and bases of lateral arms. **Gill lamellae 12 to 14 per outer demibranch. Prominent lateral ridges on mantle.** Right ventrolateral arm of males hectocotylized. **Colour:** not distinctive.

Size: To 9 cm mantle length. Total length to 34 cm.

Habitat, biology, and fisheries: Found in 100 to 400 m depth range, occasionally to 800 m. Associated with sandy, muddy, or coralline bottoms.

Distribution: In the western Atlantic Ocean, including adjacent waters, from north of Cape Hatteras to southern Brazil. Also in the Mediterranean Sea, eastern Atlantic Ocean from Bay of Biscay to Namibia, and reported from submarine banks and tops of seamounts.

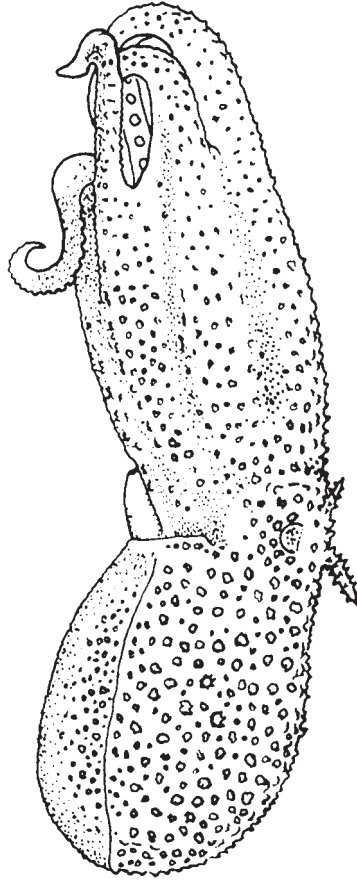
Remarks: Yet another species originally described from Mediterranean waters for which the species status of the western Atlantic form has been questioned because it differs somewhat in proportions from those of the type locality.



Tetracheledone spinicirrus Voss, 1955

Frequent synonyms / misidentifications: None / *Graneledone* sp.

FAO names: En - Spiny-horn octopod; Fr - Poulpe cornu; Sp - Pulpo cornudo.

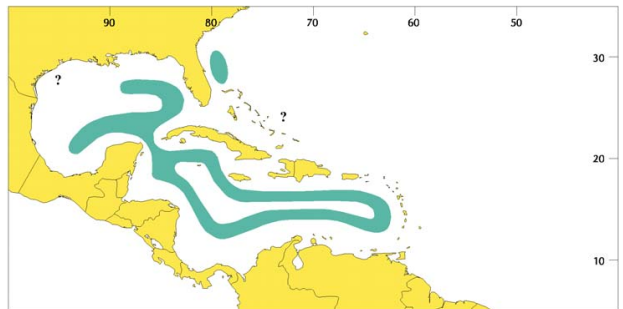


Diagnostic characters: Suckers in 1 series (may form zig-zag pattern when arms are contracted). Star-shaped cartilaginous tubercles permanently visible on dorsal surfaces of mantle, head, arms, and 2 pairs of large supraocular cirri. Funnel organ with 4 separate parts (IIII- shaped). Lateral ridge present on mantle. Gill lamellae 6 to 9 per outer demibranch. **Colour:** not distinctive.

Size: To 10 cm mantle length.

Habitat, biology, and fisheries: Occurs on mud bottoms in 200 to 400 m depth range.

Distribution: Gulf of Mexico, Straits of Florida, Caribbean Sea. Limits unknown.

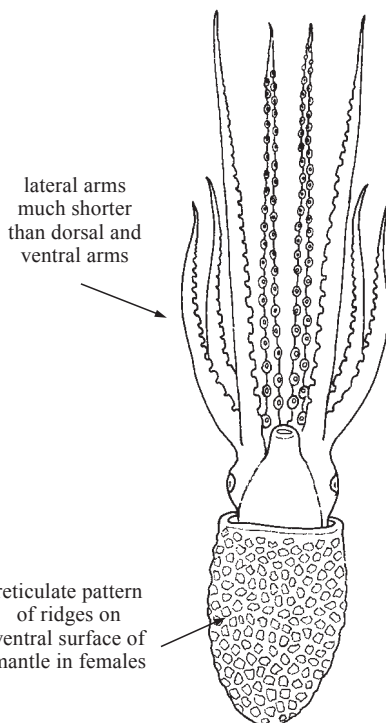


OCYTHOIDAE

Football octopods

Diagnostic characters: The females are large with mantle length up to 31 cm. Males are dwarfs with mantle length of about 3 cm. **Lateral arms much shorter than dorsal and ventral arms.** Water pores present at bases of ventral arms in both sexes. **Reticulate pattern of ridges on ventral surface of mantle in females.** **Funnel locking apparatus formed by permanent, turgid and strongly recurved corners of funnel.** Hectocotylus lacks papillate lateral fringes; contained in stalked sac extending from base of right ventrolateral arm. **Colour:** not distinctive.

Habitat, biology, and fisheries: This family contains a single recognized species found throughout the temperate latitudes of the world's oceans. This pelagic species occupies near-surface waters at least at night. The mantle is muscular and the octopod, presumably, is an excellent swimmer. Females of *Ocythoe* are the only known cephalopods with a swimbladder (Packard and Wurtz, 1994) and the only known cephalopods that give birth to live young that hatch internally (Naef, 1923). The pair of water pores leads to extensive water-filled spaces between the eyes and arms. Males are sometimes found inhabiting the tests of salps as are young females (Naef, 1923; Okutani and Osuga, 1986). Little is known about this relationship.



Similar families occurring in the area

Octopodidae: lacks a funnel locking apparatus; males are not dwarves; their hectocotyli do not develop in a sac.

Tremoctopodidae: has water pores on both dorsal and ventral sides heads; females have an extensive web connecting the dorsal and dorsolateral arms.

Argonautidae: males are hectocotylized on the left side; hectocotylus pouch not stalked; females have flaps on the dorsal arms which secrete and hold a shell-like egg case.

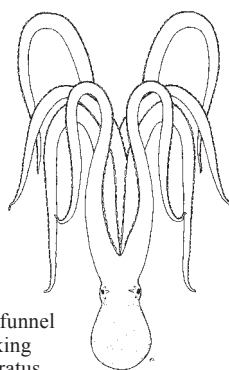
List of species occurring in the area

Ocythoe tuberculata Rafinesque, 1814.

References

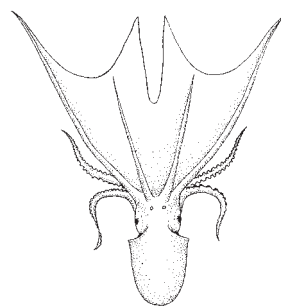
- Naef, A. 1923. Die Cephalopoden. *Fauna e Flora de Golfo di Napoli*. Monograph 35, 1(2):150-863.
- Okutani, T. and K. Osuga. 1986. A peculiar nesting behavior of *Ocythoe tuberculata* in the test of a gigantic salp, *Tethys vagina*. *Venus*, 45:67-69.
- Packard, A. and M. Wurtz. 1994. An octopus, *Ocythoe*, with a swimbladder and triple jets. *Phil. Trans. R. Soc. Lond. B*, 344:261-275.

lack a funnel locking apparatus



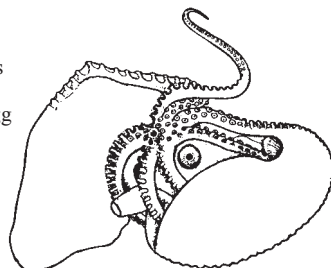
Octopodidae

extensive web between dorsal and dorsolateral arms



Tremoctopodidae

flaps on dorsal arms (holding shell-like egg case)



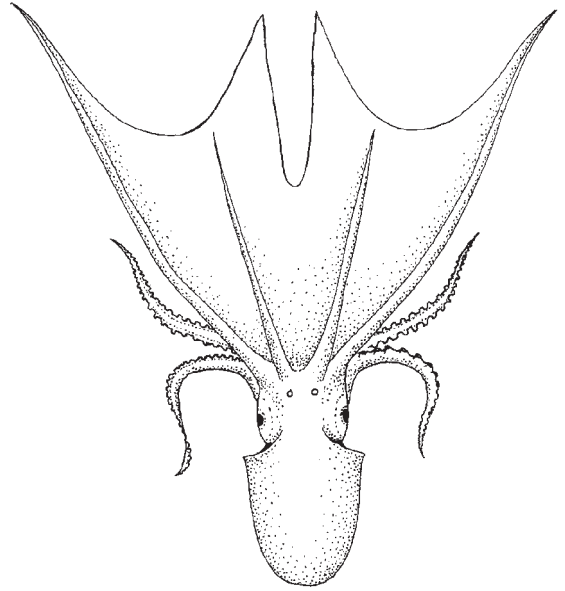
Argonautidae

TREMOCTOPODIDAE

Blanket octopods

Diagnostic characters: Females are up to 1 m in total length and are muscular. **Dorsal 4 arms much longer than ventral 4 arms; deep, thin web present between dorsal four arms. Water pores present at base of dorsal and ventral arms.** Dwarf males develop hectocotylus (right ventrolateral arm) in a pocket below the eye; proximal half of hectocotylus with papillate lateral fringes. **Colour:** not distinctive.

Habitat, biology, and fisheries: The more common species (*Tremoctopus violaceus*) occupies surface waters of tropical and subtropical oceans and seas. *Tremoctopus gelatus* is a deep-living, presumably mesopelagic, species that is cosmopolitan in tropical and temperate seas. In females of both species the dorsal and dorsolateral arms are distinctly longer than ventral and ventrolateral arms and are connected by an extensive web. Large ocelli can be displayed on the dorsal web. A web is lacking between the ventral four arms. This web and the slender tip of the arms can, apparently, be autotomized along transverse lines that are visible on the web. Young individuals carry broken tentacles of the Portuguese man-of-war siphonophore between the suckers of the dorsal arms (Thomas, 1977).

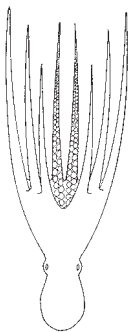


Similar families occurring in the area

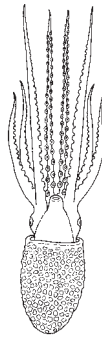
Octopodidae: lack a funnel locking apparatus and males are not dwarves, nor do their hectocotyli develop in a sac.

Ocythoidae: have water pores only on the ventral sides their heads.

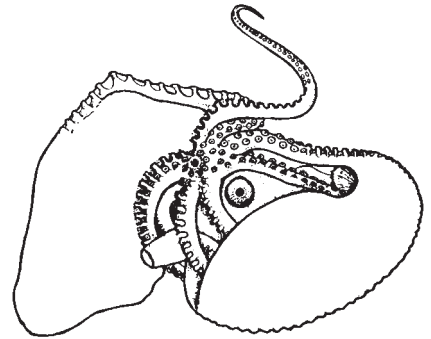
Male argonautids: are usually hectocotylized on the left side and female argonautids have flaps on the dorsal arms which secrete and hold a shell-like egg case.



Octopodidae



Ocythoidae



Argonautidae

List of species occurring in the area

- Tremoctopus gelatus* Thomas, 1977.
Tremoctopus violaceus Chiaie, 1830.

Reference

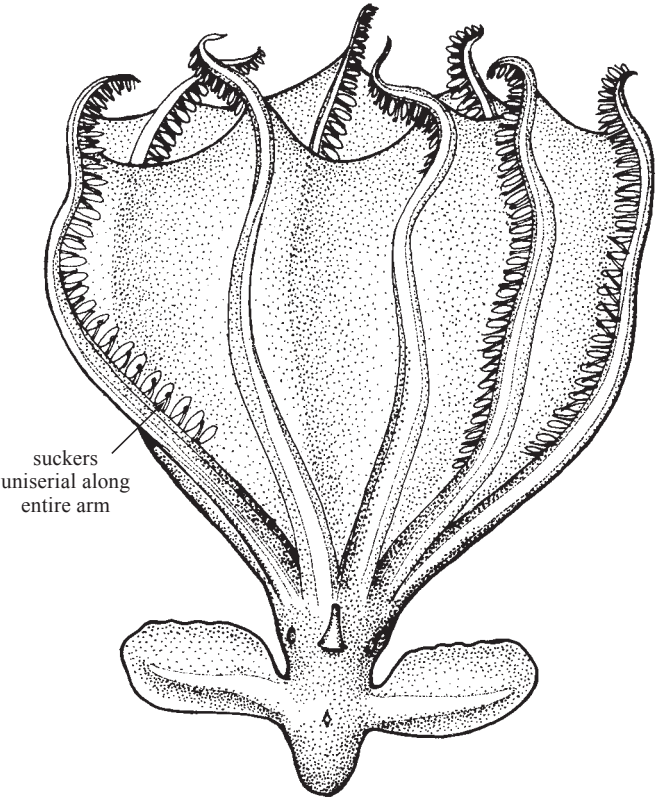
- Thomas, R.F. 1977. Systematics, distribution, and biology of cephalopods of the genus *Tremoctopus* (Octopoda: Tremoctopodidae). *Bull. Mar. Sci.*, 27:353-392.

CIRROTEUTHIDAE

Cirroteuthids

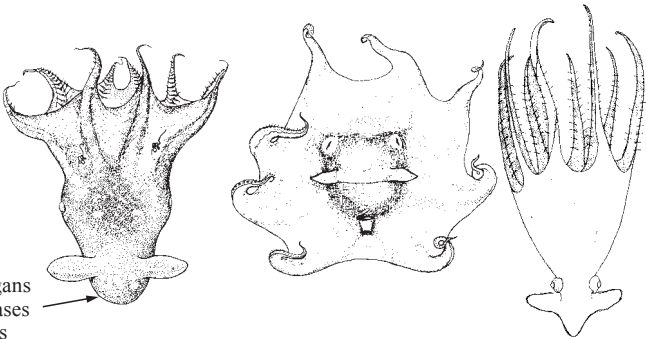
Diagnostic characters: **Fins present. Cirri on arms.** Suckers uniserial along entire arm. No filamentous appendages in pouches between bases of dorsal and dorsolateral arms. No light organ at base of each fin. **Contractile intermediate membrane (secondary web) present between each arm and the primary web.** **Shell (cartilaginous fin support) complex, with expanded fin-attachment areas (saddle-shaped).** **Gills sepioid.** **Colour:** not distinctive.

Habitat, biology, and fisheries: Species in the family are entirely pelagic and have a very fragile, gelatinous structure and small to degenerate eyes. They are usually found at great depths (greater than 1 000 m). No interest to fisheries.



Similar families occurring in the area

Vampyroteuthidae: lack suckers along the proximal arms, have filamentous appendages in pouches between the dorsal and dorsolateral arms, and light organs at the bases of the fins; the primary web is attached directly to the arms in opisthoteuthids, the gills have a 'half-orange' appearance, and the shell is a simple U-shape; in stauroteuthids the shell is also a simple U-shape.



List of species occurring in the area

Cirroteuthis sp.

Vampyroteuthidae

Opisthoteuthidae

Stauroteuthidae

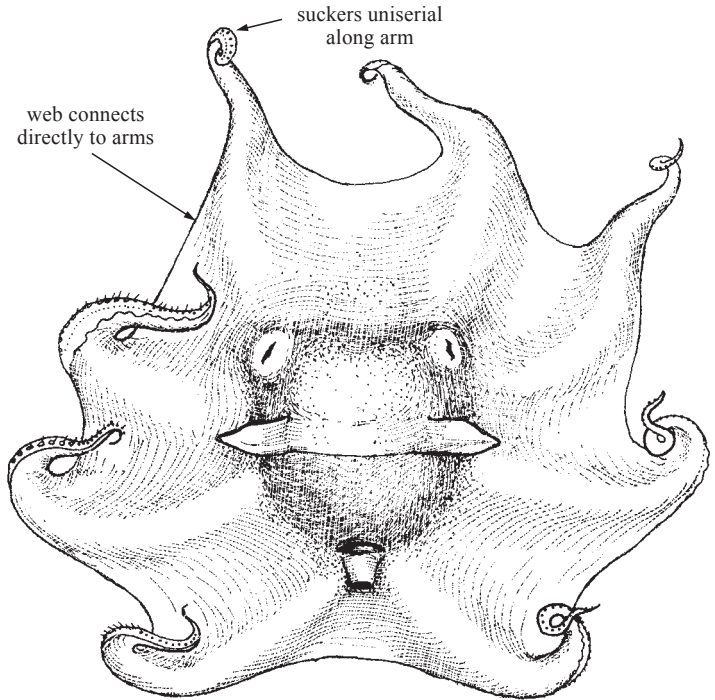
OPISTHOTEUTHIDAE

Opisthoteuthids

Diagnostic characters: Body of these octopods is foreshortened along the anterior / posterior axis. The foreshortening is extreme in *Opisthoteuthis* which is known as the 'flapjack devilfish'. **Fins present. Cirri on arms. Suckers uniserial along entire arm.** No filamentous appendages in pouches between bases of dorsal and dorsolateral arms. No light organ at base of each fin. **Web connects directly to arms;** no contractile intermediate membrane ("secondary web") between each arm and the primary web. **Shell (cartilaginous fin support) simple U-shape. Gills very foreshortened, appearing like a 'half-orange'.** **Colour:** not distinctive.

Habitat, biology, and fisheries: Sit on the ocean floor and swim just above it. *Opisthoteuthis* swims mainly by contraction of the arm-web complex (Vecchione and Roper, 1991) while *Grimpoteuthis* primarily uses powerful fin strokes to swim (Vecchione and Young, 1997).

Remarks: The generic composition of the family is not stable at present and the genera are not adequately defined.



Similar families occurring in the area

Vampyroteuthidae: lacks suckers along the proximal arms, has filamentous appendages in pouches between dorsal and dorsolateral arms; and light organs at bases of the fins.

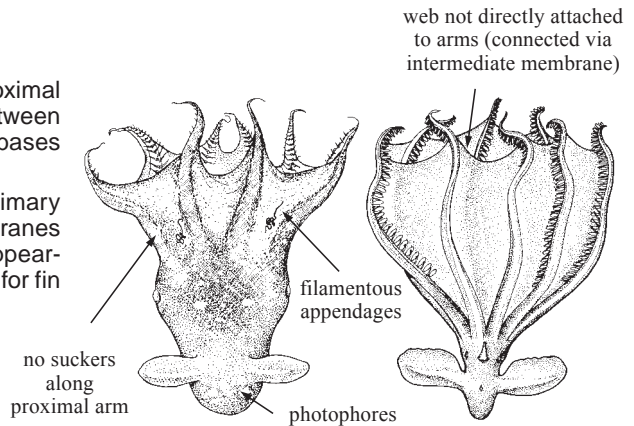
Cirroteuthidae and Stauroteuthidae: cirri long; primary web is attached to the arms via contractile membranes termed secondary webs and gills have a sepioid appearance; shell a complex shape with expanded areas for fin attachment in cirroteuthids.

List of species occurring in the area

Grimpoteuthis megaptera (Verrill, 1885).

Opisthoteuthis agassizi Verrill, 1883.

Opisthoteuthis grimaldii (Joubin, 1903).



Vampyroteuthidae

Cirroteuthidae

References

- Vecchione, M. and C.F.E. Roper. 1991. Cephalopods observed from submersibles in the western North Atlantic. *Bull Mar. Sci.*, 49:433-445.
- Vecchione, M. and R.E. Young. 1997. Aspects of the functional morphology of cirrate octopods: locomotion and feeding. *Vie et Milieu*, 47:101-110.

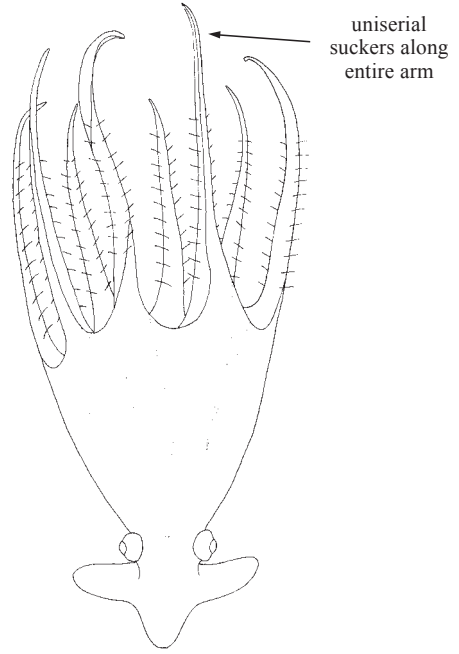
STAUROTEUTHIDAE

Stauroteuthids

Diagnostic characters: Fins present. Cirri on arms. Suckers uniserial along entire arm. No filamentous appendages in pouches between bases of dorsal and dorsolateral arms. No light organ at base of each fin. **Contractile intermediate membrane ('secondary web')** present between each arm and the primary web. **Shell (cartilaginous fin support) simple U-shape.** Gills 'sepioid'. **Colour:** not distinctive.

Habitat, biology, and fisheries: A pelagic, continental slope species. *Stauroteuthis syrtensis* has recently been shown to have luminescent organs associated with its suckers (Johnsen et al., 1999), a very unusual characteristic.

Remarks: Only a single species is currently recognized in the family but comparisons between widely distributed specimens have not been made.

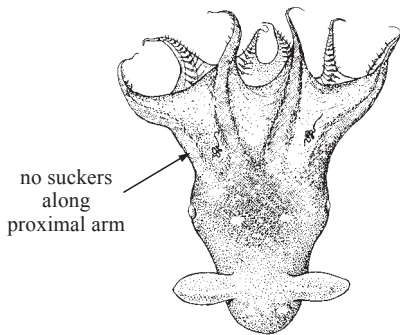


Similar families occurring in the area

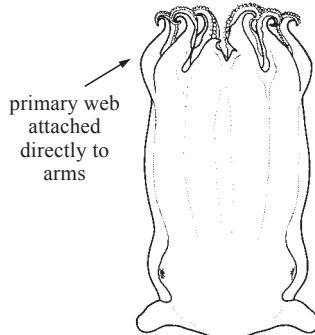
Vampyroteuthidae: lack suckers along the proximal arms, have filamentous appendages in pouches between the dorsal and dorsolateral arms, and light organs at the bases of the fins.

Opisthoteuthidae: primary web is attached directly to the arms; gills have a half-orange appearance.

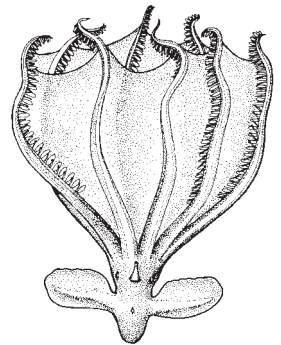
Cirroteuthidae: shell is a complex saddle-shape with broad fin attachment areas.



Vampyroteuthidae



Opisthoteuthidae



Cirroteuthidae

List of species occurring in the area

Stauroteuthis syrtensis Verrill, 1879.

Reference

Johnsen, S., E.J. Baker, E.C. Fisher, and E.A. Widder. 1999. Bioluminescence in the deep-sea cirrate octopod *Stauroteuthis syrtensis* Verrill (Mollusca: Cephalopoda). *Biol. Bull.*, 197:26-39.

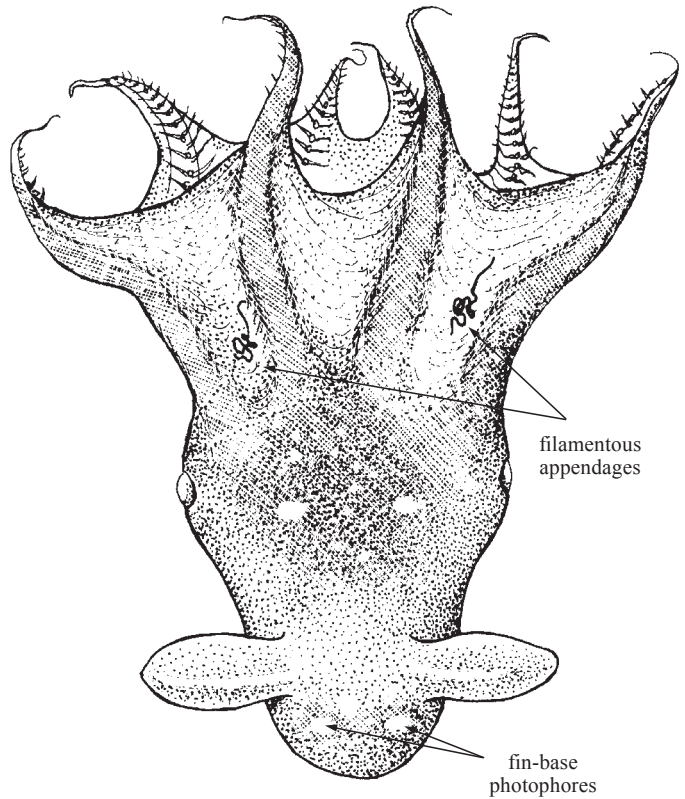
VAMPIROTEUTHIDAE

Vampire squids

Diagnostic characters: Moderately small, reaching a maximum of 13 cm mantle length; very gelatinous. **Retractile filaments extend from pockets between dorsal and dorsolateral arms. Fins present. Large circular, lidded photophores present posterior to each adult fin (fin-base organs);** numerous small photophores distributed over ventral surfaces of mantle, funnel, head and aboral surface of arms and web (skin-nodule organs). **Gladius present with broad median field and broad conus. Cirri present over entire arm length;** suckers, without cuticular lining, present only on distal half of arms. **Colour:** black chromatophores with reddish brown ones interspersed; these chromatophores, however, have lost the muscles that enable rapid colour change in other coleoids and are probably incapable of changing shape. A few normal chromatophores associated with photophores are still present.

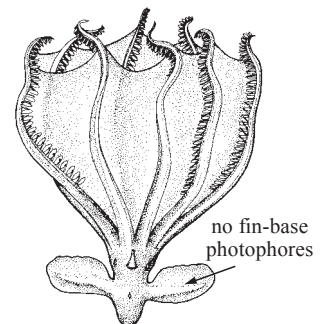
Habitat, biology, and fisheries: Occupies meso- to bathypelagic depths throughout the tropical and temperate regions of the world's oceans. The filaments are actually the second pair of arms; these are modified to extend well in excess of the total length of the animal and are retractile into pockets within the web.

Remarks: This species possesses features of both octopods and decapods. In addition, it has many features that are probably adaptations to the deep-sea environment. Among these are the loss of the ink sac and most active chromatophores, development of photophores and the gelatinous consistency of the tissues. Development of the fins in the vampire is unique among cephalopods. One pair is present at hatching and is eventually resorbed and replaced by a more anterior pair as development proceeds. At one stage in development, therefore, the vampire has 2 pairs of fins.



Similar families occurring in the area

Cirrate octopods (Cirroteuthidae, Stauroteuthidae, and Opisthoteuthidae): superficially resemble vampire squids but differ in several important characters, including (1) lack of retractile filaments in pockets between dorsal and dorsolateral arms, (2) lack of fin-base photophores, (3) cartilaginous fin supports instead of a gladius, and (4) suckers along entire length of arms.

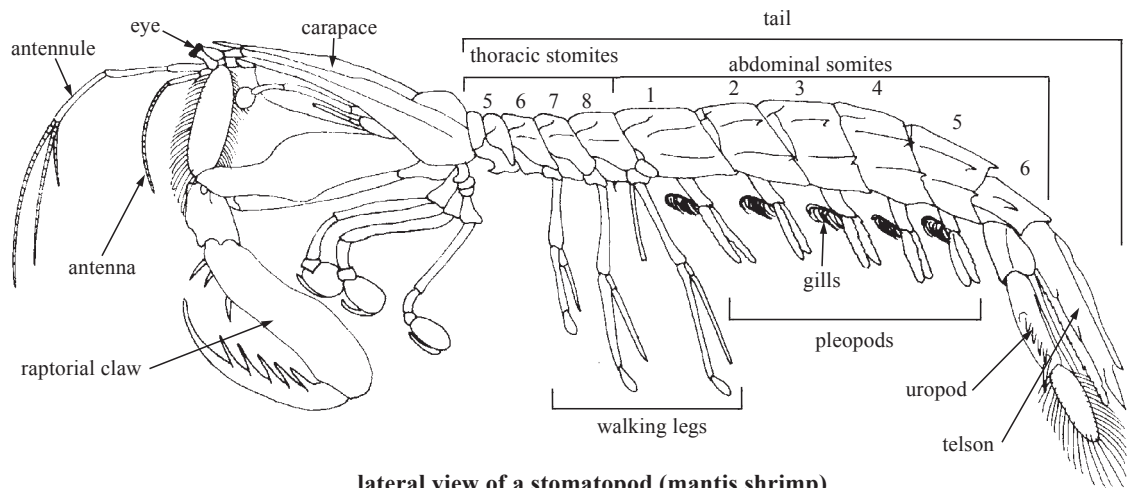


Cirroteuthidae

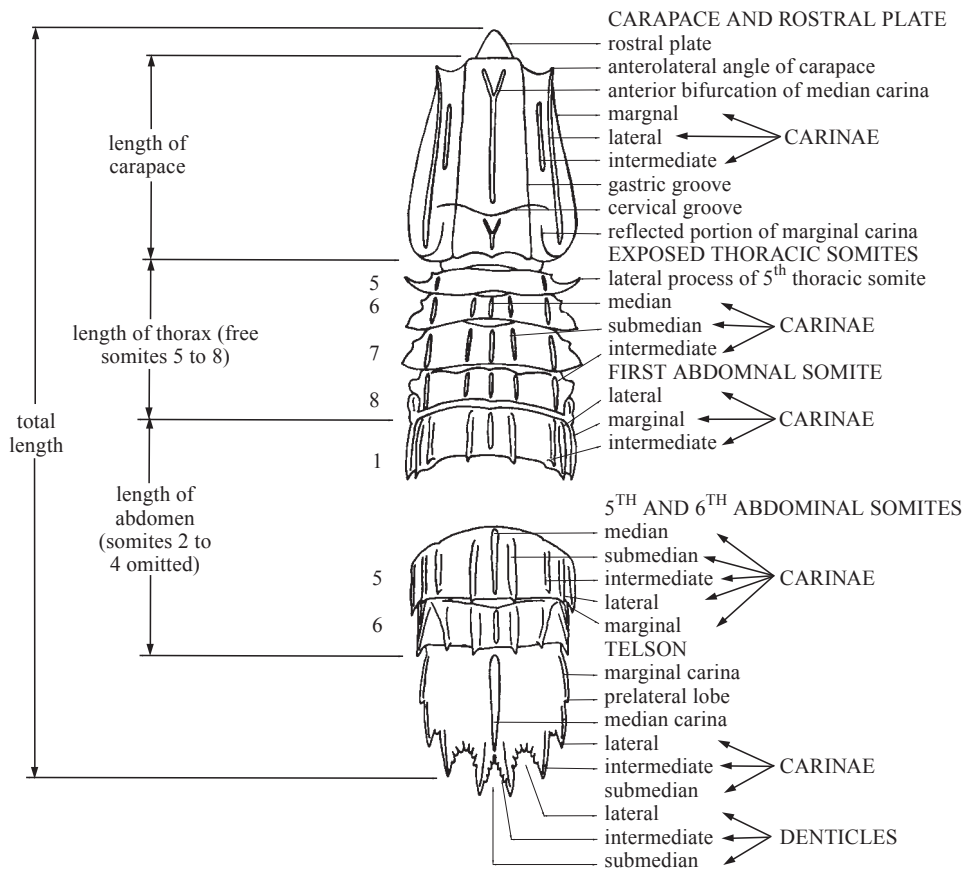
STOMATOPODS

by M. Tavares, Universidade Santa Úrsula, Brazil

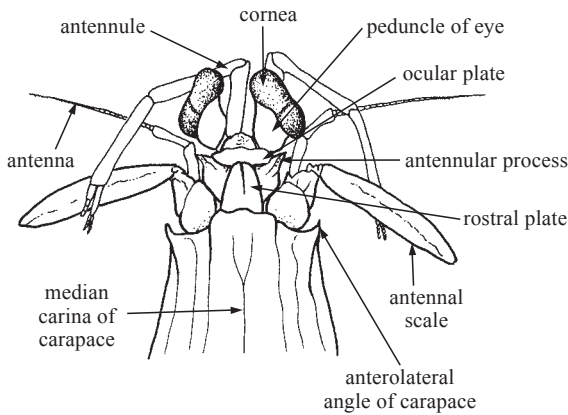
TECHNICAL TERMS AND MEASUREMENTS



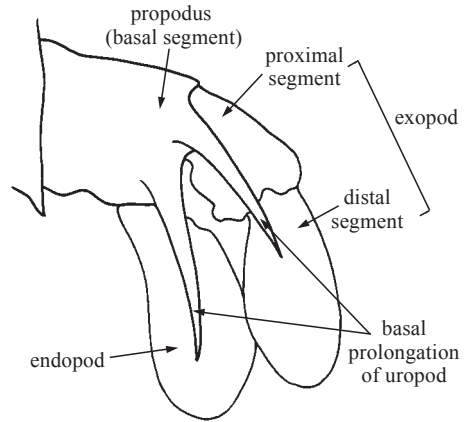
lateral view of a stomatopod (mantis shrimp)



dorsal view (without head and extremities)



anterior part of body (dorsal view)



left uropod (ventral view)

GENERAL REMARKS

The mantis shrimps include small and large shrimp-like or lobster-like animals with large movable eyes, a very short head or carapace covering only 1/3 of the body, only 3 walking legs, a long flattened tail (including thoracic and abdominal segments) with a well-developed tail fan, and large, conspicuous 'raptorial' claws (second pair of legs) resembling those of a praying mantis. In some parts of the world mantis shrimps are considered a delicacy and consequently are fished commercially and marketed. At present there is no organized fishery for stomatopods in Area 31, but 2 species are large and apparently abundant enough to be of commercial interest, *Squilla empusa* Say, 1818 (Squillidae Latreille, 1803), and *Lysiosquilla scabricauda* (Lamarck, 1818) (Lysiosquillidae Dana, 1852). The 2 species are often caught by trawls in commercial shrimp operations.

References

- Camp, D.K. 1973. Stomatopod Crustacea. *Memoirs of the Hourglass Cruises*, 3(2):1-100.
- Diaz, G.A. and R.B. Manning. 1998. The last pelagic stage and juvenile of *Lysiosquilla scabricauda* (Lamarck, 1818) (Crustacea, Stomatopoda). *Bull. Mar. Sci.*, 63(2):453-457.
- Manning, R.B. 1978. Stomatopods, 2p. (not numbered). In *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31) Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).
- Manning, R.B. and R.W. Heard. 1997. Stomatopod crustaceans from the Carolinas and Georgia, southern United States. *Gulf Research Reports*, 9(4):303-320.
- Wenner, E. and C.A. Wenner. 1989. Seasonal composition and abundance of decapod and stomatopod crustaceans from coastal habitats, southeastern United States. *Fish. Bull.*, 87(1):155-176.

GUIDE TO FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

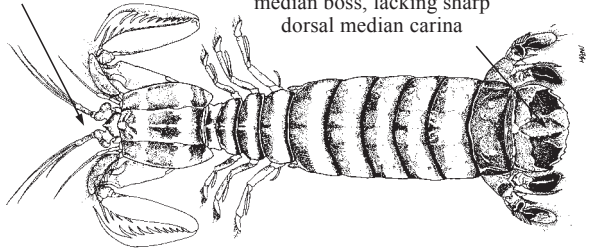
LYSIOSQUILLIDAE

Propodi of third and fourth maxillipeds broad, beaded or ribbed ventrally. Telson with, at most, low median boss, lacking sharp dorsal median carina. A single species, *Lysiosquilla scabricauda*, of potential interest to fisheries; found in mud bottoms between 50 and 200 m.

propodi of 3rd and 4th maxillipeds
broad, beaded or ribbed ventrally

Page 249

telson with, at most, low
median boss, lacking sharp
dorsal median carina



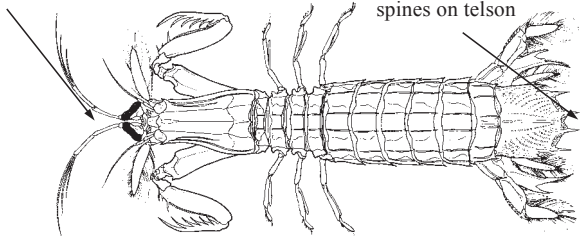
SQUILLIDAE

Propodi of third and fourth maxillipeds slender, not beaded or ribbed ventrally. At most, submedian marginal teeth of telson with movable spines; telson with 4 or more intermediate denticles on each side of posterior margin. A single species, *Squilla empusa*, of potential interest to fisheries; found at depths between 1 and 55 m.

propodi of 3rd and 4th
maxillipeds slender, not
beaded or ribbed ventrally

Page 250

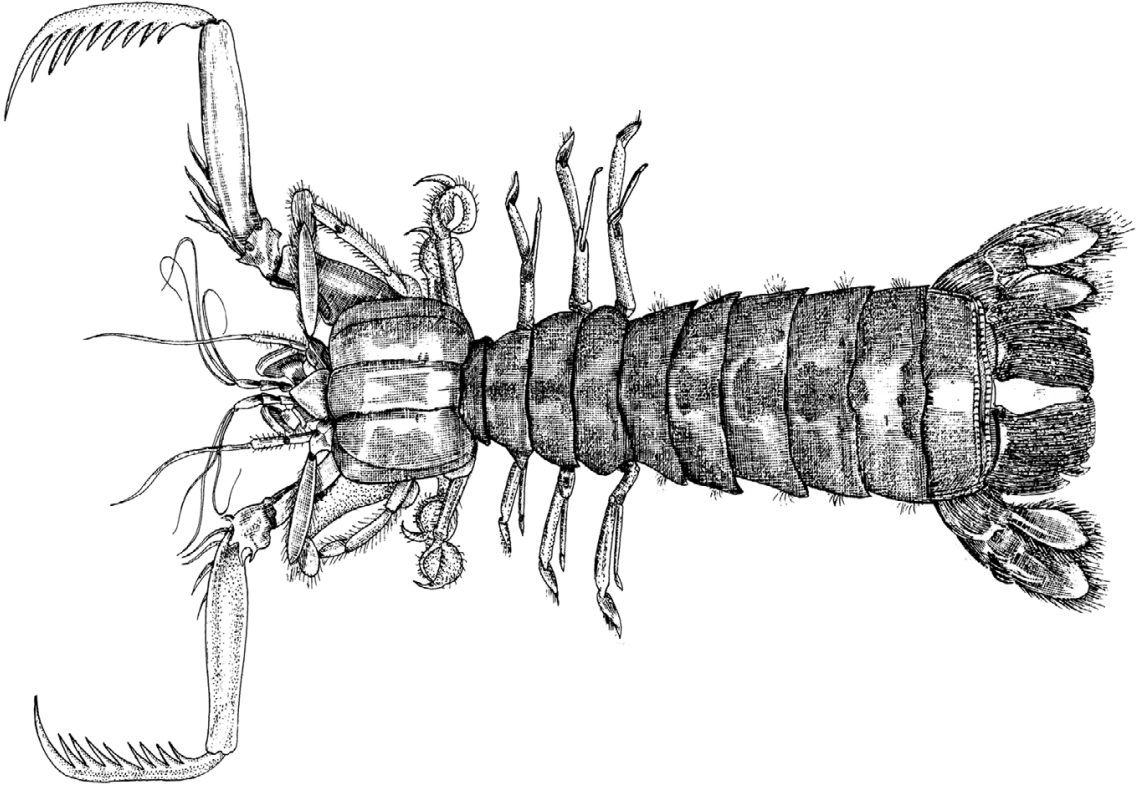
submedian marginal
teeth with movable
spines on telson



LYSIOQUILLIDAE

Lysiosquilla scabricauda (Lamarck, 1818)

LQS

Frequent synonyms / misidentifications: None / None.**FAO names:** **En** - Smooth mantis shrimp; **Fr** - Squille douce; **Sp** - Galera lisa.

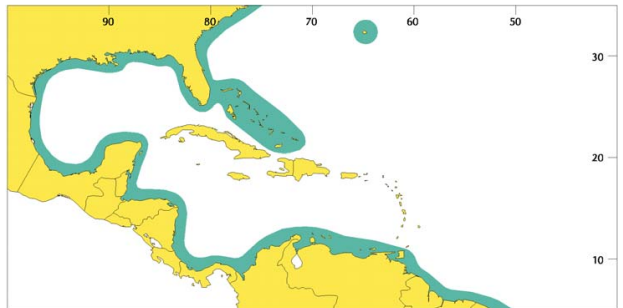
Diagnostic characters: Body smooth, except for the posterior part of tail which is prickly with small bumps and tubercles; claws very large, often longer than carapace and usually armed with 9 or 10 long, sharp spines.

Colour: body conspicuously marked with dark and light bands.

Size: Maximum length: 300 mm.

Habitat, biology, and fisheries: Inhabits muddy bottoms between 50 and 200 m. Has potential to be of interest to fisheries. Not targeted in fisheries; incidentally taken in shrimp trawling grounds for *Farfantepenaeus* species.

Distribution: Western Atlantic: Massachusetts, North and South Carolina, Bermuda, Bahamas, Florida; Gulf of Mexico, Honduras, Nicaragua, Costa Rica, Caribbean Sea, Panama; Colombia, Venezuela; French Guiana, and Brazil (down to Santa Catarina).



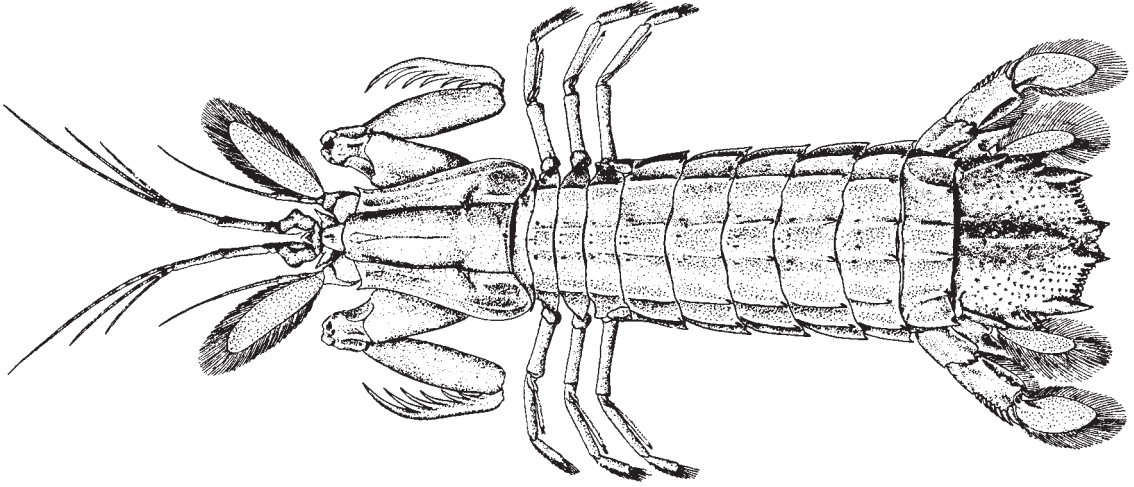
SQUILLIDAE

Squilla empusa Say, 1818

QLE

Frequent synonyms / misidentifications: None / None.

FAO names: En - Rough manits shrimp; Fr - Squille rugueuse; Sp - Galera carenada.

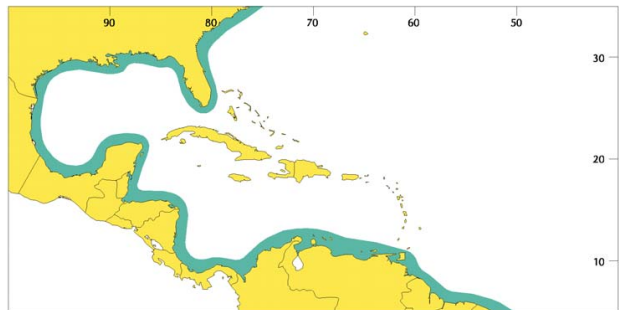


Diagnostic characters: Body ridged, claws strong, each with 6 sharp teeth on last segment. **Colour:** pattern indistinct (eyes light green and body marked with pastels in life).

Size: Maximum length: 185 mm.

Habitat, biology, and fisheries: Live in depths between 1 and 55 m, usually less than 25 m. Tolerant to salinities ranging from 11.7‰ to 34.1‰. Its burrow has been described as irregular, branched or unbranched, broadly U-shaped, and 20 to 40 mm in diameter and a metre or more in length. Common all year along the South Carolina coast. Large catches have been obtained at night in October, February, and April. In August, however few were taken during the day or night, and there was no marked nocturnal abundance. Has potential to be of interest to fisheries. Not fished for; quite common in catches of the pink shrimp *Farfantepenaeus duorarum*. Wenner and Wenner (1989) reported that in depths between 4 and 20 m (North Carolina) the biomass of *Squilla empusa* constituted 11% of the total catch and was outranked only by the blue crab *Callinectes sapidus*.

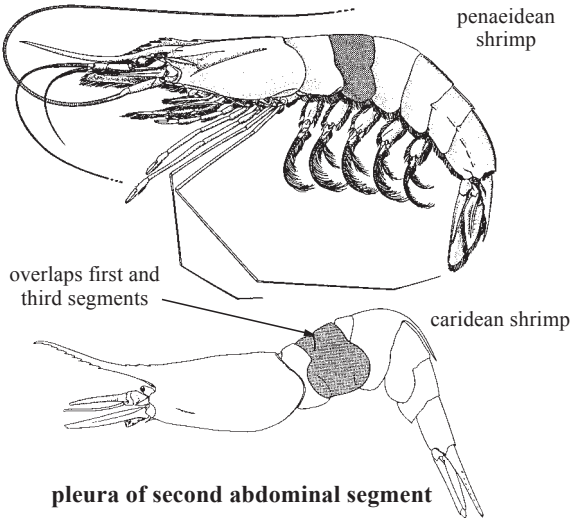
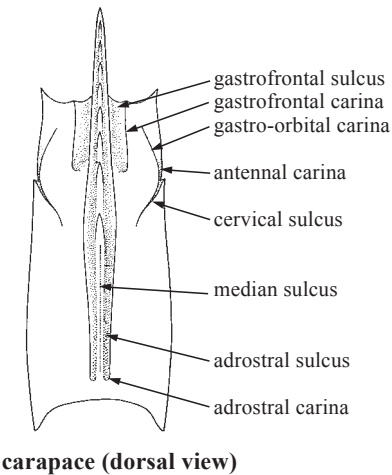
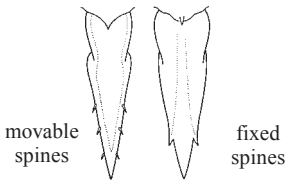
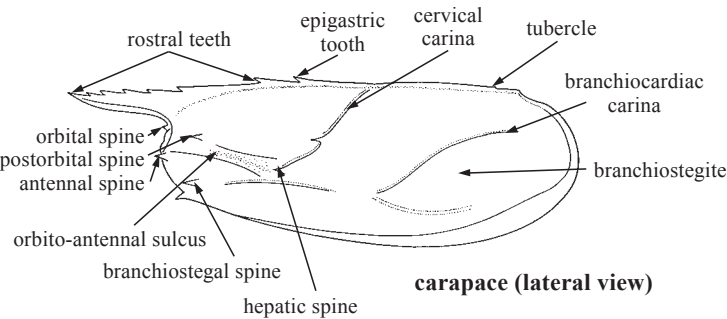
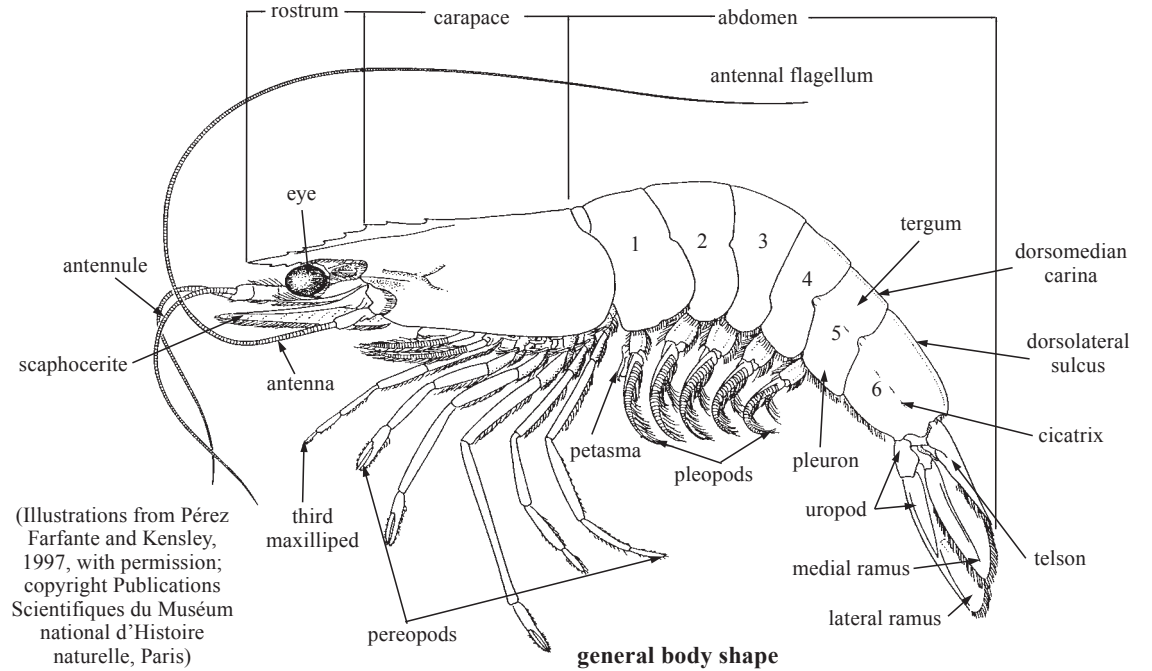
Distribution: Massachusetts to French Guiana, including numerous localities off the Carolinas and Georgia.

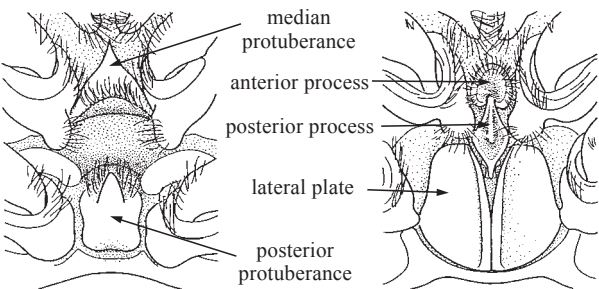


SHRIMPS

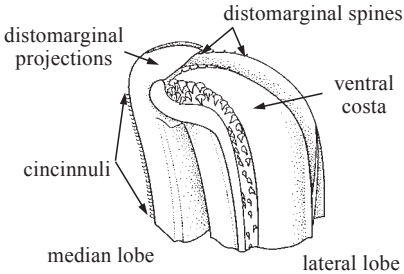
by M. Tavares, Universidade Santa Úrsula, Brazil

TECHNICAL TERMS AND MEASUREMENTS

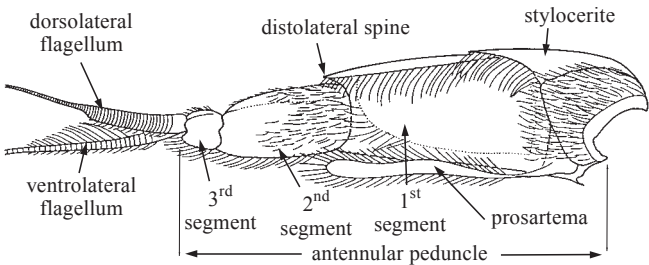




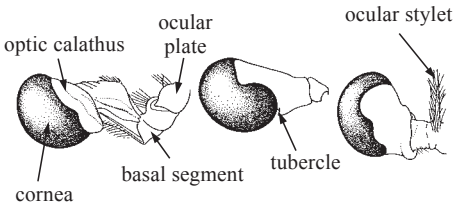
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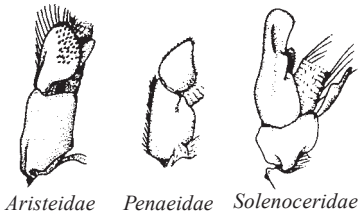
petasma



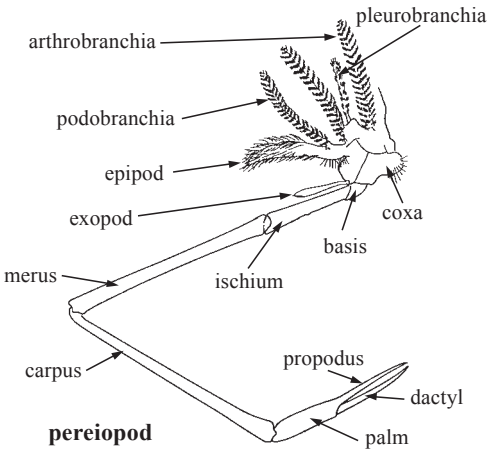
antennule



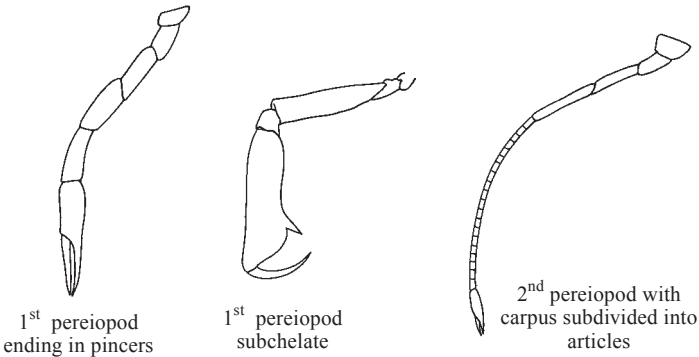
eye



types of appendices masculinae on endopods of second pair of pleopods



pereopod



schematic illustration of pereopods

GENERAL REMARKS

The shrimps constitute a large group of crustaceans varying in size from microscopic to about 35 cm long. The body is almost always laterally compressed, the rostrum usually compressed and toothed, and the abdomen long, longer than the carapace or head. The antennules, or first pair of feelers, in most species bear a small scale or spine, the stylocerite, at their bases. The antennal scales of the second pair of feelers, the antennae, are generally large and plate-like. The pereopods or legs are usually slender, but in some, a single leg or pair of legs may be stout and some pereopods end in pincers. The pleopods or abdominal appendages used for swimming, are well developed and, most often present on all 5 anterior abdominal segments.

Shrimps are widely distributed, occurring in marine, brackish, and fresh waters from the equator to the polar regions. Although the majority of the marine species occupy shallow or moderately deep water, some are found at depths of nearly 5 700 m; however, most of the commercial shrimps are taken on the continental shelves at depths of less than 100 m. In Area 31 only 3 shrimp species are trawled commercially in depths greater than 300 m; *Aristaeomorpha foliacea*, *Aristaeopsis edwardsiana*, and *Pleoticus robustus*. Many shrimps are pelagic but the majority by far are benthic, living on a large variety of bottoms such as rock, mud, peat, sand, fragments of shells, or mixtures of these materials. In addition, some frequent coral reefs, and a few species live in sponges and other invertebrates.

In most shrimps, the sexes are separate but certain species, such as *Pandalus borealis*, commonly first undergo a male phase and later are transformed into females. The paired reproductive organs are situated on each side and just below the heart: in the females the ovaries (which may extend posteriorly along the entire length of the abdomen) are connected by oviducts to openings on the basal article of the third pair of pereopods. To the male, the sperm ducts lead from the testes to terminal ampoules which open on or adjacent to the basal article (coxa) of the last pair of pereopods.

In some penaeidean shrimps the females possess sperm receptacles on the ventral side of the last thoracic segments (between the last pairs of pereopods), where the males deposit the sacs carrying the sperm, whereas in others the females exhibit protuberances and grooves for the attachment of such sacs. Either genital modification is called the thelycum, and there the sperm remain until the eggs are released. In the males there is a petasma formed by the longitudinally folded endopods of the first pair of pleopods. Most male shrimps bear an appendix masculina, a lappet borne on the endopod of the second pair of pleopods, the presence or absence of which constitutes a ready means for distinguishing males from females. In many shrimps an appendix interna (slender rod or blade) occurs adjacent to the appendix masculina; among carideans such a structure is also present on the third through the fifth pleopods of both sexes.

In the stenopodidean and caridean shrimps the female carries the eggs after extrusion, masses of them being fastened to the pleopods where they remain until they hatch at a relatively advanced larval stage or as juveniles. In contrast, in the penaeideans the eggs are not retained by the female, but released directly into the water, and the larvae undergo an extensive metamorphosis, the first part of a complex life cycle, which may require both oceanic and brackish water. For example, the members of the genera *Penaeus* and *Farfantepenaeus*, the most valuable commercial shrimps, spawn offshore at depths of about 10 to 80 m. Eggs hatch within a few hours, releasing very small, simple larvae, the nauplii, the first of usually 11 larval stages, which includes nauplii, 3 protozoae, and 3 mysis. The larvae are planktonic and are carried by currents towards shore where they arrive as postlarvae; this occurs about 3 weeks after hatching when the animals are about 6 to 14 mm long, and shrimp-like in appearance. The postlarvae invade inshore brackish waters, abandon their planktonic way of life, and become bottom dwellers, living in shallow littoral areas. In these rich nursery grounds they grow rapidly, develop into juveniles, and, as size increases, move gradually back toward the mouths of bays or estuaries where they become subadults. Soon the shrimp migrate offshore, continue growing, and finally, as adults, reach the spawning grounds, where the mature females spawn and the cycle is repeated; most shrimps in these grounds are less than a year old. Penaeidean shrimps are very prolific, for example, a single female of *Litopenaeus setiferus*, one of the principal commercial species in Area 31, may produce as many as 500 000 eggs. Carideans, in contrast, produce a much smaller number correlated with the fact that the females carry their eggs until hatching.

Only slightly more than 350 species are of economic interest, and of these about 100 comprise most of the annual world shrimp catches. A number of countries heavily depend on shrimp exports as a source of foreign currency income. Most of the commercial shrimp species belong to the 5 penaeidean families Aristidae, Penaeidae, Sicyoniidae, Solenoceridae, and Sergestidae - and 3 caridean ones - Pandalidae, Crangonidae, and Palaemonidae. The penaeideans are exploited mainly in tropical and subtropical waters, the members of Pandalidae and Crangonidae in temperate seas, and those of Palaemonidae in brackish waters from the tropic to the temperate zones. Another caridean family, Hippolytidae, contains one species of economic interest in the Western Central Atlantic.

From 1984 to 1998 the shrimp catch (penaeidean) reported from Area 31 totaled 2 602 426 t (French Guiana: 46 642 t; Guyana: 94 967 t; Honduras: 36 129 t; Mexico: 540 864 t; Nicaragua: 23 572 t; Suriname: 8 134 t; USA: 1 722 545 t; Venezuela: 129 573 t).

Shrimp or prawn? Holthuis (1980) summarized the usage of the words 'shrimp' and 'prawn' in the English-speaking world. The use of these 2 words is quite confusing, even within a single region. It is felt that the use of 'shrimp' and 'prawn' interchangeably in this guide would only add to the confusion; the name 'shrimp' is preferred instead. This is because the English FAO names for the species treated in this guide, all but *Nematopalaemon schmitti*, are based upon the word 'shrimp' (e.g., northern brown shrimp, redspotted shrimp, rock shrimp, and so on). The English FAO name for *N. schmitti* is 'white belly prawn'.

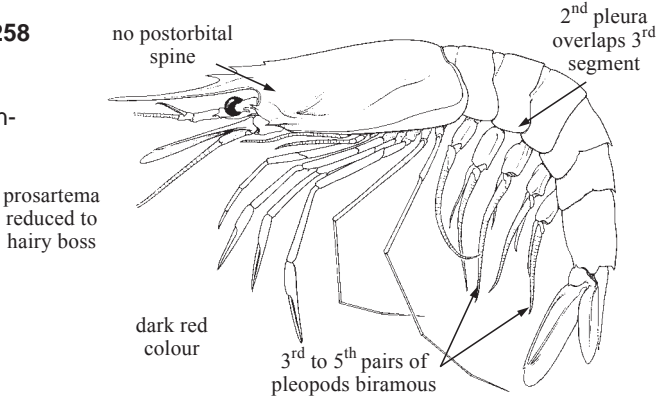
GUIDE TO THE FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

ARISTEIDAE

p. 258

Aristeid shrimps

This family includes 2 species of economic interest in the area, both from deep water.

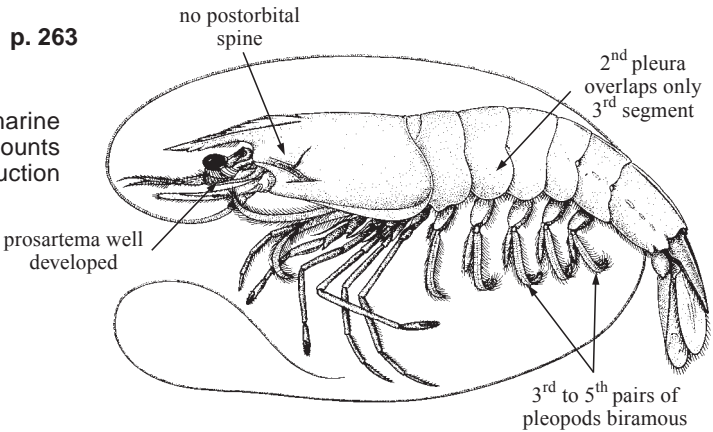


PENAEIDAE

p. 263

Penaeid shrimps

This family includes the most valuable marine commercial species of shrimp and accounts for at least 95% of the total shrimp production from Area 31.

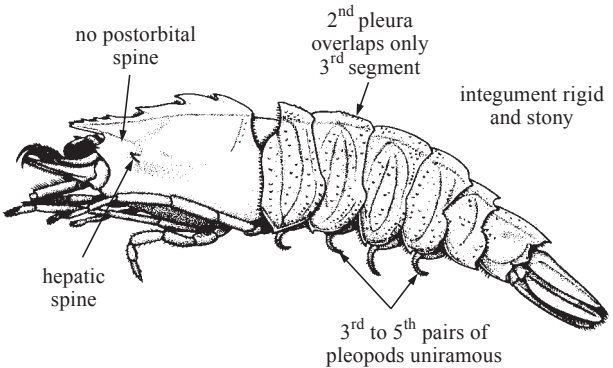


SICYONIIDAE

p. 279

Rock shrimps

One genus, *Sicyonia* H. Milne Edwards, 1830, and 43 species, all marine, have been recognized in this family; 2 species occurring in the area are of economic interest, *Sicyonia brevirostris* and *Sicyonia typica*.

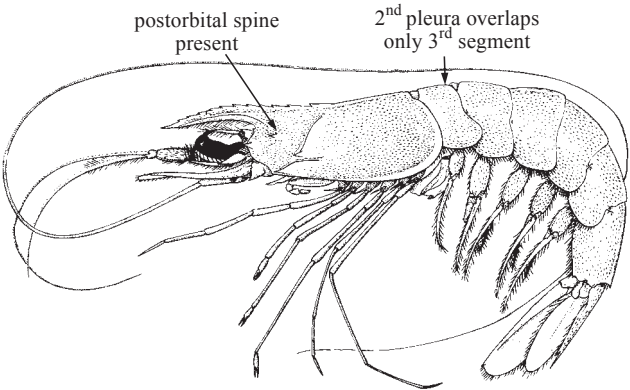


SOLENOCERIDAE

p. 284

Solenocerid shrimps

This family includes only marine representatives. Only 1 species occurring in the area is abundant and big enough to be of economic interest.

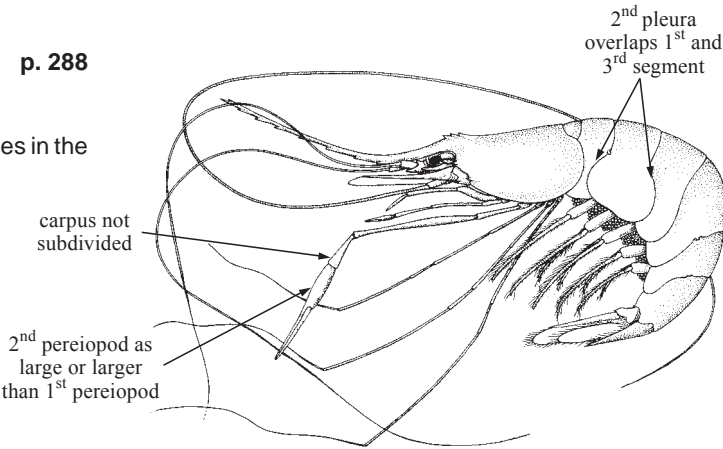


PALAEMONIDAE

p. 288

Palaemonid shrimps

A single species of interest to fisheries in the area: *Nematopalaemon schmitti*.

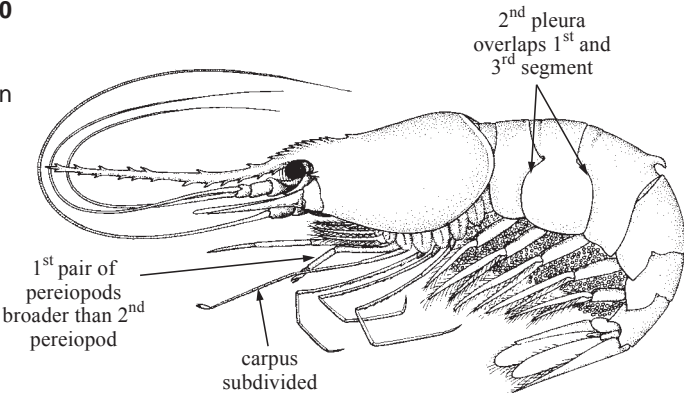


HIPPOLYTIDAE

p. 290

Cock shrimps

A single species of interest to fisheries in the area: *Exhippolysmata oplophoroides*.




KEY TO THE FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

(Penaeidae adapted from Pérez Farfante and Kensley, 1997)





- 1a. Pleura of second abdominal segment not overlapping those of first and third segments
(Suborder Dendrobranchiata). → 2
- 1b. Pleura of second abdominal segment overlapping those of first and third segments
(Suborder Pleocyemata) → 5
- 2a. Postorbital spine present Solenoceridae
- 2b. Postorbital spine absent → 3
- 3a. Integument rigid and stony; third to fifth pleopods uniramous, lacking endopods Sicyoniidae
- 3b. Integument never stony; third to fifth pleopods biramous; more than 2 rostral/postrostral
teeth. → 4
- 4a. Prosartema well developed Penaeidae
- 4b. Prosartema reduced to setose boss Aristeidae
- 5a. First pair of pereopods broader than second pair; carpus of second pair divided into sev-
eral articles. Hippolytidae
- 5b. First pair of pereopods more slender than second pair or at most as broad; carpus of sec-
ond pair undivided Palaemonidae

LIST OF FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

The symbol  is given for those families which are treated further in this contribution.

Suborder DENDROBRANCHIATA

Superfamily PENAEOIDEA

-  ARISTEIDAE
-  PENAEIDAE
-  SICYONIIDAE
-  SOLENOCERIDAE

Suborder PLEOCYEMATA

Infraorder CARIDEA

Superfamily PALAEMONOIDEA

-  PALAEMONIDAE

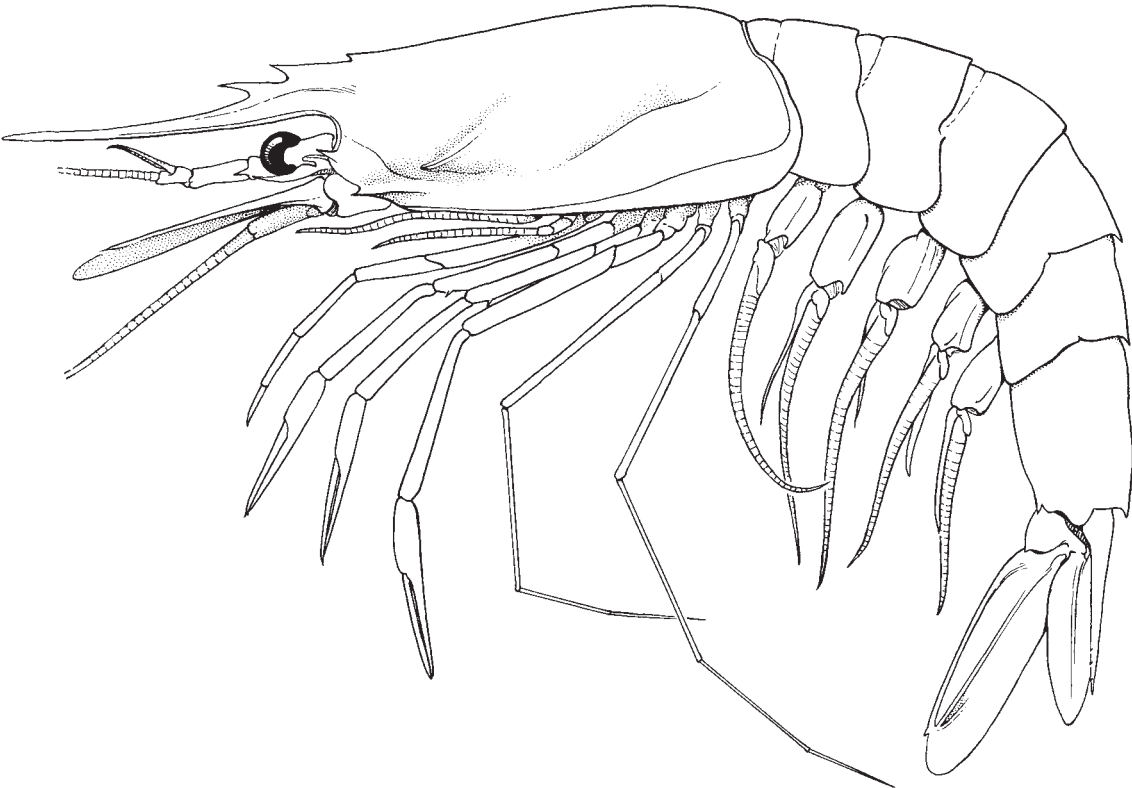
Superfamily ALPHEOPIDEA

-  HIPPOLYTIDAE

ARISTEIDAE

Aristeid shrimps

Diagnostic characters: Rostrum usually elongate in females, sexually dimorphic in several genera, being elongate in females and juvenile males, short in adult males; usually with only 3 dorsal rostral/postrostral teeth (more only in *Aristaeomorpha*); lacking ventral teeth. Carapace lacking postorbital and pterygostomian spines; cervical and postcervical grooves sometimes present, most often reaching dorsal midline, or almost absent and visible only laterally. Two well-developed arthrobranches on penultimate thoracic segment.



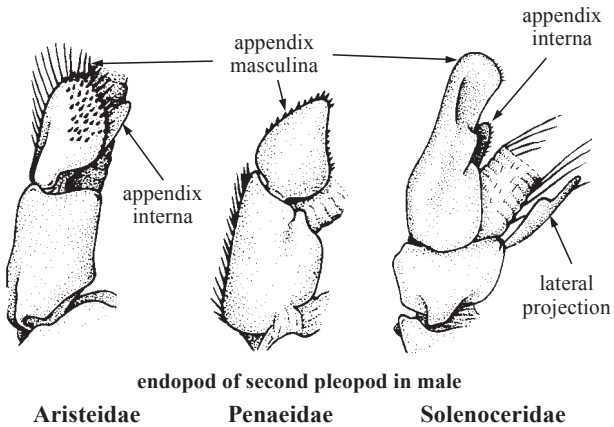
Habitat, biology, and fisheries: The species in this family usually inhabit deep waters. Some of them are actively fished because of their large size and high commercial value.

Remarks: This family includes 2 species of economic interest in the area, both from deep water.

Similar families occurring in the area

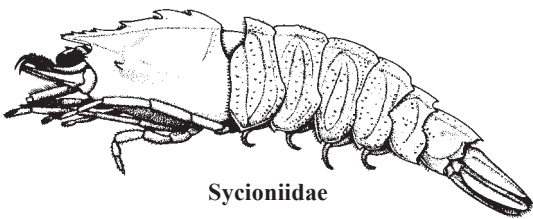
Solenoceridae: postorbital spines present on carapace; endopods of second pair of pleopods (in males) with an appendix masculina, and appendix interna and a lateral projection; telson with a fixed spine on each side of tip.

Penaeidae: eyestalks without tubercles on inner margins; cervical grooves short, ending well below dorsal midline of carapace; endopods of appendix masculina only; a single, well-developed arthrobranch on base of penultimate thoracic segment (concealed under the carapace).

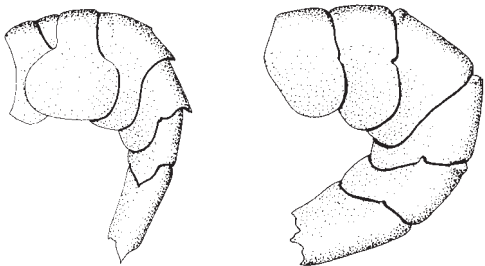


Sicyoniidae: body thick, stony in appearance, integument calcified; cervical grooves faint or absent; abdomen with deep grooves and numerous tubercles; third and fourth pairs of pleopods single-branched, endopods of second pair of pleopods (in males) with an appendix masculina only; a single, well-developed arthrobranch on penultimate throacic segment.

Caridean shrimps: pleura of second abdominal segment overlapping those of first and third segments; no pincers on third pair of pereopods.



Sycioniidae



abdomen

Caridea

Penaeidae

Key to the genera of Aristeidae occurring in the area
(from Pérez Farfante and Kensley, 1997)

- 1a. More than 3 rostral/postrostral teeth present *Aristaeomorpha*
- 1b. Three rostral/postrostral teeth present → 2

- 2a. Postantennal spine present *Parahepomadus*
- 2b. Postantennal spine absent → 3

- 3a. Hepatic spine present *Hepomadus*
- 3b. Hepatic spine absent → 4

- 4a. Exopods absent from first to fifth pereopods. → 5
- 4b. Exopods present on first to fifth pereopods → 7


- 5a. Meral spine lacking on first and second pereopods; scaphocerite in male modified, distally elongate *Aristeopsis*
- 5b. Distal movable meral spine present on first and second pereopods; scaphocerite in male not modified → 6


- 6a. Postcervical sulcus present *Pseudaristeus*
- 6b. Postcervical sulcus absent *Aristeus*

- 7a. Third to sixth abdominal somites dorsally carinate; epipod on fourth pereopod rudimentary *Hemipenaeus*
- 7b. Fourth to sixth abdominal somites dorsally carinate; epipod on fourth pereopod large → 8

- 8a. Carapace ridges and carinae weak; podobranchia on third pereopod rudimentary; ventral antennular flagellum in male modified; dactyl of third maxilliped in male modified *Austropenaeus*
- 8b. Carapace with ridges and carinae moderately strong to strong; podobranchia on third pereopod large; ventral antennular flagellum in male not modified; dactyl of third maxilliped in male not modified *Plesiopenaeus*

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Aristaeomorpha foliacea* (Risso, 1827).

 *Aristaeopsis edwardsiana* (Johnson, 1867).

Aristeus antillensis A. Milne Edwards and Bouvier, 1909.

Hemipenaeus carpenteri Wood-Mason, 1891.

Hepomadus tener Smith, 1884.

Plesiopenaeus armatus (Bate, 1881).

Plesiopenaeus coruscans (Wood-Mason, 1891).

References

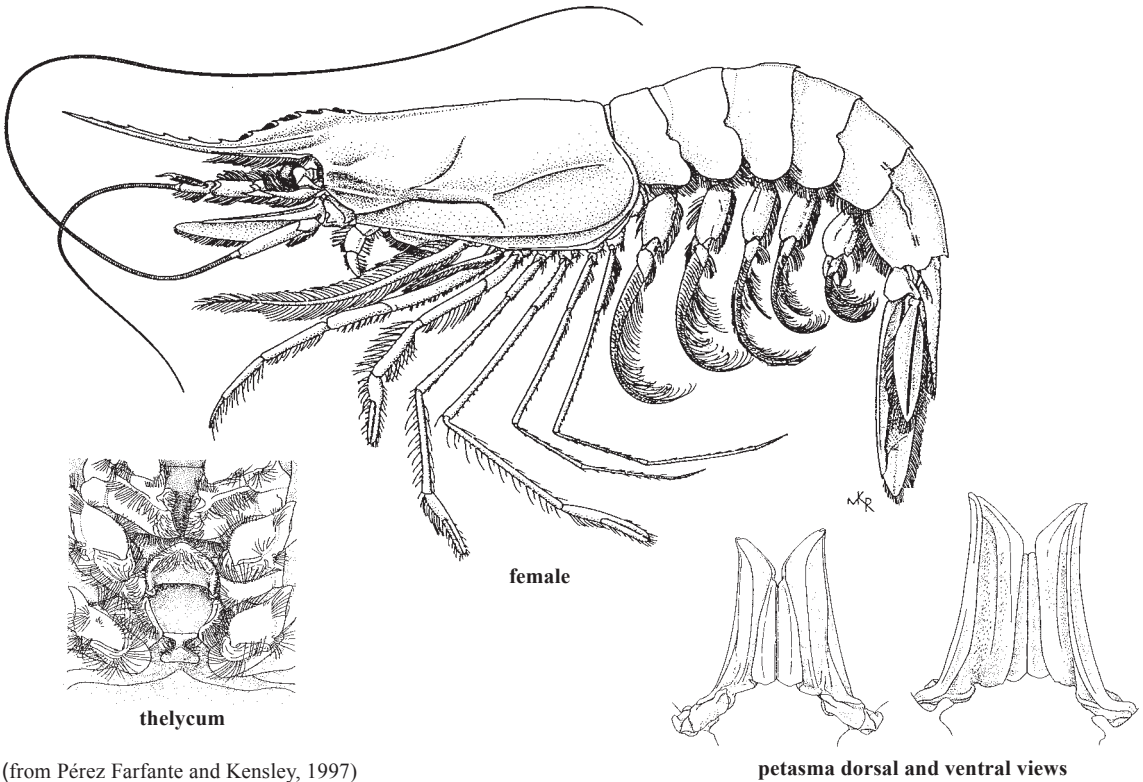
- Crosnier, A. 1978. Faune de Madagascar, 46. *Crustacés Décapodes Pénéides Aristeidae (Benthescyminae, Aristeinae, Solenocerinae)*. Paris, Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), 1-197.
- Crosnier, A. and J. Forest. 1973. Les crevettes profondes de l'Atlantique oriental tropical. *Faune Tropical*, 19:1-409.
- Davant, P. 1963. *Clave para la identificación de los camarones marinos y de río con importancia económica en el oriente de Venezuela*. Cumana, Cuadernos Oceanograficos, Instituto Oceanografico, Universidad de Oriente, 1:1-113.
- Dore, I. and C. Frimodt. 1987. *An illustrated guide to shrimp of the world*. New York, Osprey Books, 229 p.
- Guéguen, F. 2000. Distribution et abondance des crustacés décapodes du talus continental (200-900 m) de Guyane Française. *Crustaceana*, 73(6):685-703.
- Holthuis, L.B. 1980. FAO Species Catalogue. I. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, (125)1:271 p.
- Pérez Farfante, I. 1988. Illustrated key to the penaeoid shrimps of commerce in the Americas. *NOAA Tech. Rep.*, 64: 32.
- Pérez Farfante, I. and B. Kensley. 1997. Penaeoid and Sergestoid shrimps and prawns of the world. Key and diagnoses for the families and genera. *Mémoires du Muséum national d'Histoire naturelle, Paris*, 175:1-233.
- Poupin, J. 1994. *Faune marine profonde des Antilles françaises. Récoltes du navire 'Polka' faites en 1993*. Paris, Études et Thèses. ORSTOM Éditions., 80 p.

Aristaeomorpha foliacea (Risso, 1827)

ARS

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Giant red shrimp; **Fr** - Gambon rouge; **Sp** - Gamba española.



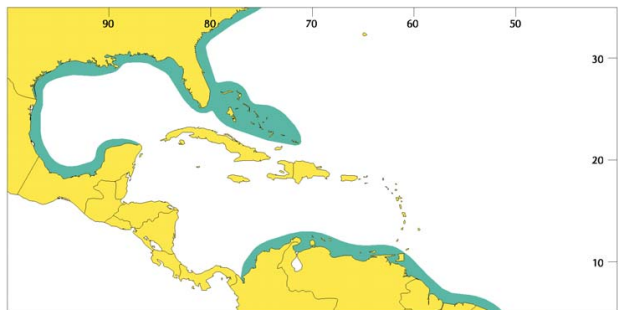
(from Pérez Farfante and Kensley, 1997)

Diagnostic characters: Integument pubescent. **Rostrum** elongate in females and juvenile males, reaching well beyond scaphocerite; short in adult males, **bearing 3 to 7 dorsal teeth along its entire length, followed by 2 postrostral teeth**. First and second abdominal somites dorsally rounded, third to sixth somites dorsally carinate. Telson bearing 4 pairs of movable lateral spines in posterior half. **Colour:** dark red.

Size: Maximum length: females, 225 mm; males, 170 mm.

Habitat, biology, and fisheries: Marine deep waters from 250 to 1 300 m; bottom mud. This species is obtained off the Mediterranean coasts of Spain, France, Italy, Algeria, and Israel; in the western Atlantic it is considered of commercial interest only in the southern part of Area 31 (Venezuela). There are no separate statistics for this species. Caught with deep sea commercial trawlers. Marketed fresh or frozen.

Distribution: Western Atlantic: South of Massachusetts to the Straits of Florida, Gulf of Mexico, Caribbean Sea, Venezuela, and southeastern Brazil. Eastern Atlantic: Bay of Biscay to western Sahara; Azores; Madeira; Canary Islands; Mediterranean; off east coast of South Africa. Indo-West Pacific: Mozambique; East Africa; Madagascar; Réunion; Maldive Islands; Sri Lanka; Indonesia; Philippines; Taiwan Province of China; Japan; Western Australia; New South Wales; Victoria; New Caledonia; New Zealand; Wallis and Futuna Islands; and Fiji.

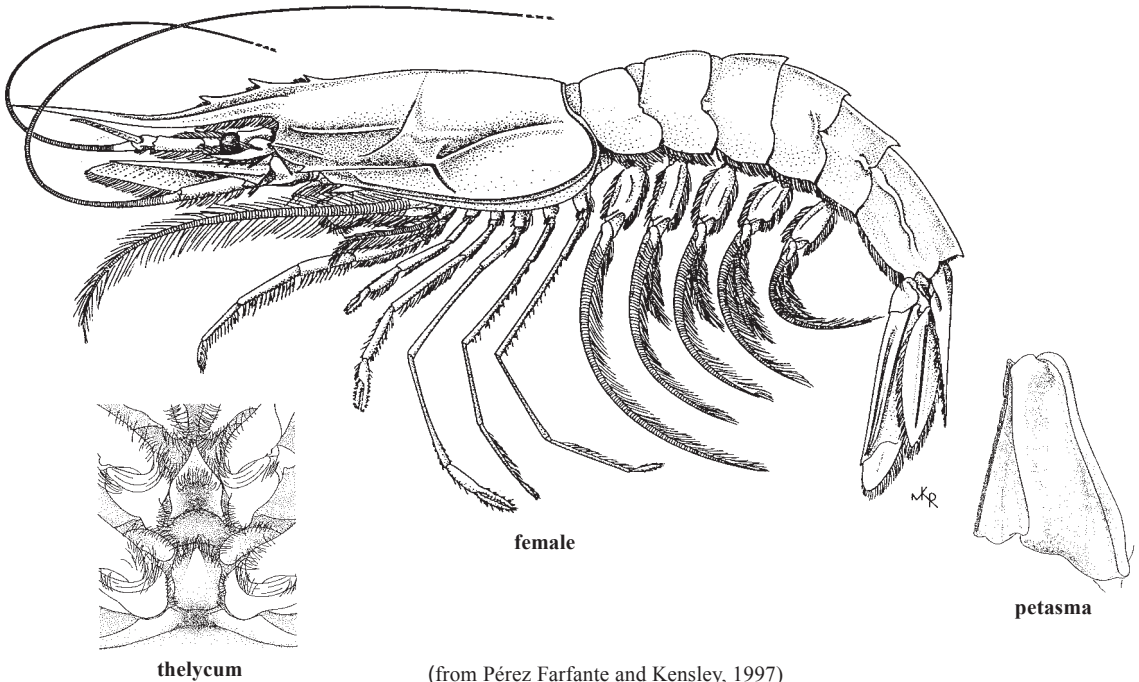


Aristaeopsis edwardsiana (Johnson, 1867)

SSH

Frequent synonyms / misidentifications: *Plesiopeneus edwardsianus* (Johnson, 1867) / None.

FAO names: En - Scarlet shrimp; Fr - Gambon écarlate; Sp - Gamba carabinero.



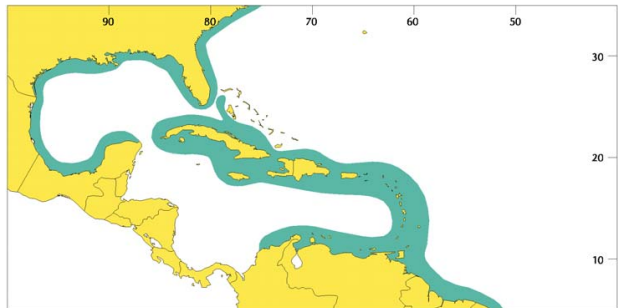
(from Pérez Farfante and Kensley, 1997)

Diagnostic characters: Integument glabrous. **Rostrum** moderately elongate in females and juvenile males, reaching beyond apex of scaphocerite; somewhat shorter in adult males, **bearing 2 basal teeth followed by a single postrostral tooth**. First abdominal somite dorsally rounded; second somite with barely discernible rounded middorsal carina in posterior half; third to sixth somites with sharp carina, ending posteriorly in short spine. **Colour:** dark red.

Size: Maximum length: females, 334 mm; males, 193 mm.

Habitat, biology, and fisheries: Marine deep waters from 274 to 1 850 m, most frequently found between 400 and 900 m; mud bottoms. This species is fished commercially in the eastern Atlantic (Senegal, Guinea, Congo, and Angola); in the western Atlantic it has been considered of commercial interest only in the southern part of Area 31 (French Guyana); production is small and entirely exported to Spain. There are no separate statistics for this species. Caught with deep sea commercial trawlers. Marketed frozen.

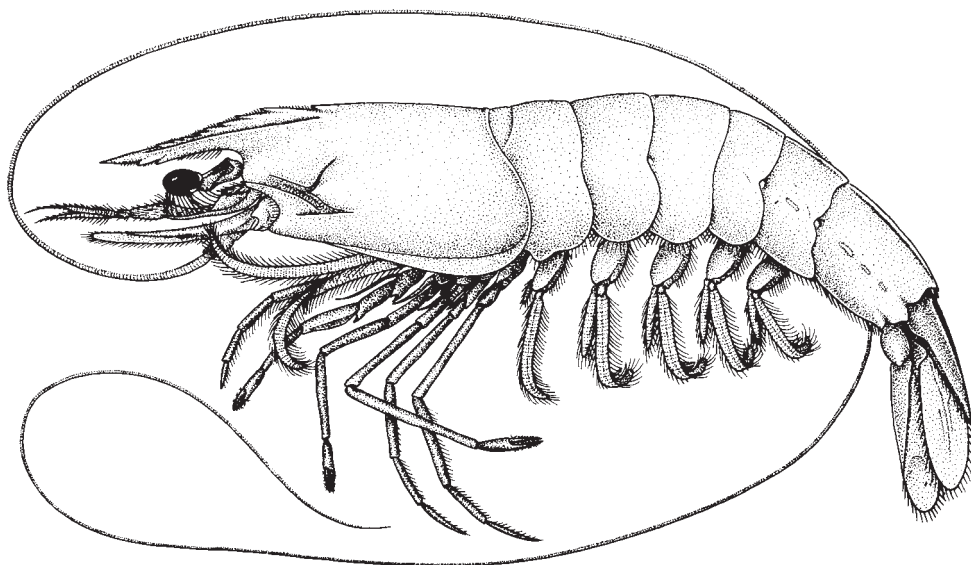
Distribution: Western Atlantic: Grand Bank (42°42'N) to the Gulf of Mexico, including Bermuda, Caribbean Sea, French Guiana, and Brazil. Eastern Atlantic: from Azores, Madeira, Canary Islands, Portugal, Morocco, western Sahara, to South Africa. Not in the Mediterranean. Indo-West Pacific: east coast of Africa, Madagascar, Arabian Sea, central Indian Ocean, Bay of Bengal, Andaman Sea, Indonesia, Japan, South China Sea, Australia (New South Wales), and Wallis and Futuna Islands.



PENAEIDAE

Penaeid shrimps

Diagnostic characters: Shrimps with well-developed and toothed rostrum which extends to or beyond distal edge of eyes; no styliform projections on bases of eyestalks and **no tubercles on their mesial (inner) borders**. Carapace without postorbital spines and with short cervical grooves ending well below dorsal midline. Last 2 pairs of pereopods well developed; third and fourth pairs of pleopods biramous; endopods of second pair of pleopods in males bearing appendix masculina only (lacking appendix interna and lateral projection). Telson sharply pointed, with or without fixed or movable spines on sides. A single well-developed arthrobranch on penultimate thoracic segment (hidden beneath the carapace), 1 rudimentary arthrobranch occasionally present. Thelycum open or closed.

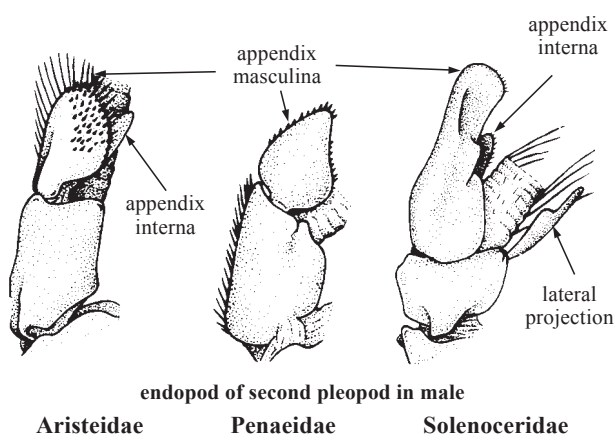


Habitat, biology, and fisheries: This family includes the most valuable marine commercial species of shrimps and accounts for at least 95% of the total shrimp production from Area 31.

Similar families occurring in the area

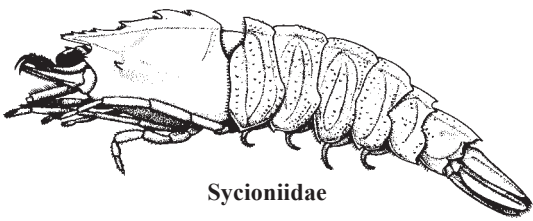
Solenoceridae: eyestalks with a tubercle on their mesial (inner) borders; carapace with postorbital spines; cervical grooves long, extending to or close to dorsal midline of carapace; endopods of second pair of pleopods in males bearing appendix masculina, appendix interna and lateral projection; telson with a fixed spine on each side of tip; 2 well-developed arthrobranches on each side of penultimate thoracic segment.

Aristeidae: eyestalks with a tubercle on mesial (inner) borders; cervical grooves long, extending to or very close to dorsal midline of carapace; endopods of second pair of pleopods in males bearing appendix masculina and appendix interna, but no lateral projection; 2 well-developed arthrobranches on each side of penultimate thoracic segment.

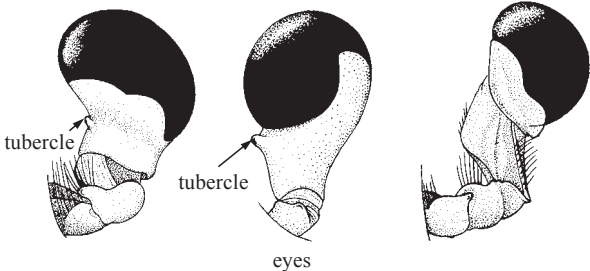


Sycioniidae: body thick, stony in appearance; cervical grooves very faint or absent; abdomen with deep grooves and numerous tubercles; third and fourth pairs of pleopods single branched; telson usually with a fixed spine on each side of tip.

Shrimps belonging to the Infraorder Caridea: pleura of second abdominal segment overlapping those of first and third segments; no pincers on third pair of pereopods.



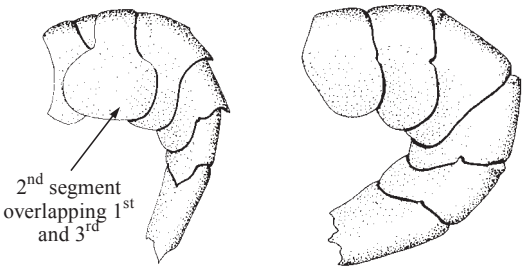
Sycioniidae



Solenoceridae

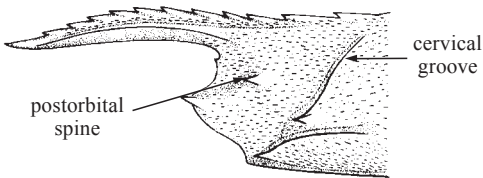
Aristeidae

Penaeidae

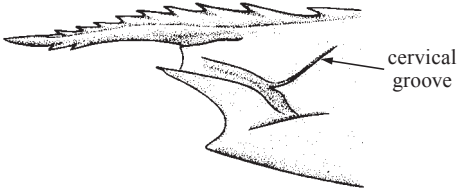


Caridea

Penaeidae



Solenoceridae



Penaeidae

Key to the genera of Penaeidae occurring in the area

(from Pérez Farfante and Kensley, 1997)

Note: The generic system of the family Penaeidae was recently revised by Pérez Farfante and Kensley (1997) and, as a result, a new generic arrangement has been proposed for the family. The new generic system has been followed here. However, for each species treated herein, the most recent previous name has been included as well. The family now includes 26 genera and 216 species and subspecies worldwide. Eleven genera and 21 species occur in Area 31; 10 species, included in 4 genera, are of economic interest.

- 1a. Rostrum armed with dorsal and usually also ventral teeth (Fig. 1) (absent only in *Funchalia*); pleurobranchia on somite 14 (last thoracic somite) → 2
- 1b. Rostrum usually armed with dorsal teeth only (Fig. 2); no pleurobranchia on somite 14 → 10

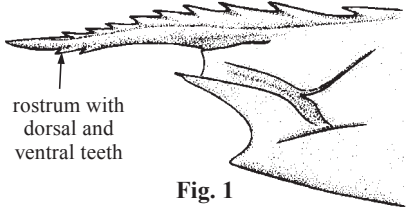


Fig. 1

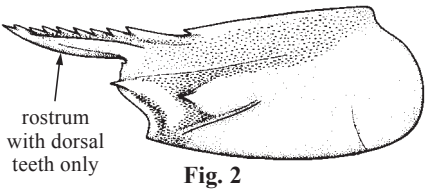


Fig. 2

- 2a. Integument glabrous (smooth) and polished; 3 short, well-defined cicatrices on sixth abdominal somite → 3
- 2b. Integument setose (hairy); single, long (sometimes interrupted) cicatrix on sixth abdominal somite or none → 8

- 3a. Adrostral sulcus and carina short, falling distinctly short or extending to about level of epigastric tooth; gastrofrontal carina absent → 4
- 3b. Adrostral sulcus and carina long, reaching much beyond epigastric tooth, usually almost to posterior margin of carapace; gastrofrontal carina present → 6
- 4a. Hepatic carina absent or if present moderately- to ill-defined *Fenneropenaeus*
- 4b. Hepatic carina prominent → 5
- 5a. Thelycum open; petasma with ventral costa short, not reaching distal margin of lateral lobe . *Litopenaeus*
- 5b. Thelycum closed; petasma with ventral costa long, reaching distal margin of lateral lobe . . . *Penaeus*
- 6a. Gastrofrontal carina not turning anterodorsally upon itself at posterior end; sixth abdominal somite with well-defined dorsolateral sulcus; telson unarmed *Farfantepenaeus*
- 6b. Gastrofrontal carina turning anterodorsally upon itself at posterior end; sixth abdominal somite lacking dorsolateral sulcus; telson usually armed with 3 pairs of movable lateral spines (absent only in *Melicertus canaliculatus*) → 7
- 7a. Gastrofrontal sulcus not markedly bifid posteriorly; thelycum with pair of lateral plates on sternite 14 shielding sac-like seminal receptacle opening along midline *Melicertus*
- 7b. Gastrofrontal sulcus markedly bifid posteriorly; thelycum with single plate on sternite 14 infolded laterally, forming pouch opening anteriorly, functioning as seminal receptacle . *Marsupenaeus*
- 8a. Integument with numerous sulci overlapped by rows of densely set stiff setae projecting from 1 margin; telson with 4 pairs of movable lateral spines; antennular flagella short, less than half length of carapace *Heteropenaeus*
- 8b. Integument with few sulci not overlapped by rows of stiff setae; telson with 3 pairs of fixed lateral spines; antennular flagella long, longer than carapace → 9
- 9a. Rostrum armed with dorsal teeth only; carapace lacking dorsolateral carina; incisor processes of mandible extremely elongate, scythe-like and crossing posterior to labrum; petasma asymmetrical with either right or left half longer than opposite *Funchalia*
- 9b. Rostrum armed with dorsal and ventral teeth; carapace with dorsolateral carina; incisor processes of mandible short, not crossing; petasma symmetrical, both halves of same length *Pelagopenaeus*
- 10a. Telson with pair of well-developed fixed subapical spines (Fig. 3) (preceded by lateral movable spines); first segment of antennular peduncle usually bearing ventromesial (parapeneid) spine (Fig. 4) → 11
- 10b. Telson without pair of subapical spines (only occasionally present as in *Parapenaeopsis stylifera* and *Rimapenaeus fuscina*), usually with movable lateral spines; first segment of antennular peduncle lacking parapeneid spine → 14

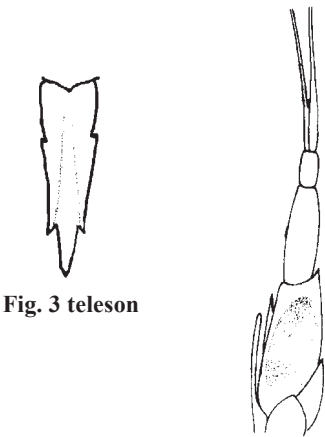


Fig. 3 telson

Fig. 4

- 11a. Carapace with longitudinal suture (extending at least 0.8 of its length) and transverse suture; not more than 1 pair of minute lateral spines anterior to subapical spines (Fig. 5) . *Parapenaeus*
- 11b. Carapace without longitudinal suture; 2 or more pairs of conspicuous spines anterior to subapical spines → 12

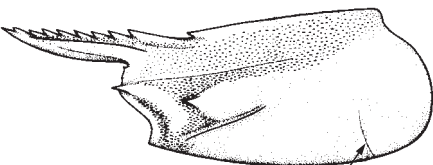


Fig. 5 transverse suture

- 12a. Pterygostomian spine absent (anteroventral margin of carapace rounded); first pereopod without basial spine; exopods lacking on second maxillipeds and all pereopods *Artemesia*
- 12b. Pterygostomian spine present (anteroventral margin of carapace tooth-like); first pereopod without basial spine; exopods on all maxillipeds and pereopods → 13

- 13a. Third maxilliped and second pereopod with basial spine; petasma asymmetrical (Fig. 6) *Metapenaeopsis*
- 13b. Third maxilliped and second pereopod without basial spine; petasma symmetrical (Fig. 7) *Penaeopsis*

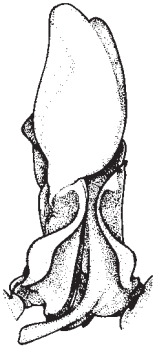


Fig. 6 petasma

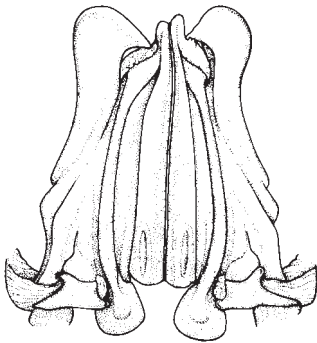


Fig. 7 petasma

- 14a. Pleurobranchia on somite 13 (penultimate thoracic somite); exopods on maxillipeds and 4 anterior pairs of pereopods, lacking on fifth *Metapenaeus*
- 14b. Pleurobranchia absent on somite 13; exopods present on all pereopods or absent from 4 posterior pairs. → 15


- 15a. Exopods on first maxilliped and first pereopod; petasma with lateral lobes distally produced into extremely long filamentous processes; thelycum with lateral plates curved posteriorly and expanded into bulbous swelling anteriorly *Macropetasma*
- 15b. Exopods at least on third maxilliped and all pereopods; petasma with lateral lobes not distally produced into extremely long, filamentous processes; thelycum with lateral plates neither strongly curved posteriorly nor expanded into bulbous swelling anteriorly → 16











- 16a. Carapace lacking longitudinal and transverse sutures; telson with subapical pair of lateral movable spines mounted on elongate shoulder; epipods not furcate; petasma with ventrolateral lobule produced into 2 or 3 distal flaps *Trachypenaeopsis*
- 16b. Carapace with either longitudinal or transverse sutures or both, absent only in *Miyadiella*; telson lacking spines or with movable one not mounted on shoulders or mounted on slight ones; petasma with ventrolateral lobule not produced into distal flaps → 17

- 17a. Second maxilliped without exopod; first 3 pereopods with elongate chela, propod lengthened and dactyl very short (much less than half length of propod) *Protrachypene*
- 17b. Second maxilliped with well-developed exopod; first 3 pereopods with not elongate chela, propod not lengthened and dactyl not less than half length of propod. → 18
- 18a. Fourth and fifth pereopods very elongate, subflagelliform, much longer than first 3. → 19
- 18b. Fourth and fifth pereopods not elongate, only slightly longer than first 3, or only fifth elongate. → 20

- 19a.** Integument pubescent; telson armed with 4 pairs of movable spines; fourth and fifth pereopods with entire dactyl *Tanypenaeus*
- 19b.** Integument glabrous; telson unarmed; fourth and fifth pereopods with multiarticulate dactyl. *Xiphopenaeus*
- 20a.** Carapace lacking longitudinal sutures; second pereopod armed with ischial spine → 21
- 20b.** Carapace with longitudinal sutures; second pereopod lacking ischial spine → 22
- 21a.** Eyestalk not surpassing first antennular segment; basal rostral teeth and postrostral carina lacking spinules; thelycum closed *Atypopenaeus*
- 21b.** Eyestalk conspicuously surpassing first antennular segment, sometimes reaching or overreaching antennular peduncle; basal rostral teeth and postrostral carina studded with spinules; thelycum open *Miyadiella*
- 22a.** Body slender, integument thin; third pereopod lacking epipod *Parapenaeopsis*
- 22b.** Body thickset, integument thick; third pereopod armed with epipod → 23
- 23a.** Carapace with longitudinal suture long, conspicuously overreaching hepatic spine; third maxilliped armed with basal spine *Rimopenaeus*
- 23b.** Carapace with longitudinal suture short, ending well anterior to hepatic spine; third maxilliped lacking basal spine → 24
- 24a.** Thelycum with plate on sternite 14 very short medially, deeply excavate, embracing extremely long caudal extension of median protuberance; petasma with distolateral projections either moderately broad to rather narrow basally and extending laterally to mesially, or forward-directed hook-like tip, or extremely broad basally but narrowing rapidly, ending in forward-directed tip *Megokris*
- 24b.** Thelycum with plate on sternite 14 relatively long, not excavate, median protuberance lacking long caudal extension; petasma with distolateral projections either relatively narrow and directed laterally almost straight, or curving backwards, or extremely broad and ending in long, twisted process → 25
- 25a.** Thelycum with plate on sternite 14 not emarginate anteriorly, instead continuous with median protuberance, lacking anterior transverse groove; petasma with distolateral projections extremely broad, extending laterally and forming apically long, flat twisted process *Trachypenaeus*
- 25b.** Thelycum with plate on sternite 14 shallowly emarginate or occasionally produced in a small median protuberance, not continuous with median protuberance; petasma with distolateral projections tapering gently from relatively narrow base, extending almost straight laterally or curving slightly backwards *Trachysalambria*

List of the species of Penaeidae occurring in the area

The symbol  is given when species accounts are included.

-  *Farfantepenaeus aztecus* (Ives, 1891).
-  *Farfantepenaeus brasiliensis* (Latreille, 1817).
-  *Farfantepenaeus duorarum* (Burkenroad, 1939).
-  *Farfantepenaeus notialis* (Pérez Farfante, 1967).
-  *Farfantepenaeus subtilis* (Pérez Farfante, 1967).
-  *Litopenaeus schmitti* (Burkenroad, 1905).
-  *Litopenaeus setiferus* (Linnaeus, 1767).
-  *Rimopenaeus constrictus* (Stimpson, 1874).
-  *Rimopenaeus similis* (Smith, 1885).
-  *Xyphopenaeus kroyeri* (Heller, 1862).

References

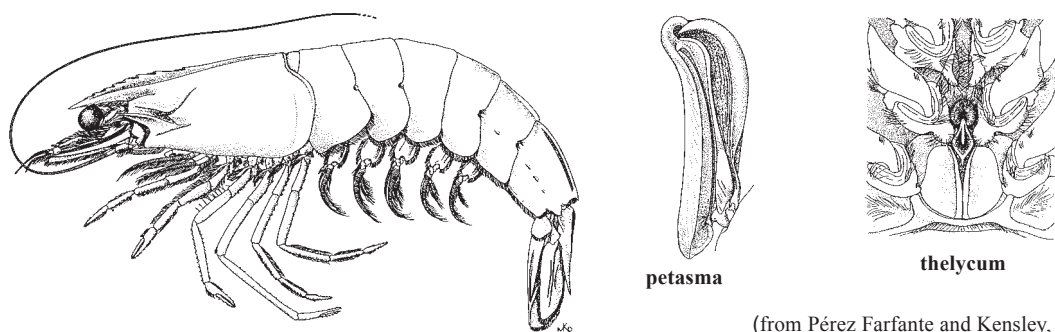
- Arreguín-Sánchez, F. and R. G. Castro-Meléndez. 2000. On the interdependence of sequential fisheries: the brown shrimp, *Farfantepenaeus aztecus*, fisheries in the northwestern Gulf of Mexico. *Crustaceana*, 73(3):333-343.
- Boschi, E.E. 1963. Los camarones comerciales de la familia Penaeidae de la costa Atlántica de América del Sur. Clave para el reconocimiento de las especies y datos bioecológicos. *Boletín del Instituto de Biología Marina*, 3:1-39.
- Davant, P. 1963. *Clave para la identificación de los camarones marinos y de río con importancia económica en el oriente de Venezuela*. Cumana, Cuadernos Oceanográficos, Instituto Oceanográfico, Universidad de Oriente, 1:1-113.
- Dore, I. and C. Frimodt. 1987. *An illustrated guide to shrimps of the world*. New York, Osprey Books, 229 p.
- Gusmão, J., C.Z. Lazoski, and A.M. Solé-Cava. 2000. A new species of *Penaeus* (Crustacea: Penaeidae) revealed by allozyme and cytochrome oxidase I analysis. *Mar. Biol.*, 137:435-446.
- Holthuis, L.B. 1980. FAO Species Catalogue. I. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, (125)1:271 p.
- Maggioni, D.E. 1996. Caracterização de algumas espécies do gênero *Penaeus* do litoral brasileiro através de eletroenfoque. *Nauplius*, 4:129-137.
- Pérez Farfante, I. 1969. Western Atlantic shrimps of the genus *Penaeus*. *Fish. Bull.*, 67(3):461-591.
- Pérez Farfante, I. 1978. Shrimps and Prawns. In *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31)*, edited by W. Fischer. Vol. 6. Rome, FAO (unpaginated).
- Pérez Farfante, I. 1988. Illustrated key to the penaeoid shrimps of commerce in the Americas. *NOAA Tech. Rep.*, 64:32.
- Pérez Farfante, I. and B. Kensley. 1997. Penaeoid and Sergestoid shrimps and prawns of the world. Key and diagnoses for the families and genera. *Mém. Mus. nat. Hist. nat., Paris*, 175:1-233.
- Takeda, M. 1983. Crustaceans. In: *Crustaceans and mollusks trawled off Suriname and French Guyana*, edited by M. Takeda and T. Okutani. Tokyo, Japan Marine Fishery Resource Research Center, 185 p.
- Williams, A. B. 1984. *Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida*. Smithsonian Institution Press, 550 p.

Farfantepenaeus aztecus (Ives, 1891)

ABS

Frequent synonyms / misidentifications: *Penaeus* (*Farfantepenaeus*) *aztecus* (Ives, 1891) / None.

FAO names: En - Northern brown shrimp; Fr - Crevette royale grise; Sp - Camarón café norteño.



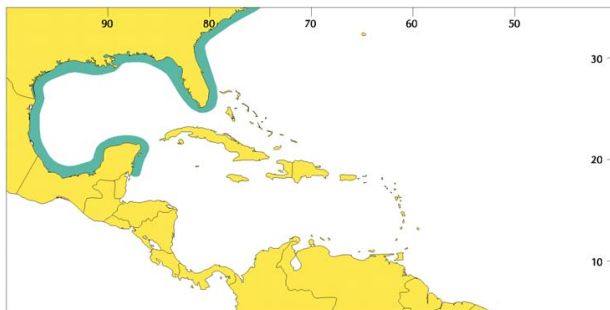
(from Pérez Farfante and Kensley, 1997)

Diagnostic characters: Carapace smooth. Rostrum armed with usually 8 or 9 teeth on dorsal margin and 2 teeth on ventral, its tip moderately short ($1/4$ or less the length of rostrum); **adrostral sulcus and carina long, extending almost to hind margin of carapace, sulcus wide posteriorly**; postrostral carina well developed as far back as adrostral sulcus, with a **deep median sulcus throughout its length**; gastrofrontal carina present. **Dorsolateral sulcus on last abdominal segment well defined and broad, ratio of height of dorsal keel to width of sulcus often less than 2.25**. Antennae short, about 1.4 times the body length. **Petasma with short distomarginal projections, distal folds not forming auricles, apices of ventral costae tightly joined to adjacent membranous portion; free border of costae unarmed, attached border with 2 or 3 series of closely set teeth**. **Thelycum with lateral plates, their anteromedian angles divergent; posterior process armed with a median crest bifurcate anteriorly (Y-shaped) and exposed**. **Colour:** often brown, sometimes with an orange or yellowish tinge, occasionally reddish or greenish; pereopods and tail fan darker, uropods often with a purple edge. Usually no dark lateral spot at junction of third and fourth abdominal segments. Juveniles are frequently light greyish with minute brown or olive green specks over entire body and, in addition, orange ones on abdomen; uropods with brown specks, particularly dense at their distal portions.

Size: Maximum length: females, 236 mm; males, 195 mm.

Habitat, biology, and fisheries: Estuarine and oceanic littoral. Found from the coastline to depths of about 110 m (occasionally in deeper water, to 165 m), mainly on mud or sandy mud, sometimes mixed with shell fragments; the juveniles inhabit muddy or peaty bottoms with shell fragments in estuarine waters. The adults are mostly active at night, burying in the substrate in daytime. Greatest quantities along the Texas coast and in the southwestern Bay of Campeche; most important species of *Farfantepenaeus* off North Carolina. The total catch for this species exceeds that of other peneids taken in the USA. In the fisheries statistics for the years 1984 to 1998 *Farfantepenaeus aztecus* has been referred to as *Penaeus aztecus*. From 1984 to 1998 the capture production reported from the USA totaled 928 222 t (mean capture production: 61 881 t/year). From 1984 to 1991 the capture production was always greater than 60 000 t, peaking to 78 667 t in 1990. From 1992 on, the mark of 60 000 t was never attained again. There are no separate statistics for this species in the other countries of Area 31, where the *Farfantepenaeus* species are referred together as *Penaeus* spp. This species is caught mainly with American-type shrimp trawls (balloon and flat); usually, 2 trawls are towed simultaneously (double-rig). In inshore and near shore waters it is mainly taken with shrimp trawls (including trynets) and various other types of gear (frame trawls, channel nets, seines, cast nets, push nets, lift nets and set gear). Marketed mostly frozen and fresh; a small fraction of the catch is canned; juvenile and subadult shrimp are mainly sold as bait. This species has been farm-raised on a small scale.

Distribution: Martha's Vineyard, Massachusetts, around peninsular Florida to Sanibel grounds, Appalachicola Bay, around Gulf of Mexico to northwestern Yucatán. *F. aztecus* extends farther north than any of the other western Atlantic species of the genus.

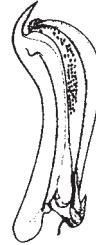
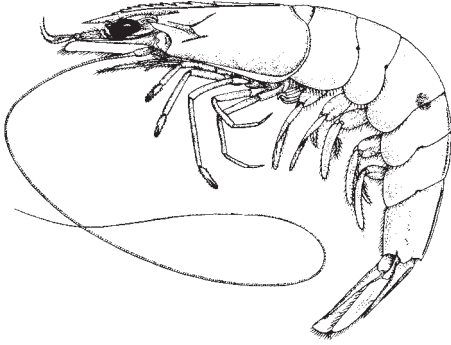


Farfantepenaeus brasiliensis (Latreille, 1817)

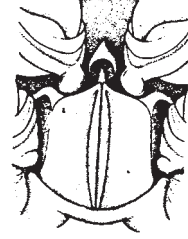
PNB

Frequent synonyms / misidentifications: *Penaeus* (*Farfantepenaeus*) *brasiliensis* Latreille, 1817 / None.

FAO names: **En** - Redspotted shrimp; **Fr** - Crevette royale rose; **Sp** - Camarón rosado con manchas.



petasma



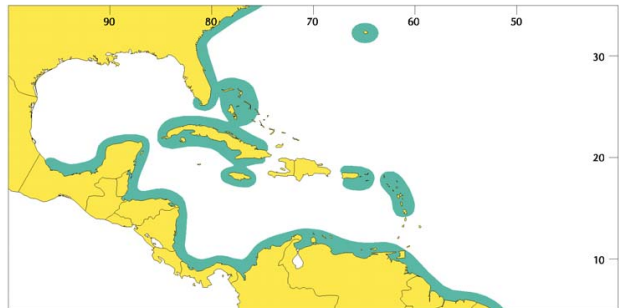
thelycum

Diagnostic characters: Carapace smooth. Rostrum armed with usually 8 or 9 teeth on dorsal margin, and 2 teeth on ventral, its tip short (about 1/4 the length of rostrum); **adrostral sulcus and carina long, extending almost to hind margin of carapace**; postrostral carina very prominent as far back as adrostral sulcus, with a **deep median sulcus throughout its length**; gastrofrontal carinae present. Dorsolateral sulcus on last abdominal segment well defined, variable in width: narrow in specimens from North America and adjacent Caribbean waters (ratio height of dorsal keel / width of sulcus usually 5 or a little less); broad in specimens from South America (ratio keel / sulcus usually less than 2.75). **Petasma with very long distomarginal projections, distal folds wide, forming auricles covered with spinules; apices of ventral costae separated from adjacent membranous portion; free border of costae usually unarmed, attached border with 6 to 12 teeth disposed in 2 irregular series.** **Thelycum with lateral plates, their anteromedian angles extended as narrow projections which completely cover the posterior process; latter may have a short, deeply situated median carina posteriorly.** **Colour:** pink or brownish red. Usually with a dark (intense brown or brownish red) lateral patch at junction of third and fourth abdominal segments.

Size: Maximum length: females, 250 mm; males, 191 mm.

Habitat, biology, and fisheries: Inhabits shelf areas from the coastline to depths of about 65 m, rarely deeper waters (366 m); most abundant between 45 and 65 m on moderately firm bottoms of mud mixed with sand; juveniles and subadults may be found on soft mud bottoms. This species is nocturnal, and the adults as well as the juveniles are caught at night. Highest yields are obtained from Guyana, Suriname, French Guyana, and especially Ilha de Marajó (Brazil). In the northern part of its range it usually forms a small percentage of the total shrimp catch. It is quite important in some localities on the Caribbean coast of Central and South America (Mexico, Nicaragua and Venezuela). In the fisheries statistics for the years 1984 to 1998 *Farfantepenaeus brasiliensis* appears as *Penaeus brasiliensis*. The captures totaled 4 t in 1989 (USA), otherwise no separate statistics have been reported during this period. However, it has been reported that the USA shrimp catches from northeast of Quintana Roo (about 332 t in 1975) were almost entirely made up by this species but were reported as *F. duorarum*. Whether this is a current procedure is unknown. Landings of *Farfantepenaeus* are not broken down to species in the other countries of Area 31. Outside the area there are separate statistics for *F. brasiliensis* in Brazil (from 1984 to 1998 the capture production totaled 114 191 t; mean capture production was 7 612 t/year). Caught mainly with American-type shrimp trawls (balloon and flat); juveniles are taken in estuaries and near-shore waters with seines, cast nets, push nets and dip nets. Marketed mostly frozen; also fresh, dried, or canned; juveniles are mainly used as bait. This species has been farm-raised on a small scale.

Distribution: Off Cape Hatteras to Florida Keys, off Campeche and Yucatán; off Bermuda, through Caribbean Sea and West Indies to Rio Grande do Sul (Brazil).

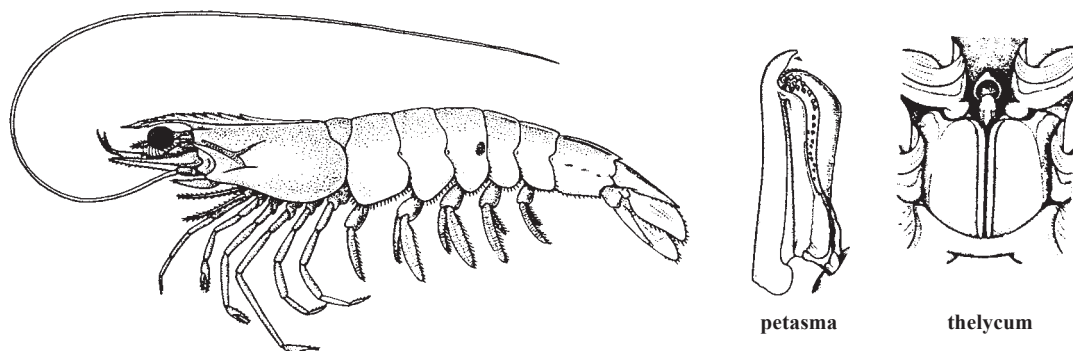


Farfantepenaeus duorarum (Burkenroad, 1939)

APS

Frequent synonyms / misidentifications: *Penaeus* (*Farfantepenaeus*) *duorarum* Burkenroad, 1939 / None.

FAO names: **En** - Northern pink shrimp; **Fr** - Crevette rodché du nord; **Sp** - Camarón rosado norteño.

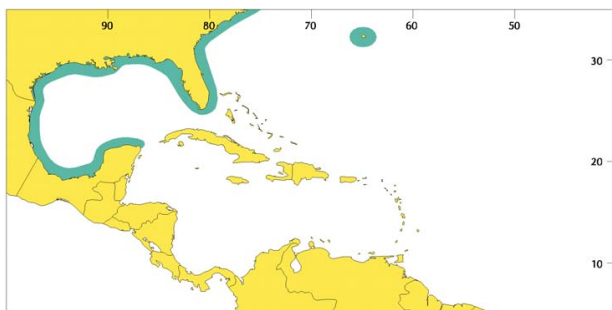


Diagnostic characters: Carapace smooth. Rostrum armed with usually 8 or 9 teeth on dorsal margin, and 2 teeth on ventral, its tip rather short (1/4 or less the length of rostrum); **adrostral sulcus and carina long, extending almost to hind margin of carapace**; postrostral carina well developed as far back as adrostral sulcus, with a **deep median sulcus throughout its length**; gastrofrontal carina present. **Dorsolateral carina on last abdominal segment well defined and narrow**, ratio of height of dorsal keel to width of sulcus usually 4.5 or more, and with **sharp lips sometimes nearly closed**. **Petasma with short distomarginal projections, distal folds not forming auricles, apices of ventral costae joined to adjacent membranous portion; free border of costae armed with spinules, attached border with a compact group of teeth**. **Thelycum with lateral plates, their anteromedian borders divergent; narrow posterior process armed with a long, simple (not bifurcate) and exposed median carina**. **Colour:** often pale to dark pink, or reddish, but sometimes lemon yellow or light grey. **Usually with a dark (purple, brown, greyish red, or blue) lateral spot at junction of third and fourth abdominal segments**; transverse lines running parallel to hind margin of carapace and on abdominal segments, and round patches on the centre of each pleuron. Juveniles and subadults may be brown, grey, green, reddish, or whitish.

Size: Maximum length: females, 280 mm; males, 269 mm, usually 190 mm.

Habitat, biology, and fisheries: Inhabits estuaries and inner oceanic littoral to depths of about 70 m (rarely greater depths, 277 to 375 m); most abundant between 11 and 36 m. The adults are found mainly on firm bottoms of mud and silt, and coral sand, often with shell fragments. Juveniles and subadults prefer coarser substrates consisting of shell fragments and sand or loose turf. Predominantly nocturnal, burying in the substrate in daytime, except on cloudy days or when the water is murky. Juveniles live in water with low salinities, adults are marine. Major centres of abundance are off southwestern to northwestern Florida and in the southeastern Bay of Campeche; minor centre of abundance in the Beaufort area of North Carolina. *Farfantepenaeus duorarum* has been referred as *Penaeus duorarum* in the FAO fisheries statistics for the years 1984 to 1998. In that period the capture production reported from the USA totaled 119 784 t (mean capture production 7 985 t/year). Although *F. duorarum* accounted for part of the shrimp catches in the other countries of Area 31, during 1984 to 1998 no separate statistics for this species were reported. This species is of great commercial value in the Gulf of Mexico, used for consumption and bait. Caught mainly with American-type shrimp trawls (balloon and flat); usually 2 trawls are towed simultaneously (double-rig). Juveniles and subadults are taken in inshore and near shore waters with various types of gear: otter trawls, channel nets, push nets, dip nets, bridge nets and roller frame trawls. Marketed mostly frozen. This species has been farm-raised on a small scale.

Distribution: Lower part of Chesapeake Bay through Florida Straits, Bermuda, around Mexico to Cape Catoche and Isla Mujeres at the tip of Yucatán Peninsula.

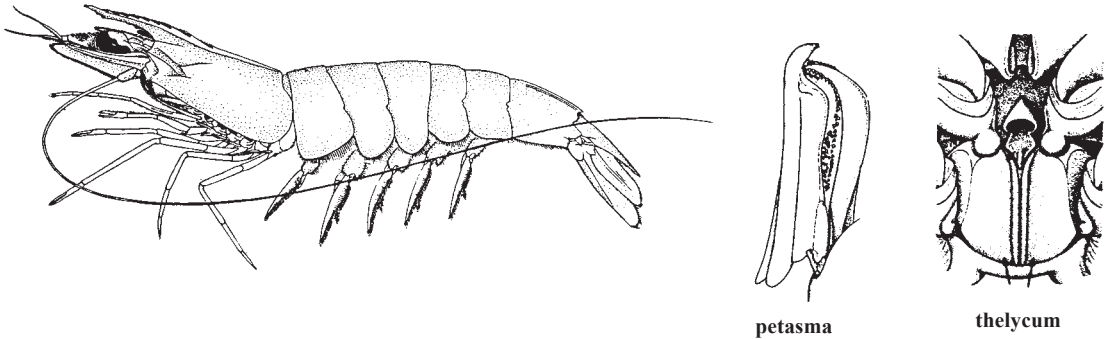


Farfantepenaeus notialis (Pérez Farfante, 1967)

SOP

Frequent synonyms / misidentifications: *Penaeus* (*Farfantepenaeus*) *notialis* Pérez Farfante, 1967/ None.

FAO names: En - Southern pink shrimp; Fr - Crevette rodché du Sud; Sp - Camarón rosado sureño.

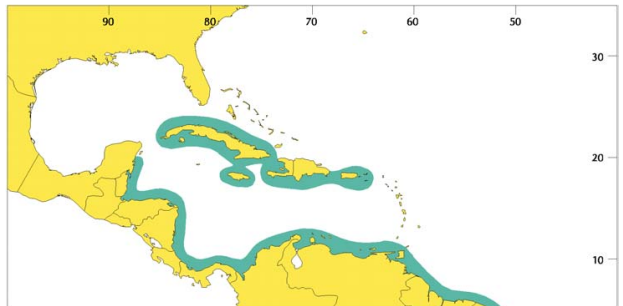


Diagnostic characters: Carapace smooth. Rostrum armed with usually 8 or 9 teeth on dorsal margin, and 2 teeth on ventral, its tip short (1/4 or less the length of rostrum); **adrostral sulcus and carina long, extending almost to hind margin of carapace, the sulcus deep and broad posteriorly**; postrostral carina well developed as far back as adrostral sulcus, with a **deep median groove throughout its length**; gastrofrontal carina present. **Dorsolateral sulcus on last abdominal segment well defined and broad, ratio of height of dorsal keel to width of sulcus usually less than 1.75.** Petasma with short distomarginal projections, distal folds not forming auricles, apices of ventral costae joined to adjacent membranous portion; free border of costae armed with spinules, attached border with a group of large teeth. Thelycum with lateral plates, their anteromedian border divergent; broad posterior process with a long, simple (not bifurcate), and exposed median carina. **Colour:** often light brown, yellowish, or pink; dark brown in some localities. **Often no dark lateral spot at junction of third and fourth abdominal segments.**

Size: Maximum length: females, 200 mm; males, 175 mm.

Habitat, biology, and fisheries: Inhabits shelf areas from the coastline to depths of about 100 m, rarely to 700 m; the largest concentrations are found between 3 and 50 m. Bottom mud or sandy mud and sandy patches among rocks. Although predominantly nocturnal, this species is also partly active in the daytime; mostly fished at night, but in some areas also by day. Juveniles living in estuarine waters. One of the most important commercial shrimps of the southeast coast of Cuba and some other localities around the Greater Antilles and the continental shelf especially off Honduras, Nicaragua, Colombia, and in the Gulf of Venezuela. Minor importance off Guyana, Suriname, and French Guyana. Outside the area the species is of commercial importance in various areas of Brazil and in West Africa, where it is fished both locally and by foreign trawlers. This species has been farm-raised on a small scale. Separate statistics are not reported for this species which accounts for part of the shrimp catches in the southern part of the area. The Cuban shrimp catches reported as *F. duorarum* are partly made up by *F. notialis*. Caught mainly with American-type shrimp trawls (balloon and flat). Juveniles and subadults are taken in inshore and near-shore waters with seines, cast nets, push nets and dip nets. Marketed mostly fresh.

Distribution: Caribbean Sea, including the greater Antilles, the Virgin Islands, and the continental shelf from Ascension Bay, Quintana Roo, to the south; along the South American coast it extends down to Rio de Janeiro, Brazil; also found off West Africa from Mauritania to Angola.

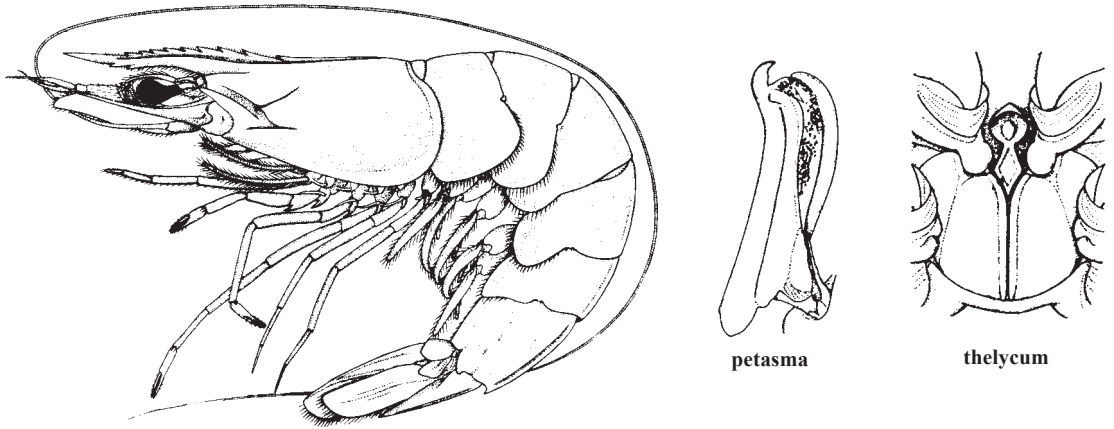


***Farfantepenaeus subtilis* (Pérez Farfante, 1967)**

PNU

Frequent synonyms / misidentifications: *Penaeus* (*Farfantepenaeus*) *subtilis* Pérez Farfante, 1967 / None.

FAO names: **En** - Southern brown shrimp; **Fr** - Crevette café; **Sp** - Camarón café sureño.



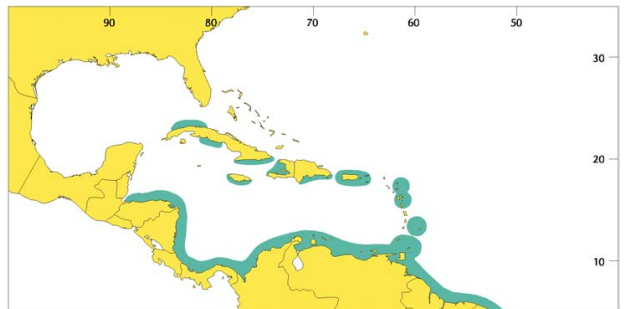
Diagnostic characters: Carapace smooth. Rostrum armed with usually 8 or 9 teeth on dorsal margin, and 2 teeth on ventral, its tip rather short (1/4 or 1/3 the length of rostrum); **adrostral sulcus and carina relatively short, ending well in front of hind margin of carapace, the sulcus narrows posteriorly; postrostral carina well developed and extending as far back as adrostral sulcus, its median sulcus interrupted;** gastrofrontal carina present. **Dorsolateral sulcus on last abdominal segment well defined and narrow, ratio of height of dorsal keel to width of sulcus usually more than 3.** Petasma with short distomarginal projections, distal folds not forming auricles, apices of ventral costae tightly joined to adjacent membranous portion; free border of costae unarmed, attached border with 2 to 4 series of closely set teeth. Thelycum with lateral plates, their anteromedian angles divergent; posterior process armed with an exposed and anteriorly bifurcate (Y-shaped) median crest. **Colour:** usually brown, sometimes greyish or yellow. **No dark lateral spot at junction of third and fourth abdominal segments.**

Size: Maximum length: females, 205 mm; males, 152 mm.

Habitat, biology, and fisheries: From the coastline to depths of about 90 m, occasionally in deeper water to 190 m, mainly on soft or hard mud, sometimes mixed with shell fragments. Adults are found in marine waters while juveniles are usually estuarine and marine, occasionally hypersaline. Off Honduras it is predominantly active at night but on the shrimp grounds off Guyana, Suriname, and French Guiana it is caught by day as well as at night. Fished along the coasts of Honduras, Nicaragua, Colombia, Venezuela, and especially Guyana, Suriname, and French Guiana. Separate statistics are not collected for this species which accounts for most of the large shrimp catches from the southern part of the area. The relatively small quantities of *F. subtilis* caught by the USA fleet are reported as *F. aztecus*. Caught mainly with American-type shrimp trawls (balloon and flat); juveniles are taken in estuaries with seines, cast nets, push nets and dip nets. Marketed mostly frozen; also fresh or dried. This species has been farm-raised in small scale.

Distribution: Caribbean Sea, including Cuba, Antilles, the continental shelf from Honduras to the south; along the South American Atlantic coast it extends down to Brazil (from Amapá to Rio de Janeiro).

Remarks: Recent allozyme and DNA-sequence data allowed the recognition of 2 different species traditionally regarded as *F. subtilis* (Maggioni, 1996; Gusmão et al., 2000). Actually, the 2 species correspond to the 2 populations recognized by Pérez Farfante (1969) on the basis of morphometrical data. Typical *F. subtilis* are found from the Caribbean Sea down to Ceará (northeastern Brazil), whereas the new species presently ranges from Ceará to Cabo Frio (southeastern Brazil) (Gusmão et al., 2000). The new *Farfantepenaeus* has not yet been named.

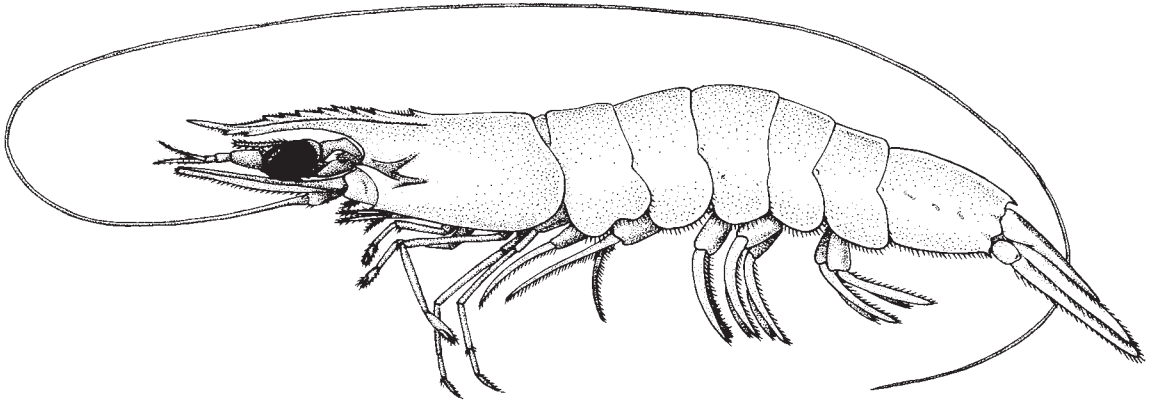


Litopenaeus schmitti (Burkenroad, 1936)

PNT

Frequent synonyms / misidentifications: *Penaeus (Litopenaeus) schmitti* Burkenroad, 1936 / None.

FAO names: En - Southern white shrimp; Fr - Crevette ligubam du sud; Sp - Camarón blanco sureño.

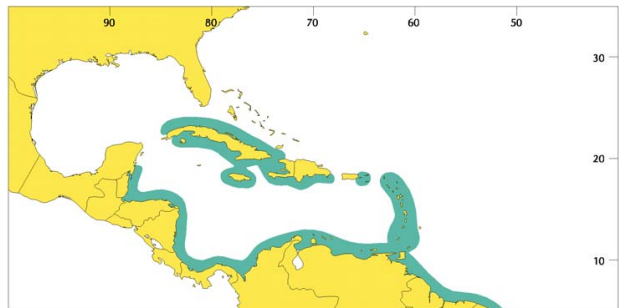


Diagnostic characters: Carapace smooth. Rostrum armed with 7 to 9 teeth on dorsal margin, and 2 teeth on ventral, its tip long and slender (almost half the length of rostrum); **adrostral sulcus and carina short, not exceeding anterior half of carapace; gastrofrontal carina absent; postrostral carina well defined anteriorly, faint posteriorly**, its median sulcus short and shallow. **Dorsolateral sulcus on last abdominal segment very faint and without lips.** Antennae long, 2.5 to 2.75 times the body length. **Distal portion of lateral lobes of petasma smooth, lacking a rib on their inner surface. Thelycum lateral plates, but with 2 subparallel ribs on anterior portion of sternite 14, each rib followed posteriorly by rounded or subconical protuberance.** **Colour:** usually translucent bluish white or grey, sometimes with a greenish or yellowish tinge. Juveniles and subadults are variable in colour but most often translucent white, with blue specks scattered over entire body.

Size: Maximum length: females, 235 mm; males, 175 mm.

Habitat, biology, and fisheries: Inhabits coastal waters to depths of 47 m, most abundant between 15 and 30 m, mainly on mud and muddy sand, sometimes mixed with shell fragments; less common on sandy substrates. Late postlarvae and juveniles live in estuarine waters on mud bottoms supporting vegetation and rich in organic debris; the adults are marine. This species is predominantly diurnal, apparently most active at dawn; however, in some areas has been shown to be active also at night. Omnivorous, feeding on algae, plant debris and various types of animals such as worms, molluscs, and crustaceans. Of considerable importance in Cuba, Belize, Honduras, Nicaragua, Colombia, Venezuela, Guyana, Suriname, and French Guyana; outside the area all along the Brazilian coast. Consumed locally and exported. Aquaculture experiments have been undertaken in Cuba. Adults are mainly caught with shrimp trawls and seines of American or Italian design (the latter used in Venezuela). Juveniles and subadults are taken in inshore and near shore waters with different types of gear: seines, cast nets, push nets, dip nets, and trap nets, especially in Colombia and Brazil, and "mandingas" in Venezuela. Marketed mostly frozen; also fresh, salted, dried or canned. This species has been farm-raised on a small scale.

Distribution: Greater Antilles from Cuba to Trinidad; Atlantic coast of Central and South America, from Belize to Brazil (from Amapá to Rio Grande do Sul).

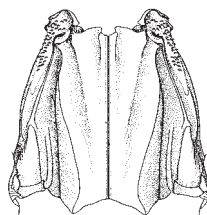
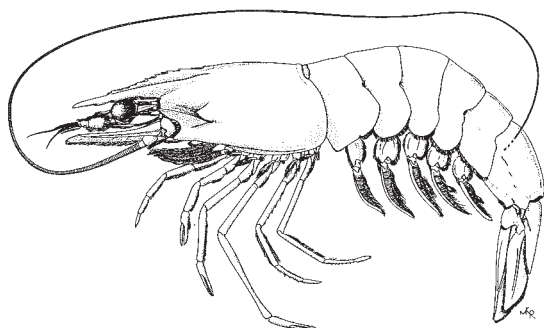


***Litopenaeus setiferus* (Linnaeus, 1767)**

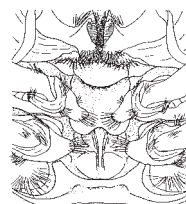
PST

Frequent synonyms / misidentifications: *Penaeus* (*Litopenaeus*) *setiferus* (Linnaeus, 1767) / None.

FAO names: En - Northern white shrimp; Fr - Crevette ligubam du nord; Sp - Camarón blanco norteño.



petasma



thelycum

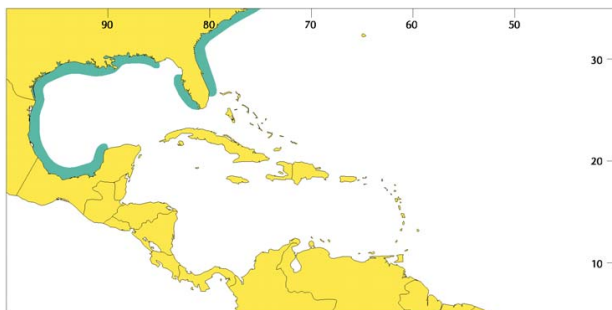
(from Pérez Farfante and Kensley, 1997)

Diagnostic characters: Carapace smooth. **Rostrum armed with usually 7 to 9 teeth on dorsal margin, and 2 teeth on ventral, its tip long and slender** (almost half the length of rostrum); **adrostral sulcus and carina short, not exceeding anterior half of carapace; gastrofrontal carina absent; postrostral carina well defined anteriorly, faint posteriorly**, its median sulcus short and shallow. Dorsolateral sulcus on last abdominal segment very faint and without lips. Antennae long, 2.5 to 3 times the body length. **Distal portion of lateral lobes of petasma bearing a conspicuous diagonal rib on inner surface. Thelycum without lateral plates, but with 2 curved ribs on anterior portion of sternite 14 converging toward the midline but not uniting; ribs followed posteriorly by a pair of fleshy subelliptical lobes.** **Colour:** usually a translucent bluish white, sometimes greyish or greenish, with rostrum and sides pinkish; dark grey transverse lines running parallel to posterior margin of carapace and on abdominal segments; pleopods reddish, telson and uropods with a red/blue band near their margins; the uropods also bear a brownish purple distal blotch and a narrow, yellowish marginal band. Juveniles are light grey, often with a greenish tinge, with bluish specks scattered over the body and densely concentrated on spines and crests; the uropods have a brown or reddish brown distal blotch.

Size: Maximum total length: females, 257 mm; males, 175 mm.

Habitat, biology, and fisheries: Normally inhabits estuaries and inner oceanic littoral, being more abundant at depths less than 30 m; it may, however, occur in deeper waters (to 82 m). The largest concentrations are found in extensive brackish water areas of soft mud or clay bottoms (sometimes with sand) connected with the sea. The postlarvae and juveniles grow up in estuarine waters, especially on vegetated mud bottoms rich in organic debris. An omnivorous species, although it prefers certain types of food such as polychaete worms. Centres of abundance are off Georgia and northeast Florida, Louisiana, Tabasco, and Campeche. This species is of great economic importance in the USA and Mexico. Fishing operations at sea extend to depths of about 27 m. A sizeable fishery of juveniles occurs in estuarine waters, although its yield is considerably smaller than that of the marine fishery for adults. In the fisheries statistics for the years 1984 to 1998 *Litopenaeus setiferus* was referred as *Penaeus setiferus*. From 1984 to 1998 the capture production reported from the USA totaled 572 349 t (mean capture production was 38 156 t/year). This species accounts for part of the Mexican shrimp catches, which totaled 540 864 t in the Area 31. In Mexico the penaeid catches are not broken down to species; instead, species are combined and referred as *Penaeus* spp. Adults are mainly caught with American-type shrimp trawls (balloon and flat); usually 2 trawls are towed simultaneously (double-rig). Juveniles and subadults are taken in inshore and near shore waters with different types of gear: seines, push nets, dip nets, cast nets, lift nets, drop nets, frame trawls, and side frame trawls. This species is marketed mostly frozen and canned, and exported all over the world. Juveniles and subadults are often sold as live bait. This species has been farm-raised on a small scale.

Distribution: New York (Fire Island) to Florida (Saint Lucie Inlet); near Dry Tortugas (rarely); Gulf of Mexico from Ochlocknee River, Florida, to Campeche, Mexico.

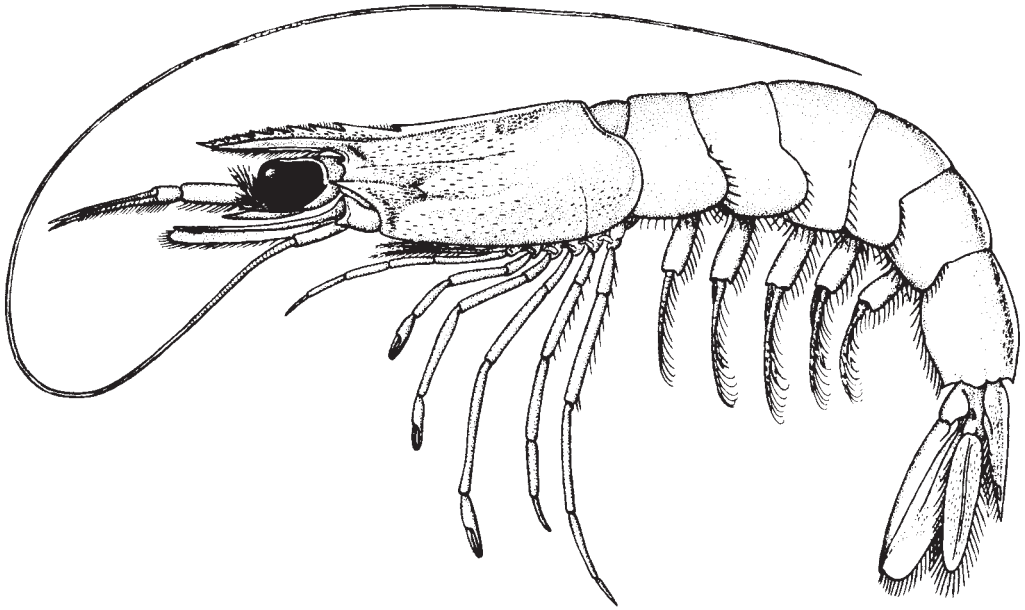


Rimapenaeus constrictus (Stimpson, 1874)

TKN

Frequent synonyms / misidentifications: *Trachypenaeus constrictus* (Stimpson, 1874) / None.

FAO names: En - Roughneck shrimp; Fr - Crevette gambri; Sp - Camarón fijador.

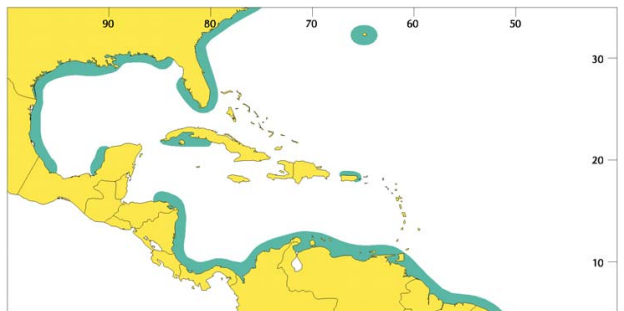


Diagnostic characters: Almost entire dorsal region and anterior part of sides of carapace densely covered with hair; branchial region sparsely pubescent (hairs almost imperceptible and widely spaced); **abdomen smooth except for a band of hair on each side of dorsal keel of last 2 segments. Rostrum with usually 7 to 9 teeth along entire dorsal margin, without teeth on ventral margin.** Carapace with longitudinal and transverse sutures. Last 2 pairs of pereopods shorter or only slightly longer than third, their dactyls undivided; **exopods of last pair of pereopods long, reaching to distomedian end of basis (second article).** In males, petasma with distolateral angles greatly produced as horn-like projections; **sternite 14 (on underside of thorax) bearing a cup-shaped protuberance with lateral margins indented, setting off broad anterior, from narrow posterior part. Thelycum with dense hair on median process of sternite 13 and on lateral plates; anterior border of median process strongly convex or angulate; anterior borders of lateral plates also strongly convex.** **Colour:** translucent with small greyish violet specks; pleopods pink.

Size: Maximum length: females, 93 mm; males, 80 mm.

Habitat, biology, and fisheries: Marine, inhabiting shelf areas to depths of 71 m; on bottoms of sand and muddy sand or mud and shells. This species is of minor importance in commercial fisheries; no special fishery exists for this species in Area 31. It is taken very frequently on the shrimp grounds of the south Atlantic coast of the USA, Campeche Bay, and Cuba. Outside the area it has been reported to enter the shrimp catches of Brazil. Separate statistics are not reported for this species. At present it is of little commercial importance, appearing mostly as bycatch in fisheries for other shrimps. Caught mainly with shrimp trawls and cast nets. Marketed frozen, dried, or fresh along with other shrimp species.

Distribution: Tangier Sound, Chesapeake Bay, to Vera Cruz, Mexico; Bermuda, Gulf of Mexico, Caribbean Sea, and South American Atlantic coast down to Santa Catarina (Brazil).

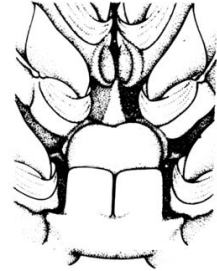
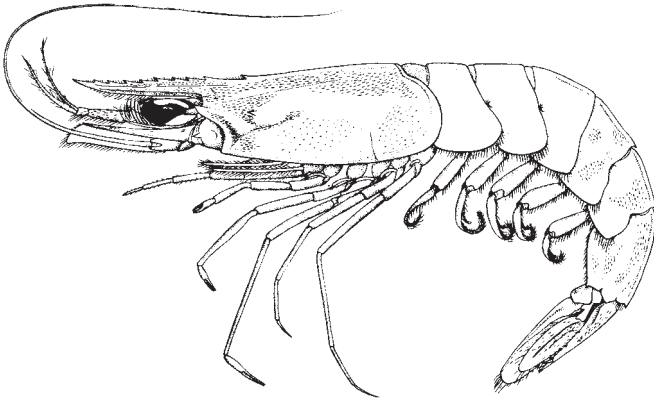


***Rimapenaeus similis* (Smith, 1885)**

TMY

Frequent synonyms / misidentifications: *Trachypenaeus similis* (Smith, 1885) / None.

FAO names: **En** - Yellow roughneck shrimp; **Fr** - Crevette gambri jaune; **Sp** - Camarón fijador amarillo.

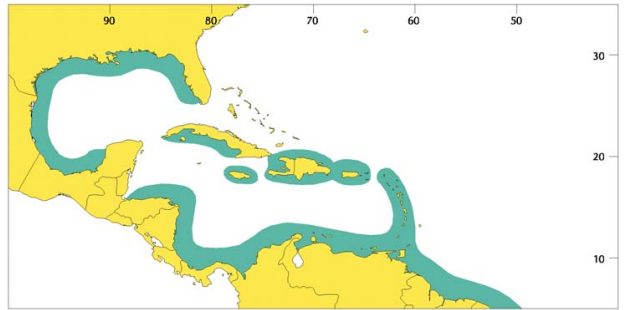


thelycum

Diagnostic characters: Entire dorsal region and anterior part of sides of carapace densely covered with hair; branchial region sparsely pubescent (hairs almost imperceptible and widely spaced); patches of hair present on posterior half of abdomen. Rostrum with usually 7 to 9 teeth distributed along entire dorsal margin, without teeth on ventral margin. Carapace with longitudinal and transverse sutures. Last 2 pairs of pereopods shorter or only slightly longer than third, their dactyls undivided; exopods of last pair of pereopod short, far from reaching to distomedian end of basis (second article). Petasma with distolateral angles greatly produced as horn-like projections; sternite 14 (on underside of thorax) bearing a nearly triangular prominence of straight borders. Thelycum devoid of hairs; anterior border of median process on sternite 13 nearly straight or concave and anterior borders of lateral plates on sternite 14 virtually straight. **Colour:** translucent, with small yellow-orange specks; pereopods and pleopods orange-red with white specks; uropods red edged with white.

Size: Maximum length: females, 104 mm; males, 73 mm.

Habitat, biology, and fisheries: Continental and inland shelves to about 100 m depth. No special fishery exists for this species in Area 31. It has been reported in the shrimp catches off the Dry Tortugas Islands and to the south of Cuba. Outside the area this species is fished for in the Amazon river delta, but is of secondary importance. Separate statistics are not reported for this species. Its commercial value is apparently small. Caught along with other shrimp species, mainly with American-type shrimp trawls in the fishery for *Farfantepenaeus duorarum*. Marketed frozen along with other shrimp species; also fresh or dried



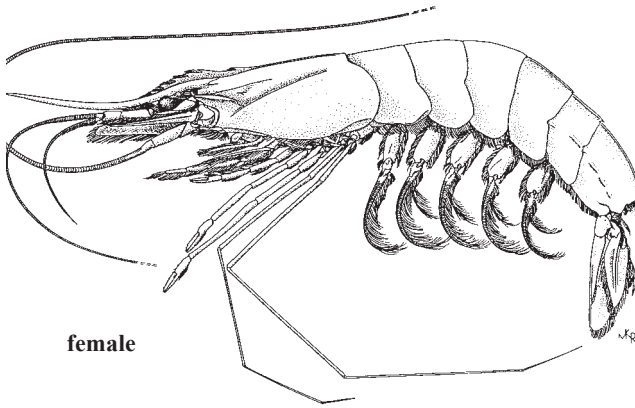
Distribution: Florida throughout the Gulf of Mexico and the Caribbean Sea; along the Atlantic coast of South America it extends down to Brazil (Amapá and Pará).

Xiphopenaeus kroyeri (Heller, 1862)

BOB

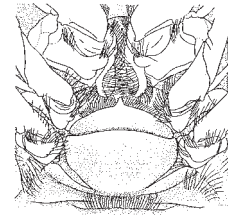
Frequent synonyms / misidentifications: None / None.

FAO names : En - Atlantic seabob; Fr - Crevette seabob; Sp - Camarón siete barbas.

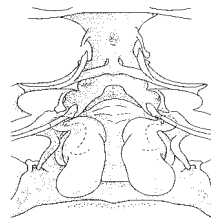


female

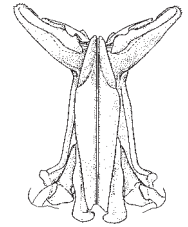
(from Pérez Farfante and Kensley, 1997)



thelycum



receptacles



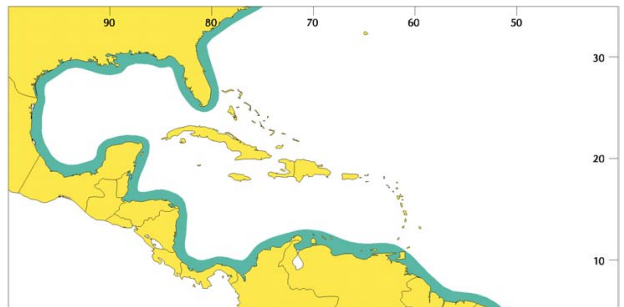
petasma

Diagnostic characters: Entire body smooth. **Rostrum as long as or longer than carapace, with a high basal crest armed with usually 5 dorsal teeth and a long, styliform, upward directed tip; ventral margin of rostrum toothless.** Carapace bearing a very small tooth behind the series of rostral teeth, and marked with longitudinal sutures (transverse sutures absent in adults). **Last 2 pairs of pereopods long and slender, their dactyls elongate, thin, and divided into several articles.** Petasma with distolateral angles greatly produced as horn-like projections. **Thelycum with a broad roughly elliptical plate on sternite 14 preceded by a narrow lip ending in a small median projection.** **Colour:** either whitish with ventral part yellowish, or yellow, more intense ventrally; occasionally greyish. Tip of rostrum and flagella reddish; pereopods pink or orange-yellow; pleopods and uropods yellowish at base and pink distally; telson and last abdominal segment sometimes pink.

Size: Maximum length: females, 140 mm; males, 115 mm.

Habitat, biology, and fisheries: Lives along the shore from a depth of 3 to 70 m, but is abundant only in shallow waters (between 20 and 30 m), especially on muddy and sometimes sandy bottoms. This species is diurnal and the largest catches are made by day. A very important commercial species from the North coast of the Gulf of Mexico from Pensacola (Florida) to Texas. Commercial concentrations have been reported off Nicaragua, off eastern Venezuela, and off Trinidad. Fishing grounds have been reported also from Honduras, Nicaragua, Costa Rica, and Colombia. In Guyana and in French Guiana it occurs in commercial concentrations. Outside the area this species is the subject of huge catches in different areas along the Brazilian coast. The catch reported from the USA in 1975 totaled 3 182 t, heads on shrimp. From 1984 to 1998 the capture production reported from the USA totaled 56 606 t; mean capture production was 3 773 t/year. Separate statistics for this species are reported by Guyana (from 1984 to 1998 the total capture production was 94 967 t; mean capture production was 6 331 t/year), and outside the area by Brazil (from 1984 to 1998 the total capture production was 140 920 t; mean capture production was 9 394 t/year). In Area 31 from 1984 to 1998 captures of *X. kroyeri* totalled 151 573 t (mean capture production: 10 104 t/year). Caught mainly with shrimp trawls and cast nets; in Guyana, Suriname, and French Guiana also with Chinese trapnets and pin seines. Marketed frozen, canned, fresh, or dried.

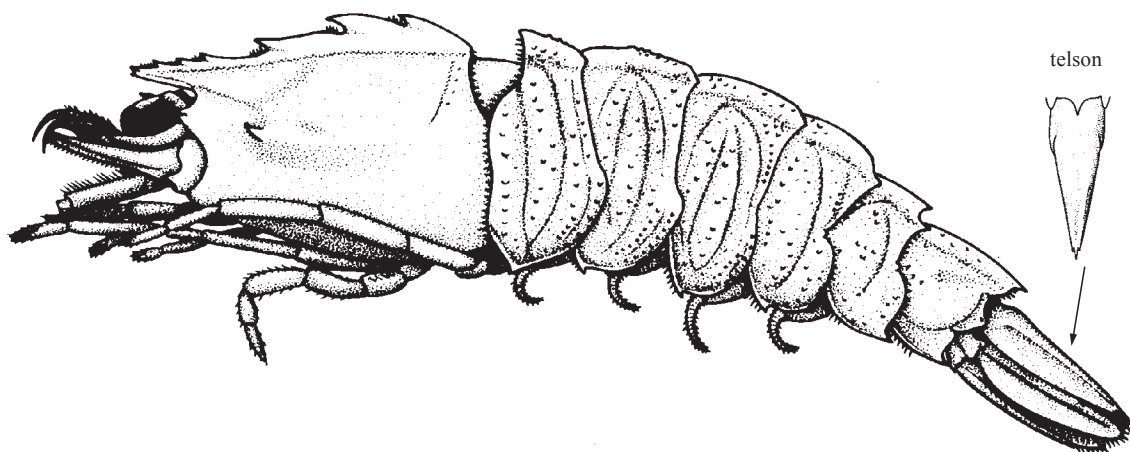
Distribution: North Carolina through the Gulf of Mexico and the Caribbean Sea including the Antilles, and along the Atlantic coast of South America down to Santa Catarina (Brazil).



SICYONIIDAE

Rock shrimps

Diagnostic characters: Body robust, rigid, of stony appearance. Rostrum short (not over-reaching antennular peduncle, armed with dorsal teeth, ventral margin toothless); bases of eyestalks with styliform projections on their inner surfaces and without a tubercle on their mesial borders. **Carapace without postorbital spines; cervical grooves very faint or absent.** Last 2 pairs of pereopods well developed. **Second pair of pleopods in males bearing only appendix masculina; third and fourth pairs of pleopod single branched.** Telson usually armed with a fixed spine on each side of tip. A single well-developed arthrobranch on penultimate thoracic segment.



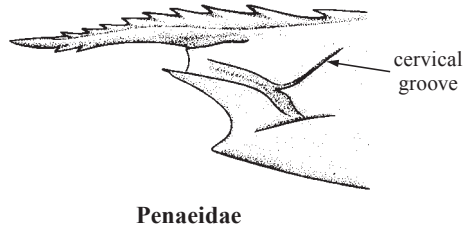
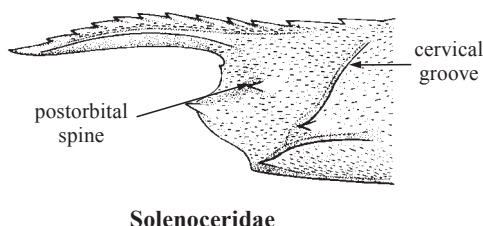
Habitat, biology, and fisheries: All of the representatives of this family are marine, but only 2 of the species occurring in the Western Central Atlantic are of economic interest.

Remarks: One genus, *Sicyonia* H. Milne Edwards, 1830, and 43 species, all marine, have been recognized in this family; 2 species occurring in the Western Central Atlantic are of economic interest, *Sicyonia brevirostris* and *Sicyonia typica*.

Similar families occurring in the area

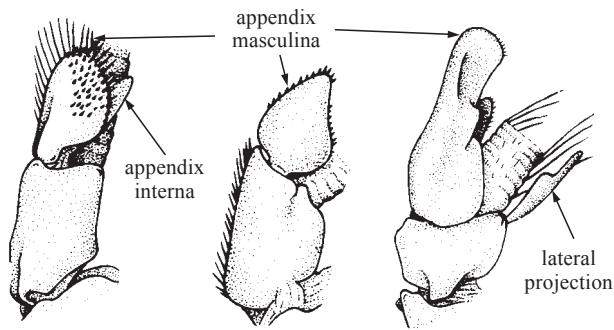
Solenoceridae, Aristeidae and Penaeidae: integument thinner and less rigid; abdomen without deep grooves or tubercles. Further distinguishing characters of these families are the following:

Solenoceridae: carapace with postorbital spines; cervical grooves long, usually ending at or close to dorsal midline; endopods of second pair of pleopods in males bearing appendix masculina, appendix interna, and lateral projection; 2 well-developed arthrobranches on penultimate thoracic segment.



Aristeidae: cervical grooves long, ending at or close to dorsal midline; second pair of pleopods in males bearing appendix masculina and appendix interna; spines on each side of tip of telson movable; 2 well-developed arthrobranchs on penultimate thoracic segment.

Penaeidae: cervical grooves short, ending well below dorsal midline; third and fourth pairs of pleopods biramous; telson without spines, or with fixed or movable spines on each side of tip.



endopod of second pleopod in male

Aristeidae Penaeidae Solenoceridae

Key to the species of Sicyoniidae occurring in the area

- 1a. Postrostral carina with 2 teeth → 2
- 1b. Postrostral carina with 3 teeth or more → 6

- 2a. Ventral margin of rostrum straight and concave → 3
- 2b. Ventral margin of rostrum concave → 5

- 3a. Rostrum with 2 or rarely 1 dorsal tooth *Sicyonia typica*
- 3b. Rostrum with 3 or more dorsal teeth → 4

- 4a. Postrostral carina with the last tooth near posterior margin of carapace *Sicyonia burkenroadi*
- 4b. Postrostral carina with the last tooth until 2/3 of carapace *Sicyonia stimpsoni*

- 5a. Postrostral carina with first tooth preceding hepatic spine *Sicyonia dorsalis*
- 5b. Postrostral carina with first tooth at the same level or behind the hepatic spine *Sicyonia wheeleri*



- 6a. Rostrum with 2, rarely 1 dorsal tooth → 7
- 6b. Rostrum with 3 or more dorsal teeth → 8

- 7a. Antennal spine absent *Sicyonia laevigata*
- 7b. Antennal spine present *Sicyonia brevirostris*

- 8a. Postrostral carina with first tooth preceding hepatic spine *Sicyonia olgae*
- 8b. Postrostral carina with first tooth at the same level or behind the hepatic spine *Sicyonia parri*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Sicyonia brevirostris* Stimpson, 1871.
- Sicyonia burkenroadi* Cobb, 1971.
- Sicyonia dorsalis* Kingsley, 1878.
- Sicyonia laevigata* Stimpson, 1871.
- Sicyonia olgae* Pérez Farfante, 1980.
- Sicyonia parri* Burkenroad, 1980.
- Sicyonia stimpsoni* Bouvier, 1905.
-  *Sicyonia typica* (Boeck, 1864).
- Sicyonia wheeleri* Gurney, 1943.

References

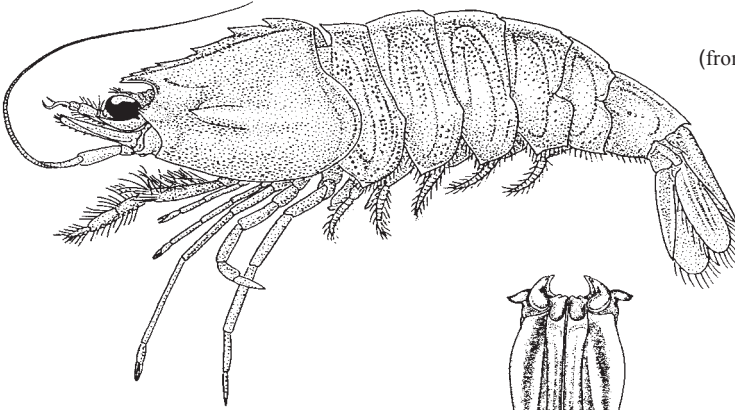
- Cobb, S.P., C.R. Futch, and D.K. Camp. 1973. The rock shrimp, *Sicyonia brevirostris* Stimpson, 1871 (Decapoda, Penaeidae). *Memoirs of the Hourglass Cruises*, 3(1):1-38.
- D'Incao, F. 1995. Brazilian rock shrimps of the genus *Sicyonia* (Decapoda: Sicyoniidae). *Nauplius*, 3:101-126.
- Dore, I. and C. Frimodt. 1987. *An illustrated guide to shrimp of the world*. New York, Osprey Books, 229 p.
- Hendrickx, M.E. 1996. *Los carnarones Penaeoidea Bentónicos (Crustacea: Decapoda: Dendrobranchiata) del Pacífico Mexicano*. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. Universidad Nacional Autónoma de México, 147 p.
- Holthuis, L.B. 1980. FAO Species Catalogue. I. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, (125)1:271 p.
- Huff, J.A. and S.P. Cobb. 1979. Penaeoid and sergestoid shrimps (Crustacea: Decapoda). *Memoirs of the Hourglass Cruises*, 5(4):1-102.
- Pérez Farfante, I. 1978. Shrimps and Prawns, 45p. (not numbered). In *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31), Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).
- Pérez Farfante, I. 1985. The rock shrimp genus *Sicyonia* (Crustacea: Decapoda: Penaeoidea) in the Eastern Pacific. *Fish. Bull.*, 83(1):1-79.
- Pérez Farfante, I. 1988. Illustrated key to the penaeoid shrimps of commerce in the Americas. *NOAA Tech. Rep.*, 64:32.
- Pérez Farfante, I. and B. Kensley. 1997. Penaeoid and Sergestoid shrimps and prawns of the world. Key and diagnoses for the families and genera. *Mémoires du Muséum national d'Histoire naturelle, Paris*, 175:1-233.
- Williams, A. B. 1984. *Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida*. Smithsonian Institution Press, 550 p.

Sicyonia brevirostris Stimpson, 1874

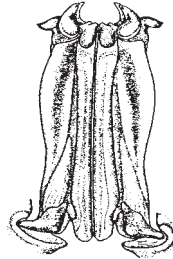
RSH

Frequent synonyms / misidentifications: None / None.

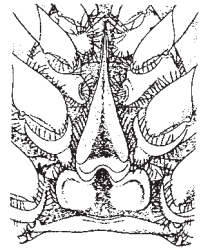
FAO names: En - Rock shrimp; Fr - Boucot ovetgernade; Sp - Camarón de piedra.



(from Pérez Farfante and Kensley, 1997)



petasma



thelycum

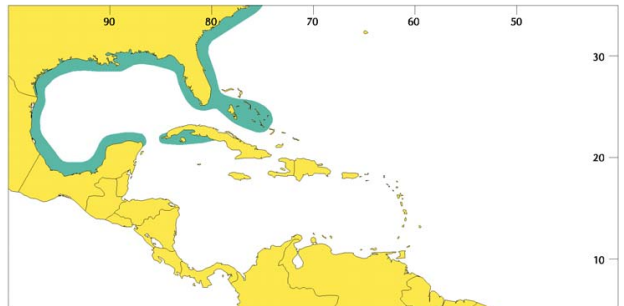
Diagnostic characters: Body thick, rigid, covered with short hair; abdomen with deep transverse grooves and numerous tubercles. Rostrum very short, not exceeding eye and with 2 or 3 teeth along dorsal margin and another 2 or 3 at tip; ventral margin toothless. Postrostral crest high and armed with 3 or 4 teeth, the last 3 large. Pleura of the 4 anterior abdominal segments terminating anteriorly in a ventral angle armed on the third and fourth (sometimes also second) segments with a blunt outward pointing spine; pleura of the last 2 or 3 segments bearing a posterior ventral spine.

Petasma (in males) with 2 distal projections on each side curved in opposite directions. Thelycum (in females) with a triangular median process on sternite 13 ending in a long slender tip and lying against trilobular border of transverse plate on sternite 14. **Colour:** variable, whitish or pinkish with the hair grey, sometimes showing a yellowish tinge; dorsal crest barred with white; appendages reddish purple, pereopods barred with white; ventral side of abdomen and uropods reddish. This shrimp can also be brown on the dorsal side, white along marginal portion of sides; ventral margin of carapace, antennal scales, and pleopods intense pink; telson, sides, and ventral part of abdomen pinkish; dorsal teeth on carapace and hind part of dorsal keels on abdominal segments white; postrostral crest mahogany; pereopods striped with violet or red and white; flagella of antennae mauve at bases, blue in the middle, and white at tips.

Size: Maximum length: 153 mm.

Habitat, biology, and fisheries: Lives mainly on sandy or white shelly sand bottoms, at depths ranging from a few metres to 190 m, rarely as deep as 330 m; the largest concentrations are found in waters shallower than 100 m. Active at night, when the largest catches are made. Off northeast Florida and in the Gulf of Mexico from Alalachicola to the Mississippi delta, Sanibel Dry Tortuga Islands; huge catches were reported from off Cape Canaveral, Fort Pierce and Yucatán. Exploitable concentrations have been found between 34 and 55 m. The total reported catch was 300 t in 1972 and 909 t in 1975, heads on shrimp, USA only. From 1984 to 1998 the capture production reported from the USA totaled 43 317 t (mean capture production was 2 887 t/year). There are no separate statistics for this species in the other countries of Area 31. Caught with shrimp trawls and seines (American type). Marketed mostly frozen.

Distribution: Western Atlantic: from Virginia to Texas, Bahamas; Cuba; Gulf of Mexico, Yucatán. Records of *S. brevirostris* from the eastern Pacific (Gulf of Tehuantepec, southern Mexico) are scattered; Hendrickx (1996: 72) maintain that all known records from the Pacific coast of Mexico are previous to 1964 and none has been confirmed since.

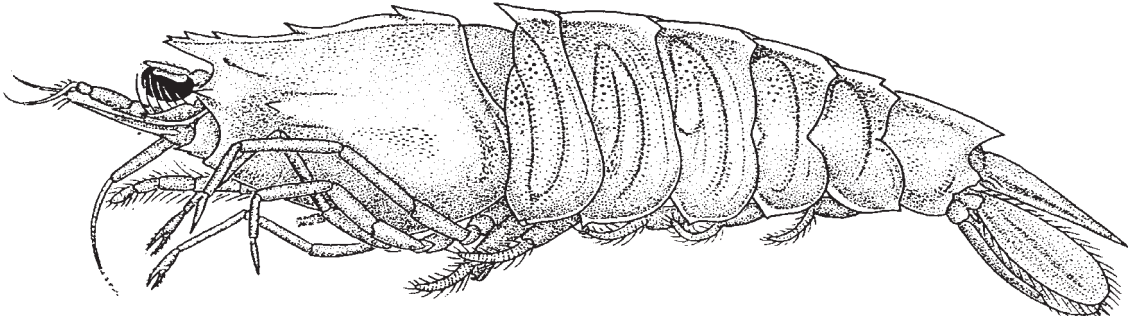


Sicyonia typica (Boeck, 1864)

YIT

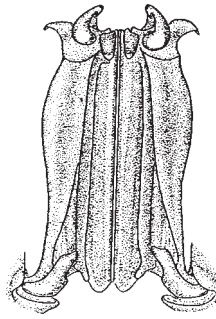
Frequent synonyms / misidentifications: None / None.

FAO names: En - Kinglet rock shrimp; Fr - Boucot roitelet; Sp - Camarón reyecito.

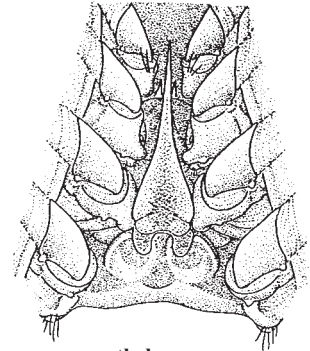


(from Pérez Farfante and Kensley, 1997)

Diagnostic characters: Body thick, rigid, covered with short hair; abdomen with deep transverse grooves and numerous tubercles. Rostrum very short, directed obliquely upward, not exceeding eye and with 1 or 2 teeth along dorsal margin not counting tip; ventral margin toothless. Postrostral crest high and armed with 2 or 3 teeth. Pleura of the 4 anterior abdominal segments terminating anteriorly in a ventral angle armed on the third and fourth (sometimes also second) segments with a blunt outward pointing spine; pleura of the last 2 or 3 segments bearing a posterior ventral spine. Petasma with 2 distal projections on each side curved in opposite directions. Thelycum with a triangular median process on sternite 13 ending in a long slender tip and lying against trilobular border of transverse plate on sternite 14. **Colour:** blue spots on tail prominent in life; bright red blotch surrounding rostrum.



petasma

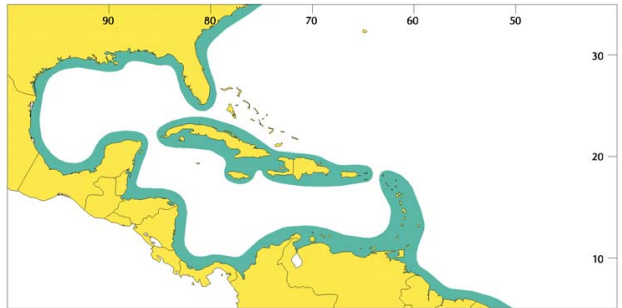


thelycum

Size: Maximum length: 77 mm.

Habitat, biology, and fisheries: Marine, from shallow water to 101 m. Occurs on mud, sand, shelly sand, rocky bottoms, and areas densely covered with algae. This species is fished commercially in southwestern Cuba and occurs in commercial quantities in the Gulf of Campeche. Outside the area it is also of secondary commercial importance (northern Brazil). Caught with shrimp trawls. Marketed fresh and frozen.

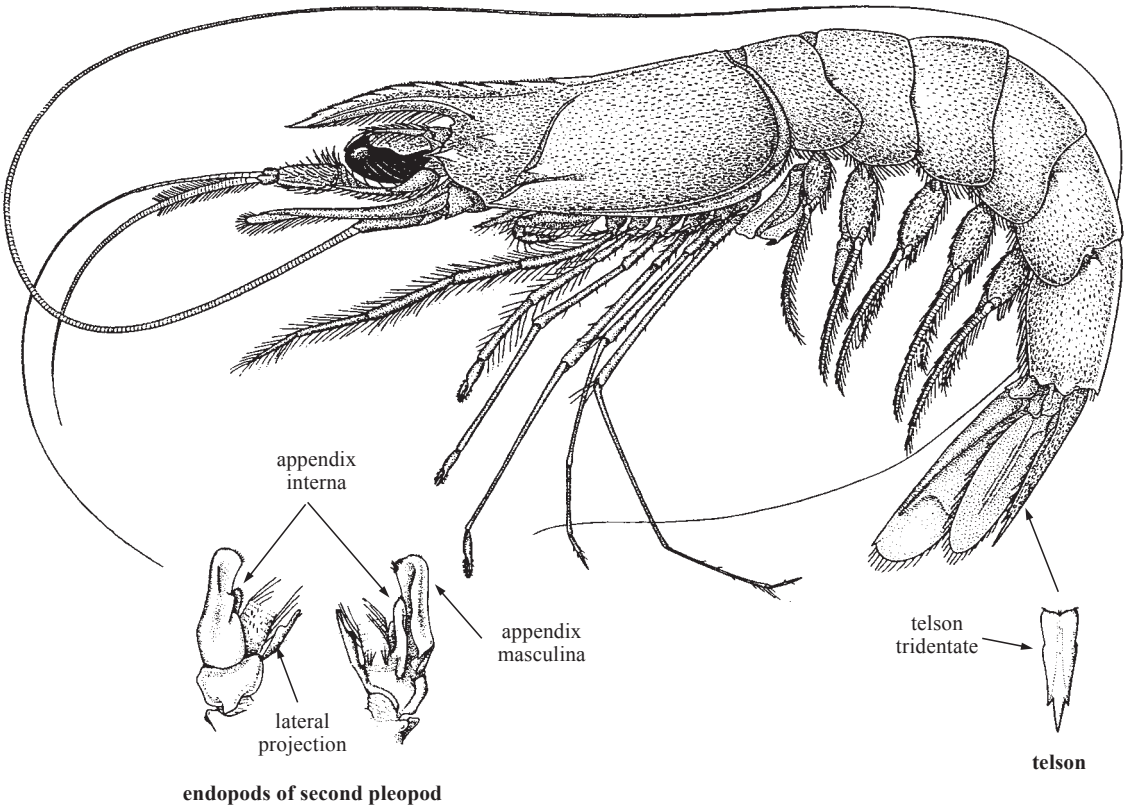
Distribution: Western Atlantic: North Carolina through Gulf of Mexico, including Central America; Cuba through West Indies, Venezuela, Suriname, French Guiana, and Brazil (from Pará to Rio Grande do Sul).



SOLENOCERIDAE

Solenocerid shrimps

Diagnostic characters: Shrimps with a well-developed and toothed rostrum which extends to or beyond distal edge of eyes; no styliform projections at bases of eyestalks **but a tubercle present on their mesial (inner) border**. Carapace with **postorbital spines and long cervical grooves which end at, or close to, dorsal midline**. Last 2 pairs of pereopods well developed; **endopods of second pair of pleopods in males bearing appendix masculina, appendix interna, and lateral projection**; third and fourth pairs of pleopods biramous. **Telson tridentate** (with a fixed spine on each side of tip). Two well-developed arthrobranches on the penultimate thoracic segment (hidden beneath the carapace).

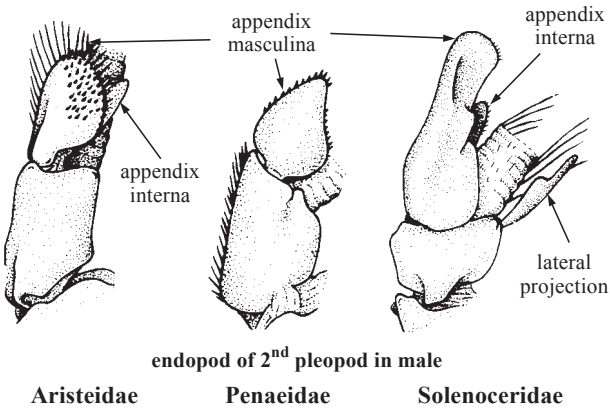


Habitat, biology, and fisheries: This family includes only marine representatives. Only 1 species occurring in the area is abundant and big enough to be of economic interest.

Similar families occurring in the area

Aristeidae, Penaeidae and Sicyoniidae: postorbital spines on carapace absent. Further distinguishing characters of these families are the following:

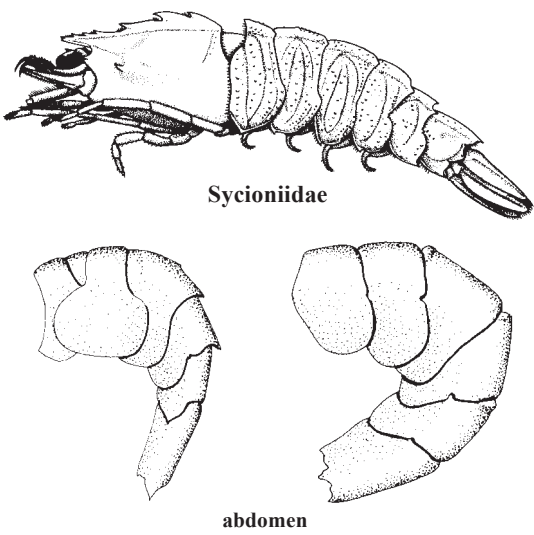
Aristeidae: telson bearing movable spines; endopods of second pair of pleopods in males bearing appendix masculina and appendix interna but no lateral projection.



Penaeidae: eyestalks without tubercles on inner border; cervical grooves much shorter, ending well below dorsal midline of carapace; endopods of second pair of pleopods in males bearing appendix masculina only; a single well-developed arthrobranch on penultimate thoracic segment (hidden beneath carapace).

Sycioniidae: body thick, stony in appearance; abdomen with deep grooves and numerous tubercles; cervical groove very faint or absent; third and fourth pairs of pleopods single-branched; endopods of second pair of pleopods in males bearing an appendix masculina only; a single well-developed arthrobranch on penultimate thoracic segment.

Shrimps belonging to the Infraorder Caridea: pleura of second abdominal segment overlapping those of first and third segments; no pincers on third pair of pereopods.



- Key to the genera of Solenoceridae occurring in the area** (from Pérez Farfante and Kensley, 1997)
- 1a. Movable lateral telsonic spines present → 2
 - 1b. Movable lateral telsonic spines absent → 3

 - 2a. Postcervical spine present, situated dorsal to hepatic spine *Gordonella*
 - 2b. Postcervical spine lacking *Haliporus*

 - 3a. Orbital spine present → 4
 - 3b. Orbital spine absent → 6

 - 4a. Both antennular flagella flattened (Fig. 1a) *Solenocera*
 - 4b. Both antennular flagella subcylindrical or ventral flagellum flattened (Fig. 1b,c) → 5

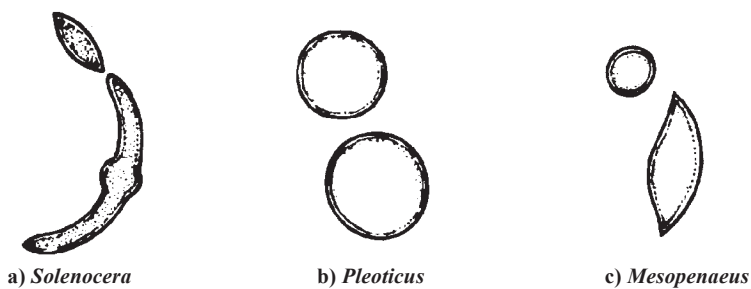


Fig. 1 cross section of antennular flagella


- 5a. Both antennular flagella subcylindrical (Fig. 1b) *Pleoticus*
- 5b. Ventral flagellum flattened (Fig. 1c) *Mesopenaeus*


- 6a. Suprahepatic spine present *Haliporoides*
- 6b. Suprahepatic spine absent → 7

- 7a. Neither fourth nor fifth pereopods flagelliform *Cryptopenaeus*
- 7b. Fifth or fourth and fifth pereopods flagelliform → 8

- 8a. Fifth pereopod flagelliform, considerably longer than fourth *Hadropenaeus*
- 8b. Fourth and fifth pereopods flagelliform *Hymenopenaeus*

List of species occurring in the area

The symbol  is given when species accounts are included.

- Hadropenaeus affinis* (Bouvier, 1906).
- Hadropenaeus modestus* (Smith, 1885).
- Hymenopenaeus aphoticus* Burkenroad, 1936.
- Hymenopenaeus debilis* Smith, 1882.
- Hymenopenaeus laevis* (Bate, 1881).
- Mesopenaeus tropicalis* (Bouvier, 1905).
-  *Pleoticus robustus* (Smith, 1885).
- Solenocera acuminata* Pérez Farfante and Bullis, 1973.
- Solenocera atlantidis* Burkenroad, 1939.
- Solenocora geijoskesi* Holthuis, 1959.
- Solenocera necopina* Burkenroad, 1939.
- Solenocera vioscai* Burkenroad, 1934.

References

Dore, I. and C. Frimodt. 1987. *An illustrated guide to shrimp of the world*. New York, Osprey Books, 229 p.

Guéguen, F. 2000. Distribution et abondance des crustacés décapodes du talus continental (200-900 m) de Guyane Française. *Crustaceana*, 73(6):685-703.

Holthuis, L.B. 1980. FAO Species Catalogue. I. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, (125)1:271 p.

Pérez Farfante, I. 1978. Shrimps and Prawns. In *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31), Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).

Pérez Farfante, I. 1988. Illustrated key to the penaeoid shrimps of commerce in the Americas. *NOAA Tech. Rep.*, 64:32.

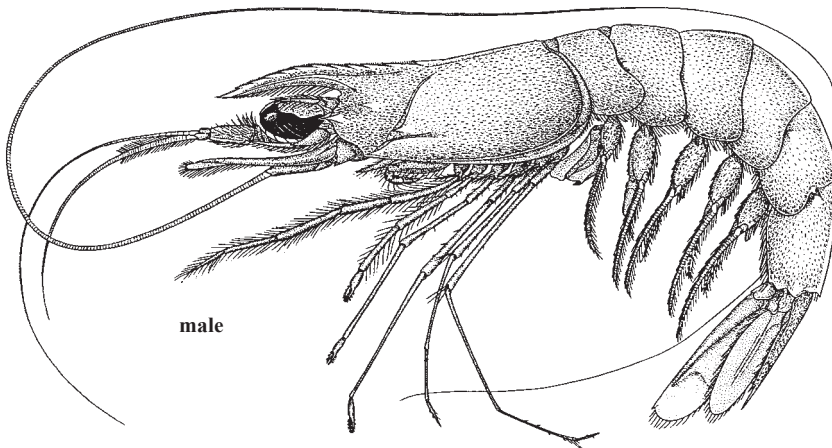
Pérez Farfante, I. and B. Kensley. 1997. Penaeoid and Sergestoid shrimps and prawns of the world. Key and diagnoses for the families and genera. *Mémoires du Muséum national d'Histoire naturelle, Paris*, 175:1-233.

Pleoticus robustus (Smith, 1885)

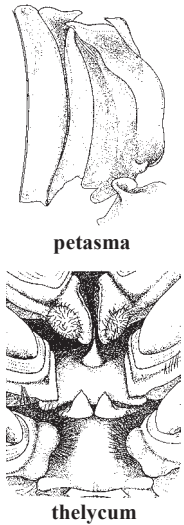
RRS

Frequent synonyms / misidentifications: None / None.

FAO names: En - Royal red shrimp; Fr - Crevette salicoque; Sp - Camarón rojo real.



(from Pérez Farfante and Kensley, 1997)

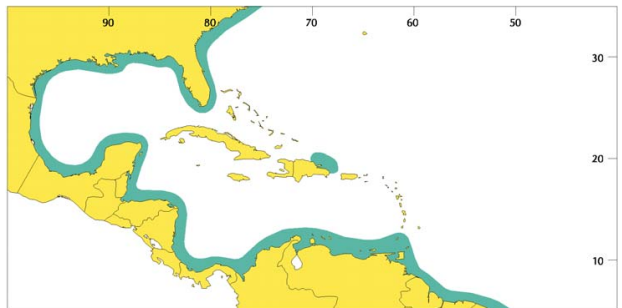


Diagnostic characters: Body completely covered with short hair. Rostrum with ventral margin toothless; 10 to 12 teeth on dorsal margin, separated by intervals regularly decreasing toward the tip; postrostral carina well defined and long, nearly reaching to hind margin of carapace from which it is separated by a small tubercle; pterygostomian spines absent; postorbital spines small. Both antennular flagella cylindrical in cross-section; antennae very long (up to 5 times body length). Petasma (on first pair of pleopods in males) lacking distomarginal projections, its lateral lobes extended distally as triangular, inward-curved tongues; thelycum (in females) with a pair of triangular projections at front end of last thoracic segment. **Colour:** milky white, pink, salmon, or orange: usually one of these colours predominates while the others form lines, bands and spots of various sizes. The general colour pattern changes from light in daytime to darker shades at night.

Size: Maximum length: females, 225 mm; males, 180 mm.

Habitat, biology, and fisheries: Inhabits upper regions of the continental slope from 180 to about 730 m depth (occasionally in shallower waters of about 140 m depth), but large concentrations are usually found at depths between 250 and 475 m over blue/black mud, sand, muddy sand, or white calcareous mud. Apparently it does not burrow into the substrate, but digs grooves in search of food. Feeds on small bottom-living organisms. Fishing grounds off northeastern Florida, from St. Augustine to Cape Kennedy, and Gulf of Mexico from the Mississippi delta to Tampa, Florida, and south-southwest of the Dry Tortugas Islands. Found in large concentrations only off northeastern Florida, to the southwest of the Dry Tortugas Islands and to the southeast of the Mississippi delta. The species has also been taken trawled off the coast of Venezuela. The total catches for this species in 1975 was 122 t, heads on shrimp (USA). From 1984 to 1998 the capture production reported from USA totaled 2 227 t (mean capture production was 148 t/year). From 1984 to 1989 the capture production never reached 100 t/year (mean production was 48 t/year), while from 1990 to 1998 the capture production was never below 135 t/year, peaking to 297 t in 1993 (mean production was 215 t/year). There are no separate statistics for this species in the other countries of Area 31. Caught with shrimp trawls (American type) by using stronger winches and longer warps than in the fishery for other shrimp species; taken by day as well as at night. Marketed whole and peeled, either fresh or precooked (breaded) and frozen.

Distribution: Throughout most of the area; continental slope off the east coast of the USA from south of Martha's Vineyard (Massachusetts) to French Guiana, almost to the Brazilian border.



PALAEEMONIDAE**Palaemonid shrimps**

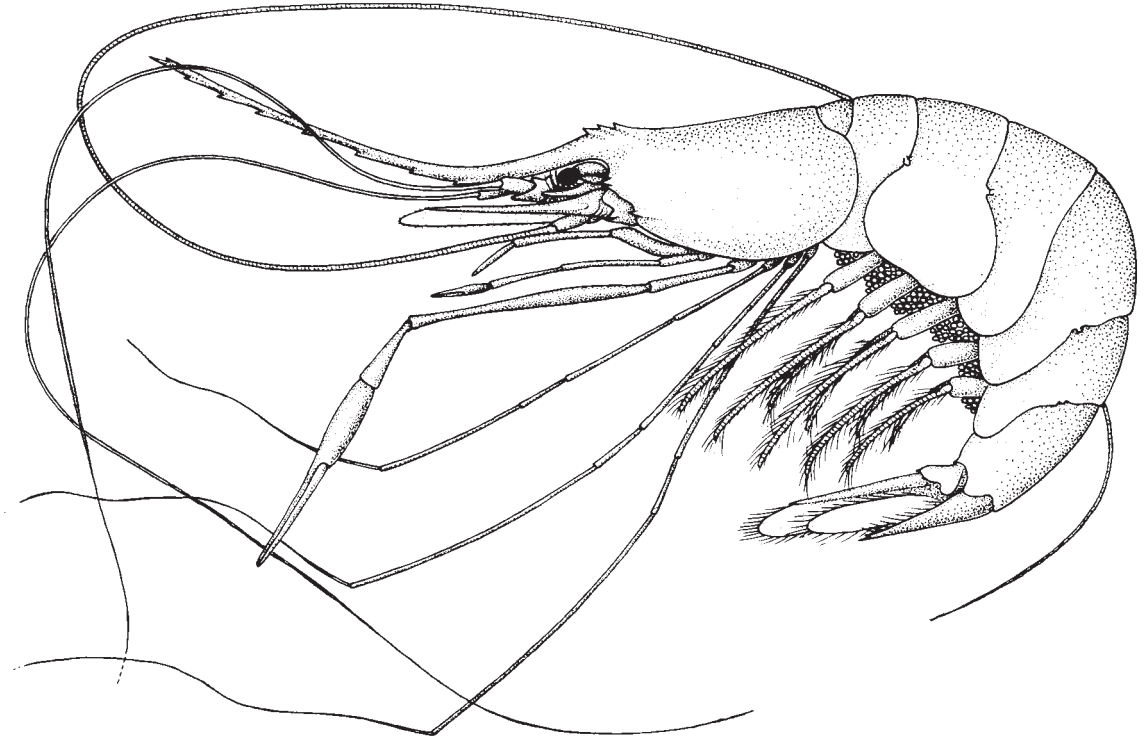
A single species of interest to fisheries occurring in the area.

Nematopalaemon schmitti (Holthuis, 1950)

NLC

Frequent synonyms / misidentifications: None / None.

FAO names: En - White belly prawn; Fr - Bouquet covac; Sp - Camarón couac.



Diagnostic characters: Carapace smooth, without minute depressions. Rostrum very long (longer than carapace), slender, and directed upward, its dorsal margin armed with **3 to 5 teeth forming a high basal crest and a single tooth near tip; ventral margin with 7 to 9 teeth set in regular intervals along anterior three-fourths of its length.** Carapace without hepatic spines or branchiostegal grooves, with antennal and branchiostegal spines, both followed by a short crest. **Third abdominal segment without dorsal spine; pleura of fifth abdominal segment extended posteriorly as rounded lobes.** Telson truncate, with a minute median projection flanked by 2 spines. Dorsal antennular flagellum bifid; **second pair of pereopods with long pincers and undivided carpus. Last 3 pairs of pereopods with very long and slender dactyls (longer than carpus and propodus combined).** **Colour:** white with reddish spots, or pink; more intense on rostrum, hind margin of abdominal segments, and tail fan; flagella and pereiopods pink, pleopods very light pink.

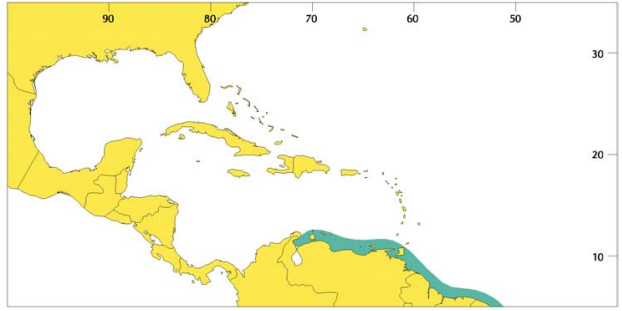
Similar families occurring in the area

Pandalidae and Crangonidae: Palaemonidae can be distinguished by the first pair of pereopod ending in clearly distinct pincers (pincers of first pair of pereopods microscopically small or absent in the Pandalidae; first pair of pereopods subchelate in the Crangonidae).

Size: Maximum length: 80 mm.

Habitat, biology, and fisheries: In marine and estuarine waters. Mud, sand mud, and gravel bottoms, from very shallow waters to 75 m. Venezuela, Guyana, Suriname, French Guiana; outside the area, Brazil (from Amapá to São Paulo). Of considerable commercial importance in Guyana, Suriname, and Brazil. Separate statistics are not reported for this species. Caught mainly with Chinese shrimp traps in Guyana and Suriname. Marketed fresh and dried.

Distribution: From the southern part of the area (Venezuela, Guyana, Suriname and French Guiana) to Brazil (from Amapá to São Paulo).



References

- Holthuis, L.B. 1980. FAO Species Catalogue. I. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, (125)1:271 p.
- Pérez Farfante, I. 1978. Shrimps and Prawns. In *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31), Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).
- Takeda, M. 1983. Crustaceans. In *Crustaceans and mollusks trawled off Suriname and French Guyana*, edited by M. Takeda and T. Okutani. Tokyo, Japan Marine Fishery Resource Research Center, 185 p.

HIPPOLYTIDAE

Cock shrimps

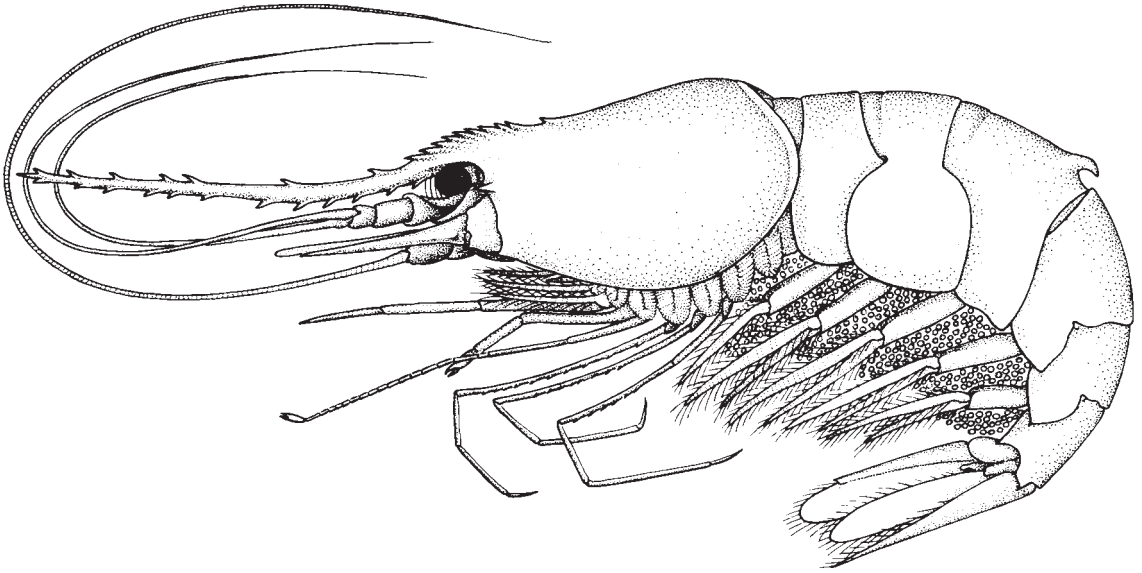
A single species of interest to fisheries occurring in the area.

Exhippolysmata oplophoroides (Holthuis, 1948)

XHO

Frequent synonyms / misidentifications: None / None.

FAO names: En - Cock shrimp; Fr - Crevette buhotte; Sp - Camarón gallo.



Diagnostic characters: Carapace smooth, with minute depressions. Rostrum very long (longer than carapace) and slightly turned upward, its **dorsal margin armed with a basal crest of 9 to 12 small teeth and 5 to 7 teeth on remaining part; ventral margin with 10 to 13 teeth distributed throughout its length.** Carapace with antennal and pterygostomian spines. **Third abdominal segment with a very prominent dorsal spine; pleura of fifth abdominal segment ending posteriorly in a spine.** Telson with a long, pointed tip and without lateral spines. Dorsal antennular flagellum unbranched. **Second pair of pereopods with short pincers, and carpus subdivided into more than 7 articles; dactyls of last 3 pairs of pereopods undivided and much shorter than respective propodi.** **Colour:** white or light red; pleopods red.

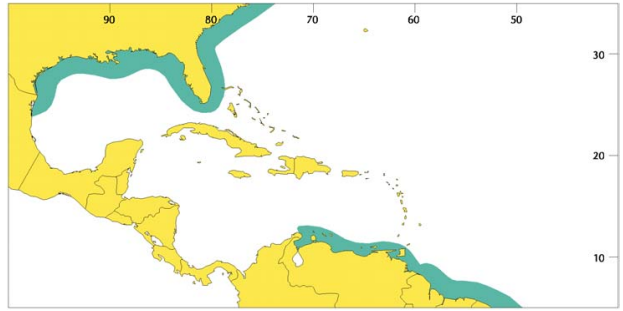
Similar families occurring in the area

Pandalidae and Crangonidae: Hippolytidae can be distinguished by the first pair of pereopod ending in clearly distinct pincers (pincers of first pair of pereopods microscopically small or absent in the Pandalidae; first pair of pereopod subchelate in the Crangonidae).

Size: Maximum length: 80.5 mm.

Habitat, biology, and fisheries: Lives on mud, mud and clay, mud and shells, sand, calcareous sand, or sandy mud bottoms, marine and estuarine (temperature 16 to 27°C; salinity 15 to 35‰) between 5 and 45 m. This species may be caught with *Xiphopenaeus kroyeri* and *Nematopalaemon schmitti*. Records from the USA are sporadic; negligible in Suriname and Guyana; outside the area, along the north and northeast coasts of Brazil, the species is of considerable commercial importance. Separate statistics are not reported for this species. The catches from Guyana and Suriname are apparently small. In Guyana and Suriname it is mainly caught with Chinese shrimp traps; in Brazil, mostly with shrimp seines. Marketed fresh or dried.

Distribution: Off Cape Fear River, North Carolina, to Port Aransas, Texas; Venezuela to the north of Uruguay.



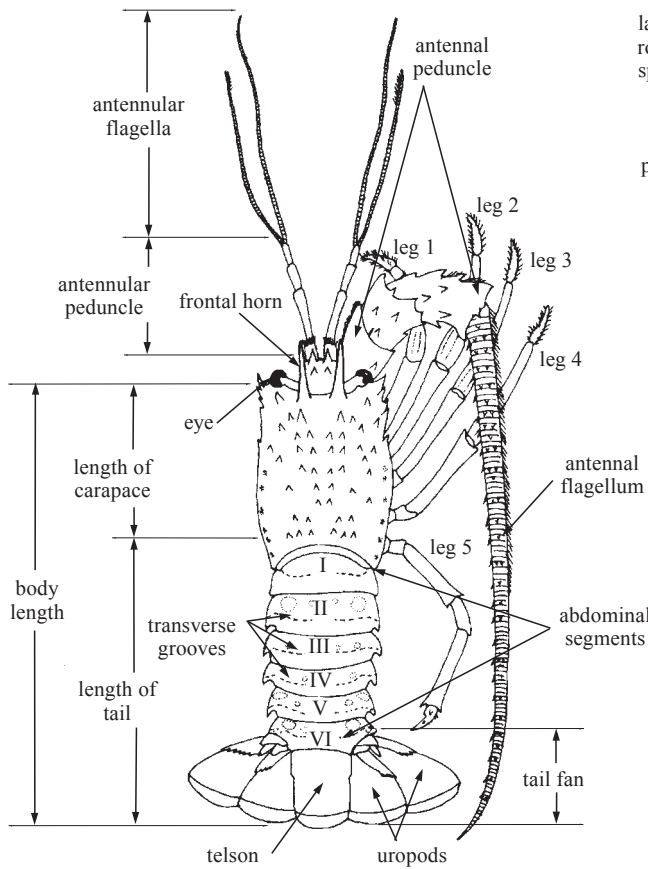
References

- Christoffersen, M.L. 1979. Decapod Crustacea: Alpheoidea. Résultats Scientifiques des Campagnes de la 'Calypso', Fascicule 11. Campagnes de la 'Calypso' au large des Côtes Atlantiques de l'Amérique du Sud (1961-1962). I. Number 36. *Annales de l'Institut Océanographique*, 55(supplement):297-377.
- Holthuis, L.B. 1980. FAO Species Catalogue. I. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fisheries Synopsis*. No. 125, 1:1-271.
- Pérez Farfante, I. 1988. Illustrated key to the penaeoid shrimps of commerce in the Americas. *NOAA Tech. Rep.*, 64:32.
- Pérez Farfante, I. 1978. Shrimp and Prawns. In *FAO Species Identification Sheets for Fisheries Purposes, Western Central Atlantic (Fishing Area 31), Volume VI*, edited by W. Fisher. Rome FAO (unpaginated).
- Takeda, M. 1983. Crustaceans. In *Crustaceans and mollusks trawled off Suriname and French Guyana*, edited by M. Takeda, and T. Okutani. Tokyo, Japan Marine Fishery Resource Research Center, 185 p.
- Williams, A.B. 1984. *Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida*. Smithsonian Institution Press, 550 p.

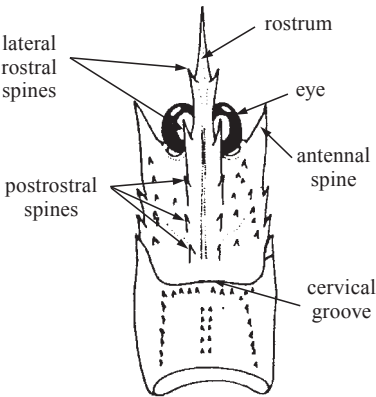
LOBSTERS

by M. Tavares, Universidade Santa Úrsula, Brazil

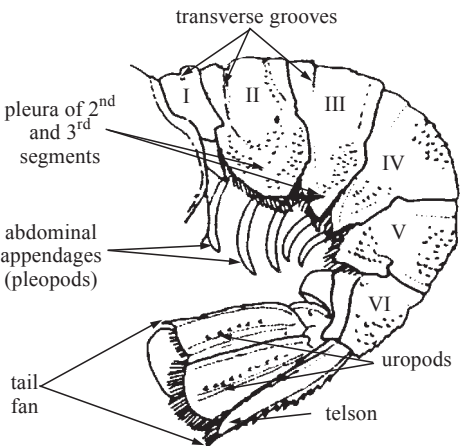
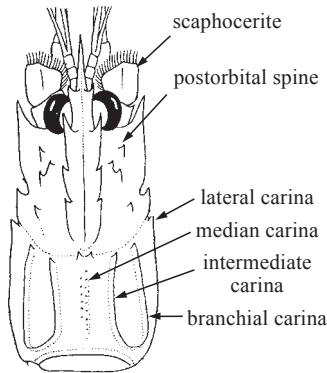
TECHNICAL TERMS AND MEASUREMENTS



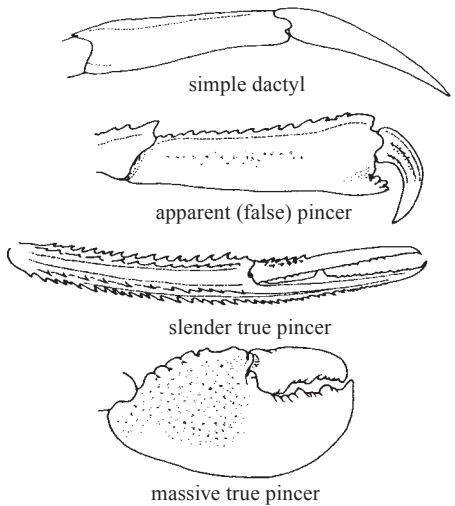
general body shape (dorsal view)



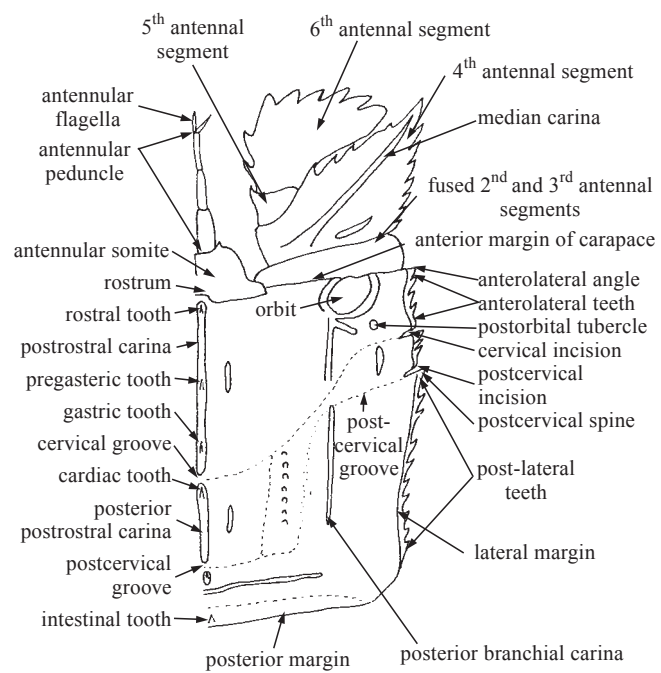
carapace (dorsal view)



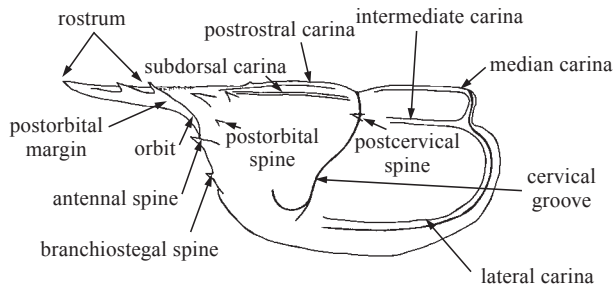
abdomen (lateral view)



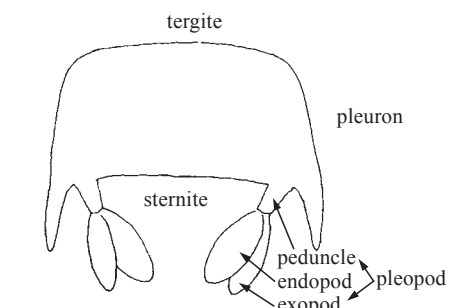
types of terminal segments in first pair of legs



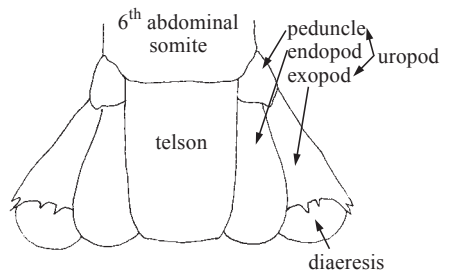
dorsal view of right half of carapace



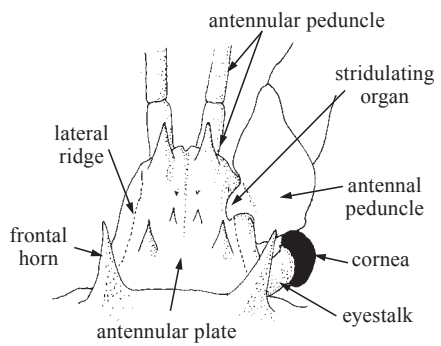
lateral view of carapace



abdomen (cross-section)



tail (dorsal)



dorsal view of head

GENERAL REMARKS

The lobsters include a variety of crustaceans ranging in size from a few centimetres to over 1 m. They are more or less elongate animals with cylindrical or flattened bodies and a prominent tail or abdomen consisting of 6 movable segments and a terminal fan, which is usually about as long as the rigid and often spiny or tuberculate head or carapace. The eyes are stalked and usually movable in the sockets of the carapace, but reduced or even absent in some families (i.e., the deepsea Thaumastocheilidae). The most conspicuous of the appendages of the anterior part of the body, under the carapace, are a pair of usually small, slender antennules, a pair of more robust antennae (long and cylindrical in most families, scale-like in the slipper lobsters or Scyllaridae) and 5 pairs of legs (pereopods or thoracic legs). The first pair of legs is enlarged in certain families (Nephropidae, Synaxidae) or in certain species of others (*Justitia* of Palinuridae); the legs may all end in a simple curved dactyl (i.e., Palinuridae, Synaxidae, Scyllaridae) or some of them may terminate in true pincers or chelae (i.e. the first 3 pairs in Nephropidae, 4 or 5 pairs in Polychelidae). The abdominal appendages are short and biramous reduced abdominal legs or pleopods.

In the Western Central Atlantic, lobsters are represented by 6 families and 34 species, of which only a few can be considered to be of interest to fisheries at the present time. Apart from the common Caribbean spiny lobster, *Panulirus argus*, no lobster species are caught at present in large quantities within Area 31; the American lobster (*Homarus americanus*), which is the most important commercial lobster species on the Atlantic coast of North America, is mainly fished to the north of Area 31. From 1984 to 1998 the lobster capture production (*Panulirus* only, almost entirely *Panulirus argus*) reported from Area 31 totaled 330 187 t (Anguilla: 1 556 t; Antigua: 1 597 t; Bahamas: 179 207 t; Belize: 8 752 t; Bermuda: 265 t; Haiti: 240 t; Honduras: 27 721 t; Mexico: 1 424 t; Nicaragua: 488 t; USA: 38 120 t; and Venezuela: 1 179 t).

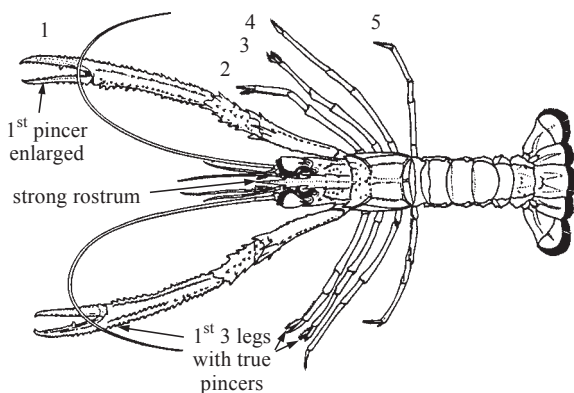
GUIDE TO THE FAMILIES OCCURRING IN THE AREA

NEPHROPIDAE

p. 299

True lobsters and lobsterettes

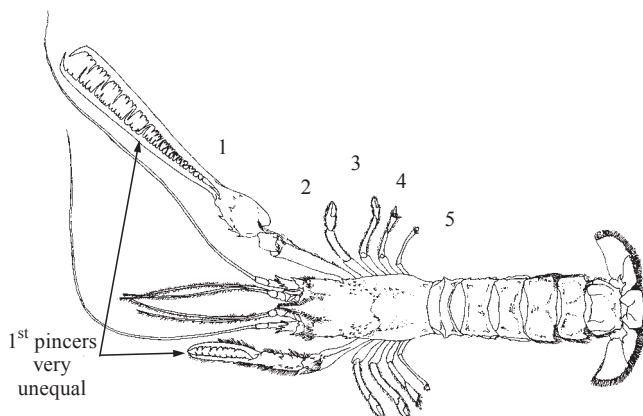
Fourteen species in the area. Body tubular; carapace with well developed rostrum; first 3 pairs of legs with pincers, first pair much larger than others; antennae cylindrical, longer than body.



THAUMASTOCHELIDAE

Pincer lobsters

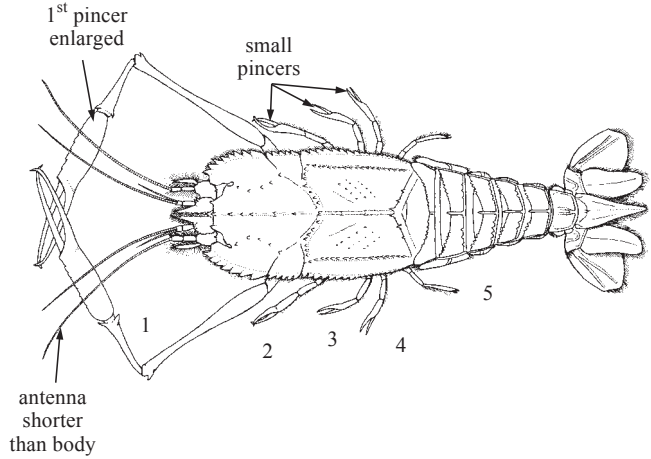
At least 1 species in the area, on the continental slope between 640 and 1 050 m. Blind (eyeless), soft-bodied deep sea lobsters; carapace with a rostrum; first 3 pairs of legs with pincers, first pair enlarged and unequal; antennae cylindrical, longer than body; antennal scale with spines. No species of interest to fisheries in Area 31.



POLYCHELIDAE

Blind lobsters

At least 2 species in the area, at depths between 100 and 2 900 m. Eyes small and lacking pigment; soft-bodied deep sea lobsters; carapace without a rostrum; telson of tail fan pointed; first 4 or all legs with pincers, first pair enlarged; antennae cylindrical, shorter than body. No species of interest to fisheries in Fishing Area 31.

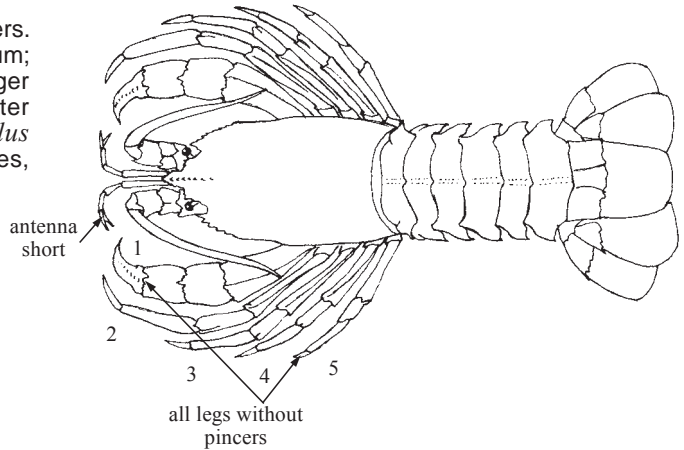


SYNTAXIDAE

p. 311

Furry lobsters

One species in the area, in shallow waters. Body tubular; carapace with a small rostrum; legs without pincers, first pair much larger than others; antennae cylindrical, shorter than body. A single species, *Palinurellus gundlachi*, body without enlarged spines, hairy, and bright orange.

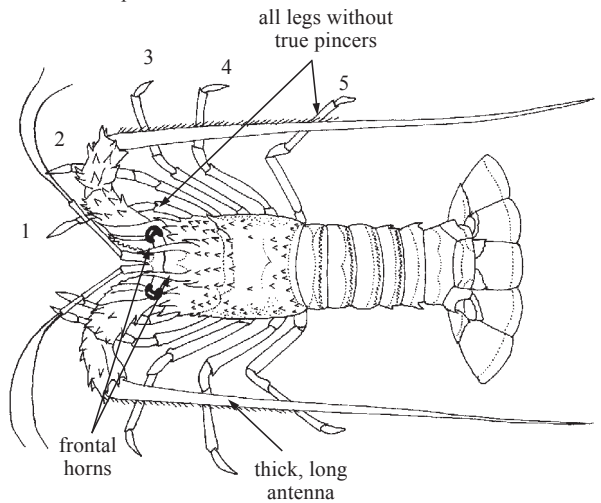


PALINURIDAE

p. 312

Spiny lobsters (langoustes)

Six species in the area. Body tubular; carapace without a rostrum; legs without true pincers; first pair not enlarged except in *Justitia*; antennae enlarged, cylindrical, longer than body.

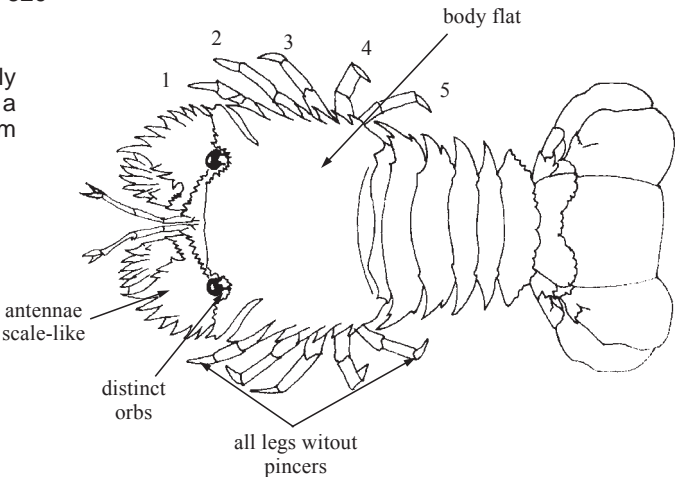


SCYLLARIDAE

p. 320

Slipper lobsters

Thirteen species in the area. Body strongly flattened dorsoventrally; carapace without a rostrum; legs without pincers, none of them enlarged; antennae scale-like.



KEY TO THE FAMILIES OCCURRING IN THE AREA

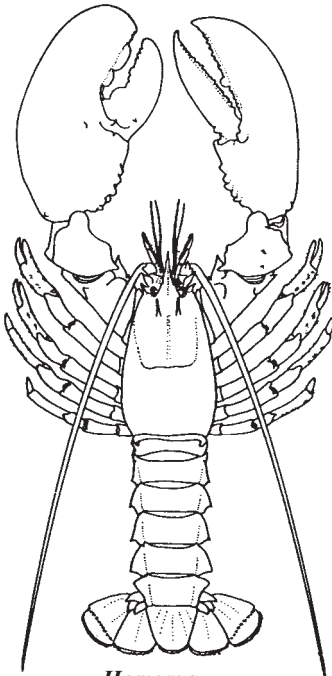
(adapted from Holthuis, 1991)

- 1a. First 3 pairs of pereopods with true chelae, the first pair the largest and most robust. → 2
- 1b. Third pereopod never with a true chela, in most groups chelae also absent from first and second pereopods. → 4
- 2a. Fourth pereopod, and usually also the fifth, without true chelae; carapace cylindrical, not flattened → 3
- 2b. All pereopods, or at least the first 4, with true chelae; carapace flattened; deep sea species **Polychelidae**
- 3a. Eyes entirely absent, or strongly reduced, without pigment; telson unarmed; chelipeds very unequal, the larger with fingers more than four times as long as palm; cutting edges of the fingers of the larger cheliped with many slender spines; fifth pereopod (at least in the female) with a chela; abdominal pleura short, quadrangular, lateral margin broad, truncate, not ending in a point; scaphocerite with several very large teeth on the inner margin **Thaumastochelidae**
- 3b. Eyes well developed or reduced, always present as movable appendages; telson with lateral and/or postlateral spines; chelipeds equal or unequal, but fingers always considerably less than twice as long as palm; teeth of the cutting edge placed in the same plane; fifth pereopod without a true chela; abdominal pleura large, triangular, or ovate, usually ending in a point; scaphocerite, if present, with the inner margin evenly curved, unarmed . . . **Nephropidae**
- 4a. Antennal flagelum reduced to a single broad and flat segment, similar to the other antennal segments **Scyllaridae**
- 4b. Antennal flagelum long, multi-articulate, flexible, whip-like, or more rigid → 5
- 5a. Carapace with numerous strong and less strong spines and 2 frontal horns over the eyes; rostrum absent or reduced to a single spine; legs 2 to 4 (usually also 1) without chelae or subchelae **Palinuridae**
- 5b. Carapace with at most a few spines; no frontal horns; rostrum present even though sometimes small; first pereopods simple, rostrum flat, broad, and triangular or broadly oval. . . **Synaxidae**

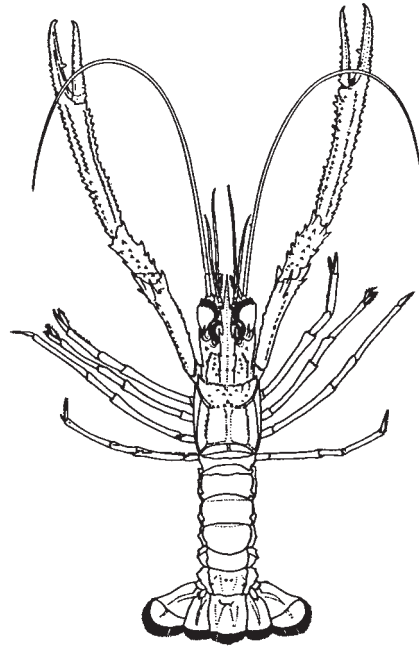
NEPHROPIDAE

True lobsters and lobsterettes

Diagnostic characters: Moderate- to large-sized crustaceans. **Carapace (or 'head')** cylindrical, with a **well-developed median rostrum** and variously ornamented with spines or nodules, occasionally smooth; eyes movable, usually well developed with black pigment, but small and lacking pigment or even absent in some deep water forms. Antennae long and whip-like, antennules slender, ending in 2 long flagella. Tail powerful, with a well-developed fan; abdominal segments smooth, or with one or more transverse grooves, or spiny, or granulate. **First 3 pairs of walking legs ending in true pincers, the first pair, and especially its pincers, usually enlarged.** **Colour:** variable, depending on the species; some drab, others marked with pink or red. Deep sea forms are whitish or pinkish.



Homarus

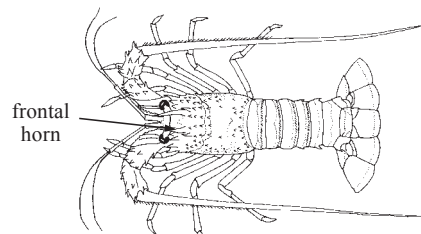


Metanephrops

Habitat, biology, and fisheries: This family comprises 12 species in Fishing Area 31 (11 genera worldwide) ranging in size from 10 to over 120 cm, and occurring in depths ranging from the shoreline to over 1 400 m. All lobsters and lobsterettes are bottom dwelling species, usually preferring hard and irregular bottoms which offer shelter, although some may also occur on open sand or even mud, digging burrows. The only important commercial species at this time in the western Atlantic is the American lobster *Homarus americanus*, but the fishing grounds for this species lie mostly to the north of Area 31. Other species from deeper waters, caught in exploratory trawling cruises, might possibly have some potential when fishing operations extend into deeper water and they are here described on individual sheets to facilitate their identification. In particular, some species of *Metanephrops* and *Nephropsis* caught during commercial fishing operations for the Royal red shrimp (*Pleoticus robustus*) have entered local markets sporadically. No statistics are available on these landings.

Similar families occurring in the area

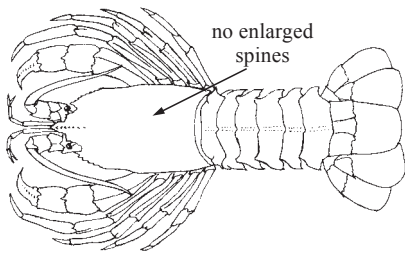
Palinuridae: carapace without a median rostrum, but with strong frontal horns over the eyes; all walking legs without pincers, first pair not greatly enlarged, except in *Justitia*.



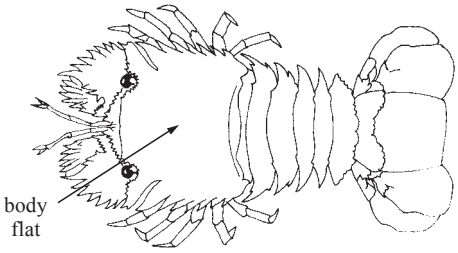
Palinuridae

Synaxidae (*Palinurellus gundiachi*): carapace covered with small, rounded nodules but without enlarged spines; antennae short; walking legs without pincers; entire body hairy and bright orange.

Scyllaridae: body strongly flattened; rostrum rudimentary or absent; no enlarged pincers; antennae scale-like.



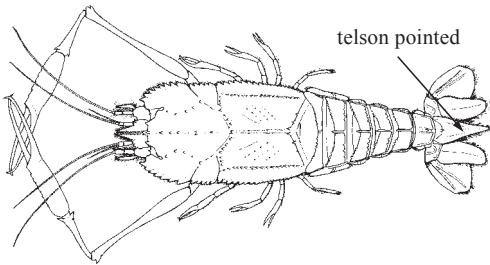
Synaxidae



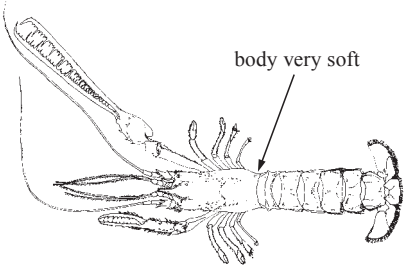
Scyllaridae

Polychelidae (no species of interest to fisheries in Area 31): blind, deep -sea lobster with a very soft body; rostrum absent; 4 to 5 pairs of legs with pincers; telson pointed.

Thaumastocheilidae (no species of interest to fisheries in Area 31): blind deep sea lobster with a very soft body; antennal scales with spines (spineless in Nephropidae); fingers of pincers much longer than rest of legs in first pair.



Polychelidae



Thaumastocheilidae

Key to the genera of Nephropidae occurring in the area

- 1a. Rostrum laterally compressed for the larger part of its length, with dorsal and ventral, but no lateral teeth (Fig. 1); carapace with branchiostegal spine; body entirely covered by numerous closely placed and sharply pointed spinules; lateral margin of the telson with 6 to 12 spines *Acanthacaris*
- 1b. Rostrum dorsoventrally depressed with lateral (and sometimes ventral), but without dorsal teeth; sometimes without any teeth; carapace without a branchiostegal spine; body never uniformly covered with spinules, although granules may be present all over, or spinules may be placed on the carapace; the lateral margin of the telson with at most 3 lateral spines, which if present, area usually small and irregular → 2

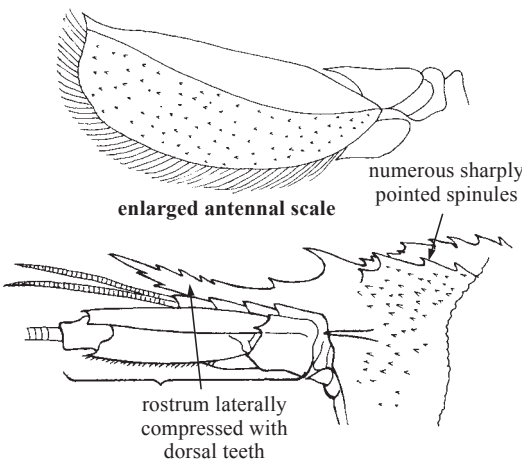


Fig. 1 lateral view of front of carapace (*Acanthacaris*)

- 2a. Scaphocerite absent; carapace without postorbital spine; abdominal sternites unarmed in both sexes; no podobranch on second maxilliped. → 3
- 2b. Scaphocerite present; carapace with a distinct postorbital spine; sternites of second to fifth abdominal somites in the male with a sharp median spine each; podobranch usually present on the second maxilliped → 4


- 3a. Pleura of abdominal somites broadly overlapping; exopod of second maxilliped without flagellum. *Thymops*
- 3b. Pleura of abdominal somites narrow, hardly if at all overlapping; lateral margin of telson unarmed, but for the posterolateral spine; exopod of second maxilliped with a distinct flagellum → 5









- 4a. Eye not pigmented; body granular and hairy, but not covered with evenly placed large pearly tubercles; pleura of second abdominal somite ending in a long sharp point *Nephropsis*
- 4b. Eye pigmented, although cornea small; body entirely covered by conspicuous rounded pearly tubercles; pleura of second abdominal somite broadly trapezoid, distal margin obliquely truncate, ending in a blunt posterior tooth *Nephropides*

- 5a. Left and right first chelipeds unequal, 1 crushing claw, the a other cutting claw; antennal spines without a strong posterior carina; first abdominal sternite of the male without a median spine *Homarus*
- 5b. Left and right chelipeds of the first pair similar size and in shape; antennal spine in most species followed by a strong carina; a distinct carina separates the abdominal tergites from the pleura; first abdominal sternite of the male with a median spine (feature not known from *Thymopides*) → 6

- 6a. Supraorbital spine followed by a strong toothed ridge which extends almost to the postcervical groove; posterior part of carapace with several longitudinal carinae *Metanephrops*
- 6b. Supraorbital spine followed by a single post-supraorbital spine, no supraorbital carina is present; the posterior part of the carapace is evenly granulate, without longitudinal carinae . *Eunephrops*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Acanthacaris caeca* A. Milne Edwards, 1881.
-  *Eunephrops bairdii* S. I. Smith, 1885.
-  *Eunephrops cadenasi* Chace, 1939.
- Eunephrops manning* Holthuis, 1974.
- Eunephrops luckhursti* Manning, 1997.
-  *Homarus americanus* H. Milne Edwards, 1837.
-  *Metanephrops binghami* (Boone, 1927).
- Nephropides caribaeus* Manning, 1969.
-  *Nephropsis aculeata* S. I. Smith, 1881.
-  *Nephropsis agassizii* A. Milne Edwards, 1880.
- Nephropsis neglecta* Holthuis, 1974.
-  *Nephropsis rosea* Bate, 1888.

References

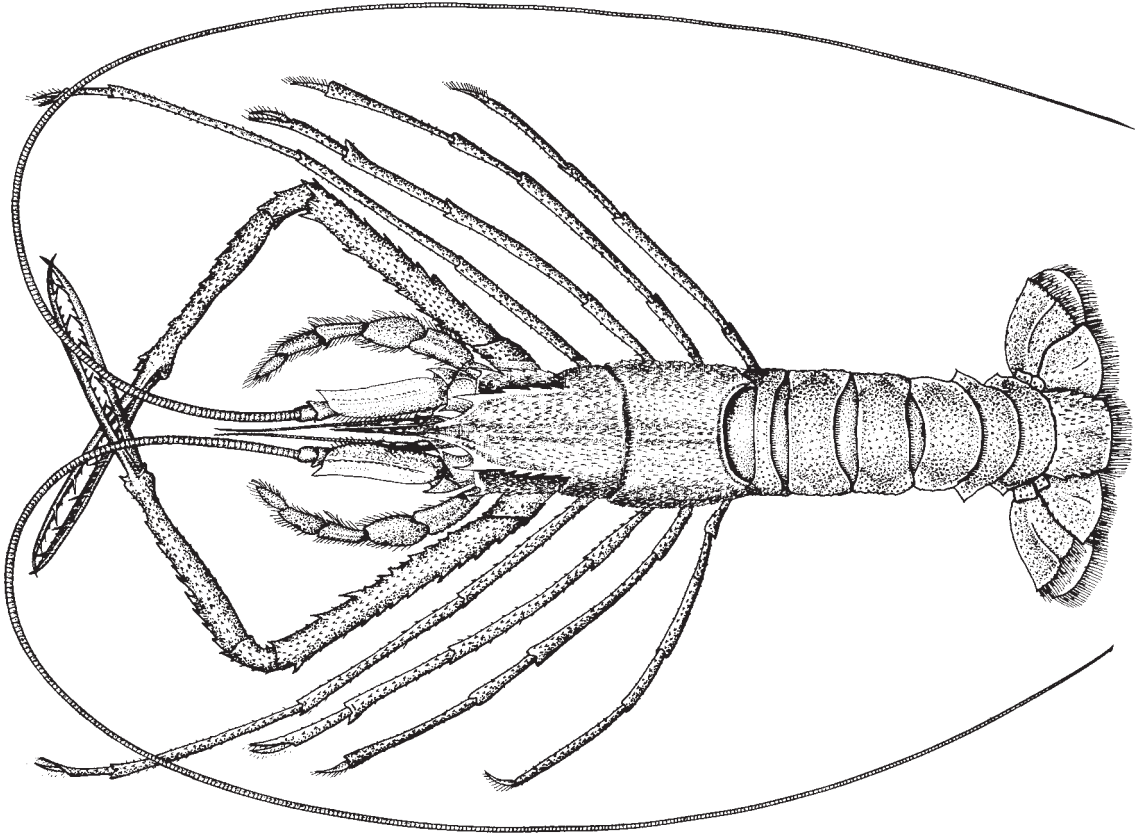
- Addison, J.T. and R.C.A. Bannister. 1994. Re-stocking and enhancement of clawed lobster stocks: a review. Proceedings of the Fourth International Workshop on Lobster Biology and Management, 1993. *Crustaceana*, 67(2):131-155.
- Guéguen, F. 2000. Distribution et abondance des crustacés décapodes du talus continental (200-900 m) de Guyane Française. *Crustaceana*, 73(6):685-703.
- Holthuis, L.B. 1974. The lobsters of the superfamily Nephropidea of the Atlantic ocean (Crustacea: Decapoda). Biological results of the University of Miami deep-sea expeditions. 106. *Bull. Mar. Sci.*, 24(4):723-884.
- Holthuis, L.B. 1991. FAO Species Catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fisheries Synopsis*. 125(13):1-292.
- Manning, R.B. 1978. Lobsters. In: *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31) Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).
- Poupin, J. 1994. *Faune marine profonde des Antilles françaises. Récoltes du navire 'Polka' faites en 1993*. Paris, Études et Thèses. ORSTOM Éditions., 80 p.
- Williams, A.B. 1984. *Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida*. Smithsonian Institution Press, 550 p.
- Williams, A.B. 1986. Lobsters – Identification, World Distribution, and U.S. Trade. *Mar. Fish. Rev.*, 48(2):1-36.

Acanthacaris caeca (A. Milne Edwards, 1881)

NTK

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Atlantic deep-sea lobster; **Fr** - Langoustine arganelle; **Sp** - Cigala de fondo.

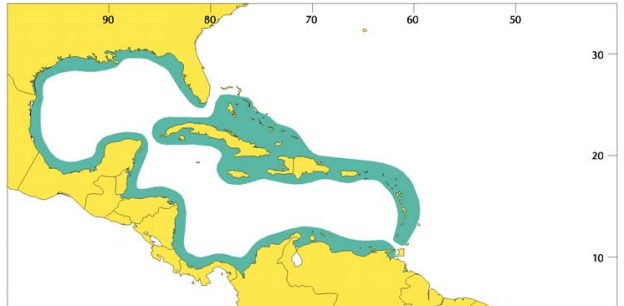


Diagnostic characters: A moderately large lobster. Body cylindrical, completely covered with small spines and sharp tubercles; carapace with a well-developed median rostrum. **Eyes very small, lacking pigment;** antennae long and whip-like; **antennal scales well-developed.** Tail powerful, with a well-developed fan. First 3 pairs of legs ending in true pincers, **the first pair equal, very slender, longer than body, covered with sharp spinules, and ending in elongate and slender fingers with long teeth on cutting edges, but without hairs.** **Colour:** uniform pink.

Size: Maximum length: About 400 mm; commonly 250 mm.

Habitat, biology, and fisheries: A deep sea lobster living in burrows in soft bottoms between 290 and 878 m, usually between 550 and 830 m. Not actively fished for at present. This species has been obtained in sizeable quantities during exploratory deep trawling operations with oversized bottom trawls in the Caribbean.

Distribution: Straits of Florida, Gulf of Mexico, Caribbean Sea, and Brazil (Amapá and Bahia).

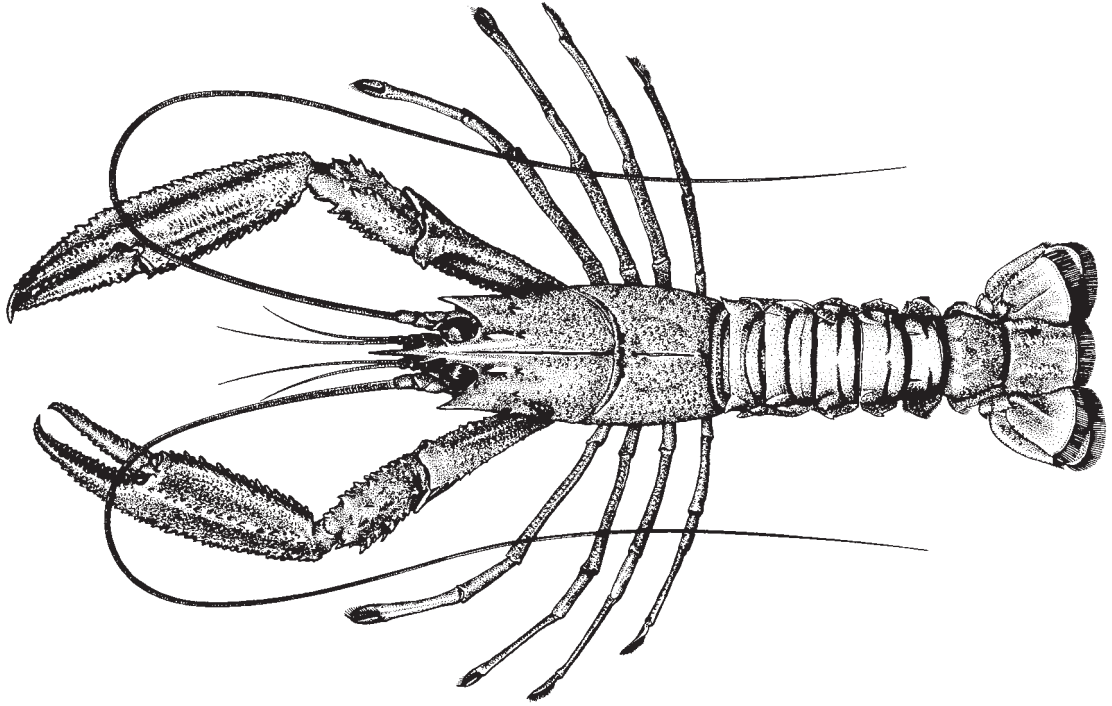


Eunephrops bairdii S.I. Smith, 1885

UFJ

Frequent synonyms / misidentifications: None / None.

FAO names: En - Red lobster; Fr - Langoustine rouge; Sp - Cigala colorada.

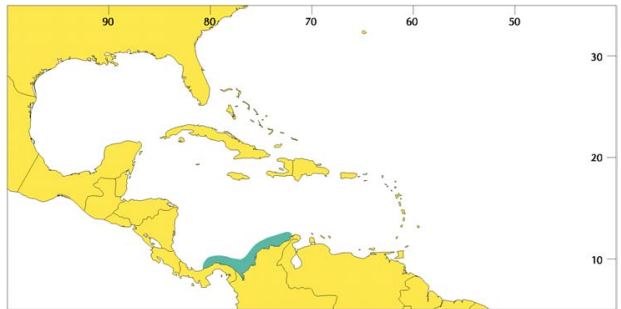


Diagnostic characters: A medium sized lobster. Body cylindrical; carapace granular, with a well-developed median rostrum armed with lateral and ventral teeth, but none on dorsal midline, and without a longitudinal ridge behind cervical groove; a pair of spines dorsally on carapace behind cervical groove. Eyes well developed and pigmented; antennae long and whip-like; small antennal scales present. Tail powerful with a well-developed fan, not conspicuously granulate; each abdominal segment with a deep transverse groove; pleura of second segment squarish in side view. First 3 pairs of legs ending in true pincers, the first pair long and stout with large, flattened, naked fingers. **Colour:** solid red to orange red; cornea black.

Size: Maximum length: about 200 mm.

Habitat, biology, and fisheries: Occurs in soft substrate (mud or coralline rubble) between 230 and 400 m. Although its large size makes it an attractive fishery subject, this deep-water species is not actively fished for at present. It has been taken during exploratory commercial fishing but is scarce.

Distribution: Southwestern Caribbean, off Panama and Colombia.

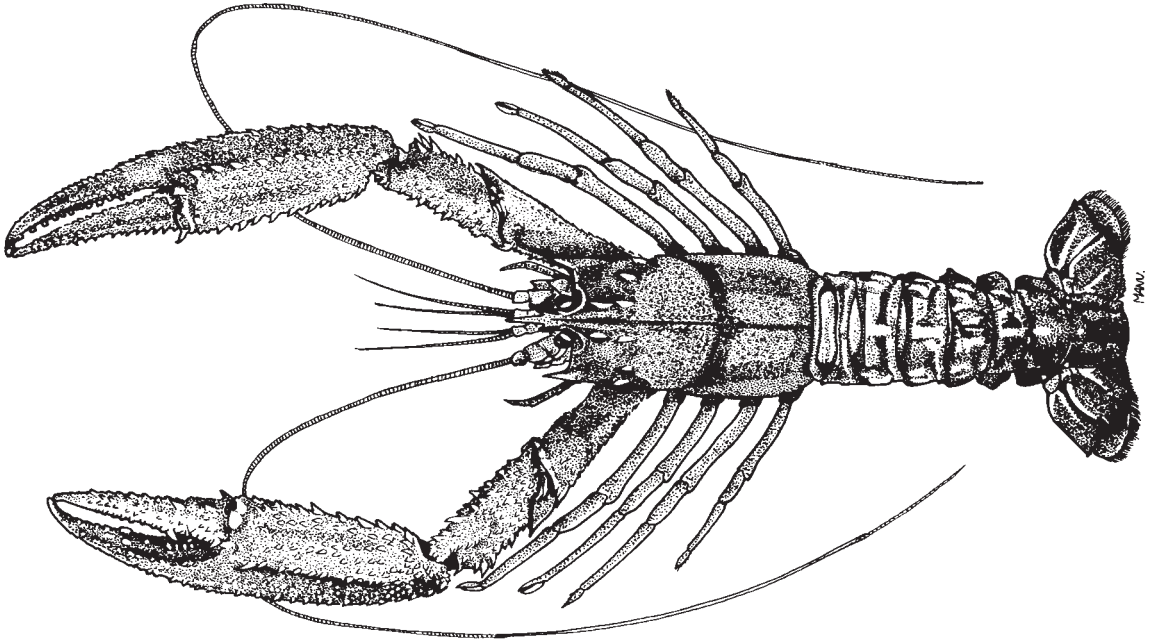


Eunephrops cadenasi Chace, 1939

UPC

Frequent synonyms / misidentifications: None / None.

FAO names: En - Sculptured lobster.

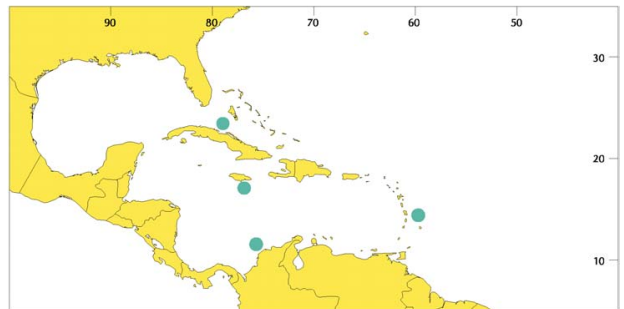


Diagnostic characters: A large lobster. Body cylindrical and smooth; carapace with a well-developed median rostrum. Antennae long and whip-like. No spines dorsally on carapace behind cervical groove. Tail powerful, with a well-developed fan. First 3 pairs of walking legs ending in true pincers (or claws), **those of enlarged first pair massive, flattened, unequal and smooth, without ridges, spines, or hairs.** **Colour:** chelipeds and abdominal ridges primarily beige or yellow; carapace marked with yellow anteriorly; walking legs clear or beige proximally, red distally.

Size: Maximum length: about 300 mm.

Habitat, biology, and fisheries: Occurs between 434 and 607 m depth; mostly common between 450 and 550 m. Sizeable quantities of this species have been reported from Guadeloupe. Its large size and rather high commercial value makes it of interest to fisheries. In Guadeloupe this species is caught with cylindrical traps. Marketed fresh and frozen.

Distribution: Off Bahamas, north of Cuba, Guadeloupe, Dominica and Martinique, Jamaica, and off Colombia.

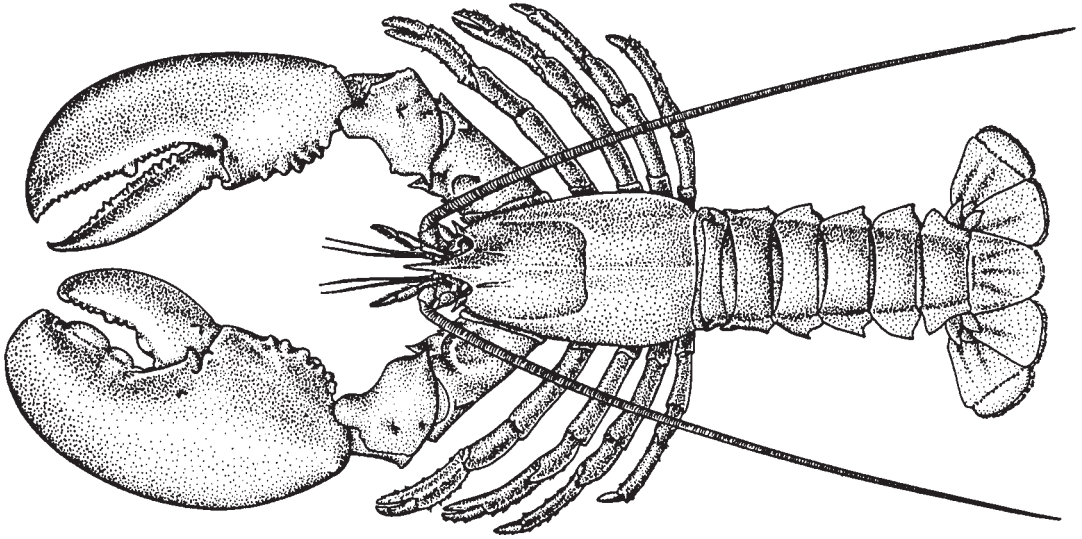


Homarus americanus H. Milne Edwards, 1837

LBA

Frequent synonyms / misidentifications: None / None.

FAO names: En - American lobster; Fr - Homard américain; Sp - Bogavante americano.

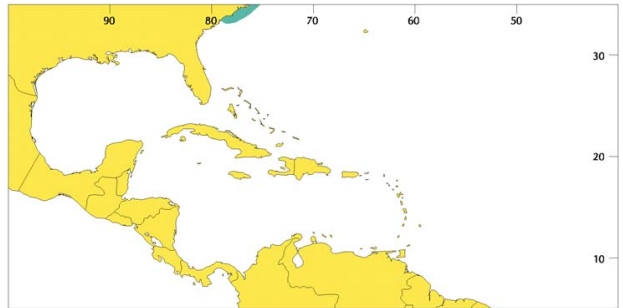


Diagnostic characters: A large lobster. Body cylindrical and smooth; carapace with a well-developed median rostrum. Antennae long and whip-like. Tail powerful, with a well-developed fan. First 3 pairs of walking legs ending in true pincers (or claws), **those of enlarged first pair massive, flattened, unequal, and smooth, without ridges, spines or hairs.** **Colour:** variable, often with a background of yellow or yellowish red, mottled with green or blue; carapace frequently with a blue stripe laterally, overall appearance dark.

Size: Maximum length: exceptionally over 640 mm; usually around 250 mm.

Habitat, biology, and fisheries: Found on various kinds of bottoms, especially rocky substrates, from the shore to depths of 480 m; most common between 4 and 50 m. Ovigerous females are found throughout the year. Migration does not occur, or occurs only on a limited scale. Feeds chiefly on bottom living fishes and crustaceans, molluscs, and other invertebrates. One of the most important Crustacea fisheries in the northwest Atlantic (Area 21). In that area, the capture production from 1984 to 1998 was 402 785 t (mean capture production was 26 852 t/year). It has been reported that small quantities may be landed in the northernmost part of Area 31 but separate statistics are not reported for this species from that area. American lobsters are traditionally obtained with traps, but in recent years trawling proved to be commercially feasible, especially in the southern part of its range. Marketed fresh, frozen, and alive (Beard and McGregor, 1991). The meat is also canned.

Distribution: Western Atlantic from Newfoundland (Canada) to Cape Hatteras, North Carolina (USA).

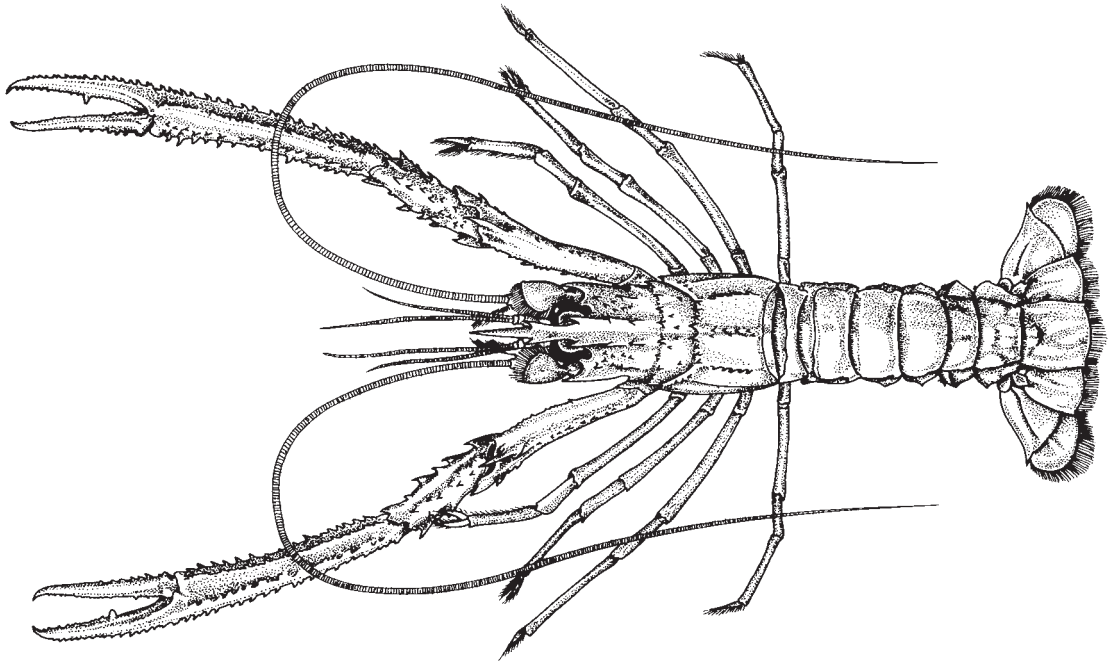


***Metanephrops binghami* (Boone, 1927)**

MFI

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Caribbean lobster; **Fr** - Langoustine caraïbe; **Sp** - Cigala del Caribe.

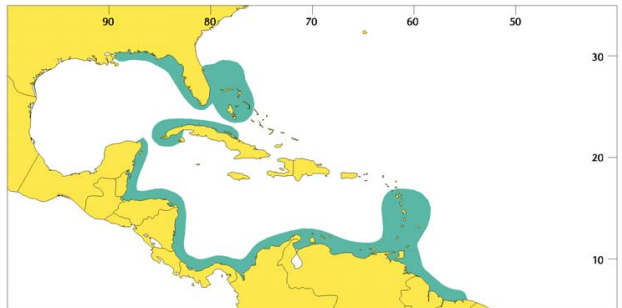


Diagnostic characters: A small to medium-sized lobster. Body cylindrical; carapace spiny, with a well-developed median rostrum armed with lateral and ventral teeth only, and **supraorbital ridges extending behind eyes, the spaces between these ridges nearly smooth; longitudinal ridges present behind cervical groove**. Eyes well developed and pigmented; antennae long and whip-like; **antennal scales present**. Tail powerful, with a well-developed fan and **smooth, shiny abdominal segments without transverse grooves**. First 3 pairs of legs ending in true pincers, the **first pair very long and moderately slender, square in cross-section, with rows of spines along ridges**. **Colour:** pinkish, with lateral stripes of red and white along body.

Size: Maximum length: 170 mm; usually around 120 mm.

Habitat, biology, and fisheries: Occurs between 230 and 700 m; most commonly obtained between 300 and 500 m on sand and mud bottoms. The Caribbean lobster is not actively fished for at present. In exploratory trawling operations off Nicaragua and Colombia this species was obtained in commercially attractive quantities (about 10 kg/h). Outside of the area, its counterpart *Metanephrops rubellus* is quite common in the Brazilian markets where it is sold frozen.

Distribution: From the Bahamas and southern Florida to French Guiana, including the Gulf of Mexico and the Caribbean Sea.

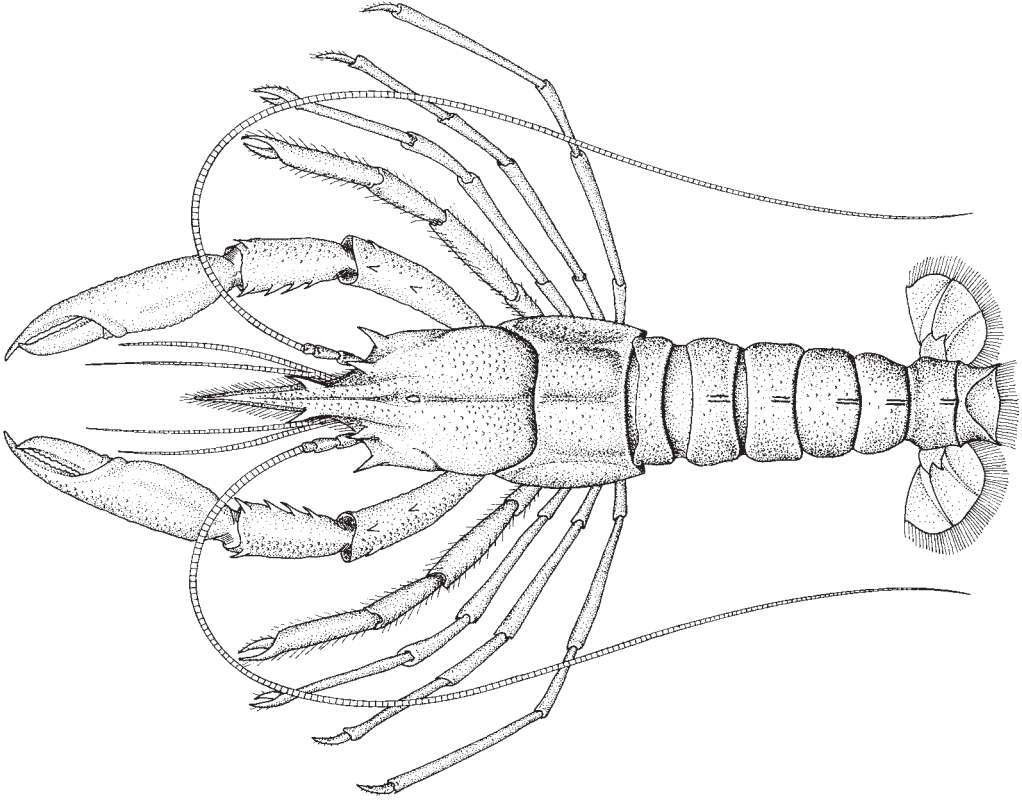


Nephropsis aculeata S.I. Smith, 1881

NFU

Frequent synonyms / misidentifications: None / None.

FAO names: En - Florida lobsterette; Fr - Langoustine de Floride; Sp - Cigala de Florida.

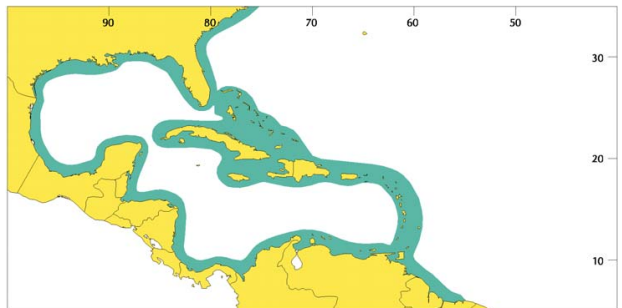


Diagnostic characters: A small lobster. Body cylindrical; carapace granular, with a well-developed median rostrum armed with 1 pair of lateral spines; a single spine behind each eye. Eyes very small, lacking pigment; antennae long and whip-like, antennal scales absent. Tail powerful, with a well-developed fan; pleura (lateral projections) of second abdominal segment triangular, without spines on front edge. First 3 pairs of legs ending in true pincers, the first pair stout with short, very hairy (woolly) fingers. **Colour:** generally pink or red, variable.

Size: Maximum length: about 140 mm; usually 80 mm.

Habitat, biology, and fisheries: Occurs between 130 and 830 m, usually between 200 and 600 m, on mud or fine sand. Potential considerable densities of this species (up to 40 kg/h) have been revealed in the Gulf of Mexico (off the mouth of the Mississippi river and off east Florida on royal red shrimp grounds) by exploratory trawling operations. Separate statistics are not reported for this species. Probably marketed fresh or frozen.

Distribution: From off Massachusetts and Bermuda southward through the Gulf of Mexico and the Caribbean Sea, including the Antilles, Suriname, French Guiana, to Brazil (from Espírito Santo to São Paulo).

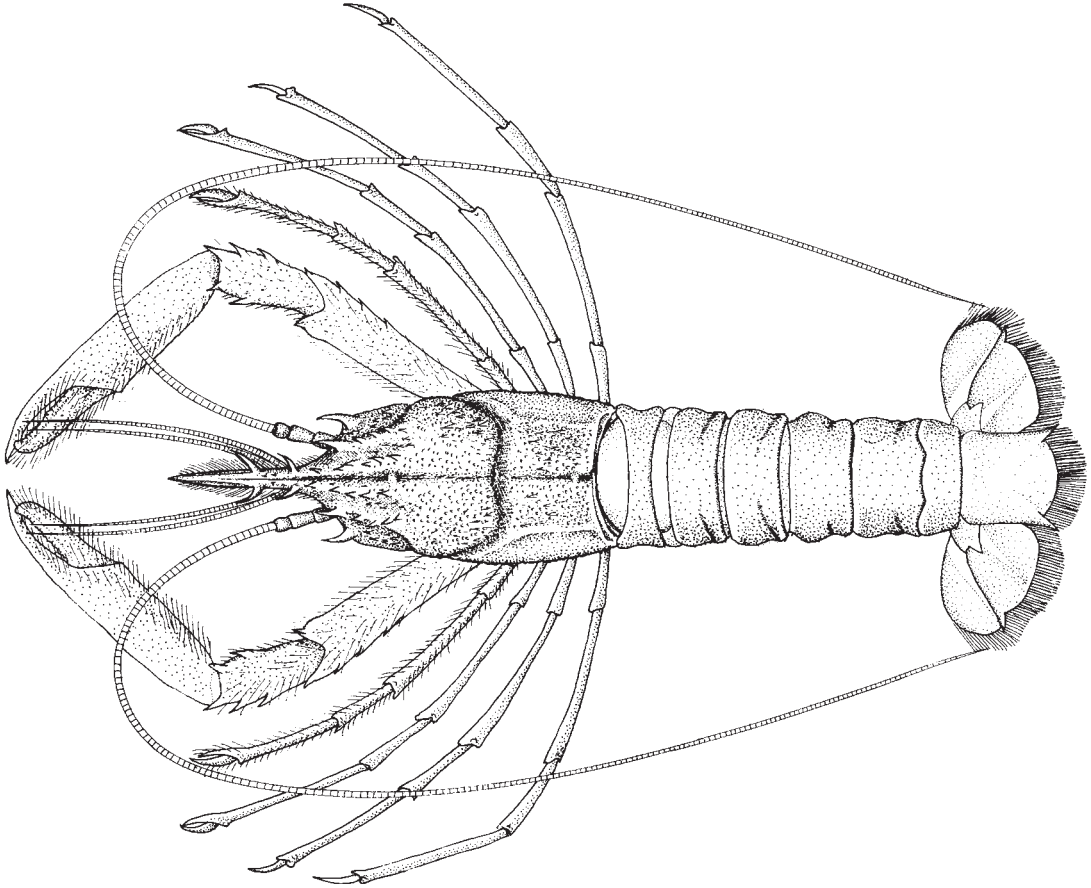


Nephropsis agassizii A. Milne Edwards, 1880

NFZ

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Prickly lobsterette; **Fr** - Langoustine épineuse; **Sp** - Cigala de grano.

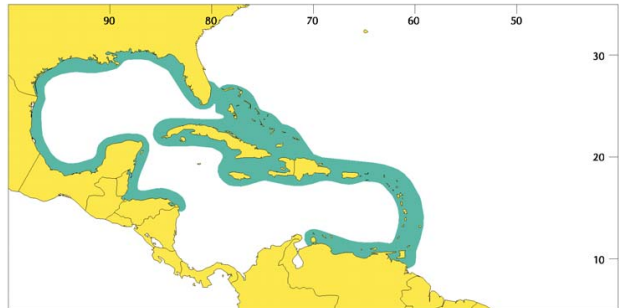


Diagnostic characters: A small lobster. Body cylindrical; carapace granular, with a well-developed median rostrum armed with 2 pairs of lateral spines. **Eyes very small, lacking pigment**; antennae long and whip-like, **antennal scales absent**. Tail powerful, with a well-developed fan; **pleura (lateral projections) of second abdominal segment with 2 spines on front edge**. First 3 pairs of legs ending in true pincers, the first pair moderately stout with **short, granular, hairy, but not woolly fingers**. **Colour:** bright red.

Size: Maximum length: about 120 mm.

Habitat, biology, and fisheries: Found at depths between 470 and 1 750 m, usually between 900 and 1 400 m, on mud bottoms. Not fished for at present. Its small size and density makes it unattractive for fisheries purposes. The species has been taken sporadically in deep trawling operations of exploratory fishing vessels but never in commercial quantities.

Distribution: Bahamas, Gulf of Mexico, Caribbean Sea, Tobago, and Brazil (Bahia and São Paulo).

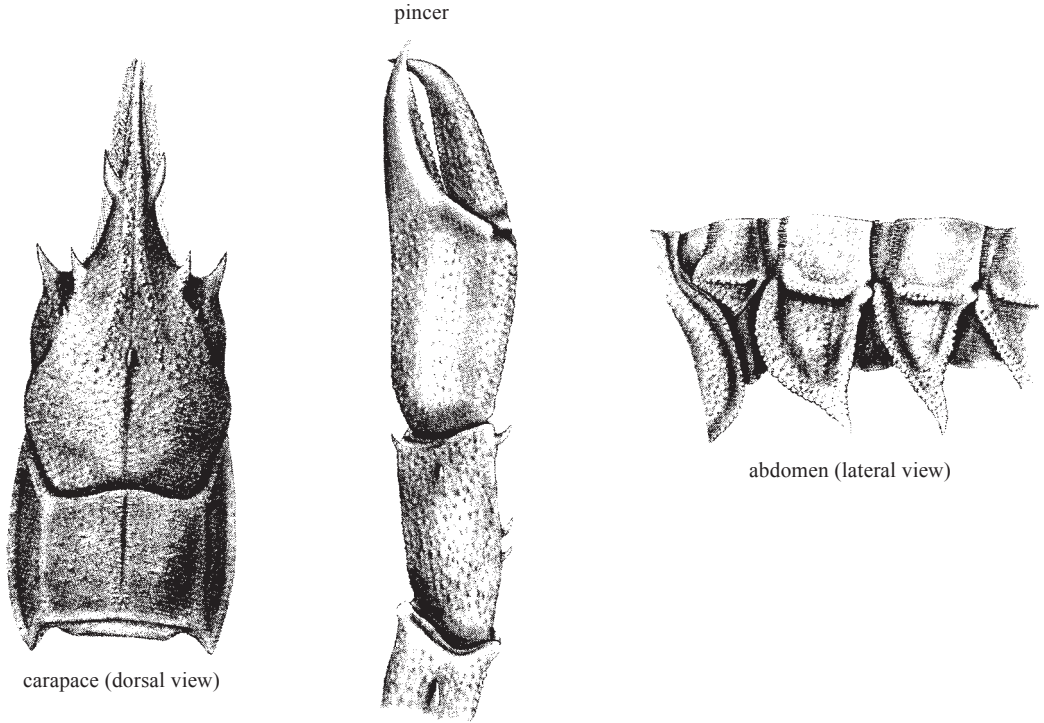


Nephropsis rosea Bate, 1888

NFI

Frequent synonyms / misidentifications: None / None.

FAO names: En - Two-toned lobsterette; Fr - Langoustine bicolore.

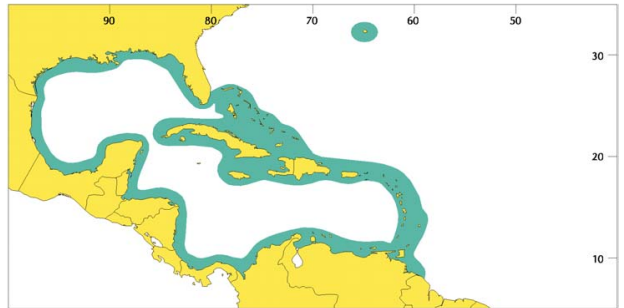


Diagnostic characaters: A small lobster. Body cylindrical; carapace granular with well-developed median rostrum armed with only 1 lateral spine at either side. Eyes small; antennae long and whip-like, antennal scales absent. Tail powerful, with a well-developed fan; pleura (lateral projections) of second abdominal segment with no spines on front edge. **Colour:** upper part of body pale, ventral surface darker, orange or orange-red.

Size: Maximum length: about 130 mm.

Habitat, biology, and fisheries: Found at depths between 420 and 1 260 m, usually between 500 and 800 m, on muddy and sandy bottoms. Potential interest to fisheries as the species is not rare. Not fished for at present.

Distribution: From Bermuda to Brazil (Bahia and Espírito Santo), including the Gulf of Mexico, Caribbean Sea, and Guyana.



SYNAXIDAE

Furry lobsters

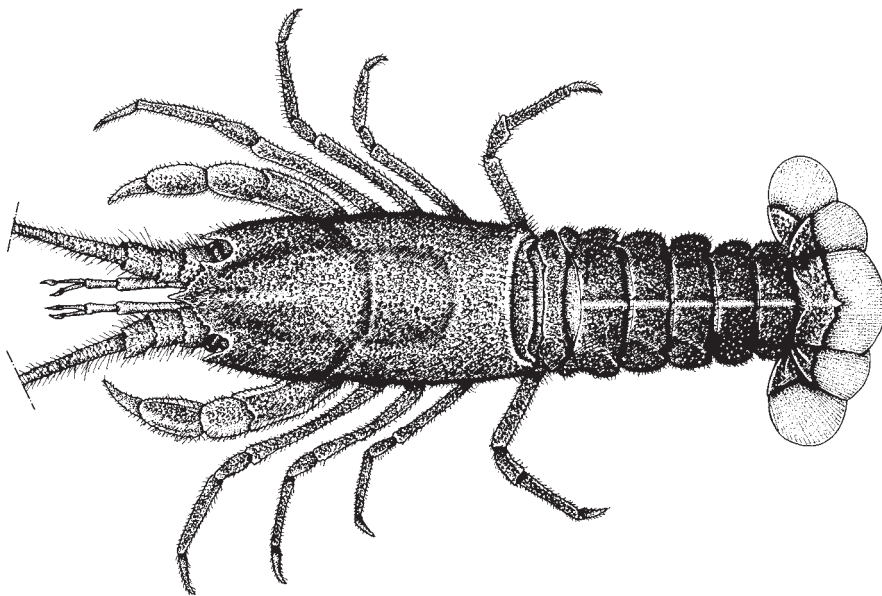
A single species occurring in the area.

Palinurellus gundlachi (Von Martens, 1878)

LLQ

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Caribbean furry lobster; **Fr** - Cacahouète; **Sp** - Langostita del Caribe.



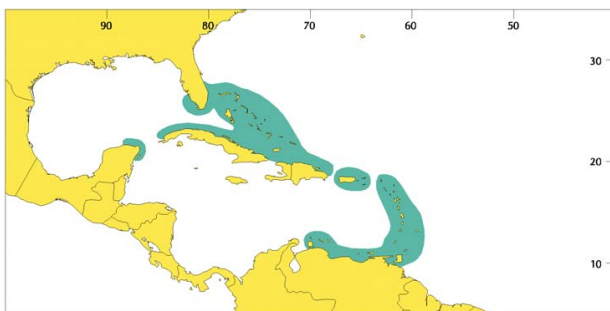
Diagnostic characters: A small lobster. Carapace long and rounded, entirely covered with small, rounded nodules and short hair, but without enlarged spines; a small triangular rostrum present between eyes. Antennae shorter than carapace, antennular flagella shorter than antennular peduncles. Abdominal segments slightly keeled along dorsal midline, hairy like the carapace, but without transverse grooves. Legs without true pincers, the first pair not longer than but at least twice as thick as the second. **Colour:** uniformly bright orange.

Size: Maximum length about 150 mm.

Habitat, biology, and fisheries: Among rocks and corals from the tide zone down to 35 m depth. This species is rather scarce and is of no interest to commercial fisheries. Caught by divers or incidentally during trapping operations set for other species.

Distribution: Bermuda, Bahamas, southern Florida, Yucatán, most of the West Indies, and Brazil (Pernambuco and Bahia States).

Remarks: This family consists of 2 genera and 3 species worldwide.



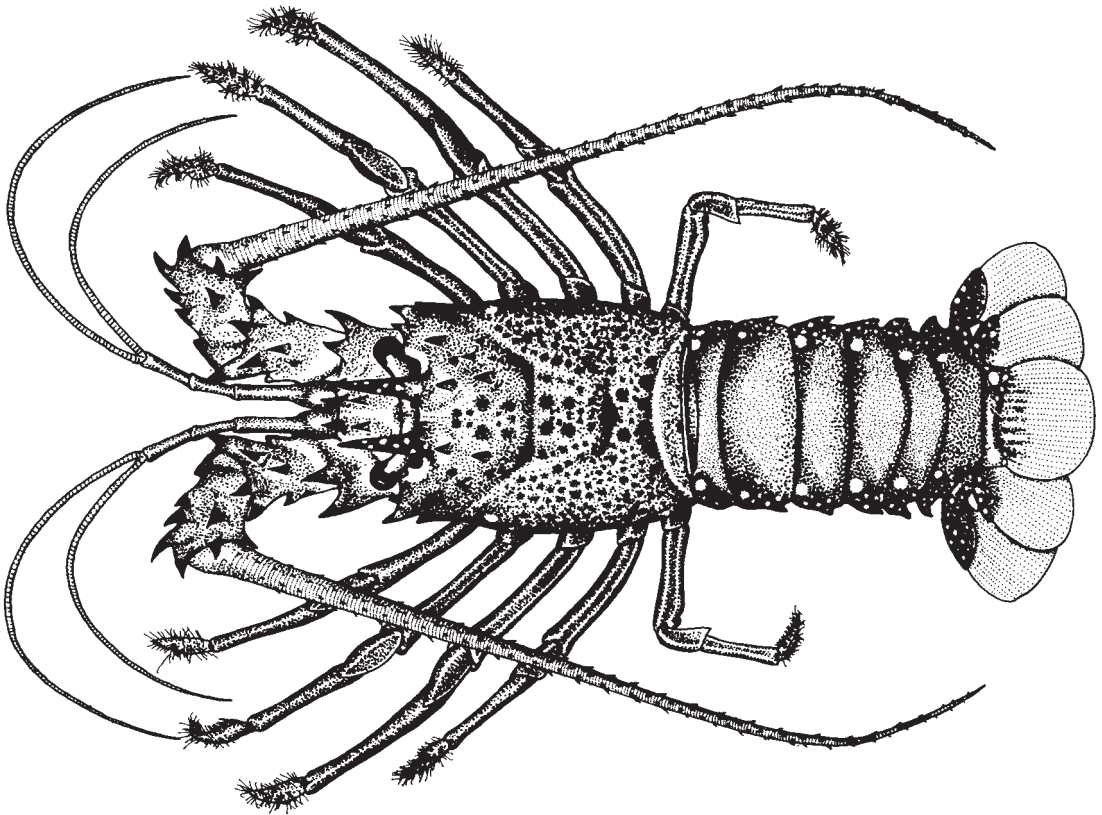
References

- Davie, P.J.F. 1990. A new genus and species of marine crayfish, *Palibythus magnificus*, and new records of *Palinurellus* (Decapoda: Palinuridae) from the Pacific Ocean. *Invertebrate Taxonomy*, 4:685-695.
- Holthuis, L.B. 1991. FAO Species Catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fisheries Synopsis*. 125(13):1-292.
- Manning, R.B. 1978. Lobsters. In: *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31) Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).

PALINURIDAE

Spiny lobsters

Diagnostic characters: Moderate to large sized crustaceans. **Carapace (or 'head')** rounded in section (subcylindrical), without a distinct median rostrum, ornamented with spines and nodules of various sizes, sometimes (*Justitia*) with a scale-like sculpturing; **each eye protected by a strong, spiny frontal projection of the carapace (frontal horns)**. Antennae long and whip-like, antennules slender, each consisting of a segmented peduncle and 2 long or short flagella; bases of antennae separated by a broad antennular plate, usually bearing 1 or 2 pairs of spines, but spineless in some species. Tail powerful, with a well-developed fan; abdominal segments either smooth or with one or more transverse grooves. **Legs without true pincers or chelae (claws)**, the first pair usually not greatly enlarged (except *Justitia*). **Colour:** most species brightly coloured and patterned with bands or spots, others uniform, dull.

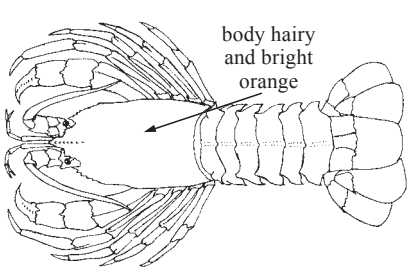


Habitat, biology, and fisheries: This family consists of 8 genera and 47 species worldwide. The 6 Western Central Atlantic representatives range in maximum size from 18 to 45 cm. Most are shallow-water forms (rarely extending beyond 100 m depth), living singly or in groups in coral reefs, rocky areas, or other habitats that offer protection, although 1 species, *Justitia longimanus*, is more common in deeper water, down to over 300 m. The spiny lobster fishery in Area 31 is mostly concentrated on *Panulirus argus*, while the other species are usually taken less frequently. All species are primarily caught with traps, but most are also taken by hand or by spearing. The catch of spiny lobsters reported from Area 31 in 1976 totalled 19 338 t (mostly *P. argus*).

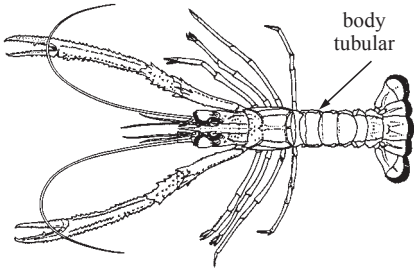
Similar families occurring in the area

Synaxidae (*Palinurellus gundlachi*): carapace covered with small, rounded nodules but without enlarged spines; a small median rostrum present; first pair of legs at least twice as thick as the second; entire body hairy and bright orange.

Nephropidae: body tubular; a well-developed rostrum present; first 3 pairs of legs ending in true pincers, first pair much larger than the others.



Synaxidae



Nephropidae

Key to the genera of Palinuridae occurring in the area

- 1a. First pair of legs enlarged in males, ending in subchelae, with wide, red crossbands (Fig. 1a); carapace ornamented with a strong scale-like sculpture (Fig. 1b); abdomen brick red, with 4 or 5 conspicuous transverse grooves on each somite and with yellowish spots and stripes. *Justitia*
- 1b. First pair of legs not enlarged, with no trace of a pincer, without crossbands; carapace without a scale-like sculpture; abdomen variously coloured, smooth or with at most 2 transverse grooves per somite → 2

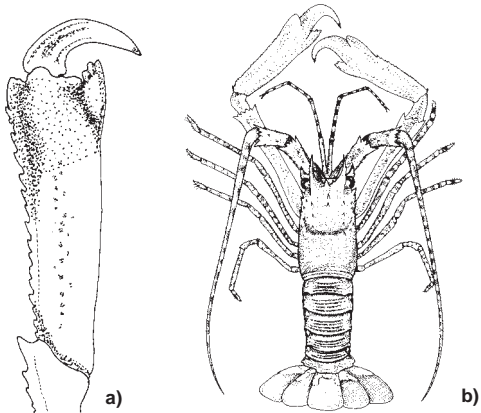


Fig. 1 *Justitia longimanus*

- 2a. Frontal horns over eyes very sharp; antennular flagella longer than peduncle (Fig. 2). . . . *Panulirus*
- 2b. Frontal horns over eyes blunt, squarish; antennular flagella shorter than peduncle (Fig. 3) . . . *Palinustus*

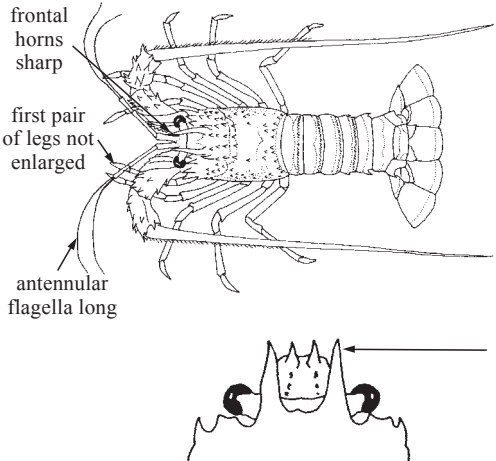


Fig. 2 *Panulirus*

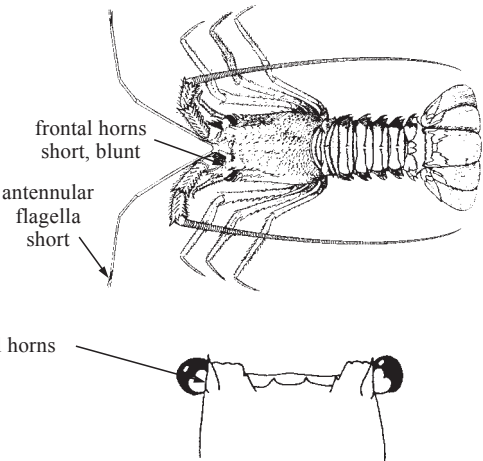




Fig. 3 *Palinustus*

List of species occurring in the area

The symbol  is given when species accounts are included.


 *Justitia longimanus* (H. Milne Edwards, 1837).

 *Palinustus truncatus* A. Milne Edwards, 1880.

 *Panulirus argus* (Latreille, 1804).

Panulirus echinatus Smith, 1869.

 *Panulirus guttatus* (Latreille, 1804).

 *Panulirus laevis* (Latreille, 1817).

References

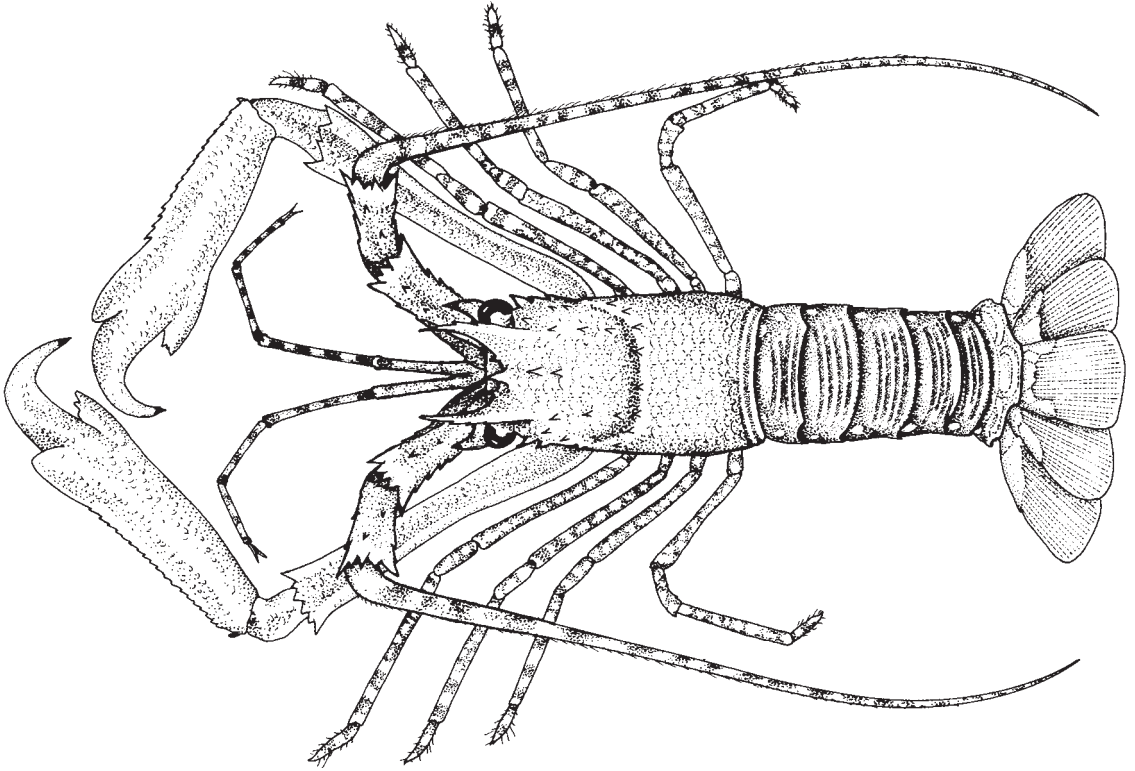
- Briones-Fourzán, P. 1994. Variability in postlarval recruitment of the spiny lobster *Panulirus argus* (Latreille, 1804) to the Mexican Caribbean coast. Proceedings of the Fourth International Workshop on Lobster Biology and Management, 1993. *Crustaceana*, 67(1):26-45.
- Field, J.M. and M.J. Butler. 1994. The influence of temperature, salinity, and postlarval transport on the distribution of juvenile spine lobsters, *Panulirus argus* (Latreille, 1804), in Florida Bay. Proceedings of the Fourth International Workshop on Lobster Biology and Management, 1993. *Crustaceana*, 67(1):26-45.
- Herrnkind, W.F. and M.J. Butler. Settlement of spiny lobster, *Panulirus argus* (Latreille, 1804) in Florida: pattern without predictability? Proceedings of the Fourth International Workshop on Lobster Biology and Management, 1993. *Crustaceana*, 67(1): 26-45.
- Holthuis, L.B. 1991. FAO Species Catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fisheries Synopsis*. 125(13):1-292.
- Manning, R. B. 1978. Lobsters. In: *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31) Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).
- Poupin, J. 1994. *Faune marine profonde des Antilles françaises. Récoltes du navire 'Polka' faites en 1993*. Paris, Études et Thèses. ORSTOM Éditions., 80 p.
- Williams, A.B. 1986. Lobsters - Identification, World Distribution, and U.S. Trade. *Mar. Fish. Rev.*, 48(2):1-36.

Justitia longimanus (H. Milne Edwards, 1837)

JUL

Frequent synonyms / misidentifications: *Justitia longimana* (H. Milne Edwards, 1837) / None.

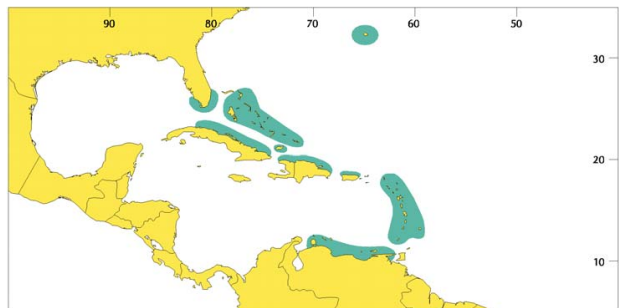
FAO names: En - West Indian furrow lobster; Fr - Langouste caraïbe; Sp - Langosta de ruedas.



Diagnostic characters: Carapace rounded dorsally, covered with spines, including a pair of very strong frontal horns over the eyes, and **ornamented with a strong, scale-like sculpturing**; a median spine but no distinct rostrum on front margin of carapace. Antennae long, their **flagella shorter than the antennular peduncle**; base of antenna separated by broad, **spineless antennular plate**. Tail powerful, with a well-developed fan; **each abdominal segment with 4 or 5 conspicuous transverse grooves**; **first pair of legs greatly enlarged in males and ending in apparent pincers** (fixed finger very small). **Colour:** body brick red, variously spotted and striped with yellow; first pair of legs conspicuously banded with red.

Habitat, biology, and fisheries: Inhabits the outer parts of coral reef slopes at depths to over 300 m; often found between 50 and 100 m. In certain areas of upwelling (near Isla Margarita, Venezuela) it has been found at depths of 1 m. Not actively fished commercially in the area, probably because it is scarce in the traditional fishing grounds. With proper gear and a better knowledge of its habits and habitat, future fishery may prove feasible.

Distribution: Bermuda, southern Florida, Caribbean arc from Cuba to Isla Margarita (Venezuela), Curaçao, and Brazil (Rio Grande do Norte, Espírito Santo).

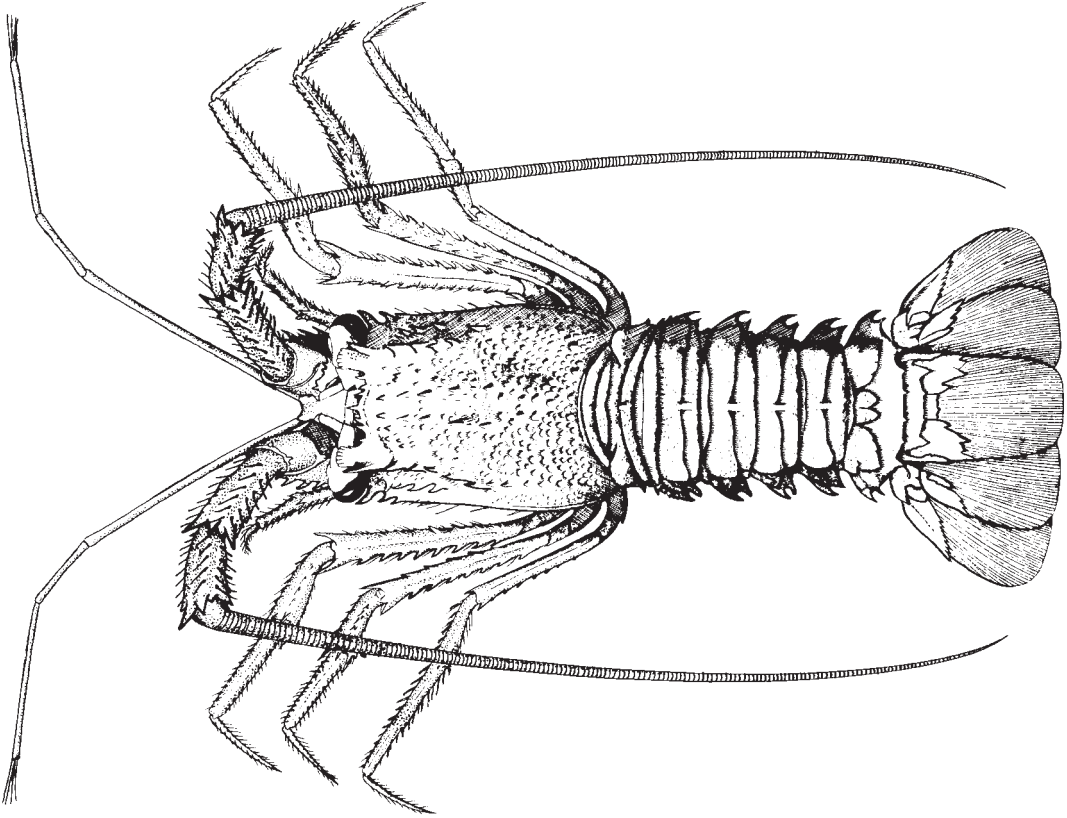


Palinustus truncatus A. Milne Edwards, 1880

INR

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - American blunthorn lobster; **Fr** - Langouste aliousta; **Sp** - Langosta ñata.

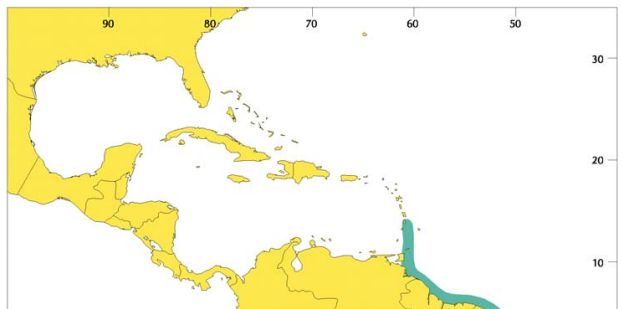


Diagnostic characters: Carapace rounded dorsally and covered with numerous spines and nodules of various sizes, including a pair of very strong, broad, and blunt frontal horns over the eyes; one or more spines, but no distinct median row on front margin of carapace. Antennae long, stiff, whip-like, antennules slender, their flagella much shorter than antennular peduncles; bases of antennae separated by a broad antennular plate lacking spines. Tail powerful, with a well-developed fan; each abdominal segment with a transverse groove interrupted on the midline. Legs without pincers. **Colour:** body pale brown, almost cream-coloured, with reddish brown spots that form no distinct pattern; legs cream-coloured with reddish brown hands.

Size: Maximum length: 100 mm.

Habitat, biology, and fisheries: It has been obtained from depths between 100 and 298 m. This species has also been recorded from the littoral zone and from 4 111 to 4 122 m. The bottom is variously described as brown mud and sand and coral. No fisheries interest so far as the species is apparently rare.

Distribution: From Carriacou Island, Lesser Antilles, to Brazil (Amapá and Pará States).

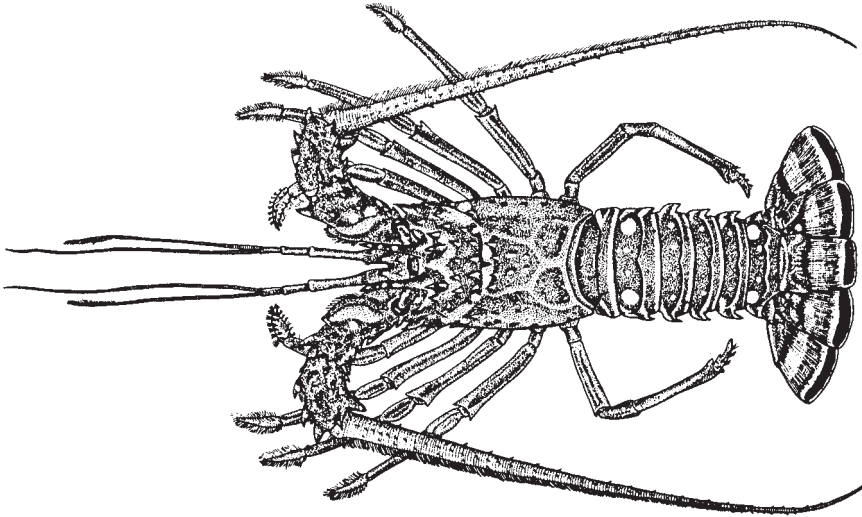


Panulirus argus (Latreille, 1804)

SLC

Frequent synonyms / misidentification: None / None.

FAO names: **En** - Caribbean spiny lobster; **Fr** - Langouste blanche; **Sp** - Langosta común del Caribe.

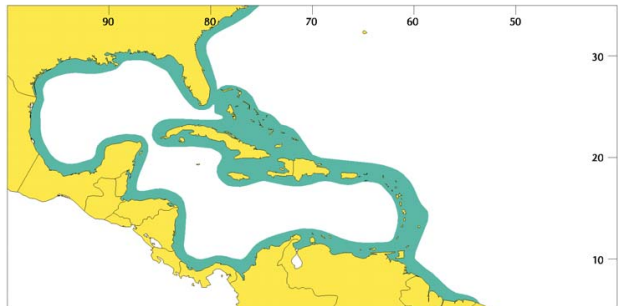


Diagnostic characters: Carapace rounded dorsally, covered with numerous spines and nodules of various sizes including a pair of very strong and sharp frontal horns over the eyes; no distinct median rostrum on frontal margin of carapace. Antennae long, stiff, whip-like; antennules slender, their flagella longer than the antennular peduncle; bases of antennae separated by a broad antennular plate **bearing 2 pairs of strong spines**. Tail powerful, with a well-developed fan; **each abdominal segment with a complete transverse groove**. Legs without pincers. **Colour:** variable, mottled greenish purple, also tan, brown, reddish, bluish, or greenish; **tail with 4 conspicuous yellow spots, one on each side of second and last abdominal segments**, in addition to other smaller spots and dark cross-bands; **legs with light and dark longitudinal stripes**.

Size: Maximum length: 450 mm; usually about 200 mm.

Habitat, biology, and fisheries: Usually recorded from shallow waters but may occur down to about 90 m, perhaps even deeper. Found among rocks, on reefs, in eelgrass beds, or in any habitat providing shelter. The species is gregarious and migratory. Females move to deeper water for spawning. Mass migrations have been reported in the autumn when in single files of up to 50 individuals the lobsters move in a certain direction in day-time, each animal having body contact with the next through the antennae. Of interest to fisheries: *Panulirus argus* is by far the most important commercial palinurid occurring in Area 31. The catch reported in 1976 totaled 19 338 t. From 1984 to 1998 the capture production was 330 112 t (mean capture production was 23 579 t/year); the largest landings were reported from the Bahamas (179 207 t; mean capture production: 11 947 t/year). Other *Panulirus* species probably accounted for part of the catch, but no separate statistics are collected. Outside the area this species is fished in large quantities off the northeastern Brazilian coast (capture production from 1984 through 1998: 124 790 t; mean capture production: 8 319 t/year). Caught mostly with traps, but also taken by hand, speared, and trawled. Fishing gear and catchability for the main fishing methods used in Cuba were discussed by Puga et al. (1996). Marketed fresh; tails are exported frozen or canned.

Distribution: Bermuda and from North Carolina southward through the Gulf of Mexico, the Antilles, and coasts of Central and South America to Brazil (from Pará to São Paulo, including the oceanic island of Fernando de Noronha). Scattered records from West Africa (Côte d'Ivoire).

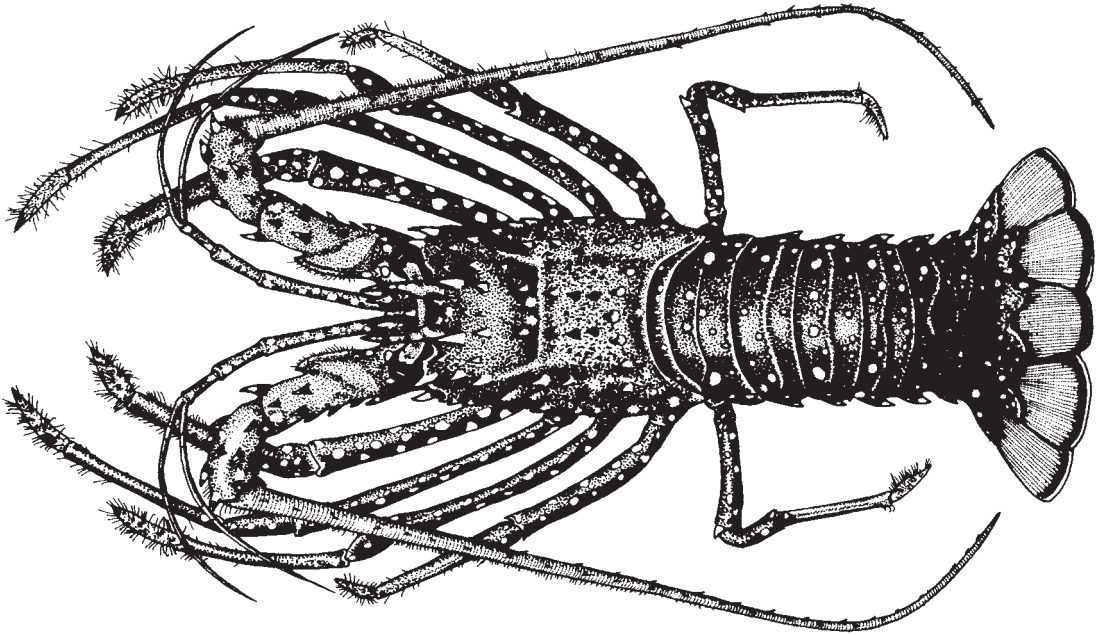


Panulirus guttatus (Latreille, 1804)

NLG

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Spotted spiny lobster; **Fr** - Langouste brésilienne; **Sp** - Langosta moteada.

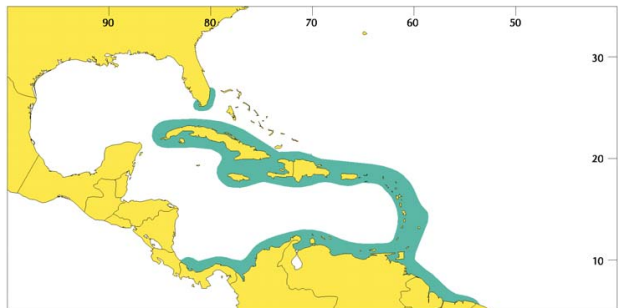


Diagnostic characters: Carapace rounded dorsally, covered with numerous spines and nodules of various sizes, including a pair of very strong and sharp frontal horns over eyes; no distinct median rostrum on frontal margin of carapace. Antennae long, stiff, whip-like; antennules slender, their flagella longer than antennular peduncle; bases of antennae separated by a broad antennular plate **bearing 1 pair of strong spines**. Tail powerful, with a well-developed fan; **each abdominal segment with a complete transverse groove**. Legs without pincers. **Colour:** purple or reddish brown, tail dark greenish, completely covered with small, yellowish spots; **legs spotted, except for the next to last segment** which is longitudinally striped.

Size: Maximum length: about 200 mm; usually 150 mm.

Habitat, biology, and fisheries: A shallow-water species inhabiting rocky areas, found mainly in crevices. Caught sporadically throughout its range. There is no special fishery devoted to this species. It is obtained by hand or speared; occasionally caught in traps mostly set for other species; usually taken along with *Panulirus argus*. Sold fresh and mostly used for local consumption. Separate statistics are not collected for this species.

Distribution: Bermuda, Bahamas, southern Florida, Belize, Panama, Caribbean arc from Cuba to Trinidad, Curaçao, Bonaire, Los Roques, Suriname, and Brazil.

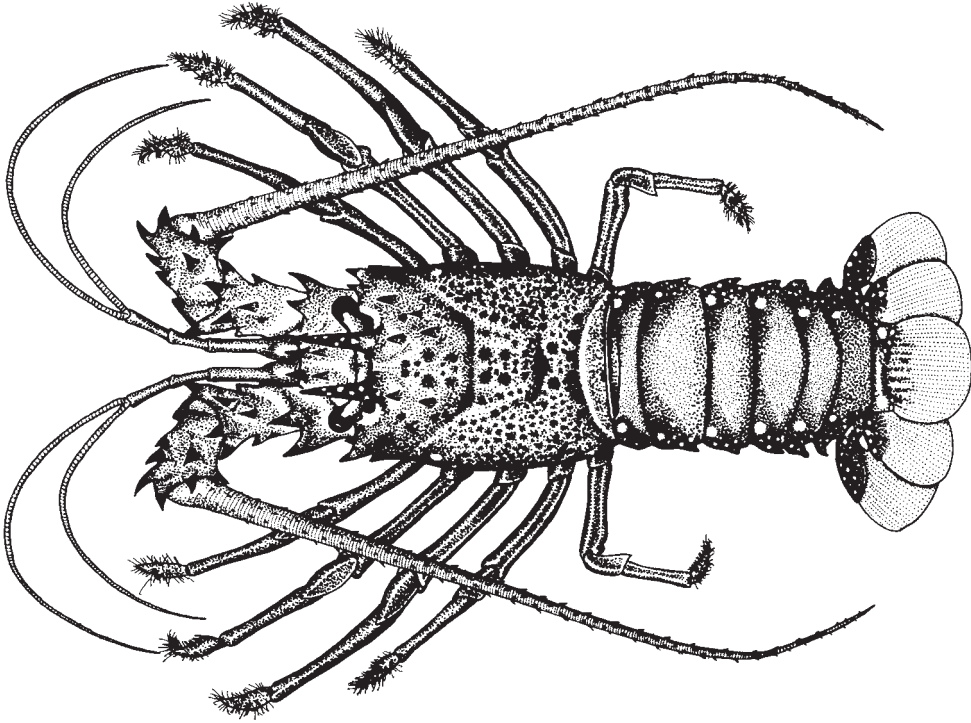


Panulirus laevis (Latreille, 1817)

NUL

Frequent synonyms / misidentifications: None / None.

FAO names: En - Smoothtail spiny lobster; Fr - Langouste indienne; Sp - Langosta verde.

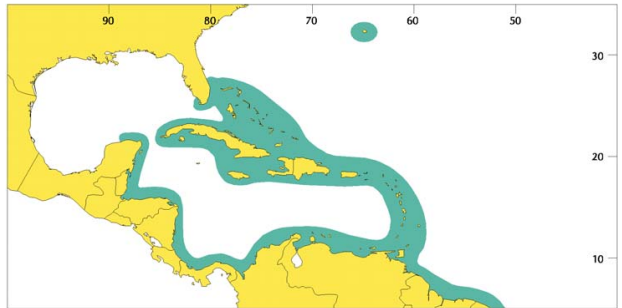


Diagnostic characters: Carapace rounded dorsally, covered with numerous spines and nodules of various sizes, including a pair of very strong, sharp frontal horns over eyes; no distinct median rostrum on frontal margin of carapace. Antennae long, stiff, whip-like; antennules slender, their flagella longer than antennular peduncles; bases of antennae separated by a broad antennular plate **bearing 2 pairs of strong spines**. Tail powerful, with a well-developed fan; **each abdominal segment smooth, without a groove**. Legs without pincers. **Colour:** variable, background greenish, yellowish, or with shades of purple; **each abdominal segment with a posterior line of small light spots**; sides of carapace and last abdominal segment with white spots; **legs longitudinally striped**.

Size: Maximum length: about 310 mm; usually to 200 mm.

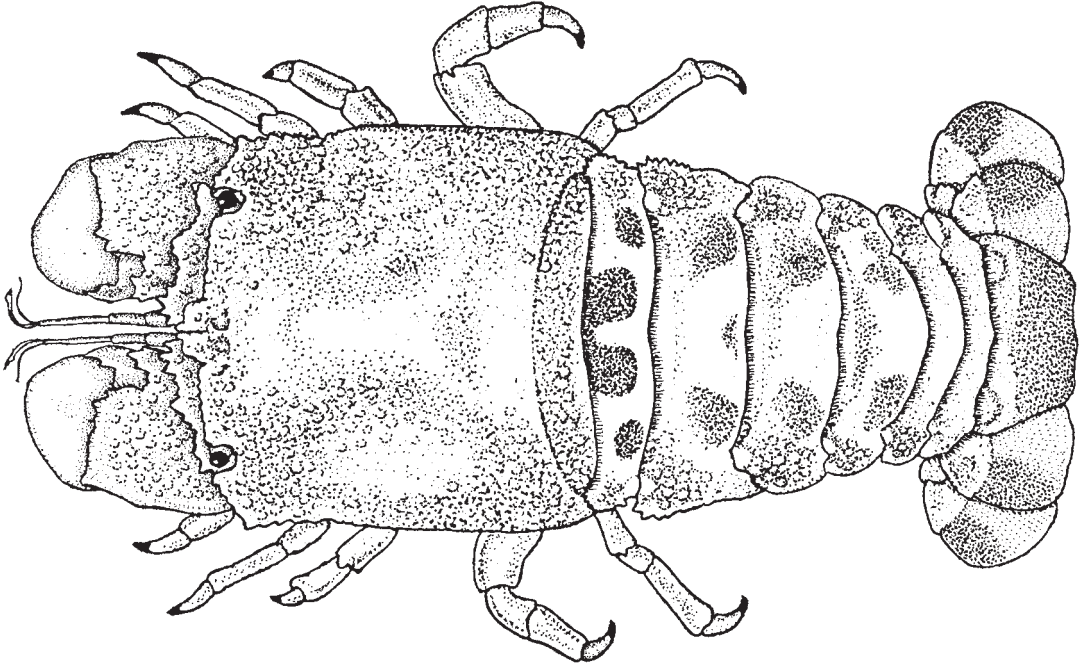
Habitat, biology, and fisheries: Coastal waters down to 50 m; on rock, gravel, and coral bottoms. This species is not actively fished commercially in the area. It is taken incidentally with *Panulirus argus*. The main fishing grounds for *P. laevis* are located to the south of Area 31, off the northeastern Brazilian coast. Separate statistics are not collected for this species. Caught mainly with traps; also taken by hand or with spears. Marketed fresh and frozen.

Distribution: From Bermuda and southern Florida to Brazil (Maranhão, Ceará, Paraíba, Pernambuco, including the oceanic island of Fernando de Noronha, and Rio de Janeiro States), including Yucatán and the Caribbean Sea.



SCYLLARIDAE**Slipper lobsters**

Diagnostic characters: Small to large crustaceans. **Body more distinctly flattened than in any other group of lobsters.** Carapace (or 'head') usually granular, sometimes with blunt spines; eyes movable but recessed into anterior margins of carapace. **Antennae short and broad, scale-like, lacking long flagella;** antennules short and slender. Tail broad, powerful with a well-developed fan. **All legs without pincers, none of them enlarged.** **Colour:** usually drab, brownish; some species with bright spots anteriorly on abdomen.



Habitat, biology, and fisheries: This family comprises 10 species in Fishing Area 31 (7 genera and 71 species worldwide), ranging in size from 5 to 30 cm in total length, and occurring from the coastline to at least a depth of 450 m. All slipper lobsters are benthic species, many of them living on level bottoms (sand, mud, or rock) but some preferring reef areas like the spiny lobsters. There is no established fishery for any of the Western Central Atlantic species, although some of them - especially the larger *Scyllarides* species - are fished locally or caught incidental to spiny lobster fishing operations, and may hence be sporadically seen in local markets.

Similar families occurring in the area

No other family of lobsters has such a flattened body or scale-like antennae without flagella.

Key to the genera of Scyllaridae occurring in the area

(adapted from Holthuis, 1991)

- 1a. Exopod of third and first maxilliped without a flagellum; the flagellum of the second maxilliped transformed to a single laminate segment (Fig. 1) *Scyllarus*
- 1b. Exopods of all maxillipeds with a multiarticulate flagellum → 2

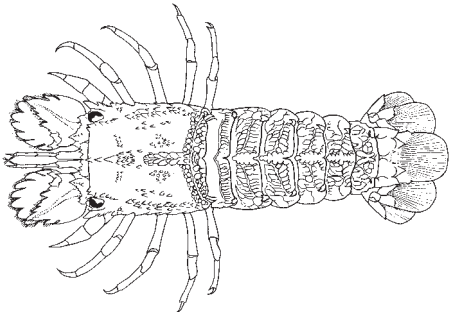


Fig. 1 *Scyllarus*

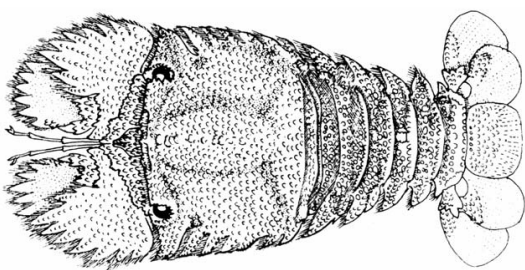


Fig. 2 *Parribacus*

- 2a. Carapace strongly depressed, with a deep cervical incision in the lateral margin; mandible with a simple or 2-segmented palp (Fig. 2) *Parribacus*
- 2b. Carapace rather highly vaulted, with a small, shallow cervical incision, which may be lacking altogether; mandible with a 3-segmented palp → 3
- 3a. First abdominal somite without a transverse groove dorsally; it is smooth on first abdominal somite and shows a pattern of coloured spots; carapace without postorbital spine; apart from a median ridge, the abdomen shows no dorsal sculpturation (Fig. 3) *Scyllarides*
- 3b. First abdominal somite with a distinct transverse groove dorsally; carapace with postorbital spine; abdominal somites with a distinct sculpturation on either side of the median line (Fig. 4) *Arctides*

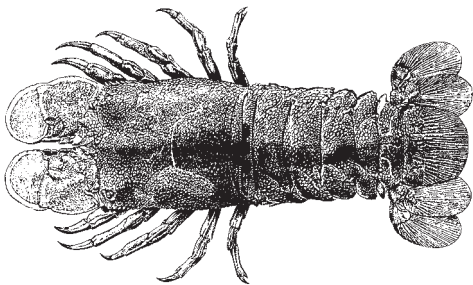


Fig. 3 *Scyllarides*

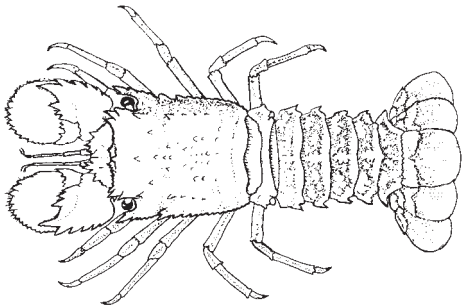



Fig. 4 *Arctides*

List of species occurring in the area

The symbol  is given when species accounts are included.

Arctides guineensis (Spengler, 1799).

 *Parribacus antarcticus* (Lund, 1793).

 *Scyllarides aequinotialis* (Lund, 1793).

Scyllarides brasiliensis Rathbun, 1906.

Scyllarides deceptor Holthuis, 1963.

Scyllarides delfosi Holthuis, 1960.

 *Scyllarides nodifer* (Stimpson, 1866).

Scyllarus americanus (S.I. Smith, 1869).
Scyllarus chacei Holthuis, 1960.
Scyllarus depressus (S.I. Smith, 1881).
Scyllarus faxoni Bouvier, 1917.
Scyllarus planorbis Holthuis, 1969.

References

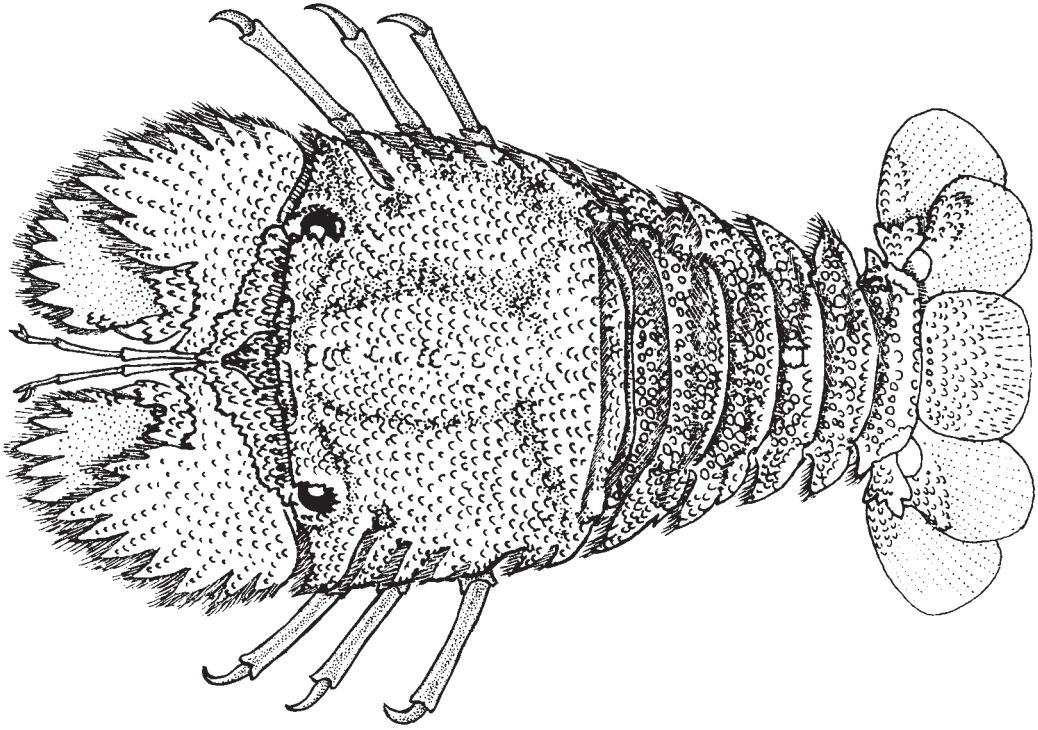
- Holthuis, L.B. 1991. FAO Species Catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fisheries Synopsis*. 125(13):1-292.
- Lyons, W.G. 1970. Scyllarid lobsters (Crustacea, Decapoda). *Mem. Hour. Cruises*, 1(4):1-74.
- Manning, R.B. 1978. Lobsters. In: *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31) Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).
- Williams, A.B. 1984. *Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida*. Smithsonian Institution Press, 550 p.
- Williams, A.B. 1986. Lobsters – Identification, World Distribution, and U.S. Trade. *Mar. Fish. Rev.*, 48(2):1-36.

Parribacus antarcticus (Lund, 1793)

RRN

Frequent synonyms / misidentifications: None / None.

FAO names: En - Sculptured mitten lobster; Fr - Cigale savate; Sp - Cigarra china.

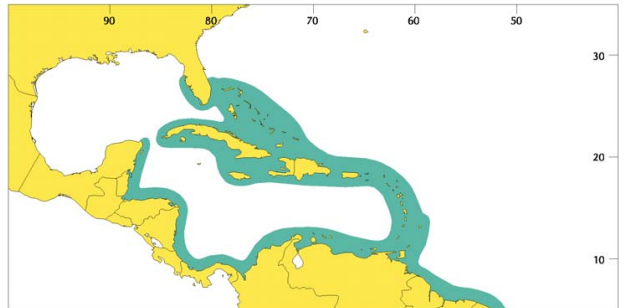


Diagnostic characters: Body very strongly flattened with pebble-like and scale-like sculpture on surface. Carapace broader than long, its sides very thin and cut into large, flattened, tooth-like triangular projections. Antennae short and broad, scale-like, lacking flagella, their anterior margins cut into moderately large teeth; antennules short and slender. Tail broad, powerful, with a well-developed fan. All legs without pinners, none of them enlarged. **Colour:** dorsal surface tan, extensively marbled with dark purplish grey. A broad pale band extends over the median region of the abdomen. The underside is of a plain, pale yellowish brown colour.

Size: Maximum length about 200 mm.

Habitat, biology, and fisheries: Shallow waters between 0 and 20 m; in coral and stone reefs with sandy bottoms. It has been reported that it is a nocturnal species hiding in crevices during the daytime, sometimes in small groups. Esteemed for food throughout its range but there is no organized fishery at present. Obtained with dipnets, by hand, or speared. Marketed fresh or cooked and used for local consumption. Separate statistics are not collected for this species.

Distribution: Western Atlantic: from southern Florida through the West Indies and along the northeastern coast of South America to Brazil (Ceará; Rio Grande do Norte; Pernambuco, including the oceanic island of Fernando de Noronha; Alagoas; and Espírito Santo States). Indo-West Pacific: from East Africa to Hawaii and Polynesia.

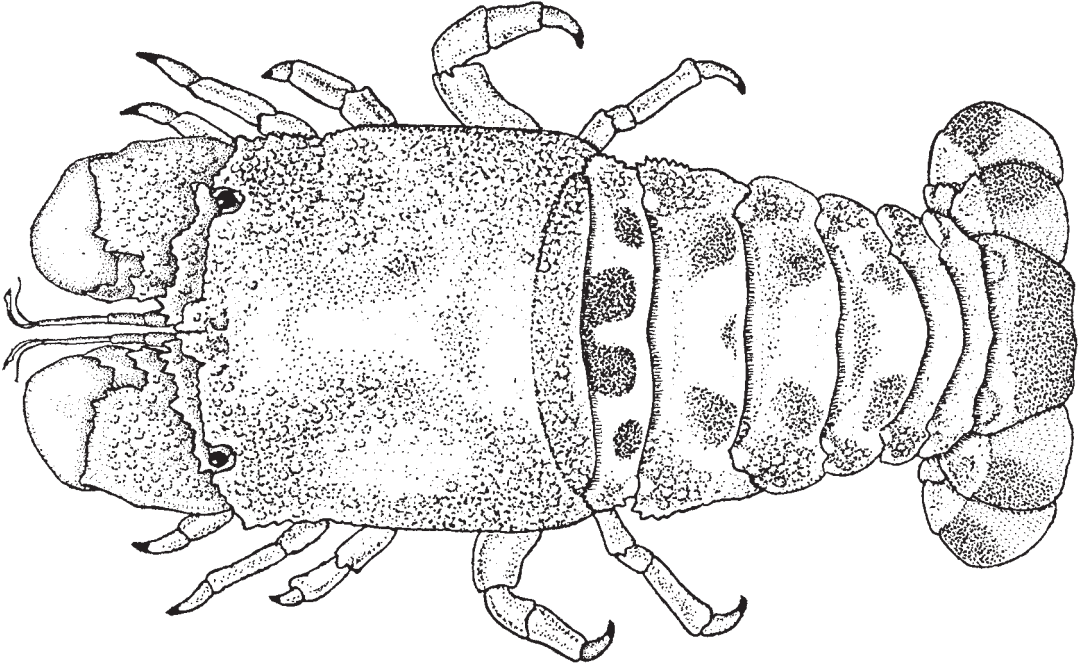


Scyllarides aequinoctialis (Lund, 1793)

YLA

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Spanish slipper lobster; **Fr** - Cigale marie-carogne; **Sp** - Cigarro español.

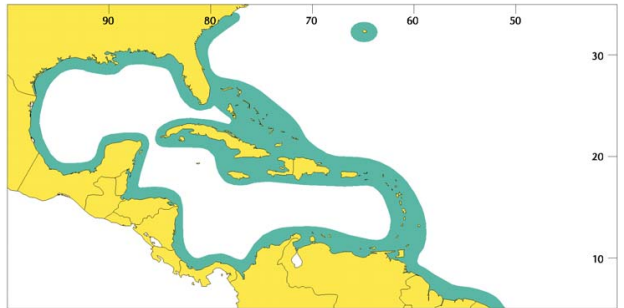


Diagnostic characters: Body flattened, **dorsal surface evenly rounded, relatively smooth**, appearing pebbled. **Carapace longer than broad, its lateral margins smooth or finely denticulate. Antennae** short and broad, scale-like, lacking flagella, their **front edges smooth and entire**; antennules short and slender. Tail broad, powerful, with a well-developed fan. All legs without pincers, none of them enlarged. **Colour:** reddish orange to tan or brown, usually variously marked with red, duller in large specimens; **4 conspicuous red spots on first abdominal segment, the inner 2 largest and joined anteriorly**; legs yellowish brown with brownish red spots.

Size: Maximum length: over 300 mm.

Habitat, biology, and fisheries: Usually found in shallow water from 0.6 to 64 m, inhabiting among rocks, on reefs, on sand, or in any habitat that affords concealment (they bury themselves in the sand). It has been recorded as deep as 180 m. Used for food almost throughout its range. May be common in certain markets but is not of great economic importance. Separate statistics are not collected for this species. Caught mainly with traps set for other species, but also with gill nets and seines. Sold fresh.

Distribution: From South Carolina, Bermuda, eastern coast of Florida, and Florida Keys, through the West Indies to Brazil.

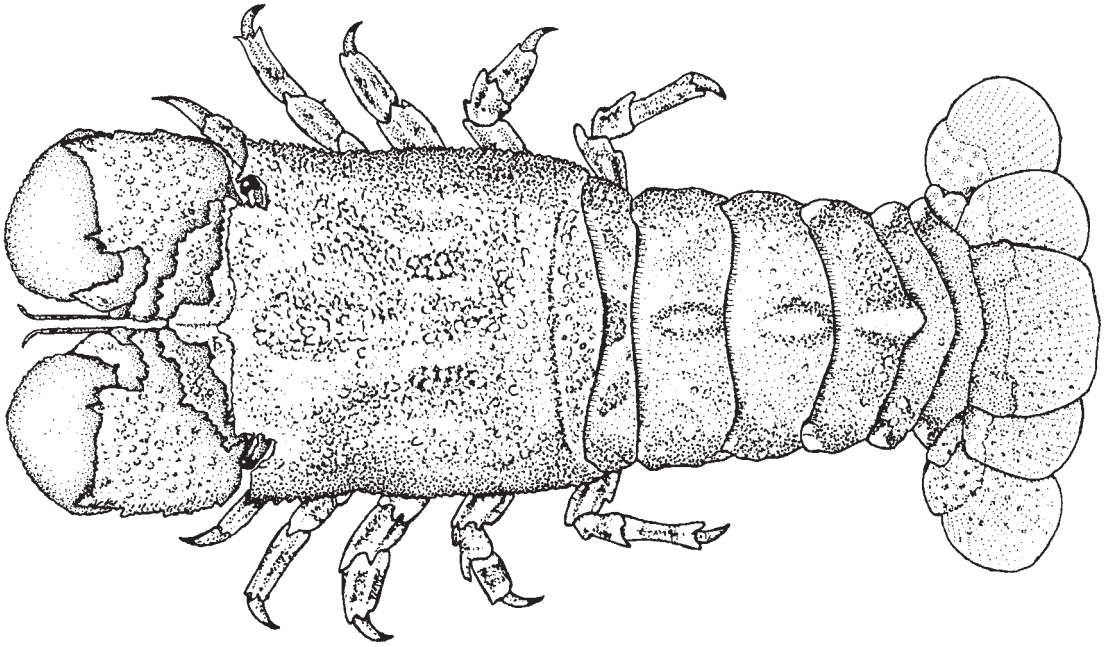


Scyllarides nodifer (Stimpson, 1866)

YLO

Frequent synonyms / misidentifications: None / None.

FAO names: En - Ridged slipper lobster; Fr - Cigale chambrée; Sp - Cigarro de quilla.

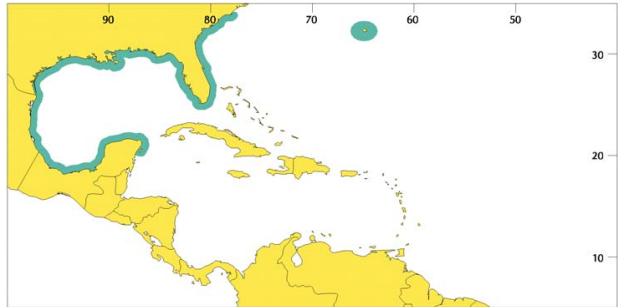


Diagnostic characters: Body flattened, with pebble-like sculpture and a **broad, low median longitudinal ridge**. Carapace longer than broad, its lateral margins smooth or finely denticulate. Antennae short and broad, scale-like, lacking flagella, their **front edges smooth and entire**; antennules short and slender. Tail broad, powerful, with a well-developed fan. All legs without pincers, none of them enlarged. **Colour:** variable, background tan, yellow-brown, or orange, with red tubercles and reddish spots of varying size; **1 large red spot on middle of first abdominal segment, with a smaller spot on each side, legs conspicuously banded with red.**

Size: Maximum length about 300 mm.

Habitat, biology, and fisheries: Inhabiting shelf waters to depths of about 100 m, on shell, mud, sand, or coral bottoms. Minor; no special fishery exists for this species. Used for food or bait. May be taken in trapping operations set for other species. Separate statistics are not reported for this species. Sold fresh.

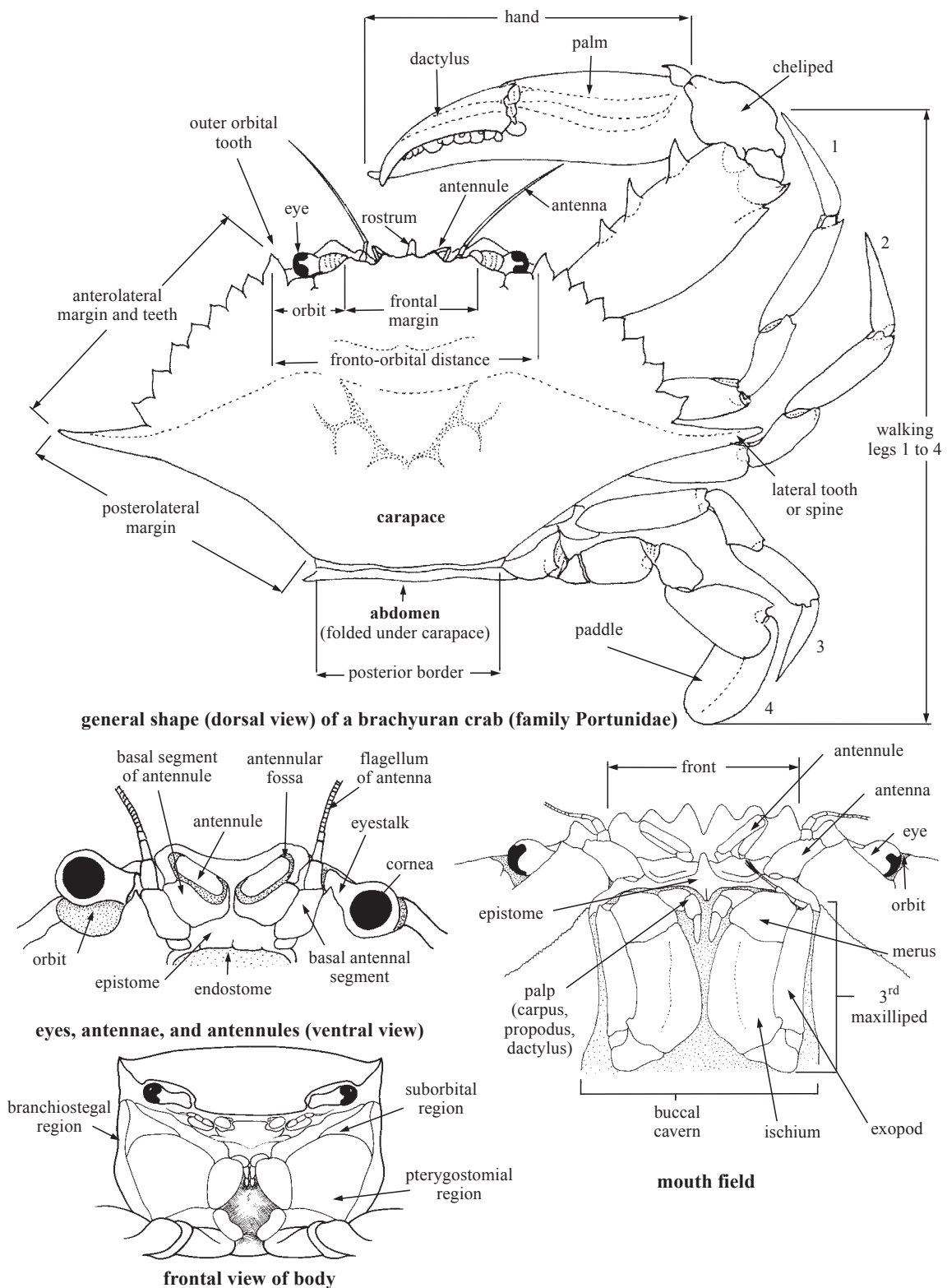
Distribution: Bermuda, North Carolina to Florida, entire Gulf of Mexico to Yucatán.

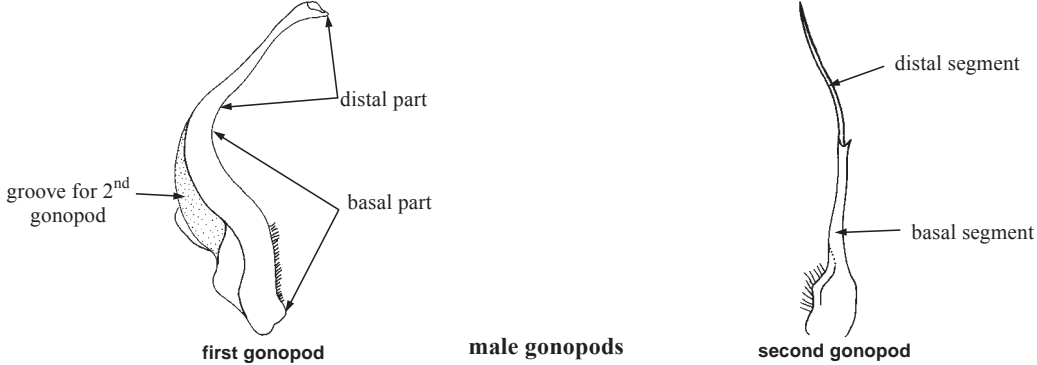
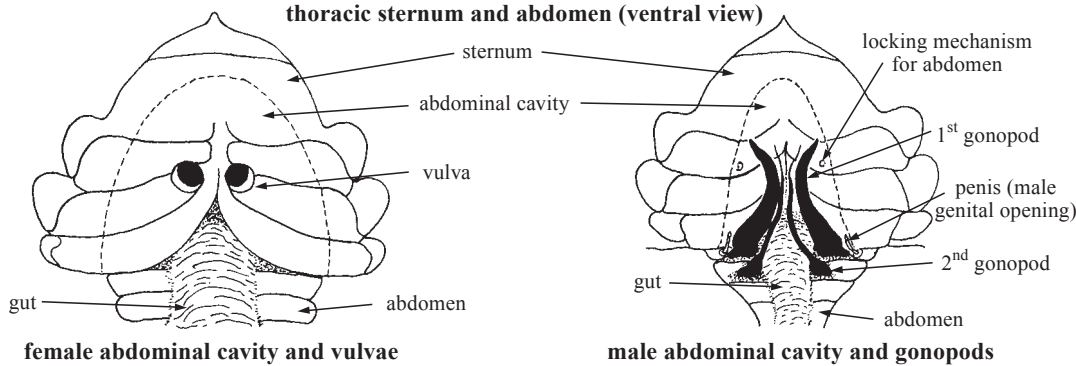
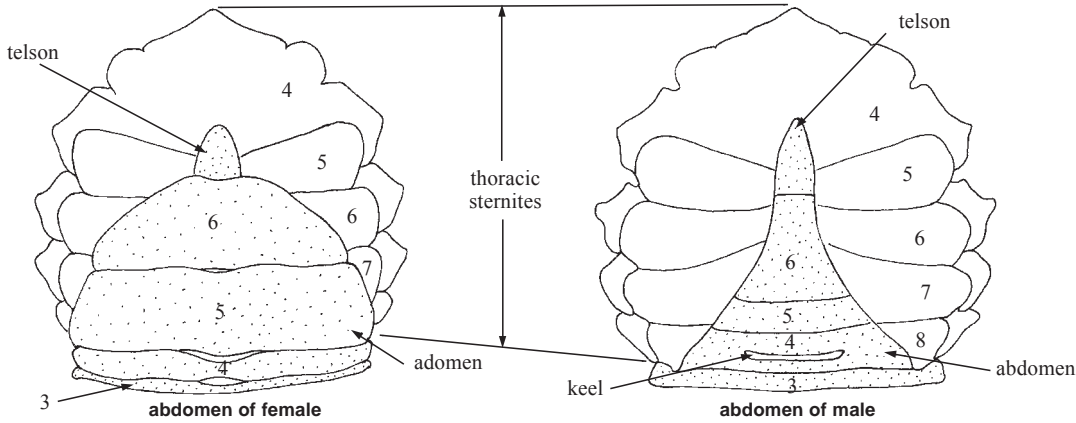
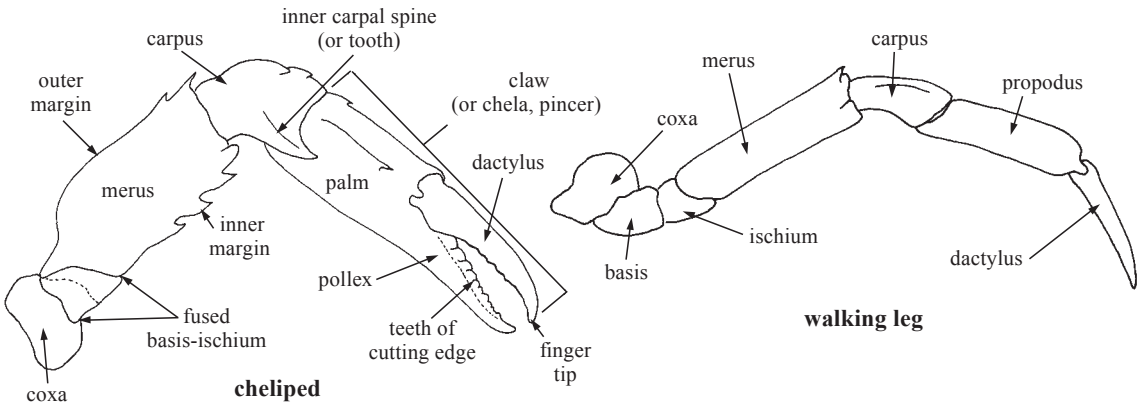


TRUE CRABS

by M. Tavares, Universidade Santa Úrsula, Brazil

TECHNICAL TERMS AND MEASUREMENTS





GENERAL REMARKS

The true crabs (Decapoda: Eubrachyura) have a depressed carapace or cephalothorax and a much reduced, straight, and symmetrical abdomen which is closely bent under the cephalothorax; this abdomen is never used for swimming and lacks biramous uropods; in the female, during the spawning season, the eggs are attached to the abdominal appendages (berried crabs). The cephalothorax has 5 pairs of walking legs, the first of which is chelate (ending in pincers) and nearly always much stronger than the other legs.

Species in Area 31 which contribute substantially to commercial fisheries or may occasionally be found in them belong to only 6 families. Most of these include a large number of genera and species of no economic value; hence, the presentation of keys to genera and comprehensive species lists goes beyond the scope of any practical field identification guide designed for fishery purposes.

From 1984 to 1998 capture production reported from Area 31 totaled 864 901 t (Bahamas: 250 t; Belize: 123 t; Honduras: 110 t; Mexico: 138 352 t; Nicaragua: 263 t; USA: 652 087 t; Venezuela: 73 716 t).

GUIDE TO FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

CANCRIDAE

p. 337

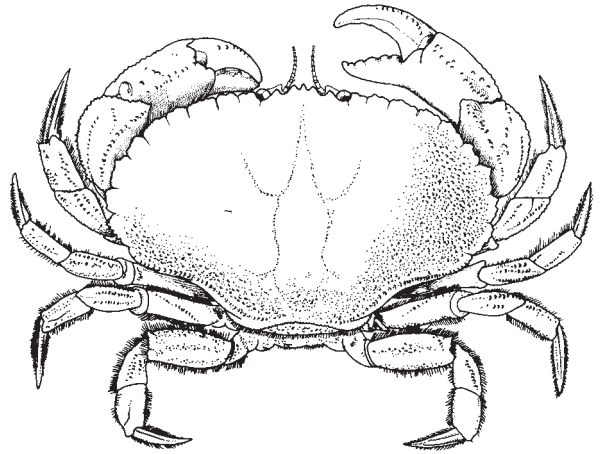
Rock crabs

Carapace broadly oval or hexagonal; front not produced in form of a rostrum but having a central tooth; anterolateral margins toothed (9 quadrangular or pentagonal teeth in species listed herein); lateral spines not strongly developed; antennules folding lengthwise. Found only in northern part of area. This family comprises 1 genus, *Cancer* Linnaeus, 1758, and 4 living species in the Atlantic ocean, 2 of which are eastern Atlantic in distribution (*Cancer bellianus* Johnson, 1861, and *Cancer pagurus* Linnaeus, 1758) and 2 western Atlantic (*Cancer borealis* Stimpson, 1859, and *Cancer irroratus* Say, 1817). Nations' (1979) proposition of dividing the genus *Cancer* into subgenera is followed here.

Two species of interest to fisheries marginally in the area:

Cancer (Cancer) irroratus Say, 1817.

Cancer (Metacarcinus) borealis Stimpson, 1859.



GECARCINIDAE

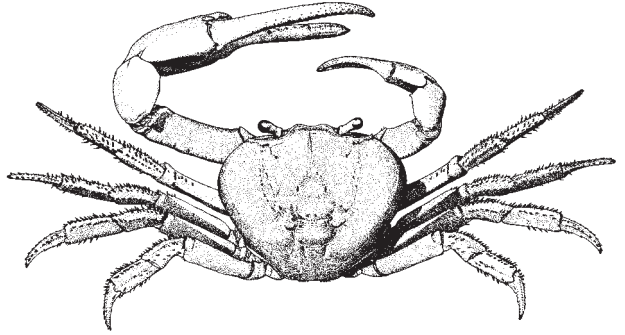
p. 339

Land crabs

Carapace transversely oval, not strongly depressed, anterolateral margins strongly arched, not divided into teeth or lobes; fronto-orbital margin (between outer orbital angles) very much shorter than greatest width of carapace; third maxillipeds gaping noticeably, exposing the mandibles; dactyls of walking legs ridged and spiny. Live on land, always at the reach of the water table.

A single species of interest to fisheries in the area:

Cardisoma guanhumi Latreille, 1828.

**GERYONIDAE**

p. 340

Golden crabs

Carapace hexagonal; dorsal surface relatively smooth to granular; frontal margin with 4 teeth; anterolateral margins distinctly convex, each with 3 to 5 low, sometimes indistinct teeth. Dactylus of walking legs T-shaped in cross-section. Male abdominal segments 3 to 5 fused, functionally immovable, but sutures still visible.

A single species, *Chaceon fenneri* of major interest to fisheries in the area. Also occurring in the area are:

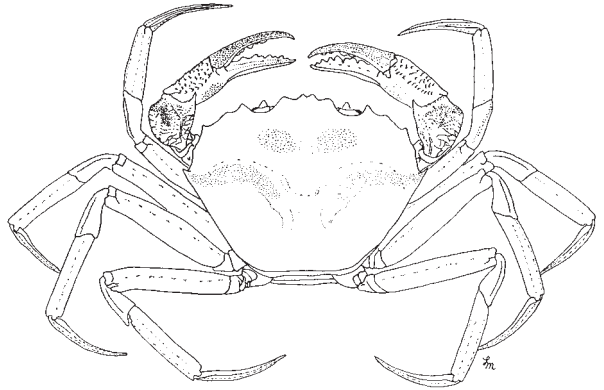
Chaceon eldorado (Manning and Holthuis, 1989).

Chaceon fenneri Manning and Holthuis, 1984.

Chaceon inghami (Manning and Holthuis, 1986).

Chaceon notialis Manning and Holthuis, 1989.

Chaceon quinquedens (Smith, 1879).



(from Manning and Holthuis, 1984)

MENIPPIDAE

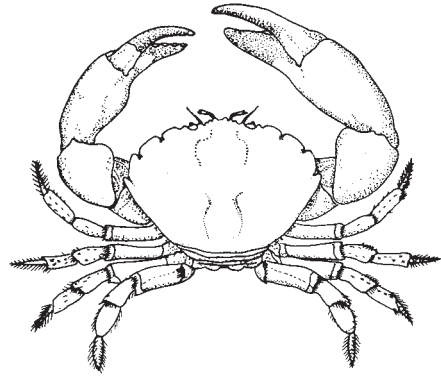
p. 341

Stone crabs

Carapace transversely oval or transversely hexagonal, front broad and notched centrally; never produced in form of a rostrum; anterolateral margin lobate (in the species listed herein) or toothed; antennules folding transversely or obliquely.

A single species of interest to fisheries in the area:

Menippe mercenaria Say, 1818.

**OCYPODIDAE**

p. 342

Ghost crabs

Carapace usually rectangular or nearly so, or trapezoidal; front relatively narrow and somewhat bent downward; orbits occupying whole anterior border outside front, outer walls of orbits often open, eyestalks long (longer than width of front); third maxillipeds usually completely covering mouth cavity, concealing the mandibles; dactyls of walking legs smooth or ridged but not conspicuously spiny.

A single species of interest to fisheries in the area:

Ucides cordatus (Linnaeus, 1763).

**PORTUNIDAE**

p. 343

Swimming crabs

Carapace broad and flat, with 5 to 9 teeth on anterolateral margin; well-developed lateral spine at greatest width (in the species listed herein); last pair of legs usually distinctly adapted for swimming, flattened and paddle-shaped, but flattened without being paddle-shaped in a few species (not included here).

Ten species of interest to fisheries in the area:

Arenaeus cribrarius (Lamarck, 1818).

Callinectes bocourti A. Milne Edwards, 1879.

Callinectes danae Smith, 1869.

Callinectes exasperatus (Gerstaecker, 1856).

Callinectes larvatus Ordway, 1863.

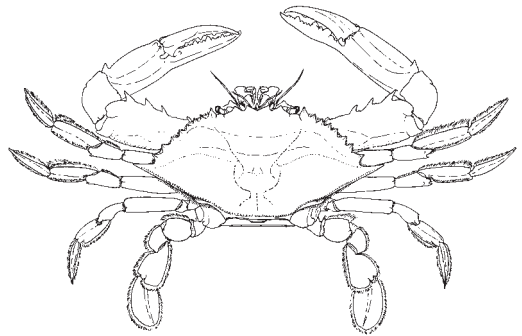
Callinectes maracaboensis Taissoun, 1969.

Callinectes ornatus Ordway, 1863.

Callinectes rathbunae Contreras, 1930.

Callinectes sapidus Rathbun, 1896.

Callinectes similis Williams, 1966.



Key to the genera of Gecarcinidae occurring in the area

Note: The genus *Discoplax* A. Milne Edwards, 1867 (type species: *Discoplax longipes* A. Milne Edwards, 1867) should no longer be included in the synonymy of *Cardisoma*. This issue, however, is well beyond the scope of the present review and will be dealt with in a separate work.

- 1a. Exopod of the third maxilliped not concealed by ischium; provided with a long flagellum; first gonopod ending in a pectinated tip, gonopod aperture terminal (Fig. 1) *Cardisoma*
- 1b. Exopod of the third maxilliped concealed or not by ischium; flagellum absent or extremely short; first gonopod ending in a pectinated tip, gonopod aperture subterminal → 2

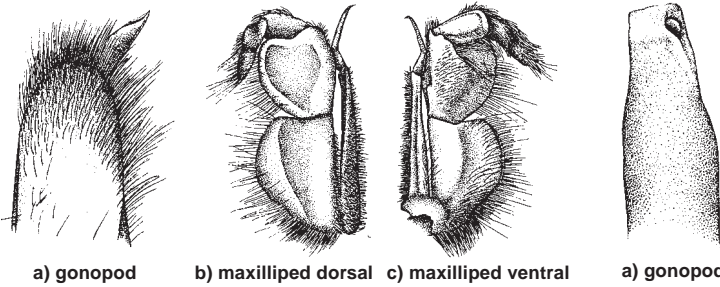


Fig. 1 *Cardisoma*

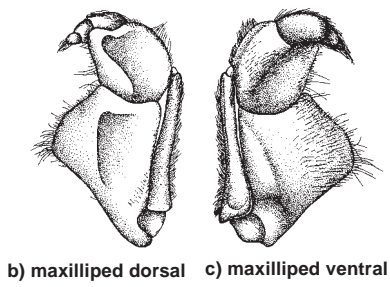


Fig. 2 *Epigrapsus*

- 2a. Pterygostomian region densely covered with short hairs; exopod of the third maxilliped not concealed by ischium, provided with extremely short flagellum (Fig. 2) *Epigrapsus*
- 2b. Pterygostomian region covered with scattered hairs; exopod of the third maxilliped concealed by ischium, flagellum absent → 3

- 3a. Closed orbit; palp of the third maxilliped concealed by merus; merus and ischium subequal in size (Fig. 3) *Gecarcinus*
- 3b. Open orbit; palp of the third maxilliped exposed; merus much smaller than ischium (Fig. 4) . *Gecarcoidea*

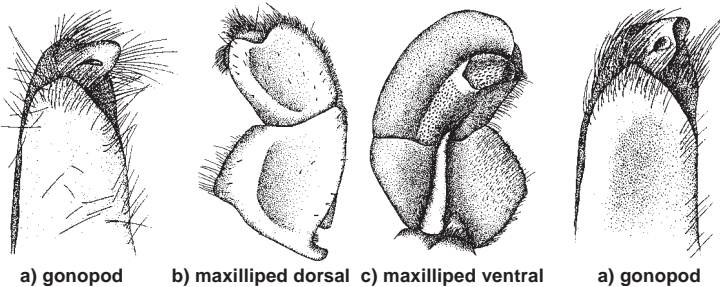


Fig. 3 *Gecarcinus*

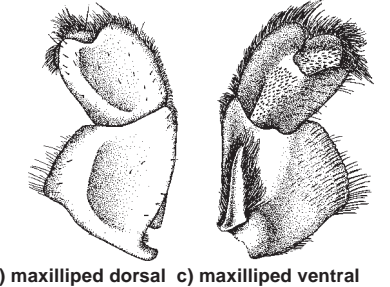


Fig. 4 *Gecarcoidea*

Key to the genera of Ocypodidae occurring in the area

(adapted from Williams, 1984)

- 1a. Slender eyestalk, with cornea not conspicuously enlarged; chelipeds of male very unequal, of female equal and quite small (Fig. 1) *Uca*
- 1b. Stout eyestalk with conspicuous, enlarged cornea; chelipeds of both sexes well developed and somewhat unequal. → 2

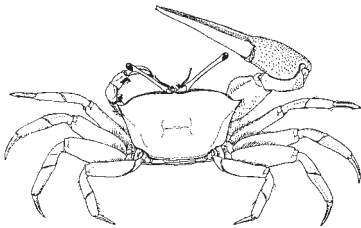


Fig. 1 *Uca*



Fig. 2 *Ucides*

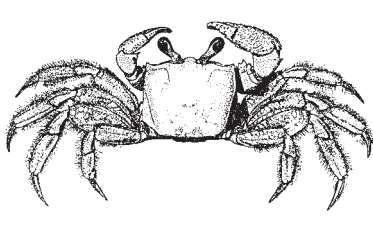


Fig. 3 *Ocypode*

- 2a. Fronto-orbital distance (between outer orbital angles) less than 2/3 of maximum carapace width; tufts of setae between the bases of the third and fourth pereopods lacking (Fig. 2) . . . *Ucides*
- 2b. Fronto-orbital distance (between outer orbital angles) and maximum carapace width almost the same; long tufts of setae between the bases of the third and fourth pereopods (Fig. 3) *Ocypode*

Key to the genera of Portunidae occurring in the area

(modified from Rathbun, 1930)

- 1a. Distal articles of fifth legs not paddle-like *Carcinus*
- 1b. Distal articles of fifth legs paddle-like → 2
- 2a. Carapace anterolateral teeth 3, 5, or 6 (including the outer orbital tooth) → 3
- 2b. Carapace anterolateral teeth 9 to 11 (including the outer orbital tooth). → 7
- 3a. Front subentire; movable portion of antenna excluded from orbit; anterolateral teeth 3 *Coenophthalmus*
- 3b. Front dentate; movable portion of antenna not excluded from orbit; anterolateral teeth 3, 5, or 6 → 4
- 4a. Anterolateral teeth 5, last tooth very long and spiniform, much longer than others *Bathynectes*
- 4b. Anterolateral teeth similar, either dentiform or spiniform; 3, 5, or 6 in number → 5
- 5a. Anterolateral teeth 3, spiniform *Raymmaninus*
- 5b. Anterolateral teeth 5 or 6, dentiform → 6
- 6a. Anterolateral teeth 5 *Ovalipes*
- 6b. Anterolateral teeth 6 *Charybdis*
- 7a. Movable portion of antenna excluded from orbit by a prolongation of its basal article; anterolateral teeth alternately large and small *Cronius*
- 7b. Movable portion of antenna not excluded from orbit. → 8

- 8a.** Chelipeds robust, palm inflated and smooth, not costate *Scylla*
- 8b.** Palm costate and usually armed with spines → **9**
- 9a.** No longitudinal ridge on the palate; superior fissures of orbit open, V-shaped *Arenaeus*
- 9a.** A longitudinal ridge on the palate → **10**
- 10a.** Last 2 articles of palp of third maxillipeds compressed and lamellate; chelipeds of male extremely long and slender *Lupella*
- 10b.** Articles of palp subcylindrical; chelipeds of male and female subequal, not noticeably long and slender → **11**
- 11a.** Carpus of cheliped without mesiodistal spine; male abdomen T-shaped *Callinectes*
- 11b.** Carpus of cheliped with mesiodistal spine; male abdomen triangular → **12**
- 12a.** Pterygostomial region of the carapace without a stridulating ridge *Portunus*
- 12b.** Pterygostomial region of the carapace with a stridulating ridge *Laleonectes*

References

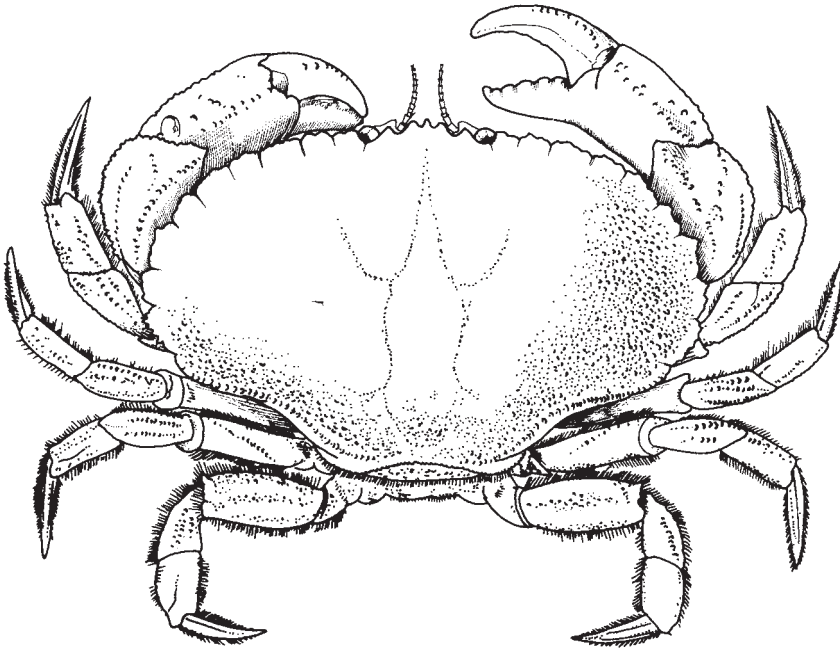
- Adema, J.P.H.M. 1991. *De Krabben van Nederland en België* (Crustacea, Decapoda, Brachyura). Leiden, Nationaal Natuurhistorisch Museum, 244 p.
- Alcântara-Filho, P. 1978. Contribuição ao estudo da biologia e ecologia do caranguejo-uçá, *Ucides cordatus* (Linnaeus, 1763) (Crustacea, Decapoda, Brachyura), no manguezal do rio Ceará (Brasil). *Arquivos de Ciências do Mar, Fortaleza*, 18(1/2):1-41.
- Bert, T.M. and R.J. Hochberg. 1988 (1992). Stone crabbing in Belize: profile of a developing fishery and comparison with the Florida stone crab fishery. *Proceedings of the Gulf and Caribbean Fisheries Institute*, 41:363-381.
- Boschi, E.E., C.E. Fischbach, and M.I. Iorio. 1992. Catalogo ilustrado de los crustaceos estomatopodos y decapodos marinos de Argentina. *Frente Marítimo*, 10(A):7-94.
- Burggren, W.W. and B.R. McMahon. 1988 (eds). *Biology of the land crabs*. Cambridge, Cambridge University Press, 479 p.
- Chace, F.A., Jr. and H.H. Hobbs, Jr. 1969. The freshwater and terrestrial decapod crustaceans of the West Indies with special reference to Dominica. Bredin-Archbold-Smithsonian Biological Survey of Dominica. *US Nat. Mus. Bull.*, 292:1-258.
- Dawson, E.W. and W.R. Webber. 1991. The deep-sea red crab *Chaceon* ("Geryon"): a guide to information and reference list of the family Geryonidae. *Nat. Mus. New Zealand Misc. Series*, 24:1-83.
- Erdman, R.B. and N.J. Blake. 1988. Reproductive ecology of female crabs *Geryon fenneri* Manning and Holthuis, from southeastern Florida. *J. Crustacean Biol.*, 8(3):392-400.
- Fransozo, M.L. and Fransozo, A. 1995. On the distribution of *Callinectes ornatus* and *Callinectes danae* (Brachyura, Portunidae) in the Fortaleza Bay, Ubatuba, Brazil. *Iheringia, série Zoologia*, 79:13-25.
- Haefner, A. 1990. Natural diet of *Callinectes ornatus* (Brachyura: Portunidae) in Bermuda. *J. of Crustacean Biol.*, 10(2):36-246.
- Hines, A.H. 1988. Fecundity and reproductive output in two species of deep-sea crabs, *Geryon fenneri* and *Geryon quinquedens* (Decapoda: Brachyura). *J. Crustacean Biol.*, 8(4):557-562.
- Hinsch, G.W. 1988. Morphology of the reproductive tract and seasonality of reproduction in the golden crab *Geryon fenneri* from the eastern Gulf of Mexico. *J. Crustacean Biol.*, 8(2):254-261.
- Holthuis, L.B. 1959. The Crustacea Decapoda of Suriname (Dutch Guiana). *Zoo. Verhan.*, 44:292.
- Hsueh, P.W., J.B. McClintock, and T.S. Hopkins. 1993. Population dynamics and life history characteristics of the blue crabs *Callinectes similis* and *C. sapidus* in bay environments of the northern Gulf of Mexico. *Mar. Ecology*, 14(3): 239-257.
- Ingle, R.W. 1980. *British crabs*. London, British Museum (Natural History), 222 p.
- Lockhart, F.D., W.J. Lindberg, N.J. Blake, R.B. Erdman, H.M. Perry, and R.S. Waller. 1990. Distributional differences and population similarities for two deep-sea crabs (family Geryonidae) in the Northeastern Gulf of Mexico. *Canadian J. Fish. and Aquatic Sci.*, 47:2112-2122.
- Luckhurst, B. 1986. Discovery of deep-water crabs (*Geryon* spp.) at Bermuda - a new potential fishery resource. *Proc. Gulf and Caribbean Fish. Inst.*, 37:209-211.
- Manning, R.B. and L.B. Holthuis. 1981. West African brachyuran crabs. *Smithsonian Contrib. Zoo.*, 306:379.
- Manning, R.B. and L.B. Holthuis. 1984. *Geryon fenneri*, a new deep-water crab from Florida (Crustacea: Decapoda: Geryonidae). *Proc. Biol. Soc. Wash.*, 97(3):666-673.

- Manning, R. B. and L.B. Holthuis. 1989. Two new genera and nine new species of geryonid crabs (Crustacea: Decapoda: Geryonidae). *Proc. Biol. Soc. Wash.*, 102(1):50-77.
- McClintock, J.B., K.R. Marion, J. Dindo, P.W. Hsueh, and R.A. Angus. 1993. Population studies of blue crabs in soft-bottom, unvegetated habitats of a subestuary in the northern Gulf of Mexico. *J. Crustacean Biol.*, 13(3):551-563.
- McKee, K.L. 1995. Mangrove species distribution and propagule predation in Belize: an exception to the dominance-predation hypothesis. *Biotropica*, 27(3):334-345.
- Melo, G.A.S. de. 1996. *Manual de identificação dos Brachyura (caranguejos e siris) do litoral brasileiro*. São Paulo, Plêiade, 603 p.
- Nations, J.D. 1975. The genus *Cancer* (Crustacea: Brachyura): systematics, biogeography and fossil record. *Natural Hist. Mus. Los Angeles County Sci. Bull.*, 23:1-104.
- Nations, J.D. 1979. The genus *Cancer* and its distribution in time and space. *Bull. Biol. Soc. Wash.*, 3:153-187.
- Pinheiro, M.A., A. Fransozo, and M.L. Negreiros-Fransozo. 1996. Distribution patterns of *Areanaeus cribrarius* (Lamarck, 1818) (Crustacea: Portunidae) in Fortaleza Bay, Ubatuba (SP), Brazil. *Revista Brasileira de Biologia*, 56(4):705-716.
- Powers, L.W. 1977. A catalogue and bibliography to the crabs (Brachyura) of the Gulf of Mexico. *Cont. Mar. Sci.*, 20(supplement):1-190.
- Restrepo, V.R. 1989. Growth estimates for male stone crabs along the southeast coast of Florida: a synthesis of available data and methods. *Trans. American Fish. Soc.*, 118(1):20-29.
- Rodriguez, G. 1980. *Los Crustaceos Decapodos de Venezuela*. Caracas, Instituto Venezolano de Investigaciones Cientificas, 494 p.
- Rosas, C., E. Lazaro-Chavez, and F. Buckle-Ramirez. 1994. Feeding habitats and food niche segregation of *Callinectes sapidus*, *C. rathbunae*, and *C. similis* in a subtropical coastal lagoon of the Gulf of Mexico. *J. Crustacean Biol.*, 14(2): 371-382.
- Stehlik, L.L., C.L. MacKenzie, and W.W. Morse. 1991. Distribution and abundance of four brachyuran crabs on the northwest Atlantic shelf. *Fish. Bull.*, 89(3):473-492.
- Stoner, A.W. and B.A. Buchanan. 1990. Ontogeny and overlap in the diets of four tropical *Callinectes* species. *Bull. Mar. Sci.*, 46(1):3-12.
- Tavares, M. 1989. Considérations sur la position systématique du genre *Ucides* Rathbun, 1897 (Crustacea, Decapoda, Ocypodidae). *Boletim do Museu Nacional*, 342:1-8.
- Türkay, M. 1970. Die Gecarcinidae Amerikas, mit einem Anhang über *Ucides* Rathbun (Crustacea: Decapoda). *Senckenbergiana Biologica*, 51:333-354.
- Wenner, E., G.F. Ulrich, and J.B. Wise. 1987. Exploration for golden crab, *Geryon fenneri*, in the South Atlantic bight: distribution, population structure, and gear assessment. *Fish. Bull.*, 85(3):547-560.
- Wenner, E. and C. A. Barans. 1990. In situ estimates of density of golden crab, *Chaceon fenneri*, from habitats on the continental slope, southeastern U.S. *Bull. Mar. Sci.*, 46(3):723-734.
- Wilber, D.H. 1986. The distribution and daily movement of stone crabs (*Menippe mercenaria*) in a tidal oyster habitat on the northwest coast of Florida. *Mar. Behaviour and Physiology*, 12(4):279-291.
- Williams, A.B. 1974. The swimming crabs of the genus *Callinectes* (Decapoda: Portunidae). *Fish. Bull.*, 72(3):685-798.
- Williams, A.B. 1978. True Crabs. In: *FAO Species Identification Sheets for Fisheries Purposes. Western Central Atlantic (Fishing Area 31), Volume VI*, edited by W. Fischer. Rome, FAO (unpaginated).
- Williams, A.B. 1984. *Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida*. Smithsonian Institution Press, 550 p.

CANCRIDAE

Cancer (Metacarcinus) borealis Stimpson, 1859

CRJ

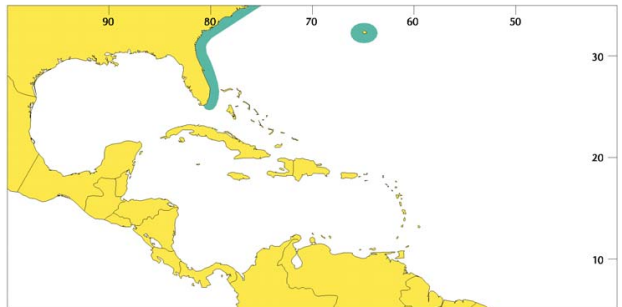
Frequent synonyms / misidentifications: *Cancer borealis* Stimpson, 1859 / None.**FAO names:** En - Jonah crab; Fr - Crabe jona; Sp - Jaiba de roca jonás.

Diagnostic characters: Carapace approximately 2/3 as long as wide, surface coarsely granulate; **front** (excluding inner orbital angles) **with 3 teeth**, middle one exceeding others and depressed (flattened dorsoventrally); anterolateral margins divided into 9 quadrangular lobes or teeth with **margins minutely denticulate**; notches between teeth continued on carapace as short, closed fissures. Pincers stout, nearly as long as second legs, carpus and hand with strong granulose rugae, **upper margin of pincers denticulate**, carpus with sharp inner dorsal spine. **Colour:** red dorsally, yellow ventrally; back with 2 curved lines of yellowish spots and, behind middle, a figure somewhat resembling letter H; legs mottled and reticulated with yellow and red, more or less purplish.

Size: Maximum width: male 175 mm; female 137 mm.

Habitat, biology, and fisheries: This is a cold-water species centred in the region north of Area 31. It ranges from the intertidal zone among rocks to 800 m. Small to medium-sized individuals are found near shore seasonally (especially in the south), while larger ones occur in deeper waters. This species has been found in rocky bottoms in association with *Homarus americanus*. It feeds mainly on molluscs, echinoderms, and other invertebrates. Mainly outer continental shelf and beyond, often caught along with lobsters. Caught with bottom trawls and lobster traps. Marketed fresh. Separate statistics for this species are collected only for Area 21 (catches from 1984 to 1998 totaled 12 196 t).

Distribution: Nova Scotia to South Tortugas, Florida. Southward (Carolinas) only in deep water. There is a doubtful record from Bermuda.

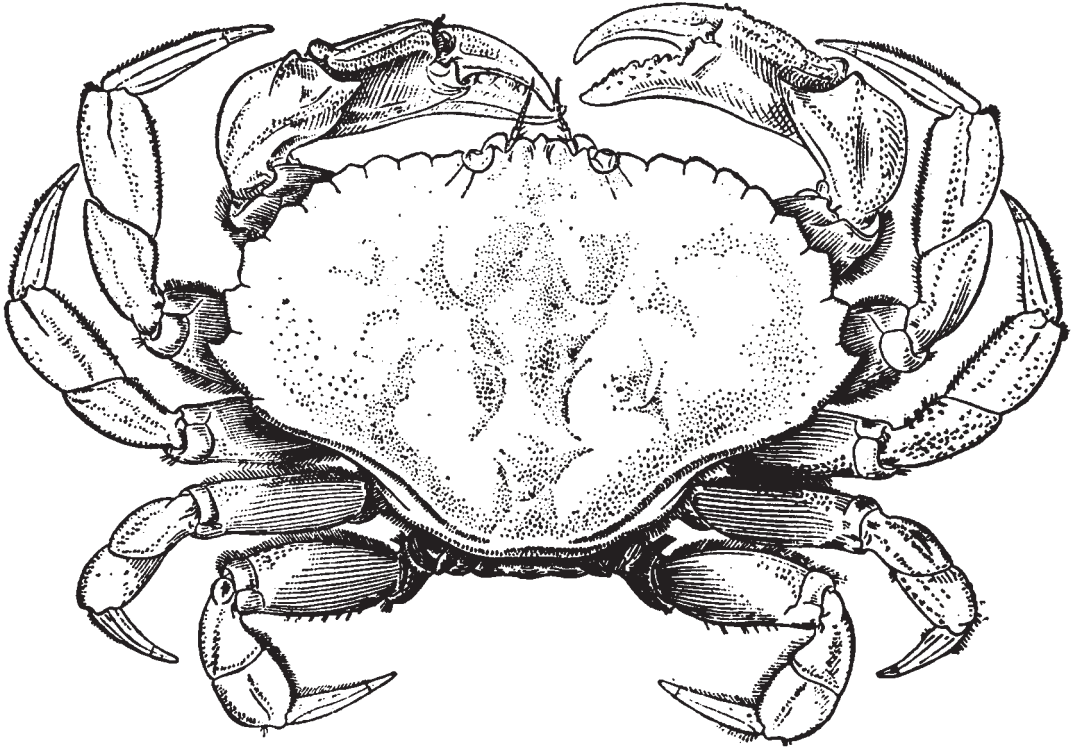


Cancer (Cancer) irroratus Say, 1817

CRK

Frequent synonyms / misidentifications: *Cancer irroratus* Say, 1817 / None.

FAO names: En - Rock crab; Fr - Tourteau poinclos; Sp - Jaiba de roca amarilla.

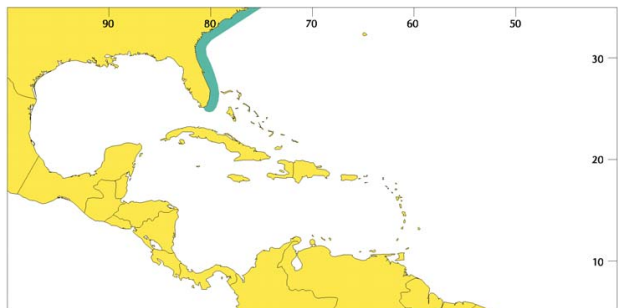


Diagnostic characters: Carapace approximately 2/3 as long as wide, convex, granulated; **front with 3 teeth**, middle one exceeding others and depressed (flattened dorsoventrally); anterolateral margins (excluding inner orbital angles) divided into 9 lobes or teeth with **edges granulate**; notches between teeth continued on carapace as short, closed fissures giving teeth a pentagonal character. Pincers moderate-sized, shorter than second legs, **ridges granulated**, carpus with sharp inner dorsal spine. **Colour:** yellowish, closely dotted with dark purplish brown, becoming reddish brown after death.

Size: Maximum width: male 135 mm; female 113 mm.

Habitat, biology, and fisheries: This is basically a cold-water species centred in the region north of Area 31. It ranges in depth from the low-water mark to 575 m. Small to medium-sized crabs move into shallower depths, especially in winter, whereas larger ones occur in deeper water. Feeds mainly on molluscs, echinoderms, and other invertebrates. Mainly outer continental shelf and beyond, often caught along with lobsters. Caught with bottom trawls and lobster traps. Marketed fresh. Separate statistics for this species are collected only for Area 21 (catches from 1984 to 1998 totaled 10 744 t).

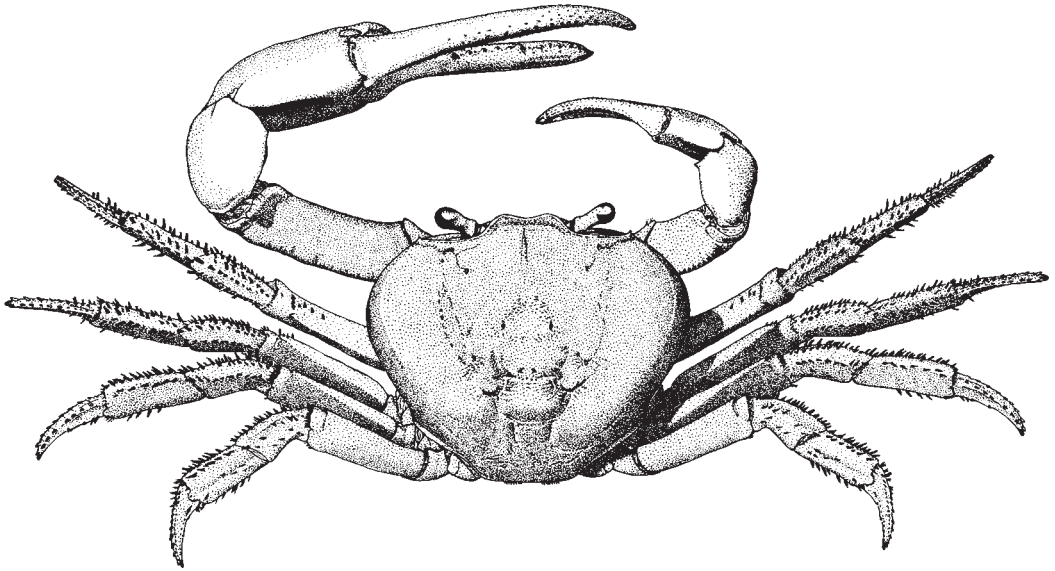
Distribution: From Labrador to off Miami, Florida. Southward (Carolinas) only in deep water.



GECARCINIDAE

Cardisoma guanhumi Latreille, 1828

KDG

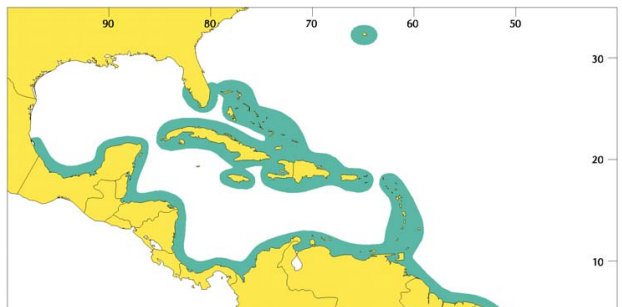
Frequent synonyms / misidentifications: None / None.**FAO names:** En - Blue land crab; Fr - Tombourou matoutou; Sp - Moro de mangle azul.

Diagnostic characters: Carapace broadly egg-shaped, narrow posteriorly and **greatly inflated anterolaterally in adults; lateral margins not sharply defined**; fronto-orbital distance (space between outer orbital angles) about 2/3 of maximum carapace width in adult males, nearly 3/4 in females. Pincers distinctly unequal, relatively smooth; fingers meeting only at tips, more gaping in larger hand, size of larger hand increasing disproportionately with age, especially in males. **Walking legs sparsely hairy on margins, dactyls with 4 rows of spines. Colour:** juveniles dark brown; transitional stage dark purple and orange; adults lavender blue, females change to white or dull yellow at time of ovulation (once attained, colour remains through autumn and winter in Florida population); males sometimes undergo less frequent and usually incomplete colour changes.

Size: Maximum width: male 120 mm; female 110 mm.

Habitat, biology, and fisheries: This is a nearly terrestrial species. It lives in greatest concentration in burrows (to 1.5 m deep) in relatively low lying ground, but also along canals or ditches among rocks and debris. Common in mangrove areas. Burrows may be as far as 8 km from the sea but always where the water table (fresh or salt) can be reached. Crabs normally live subaerially, occasionally wetting the gills, but can survive long periods of immersion and can adapt easily to great variations in water salinity. Females return briefly to the sea where eggs must hatch and larvae undergo developmental changes before transformation to the emergent crab stage. Feeds on a wide variety of plant material, occasionally some carrion. Cannibalism has been reported. Industrialized by some Caribbean countries. It has been reported that it is exported by Venezuela, Colombia, and the Dominican Republic. No separate statistics are collected for this species. Collected at night by hand or trapped and held alive in fenced pens. In some cases captive crabs are 'fattened' on corn for a few days before processing. Marketed alive, frozen, or canned.

Distribution: Bermuda; southern Florida and Texas throughout the Caribbean Sea to Brazil (from Ceará to São Paulo).

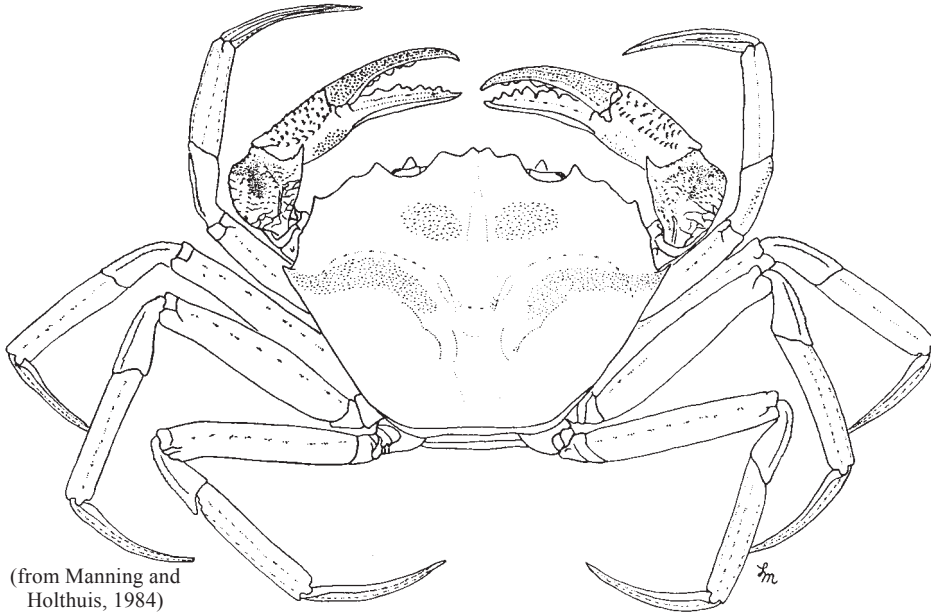


GERYONIDAE

Chaceon fenneri (Manning and Holthuis, 1984)

Frequent synonyms / misidentifications: None / None.

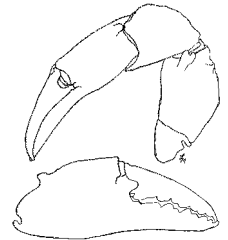
FAO names: En - Gulf of Mexico golden crab.



(from Manning and
Holthuis, 1984)



pereiopods



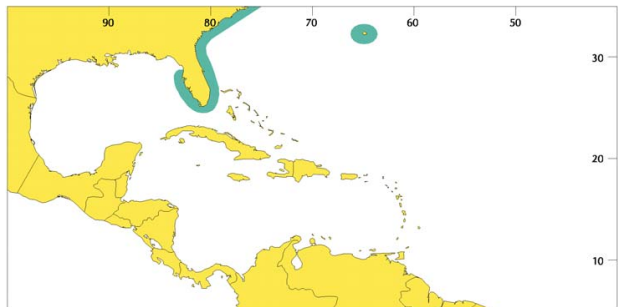
chelipeds

Diagnostic characters: Carapace broader than long. Median pair of frontal teeth separated by a wide sinus, teeth scarcely overreaching obtuse lateral frontal teeth. Orbits usually more than 3/4 frontal width. Anterolateral teeth 5, second and fourth reduced, distance between first and third usually smaller than distance between third and fifth. Cheliped with blunt lobe on upper margin of merus, carpus lacking outer spine, propodus lacking distal dorsal spine. Meri of pereiopods lacking distal dorsal spine. Fifth leg: merus broad, less than 2/3 carapace width; propodus broad, length less than 4.5 times width; propodus and dactylus subequal in length, or dactylus slightly longer. Dactili of pereiopods compressed, narrow, height at midlength much greater than width. **Colour:** tan to cream.

Size: Maximum width: males 185 mm, females 147 mm.

Habitat, biology, and fisheries: Inhabits the continental slope at depths of 247 to 1 468 m, on flat foraminiferan ooze habitat, coral mounds, ripple habitat, dunes, black pebble habitat, rock outcrops, and soft-bioturbated habitat. Bottom water temperature ranging from 7 to 15.5°C (Wenner et al., 1987; Wenner and Barans, 1990). Female crabs collected monthly from the east coast of Florida indicate an annual reproductive cycle. Ovipositions begins in late August and continues through October with eggs retained for 6 months until hatching during March. Size of ovigerous females ranges from 96 to 147 mm of carapace width (Erdman and Blake, 1987). This species supports a newly established commercial fishery in the Gulf of Mexico. Present fishing grounds are located in Florida, Georgia, South Carolina, and Bermuda. It has been estimated that the standing stock off Florida's Gulf Coast to be about 7.8 million crabs, about 13.6 million pounds. Separate statistics for this species are not collected. More biological background for a sustainable fishery is needed. Caught with traps.

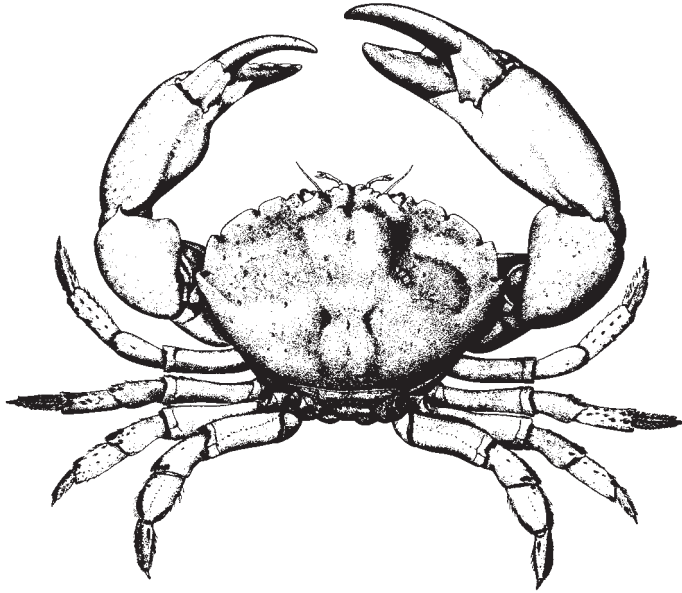
Distribution: Off South Carolina and Florida, Bermuda, Gulf of Mexico.



MENIPPIDAE

Menippe mercenaria (Say, 1818)

STC

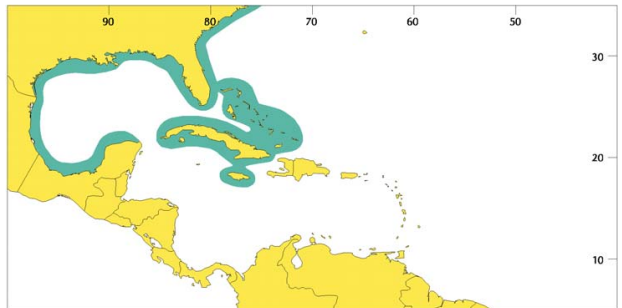
Frequent synonyms / misidentifications: None / None.**FAO names:** En - Stone crab; Fr - Crabe caillou noir; Sp - Cangrejo de piedra negro.

Diagnostic characters: Carapace transversely oval, about 2.3 times as long as wide, **convex, nearly smooth to unaided eye**, minutely granulate and punctate; anterolateral margins (excluding outer orbital teeth) divided into 4 lobes, front (excluding inner orbital angles) with a median notch and a broad tri-lobulate lobe on each side. **Pincers large and heavy, unequal, nearly smooth; inside of hands with patch of fine, oblique, parallel striae**; walking legs stout and hairy distally. **Colour:** juveniles dark purplish blue, very young with legs banded cream and red and a white spot on carpus of pincer. Older individuals become dark brownish red to black or less mottled and spotted with dusky grey; fingers dark; walking legs with reddish and yellow bands.

Size: Maximum width: male 130 mm; female 120 mm.

Habitat, biology, and fisheries: Adult stone crabs live in the depths down to 51 m. They burrow in mudflats just below low-tide mark, among rocks on jetties, on offshore reef areas, under rocks or coral heads and among dead shells or grass clumps. Occasionally burrow in colonies. Tolerant to salinities considerably lower or higher than 35‰. Stone crabs are somewhat active both day and night, greatest activity observed during the evening before dark. Predatory on oysters and other molluscs. Ovigerous females are known from May to September. Larva reared in laboratory conditions developed into the megalopa in 14 days and the first crab stage was attained in 21 days. Crabs grow to maturity in about 2 years and may be beyond this age, although it has been suggested that males reach a terminal molt after which further growth and regeneration ceases. Fishing grounds located mainly along the coasts of Florida and Mexico. The total capture production reported from the area between 1984 and 1998 was 38 699 t (mean captures production 2 579 t/year). Caught with pots and dip nets; also by hand and occasionally in bottom trawls. Marketed fresh.

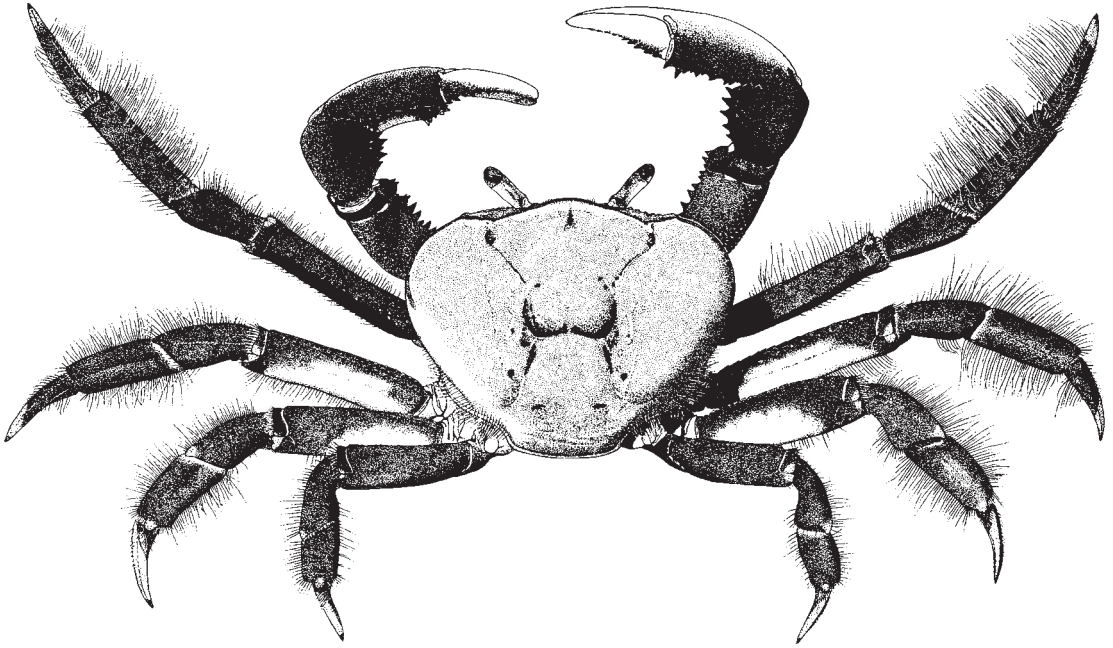
Distribution: North Carolina (Cape Lookout) to Mexico (Yucatán); Bahamas; Cuba; Jamaica.



OCYPODIDAE

Ucides cordatus (Linnaeus, 1763)

UCC

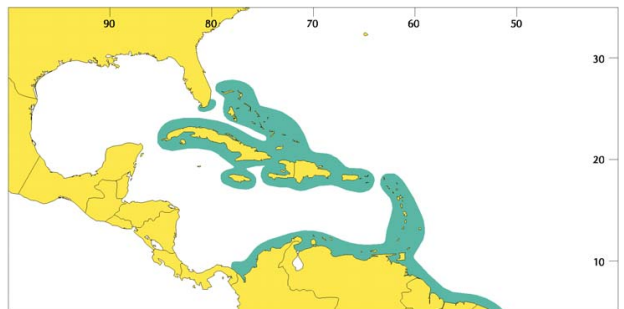
Frequent synonyms / misidentifications: None / None.**FAO names:** En - Ghost crab; Fr - Crabe mantou; Sp - Capuco fantasma.

Diagnostic characters: Carapace broadly egg-shaped, narrow posteriorly, its length slightly less than 4/5 of width, strongly convex longitudinally, nearly subcylindrical in midline, and smooth but with regions well outlined; lateral marginal ridges regularly curved, not divided into lobes, converging posteriorly; **fronto-orbital distance** (space between outer orbital angles) **not more than 2/3 of maximum carapace width in adult males**. Pincers elongate, usually somewhat dissimilar and unequal in both sexes, armed with sometimes strong spines or sharp tubercles on inner margins; fingers of major hand slightly longer than palm; **dactyls of walking legs ridged but not spiny, legs of males bearing very low silky hairs**. **Colour:** carapace usually bluish with some yellowish areas, legs pinkish; hairs on legs grey to almost black, lateral margins of carapace dark in adults.

Size: Maximum width: male 100 mm.

Habitat, biology, and fisheries: Commonly associated with mangroves; lives in burrows as deep as 70 cm, always reaching to the water table, either in open ground or under vegetation; often occurring among burrows of other crabs (*Cardisoma*, *Uca*, and *Goniopsis*). It is by far the most sluggish of the land crabs. This species and *Callinectes bocourti* are the most important species of crabs in Suriname fisheries; also fished intensively in French Guyana. Traditionally collected by hand from burrows. Marketed fresh or cooked. Separate statistics for this species are not collected in the area.

Distribution: From southern Florida throughout the Antilles, and northern coast of South America; southward to Santa Catarina, Brazil.



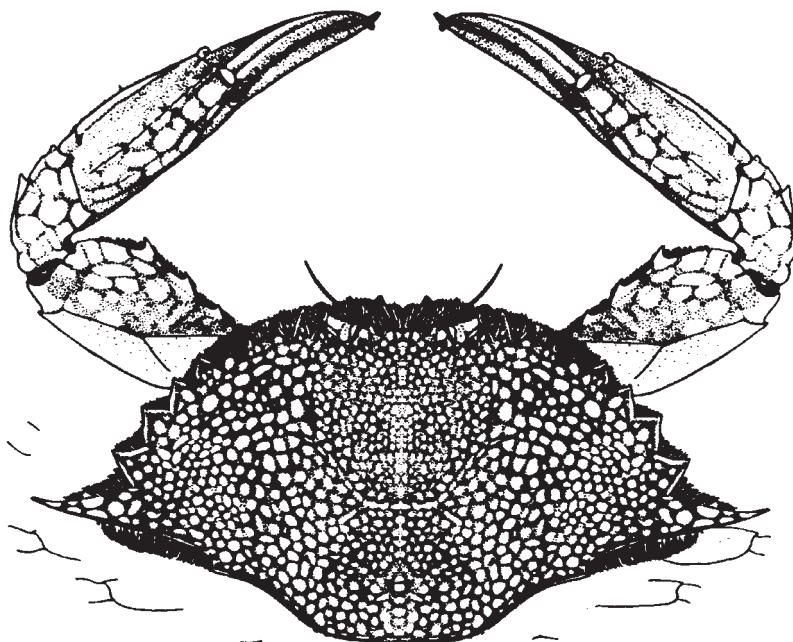
PORTUNIDAE

Arenaeus cribrarius (Lamarck, 1818)

RSQ

Frequent synonyms / misidentifications: None / None.

FAO names: En - Speckled swimcrab; Fr - Crabe cyrique; Sp - Jaiba pintada.

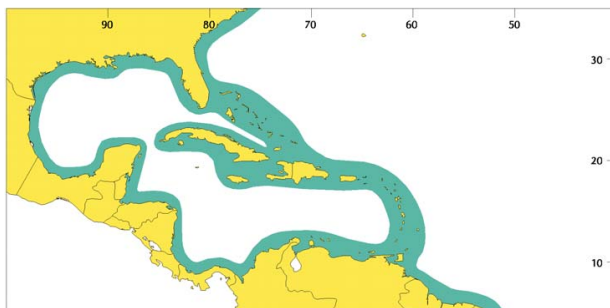


Diagnostic characters: Carapace more than twice as broad as long; 9 teeth on broadly arched anterolateral margin (outer orbital tooth and strong lateral spine included); **front not so advanced as outer orbital teeth, bearing, between the inner orbital angles, one pair of bicuspid teeth** (resulting from the coalition of 2 separate pairs). Convex dorsal surface finely granulate, **fissures on orbital margin broadly open**; lower surface of carapace hairy; pincers moderate-sized; legs rather short and broad, densely fringed with hairs; fifth legs flattened in form of paddles. Basal segment of abdomen produced on each side into a strong, sharp, slightly upcurved spine. **Colour: dorsal surface, including pincers, light reddish brown to olive brown covered with many small, rounded white spots, tips of walking legs yellow; colour pattern persisting in alcohol.**

Size: Maximum width: about 141 mm.

Habitat, biology, and fisheries: Lives in shallow water along ocean sand beaches and is well adapted to life in the waves and shifting sand; burrows in bottom and emerges at night. Presumably feeds on a variety of materials including molluscs, other bottom invertebrates, and some fishes, carrion, and detritus. This species has been found in temperatures ranging from 11 to 28.6°C at 27.5 to 35‰ salinity. In the area ovigerous females have been reported from May to September. Of minor interest to fisheries. This species is not abundant enough to support an organized fishery. It is obtained as an admixture to the main catch (*Farfantepenaeus*), and is considered of excellent flavour. Caught with bottom trawls. Separate statistics not collected.

Distribution: Vineyard Sound, Massachusetts, Caribbean Sea, Gulf of Mexico, Atlantic coast of South America down to Uruguay.

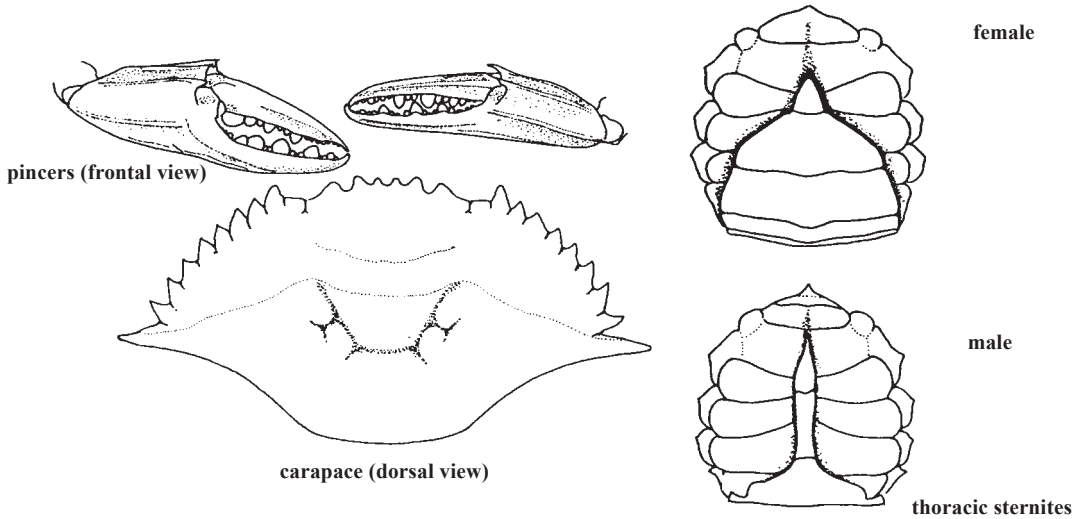


Callinectes bocourti A. Milne Edwards, 1879

KLB

Frequent synonyms / misidentifications: None / None.

FAO names: En - Blunttooth swimcrab; Fr - Crabe chancre; Sp - Jaiba roma.

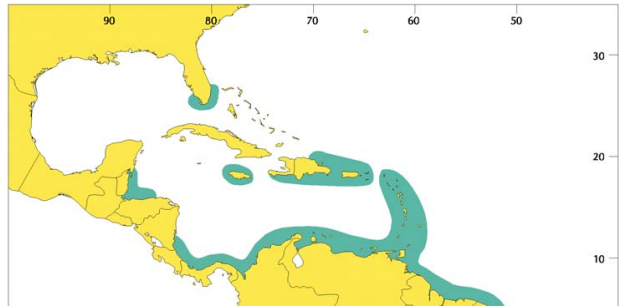


Diagnostic characters: Carapace almost twice as broad as long; 9 teeth on **moderately arched** anterolateral margin, **all except outer orbital teeth and strong lateral spine swept forward, front** (excluding inner orbital angles) **bearing 4 well-developed teeth** (excluding outer orbital angles), **outer pair obtuse**. Marginal slopes of convex dorsal surface smooth and glistening (when wet), central part and transverse lines granulate. Pincers remarkably smooth except for usual spines, obsolescent granules on ridges; fingers of major hand heavily toothed; fifth legs flattened in form of paddles. Male with T-shaped abdomen reaching nearly to juncture between thoracic sternites 3 and 4; **slender first pleopods sinuously curved, overlapping in 2 places proximally, diverging distally but often exceeding telson, crossed near tips** and armed distally with dorsolateral band of large and small retrogressive spinules (magnifying glass required). **Colour:** variable. Overall cast olive green with prominent reddish markings. Carapace olive, greyish green, greenish chestnut or forest green with variable purplish to red markings, especially on branchial, hepatic, cardiac, and gastric areas, individuals of large sizes are sometimes dark chestnut tinted blackish brown on gastric and metagastric areas, with an oblique spot on subbranchial region; anterolateral teeth olive green with brown to red tints and yellowish white tips. Chelipeds red to dark reddish brown above and whitish below with bluish tints, main colours being sharply separated on outer surface of palm; fingers red to reddish brown, a purplish cast on internal articulation of merus with carpus and this member with chela; tubercles, tips of fingers and spines, on articulations cream; remaining legs reddish, variable. Underparts of body mainly dirty white to purplish red with suffusion of blue marginally.

Size: Maximum width: male 160 mm; female 150 mm.

Habitat, biology, and fisheries: Lives in shallow brackish waters ranging in salinity from nearly fresh to nearly full marine, on sand or rock-shell bottoms. Tolerant of stagnant, polluted environments. Presumably feeds on a variety of materials including molluscs, other bottom invertebrates, and some fishes, carrion and detritus. Separate statistics for this species are not collected within the area. Caught with bottom trawls, pots, dip nets, and seines. Consumed locally. Marketed fresh or frozen.

Distribution: North Carolina, Florida, and Mississippi (occasional). Jamaica, Belize, Antilles, Colombia, Venezuela, Guyana, Suriname, and Brazil (from Amapá to Santa Catarina).

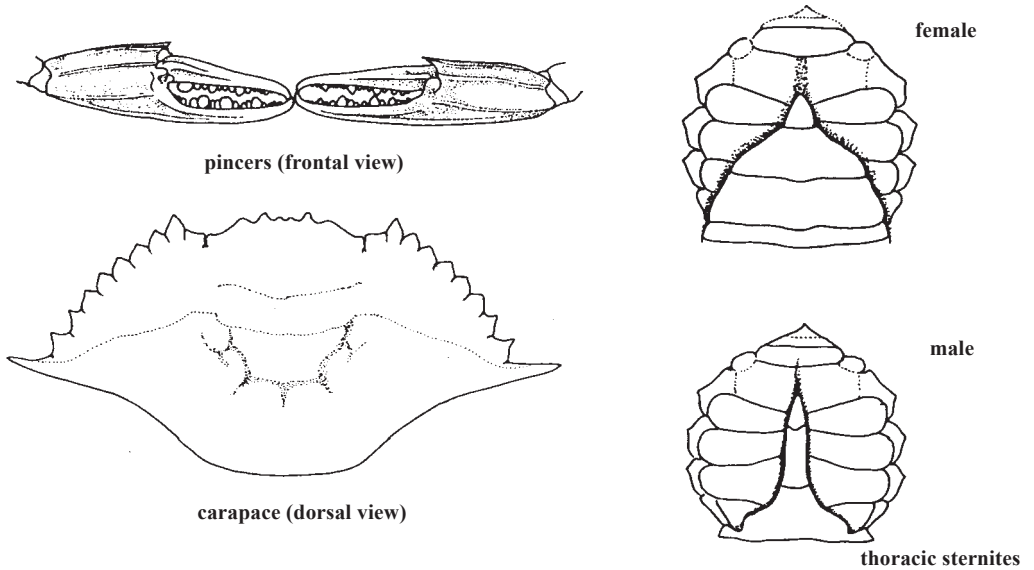


Callinectes danae Smith, 1869

CRZ

Frequent synonyms / misidentifications: None / None.

FAO names: En - Dana swimcrab; Fr - Crabe l  n  e; Sp - Cangrejo siri.

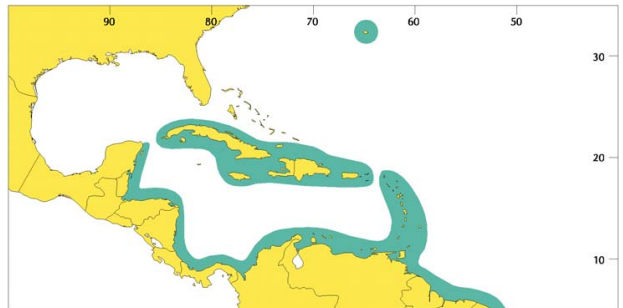


Diagnostic characters: Carapace slightly more than twice as broad as long; 9 teeth on arched anterolateral margin (outer orbital tooth and strong lateral spine included) **progressively more acuminate laterally**; outer pair of frontal teeth (excluding inner orbital angles) prominent but **inner pair small**. Much of convex dorsal surface lightly granulate, most prominently so on anterior and elevated areas and in transverse lines; central trapezoidal (metagastric) area short and wide (anterior width about 2 to 2.5 times, posterior width about 1.5 times length). Pincers dissimilar, ridged longitudinally; fifth legs flattened in form of paddles. Male with T-shaped abdomen reaching slightly beyond suture between thoracic sternites 4 and 5; **first pleopods reaching beyond midpoint of thoracic sternite 6, nearly straight distally except for membranous tips usually bent ventrolaterally**, armed with scattered, minute, mainly dorsal spinules and 2 to 4 subterminal, exceedingly slender, elongate sternomesial spinules (magnifying glass required). **Colour:** variably olive to greyish blue dorsally, spines olive to indigo and white-tipped; pincers with variable blue to purple on upper and inner surfaces, olive to blue externally; legs predominantly dark blue to azure or greenish, underparts white. Some individuals are duller and some have a reticulate pinkish blue cast on the upper surface of chelipeds.

Size: Maximum width: male 139 mm; female 108 mm.

Habitat, biology, and fisheries: Inhabits from muddy estuaries in mangroves and algae-covered broken shell bottoms, to beaches and open ocean depths down to 75 m. Tolerant to salinities ranging from fresh to hypersaline. Presumably feeds on a variety of materials including molluscs, other bottom invertebrates, and some fishes, carrion, and detritus. Separate statistics for this species are not collected within the area. Caught with bottom trawls, pots, beach seines, and dip nets. Marketed fresh. Capture production from 1984 to 1998 totaled 53 125 t. Marketed fresh or frozen. The meat is sold cooked.

Distribution: Bermuda; New Hanover County, North Carolina, near Cape Fear; southern Florida and eastern Yucat  n throughout the Caribbean Sea, Colombia, Venezuela, to Brazil (from Para  ba to Rio Grande do Sul).

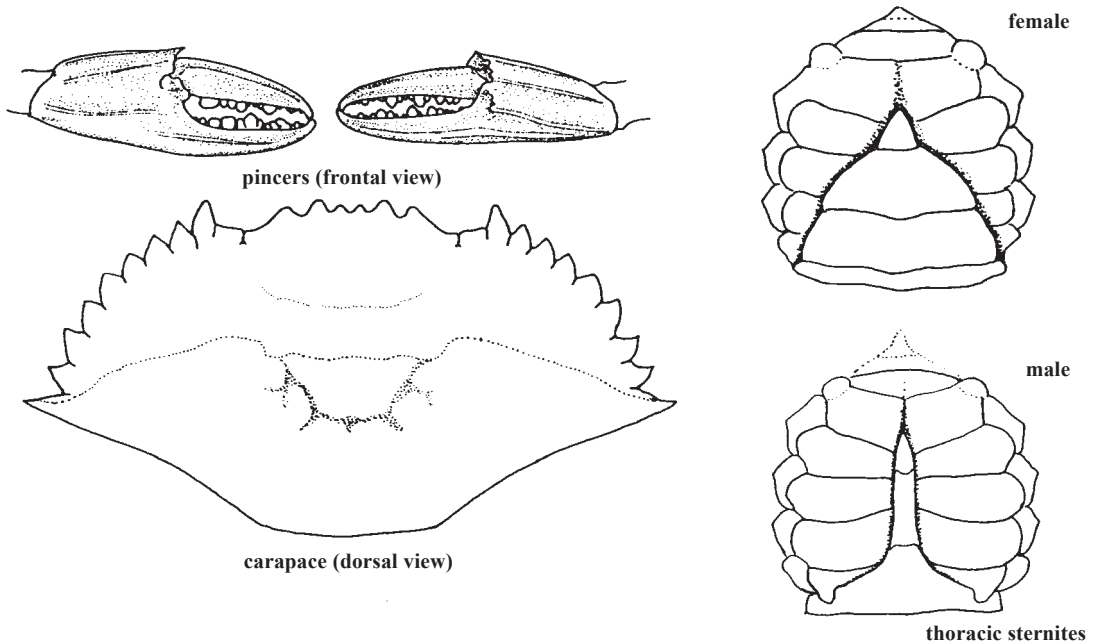


Callinectes exasperatus (Gerstaecker, 1856)

KLE

Frequent synonyms / misidentifications: None / None.

FAO names: En - Rugose swimcrab; Fr - Crabe lîré; Sp - Jaiba rugosa.

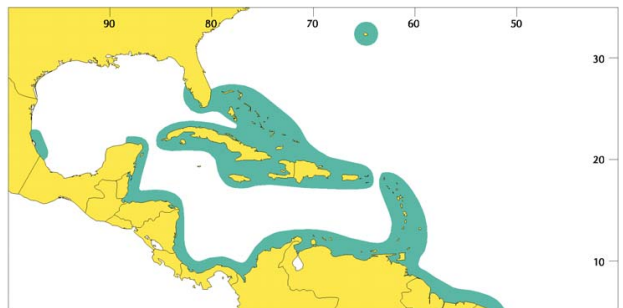


Diagnostic characters: Carapace less than twice as broad as long; 9 stout teeth on **strongly arched anterolateral margin**, all except outer orbital tooth and **short lateral spine usually swept forward; front bearing 4 well-developed teeth** (excluding inner orbital angles). Coarse scattered and transverse lines of granules on convex dorsal surface. Pincers robust, ridges and crests coarsely granulate; fifth legs flattened in form of paddles. Male with T-shaped abdomen reaching posterior quarter of thoracic sternite 4; **first pleopods reaching slightly beyond suture between thoracic sternites 6 and 7, sinuously curved, overlapping proximally, diverging distally to tips curved abruptly inward**, armed distally with scattered minute spinules (magnifying glass required). **Colour:** adult male dorsally purplish red, more accented on proto-, meso-, and metagastric areas and at base of lateral spines and anterolateral teeth; branchial region and anterolateral teeth obscure maroon; dorsal surface of all legs purplish red with intense orange red on articulations; inferior portions of merus, carpus, and fingers of chelipeds intense violet; internal and external portion of chelae as well as remaining ventral aspect of animal white with tints of soft purple.

Size: Maximum width: male 129 mm; female 124 mm.

Habitat, biology, and fisheries: Inhabits estuaries and shallow oceanic littoral, especially in association with mangroves and near river mouths, down to 8 m. Presumably feeds on a variety of materials including molluscs, other bottom invertebrates, some fishes, carrion, and detritus. Separate statistics for this species are not collected within the area. The species is not so abundant as *Callinectes sapidus* and *C. bocourti*. Consumed locally. Caught mainly with hand nets. Marketed fresh.

Distribution: Florida (Duval County, East of Jacksonville); Bermuda; Mexico (Veracruz) to Brazil (from Maranhão to Santa Catarina).

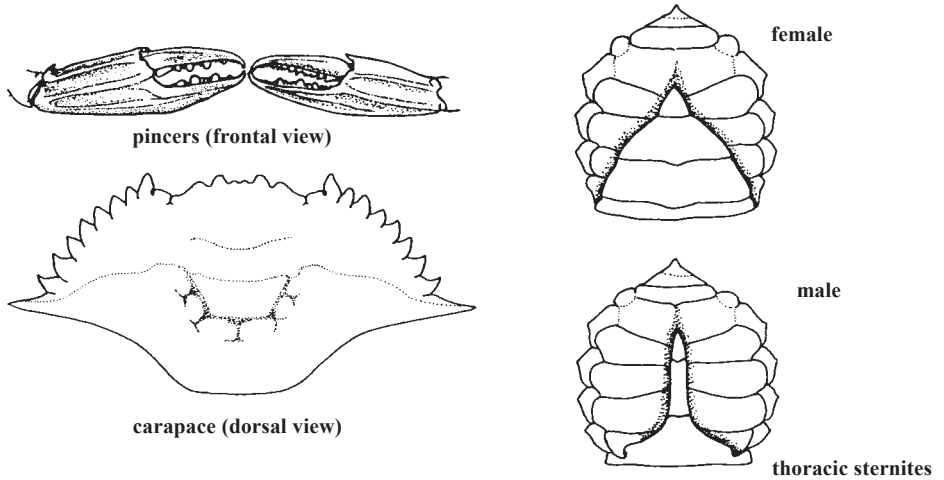


Callinectes larvatus Ordway, 1863

KLL

Frequent synonyms / misidentifications: None / None.

FAO names: En - Masked swimcrab; Fr - Crabe draguenelle; Sp - Jaiba de máscara.



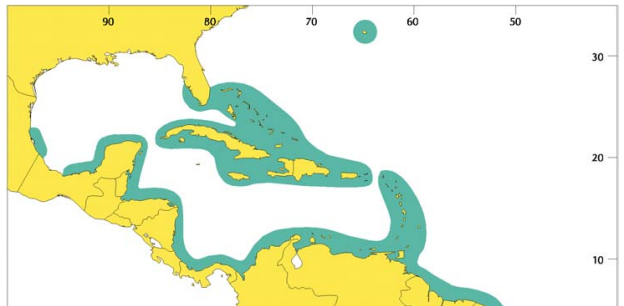
Diagnostic characters: Carapace slightly more than twice as broad as long; 9 teeth on arched anterolateral margin (outer orbital tooth and strong lateral spine included), **second to eighth usually trending forward, without shoulders, anterior margins concave except first 2; front** (excluding outer orbital angles) **bearing 4 teeth, inner pair small but definitely formed**. Anterior half of convex dorsal surface coarsely granulate, variably finer and more numerous granules on posterior part and in transverse lines; central trapezoidal (metagastric) area short and wide (anterior width about 2.4 times, posterior width about 1.5 times length). Pincers dissimilar, ridged longitudinally, fingers compressed but broadened dorsoventrally producing pointed spatulate shape; fifth legs flattened in form of paddles. Male with T-shaped abdomen reaching slightly beyond suture between thoracic sternites 4 and 5, sixth segment nearly parallel-sided but broadened proximally; first pleopods **short, reaching about midlength of sternite 7, approximating each other or occasionally overlapping at level of abrupt curve beyond which short terminal part tapers to rather sharp tip**; armed with minute scattered retrogressive spinules distally (magnifying glass required). **Colour:** carapace brown with areas of bluish black. Chelae brown above; fingers dark on external face except for tips and proximal portion, internal face dark in distal 2/3; dark colour of fingers retained in preservation.

Size: Maximum width: male 142 mm; female 95 mm.

Habitat, biology, and fisheries: Inhabits a variety of shallow environments to depths seldom exceeding 15 m, usually 5 m or less. Found often in intertidal pools. Lives on sand and muddy flats, algae and grass flats, sand beaches, rocky pools, eroded coral bases, oyster bars, shallows at edges of mangroves, and at the surface under lights at night. Presumably feeds on a variety of prey including molluscs, other bottom invertebrates, and some fishes, carrion, and detritus. Of minor fisheries importance as this *Callinectes* is never abundant. Used for food locally when obtained. Separate statistics for this species are not collected within the area. Caught with seines, dip nets, and by hand.

Distribution: North Carolina (Beaufort), Bermuda, Gulf of Mexico, Caribbean Sea, Colombia, Venezuela down to Brazil (from Ceará to São Paulo).

Remarks: This species had long been included in the synonymy of *Callinectes marginatus* (A. Milne Edwards, 1861), until Manning and Holthuis (1981: 92, 93) showed a number of seemingly constant differences which granted recognition of 2 distinct species. The name *Callinectes larvatus* was given to the Western Atlantic species, whereas the name *Callinectes marginatus* was retained for the African species.

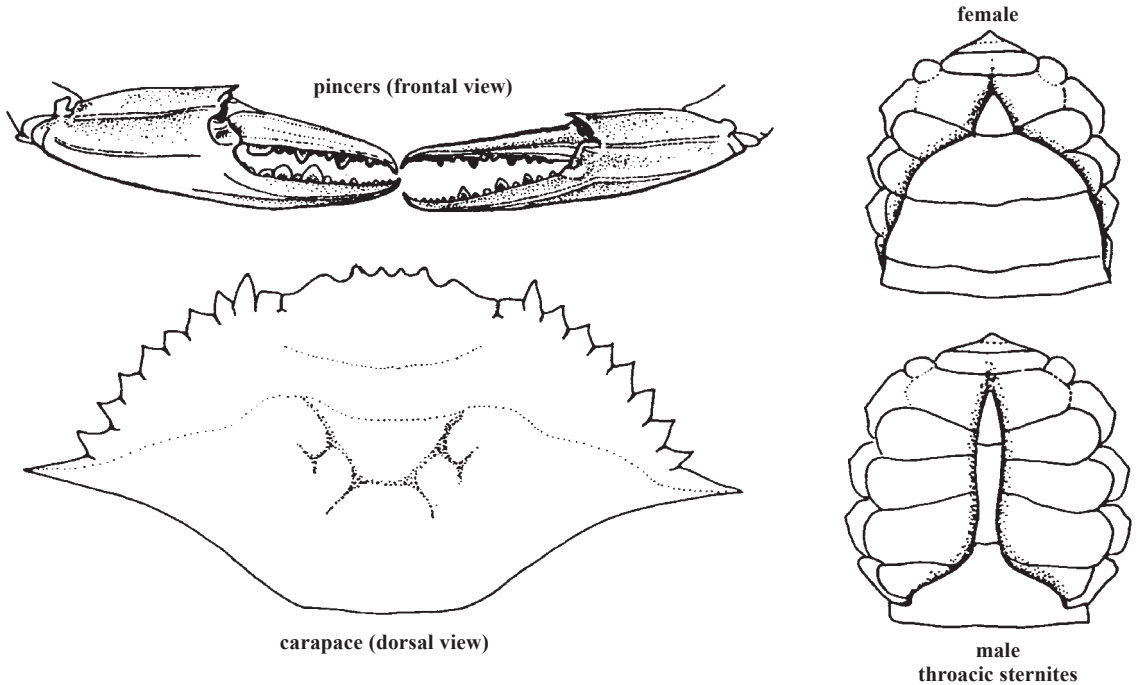


Callinectes maracaiboensis Taissoun, 1969

KLC

Frequent synonyms / misidentifications: None / None.

FAO names: En - Maracaibo swimcrab; Fr - Crabe d'Alaine; Sp - Jaiba de Maracaibo.

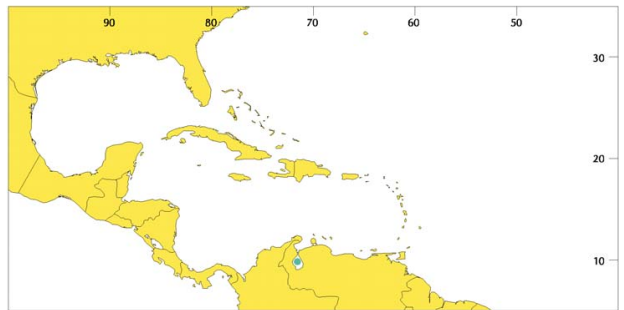


Diagnostic characters: Carapace almost twice as broad as long; 9 teeth on moderately arched anterolateral margin (including outer orbital tooth and strong lateral spine) tending to be acuminate especially in outer part of row, with **tips directed outward; front** (excluding inner orbital angles) **bearing 4 well-developed teeth, lateral pair moderately acute**. Marginal slopes of convex dorsal surface smooth and glistening (when wet), central part and transverse lines variably granulate. Pincers granulate on ridges, fingers of major hand heavily toothed; fifth legs flattened in form of paddles. Male with T-shaped abdomen reaching to anterior 1/4 of thoracic sternite 4; **slender first pleopods sinuously curved, overlapping in 2 places proximally, diverging distally then recurving to termination near midline and tip of telson**, armed distally with dorsolateral band of large and small retrogressive spinules (magnifying glass required). **Colour:** carapace olive green with variable tints of brown and blue; pincers similar dorsally, fingers intense blue on internal side, legs cream proximally and blue distally, articulations and spines of legs orange and blue; underparts cream and light yellow with suffusion of light blue.

Size: Maximum width: male 160 mm; female 120 mm.

Habitat, biology, and fisheries: Inhabits brackish to occasionally fresh waters containing much silt and decomposing organic material, usually below 16‰ salinity, on sandy and muddy bottoms and among roots of mangroves. Of minor interest to fisheries. Fishing grounds are located in the Lake Maracaibo and Bay of Tablazo (Venezuela). Separate statistics are not reported for this species. Caught with traps. Marketed fresh.

Distribution: Confined so far as known, to the Lake Maracaibo estuarine system, but probably wide spread.

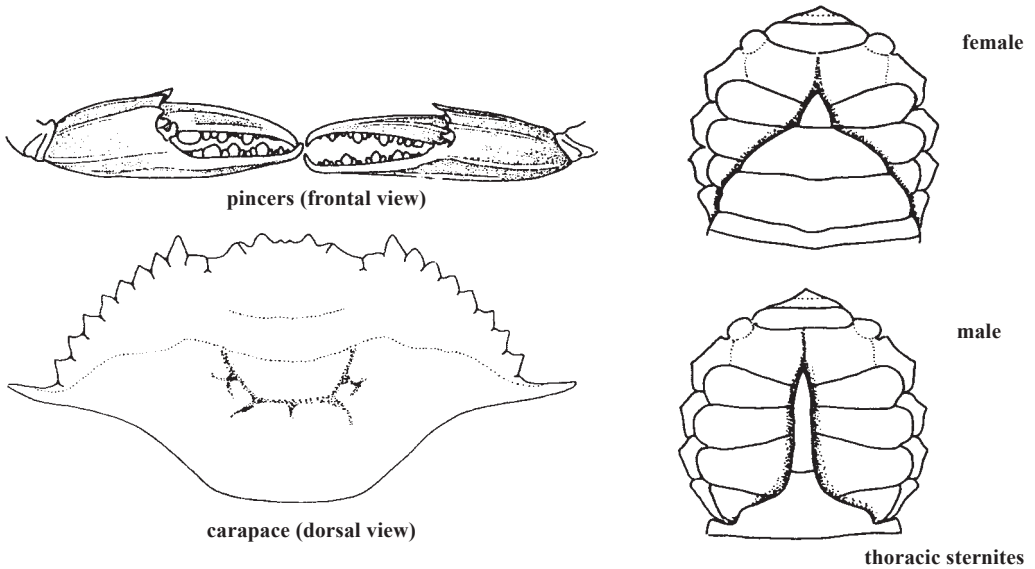


Callinectes ornatus Ordway, 1863

KLO

Frequent synonyms / misidentifications: None / None.

FAO names: En - Shelligs crab; Fr - Crabe grise; Sp - Jaiba gris.

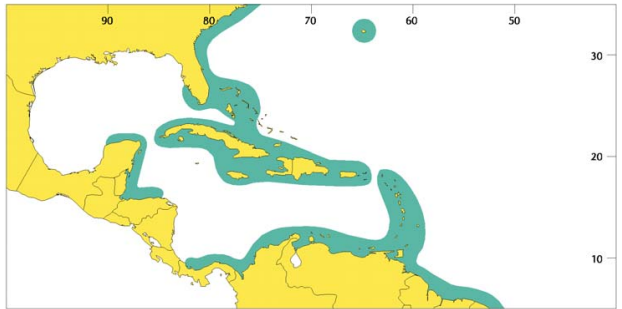


Diagnostic characters: Carapace slightly more than twice as broad as long; 9 teeth on arched anterolateral margin (outer orbital tooth and strong lateral spine included) **progressively more acuminate laterally**; outer pair of frontal teeth (excluding inner orbital angles) prominent but **inner pair small, often almost completely rudimentary**. Much of convex dorsal surface lightly granulate, most prominently so on anterior and elevated areas and in transverse lines; central trapezoidal (metagastric) area short and wide (anterior width about 2.8 times, posterior width about 1.75 times length). Pincers dissimilar, ridged longitudinally; fifth legs flattened in form of paddles. Male with T-shaped **abdomen** reaching slightly beyond suture between thoracic sternites 4 and 5, usually with **distal parts recessed below plane of sternum in retracted position**. **First pleopods overlapping proximally, nearly straight distally, terminating in usually lanceolate membranous tip** near level of suture between thoracic sternites 6 and 7, armed subterminally with short retrogressive spinules easily visible at low magnification. **Colour:** variable. Light greyish green, olive, pinkish, or brown, spines maroon to blue or white, white-tipped; pincers with outer face white, inner surface dark blue; varying transverse light-dark bands on paddles, other legs tinted blue; underparts whitish to grey. Albinistic individuals occur where substrates are light coloured. Williams (1984) gives a detailed description of the colour variations in this species.

Size: Maximum width: male 130 mm; female 110 mm.

Habitat, biology, and fisheries: Mostly tropical inhabiting mainly sandy or muddy bottoms, or shell and sponge covered bottoms (young crabs). Found in depths as great as 75 m. Tolerant of a broad range of salinity from 0 to 50‰ and temperatures of 18 to 31°C. May be obtained in bays and river mouths or even in fresh water, but it is abundant in waters of relatively high salinities. Presumably feeds on a variety of prey including molluscs, other bottom invertebrates, and some fishes, carrion, and detritus. Separate statistics not collected within the area. Consumed locally when obtained. Caught with bottom trawls, seines, pots, fish traps, and dip nets. Marketed fresh.

Distribution: Bermuda; Virginia, North and South Carolina through southeastern Florida; Gulf of Mexico, including northwestern Yucatán to Brazil (from Amapá to Rio Grande do Sul).

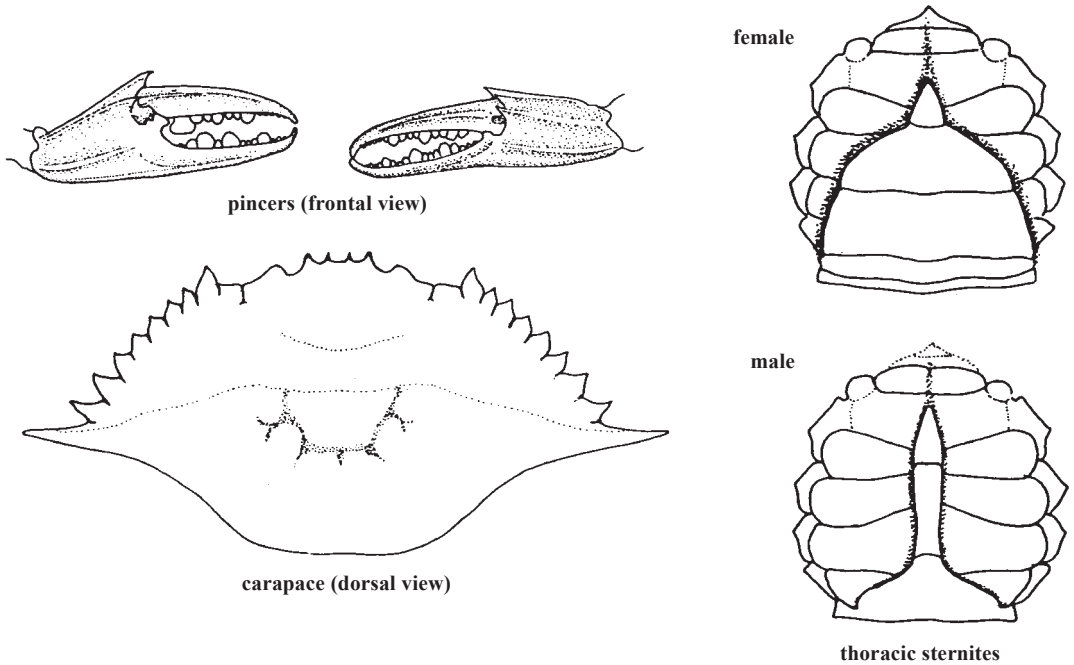


Callinectes rathbunae Contreras, 1930

KLT

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Sharptooth swimcrab; **Fr** - Crabe balleresse; **Sp** - Jaiba de puntas.

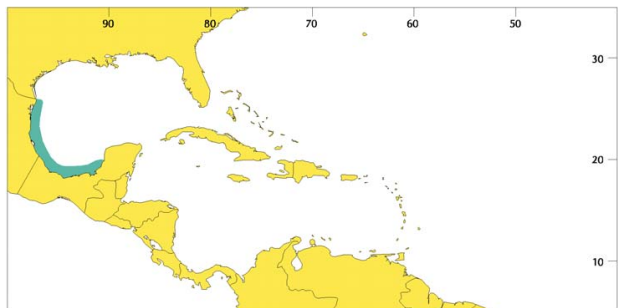


Diagnostic characters: Carapace twice as broad as long; 9 teeth on moderately arched anterolateral margin (including outer orbital tooth and strong lateral spine) **acuminate with edges variably granulate**; **front** (excluding inner orbital angles) **bearing 4 acuminate teeth, inner pair narrower than outer**. Marginal slopes of convex dorsal surface smooth and glistening (when wet), central part lightly and evenly granulate, transverse lines prominent. Pincers with sharp granulate ridges, fingers of major hand heavily toothed but not gaping; fifth leg flattened in form of paddles. Male with T-shaped abdomen reaching nearly to juncture between thoracic sternites 3 and 4; **slender first pleopods sinuously curved, overlapping in proximal half, diverging distally then recurving gradually to termination near midline and tip of telson**, armed distally with dorsolateral narrow band of large and small sharp retrogressive spinules (magnifying glass required). **Colour:** green and blue with tints of red, orange, and purple; underparts white.

Size: Maximum width: male 140 mm; female 150 mm.

Habitat, biology, and fisheries: Lives in estuarine waters of ditches, lagoons, and river mouths. Presumably feeds on a variety of prey including molluscs, other bottom invertebrates, and some fishes, carrion, and detritus. Minor interest to fisheries. Separate statistics are not collected within the area. Caught with hand nets. Marketed fresh.

Distribution: Western Gulf of Mexico.

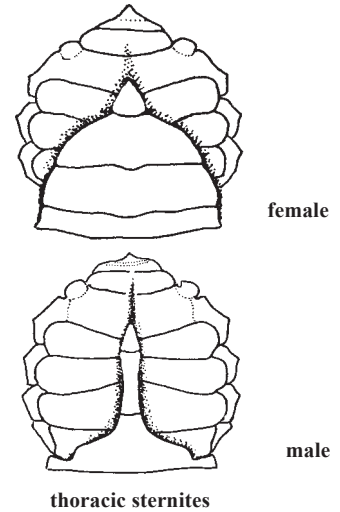
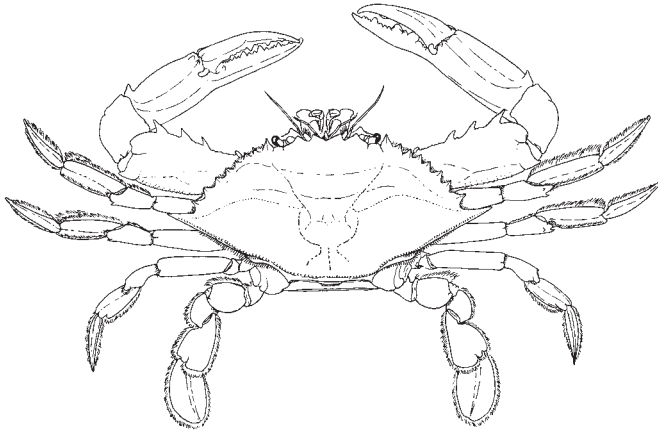


Callinectes sapidus Rathbun, 1896

CRB

Frequent synonyms / misidentifications: None / None.

FAO names: En - Blue crab; Fr - Crabe bleu; Sp - Cangrejo azul.

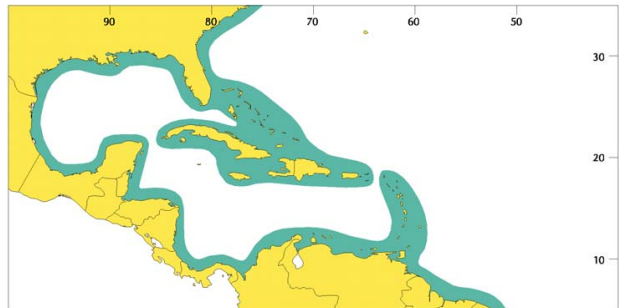


Diagnostic characters: Carapace more than twice as broad as long; **9 blunt to acuminate teeth** (outer orbital tooth and strong lateral spine included) on arched anterolateral margin; **front** (excluding inner orbital angles) **bearing 2 obtuse to acuminate, broadly triangular teeth with often sinuous inner margins longer than outer margins**. Much of convex dorsal surface smooth, but scattered and transverse lines of fine granules; sculpture of regions near centre varying from low and smooth to rather sharply raised relief with crowded granules; pincers strong, dissimilar, and ridged longitudinally; fifth legs flattened in form of paddles. Males with T-shaped abdomen reaching level of thoracic sternite 4; slender **first pleopods with membranous tip reaching beyond suture between thoracic sternites 4 and 5**; sinuously curved, overlapping proximally and armed distally with a row of large and small retrogressive spinules (magnifying glass required). **Colour:** greyish, bluish, or brownish green of varying shades and tints dorsally on carapace and chelipeds; spines may have reddish tints, tubercles at articulations of legs orange, and legs varying blue and white with traces of red or brownish green. Males with propodi of chelae blue on inner and white on outer surfaces, fingers blue on inner and white on outer surfaces and tipped with red. Mature females with orange fingers on chelae tipped with purple. Underparts off-white with tints of yellow and pink. Colour variations associated with sexual dimorphism and molt cycle are known.

Size: Maximum width: 209 mm, exceptionally 227 mm.

Habitat, biology, and fisheries: A coastal crab inhabiting a variety of bottoms in fresh water, estuaries, and shallow marine waters usually down to 35 m, occasionally 90 m depth. Hatching occurs in mouths of estuaries and shallow marine waters, development of larvae progresses in the ocean, followed by migration of megalopae and young crabs back into estuarine waters to mature into adults. Feeds on a variety of prey including oysters, clams, other bottom invertebrates, fishes, some vascular plant material and detritus, and carrion. Of major interest to fisheries. Traditionally, however, the seat of this fishery is in Area 21 (mostly Chesapeake Bay). In Area 31 from 1984 to 1998, 750 449 t of blue crab were caught (mean capture production was 50 029 t/year). Caught with pots, trotlines, bottom trawls, fyke nets, dip nets, scrapes, and dredges. Marketed fresh.

Distribution: Western Atlantic: Nova Scotia, Maine, and northern Massachusetts to Argentina, including Bermuda and the Antilles. Introduced in Europe (Denmark, Netherlands and adjacent North Sea, France, Golfo di Genova; northern Adriatic; Aegean, western Black, and eastern Mediterranean Seas. Introduced also in Japan. (found twice); now rather abundant in parts of northern and eastern Mediterranean Sea and also in Japan.

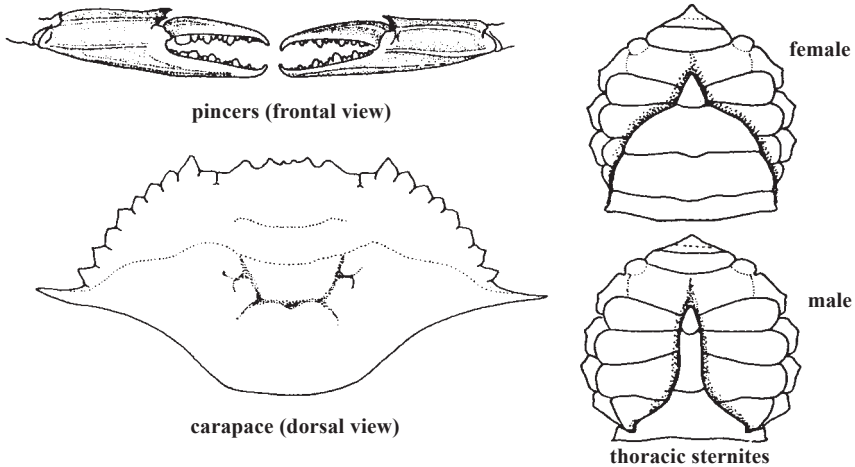


Callinectes similis Williams, 1966

KLS

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Lesser blue crab; **Fr** - Crabe ciarlatan; **Sp** - Jaiba azul menor.

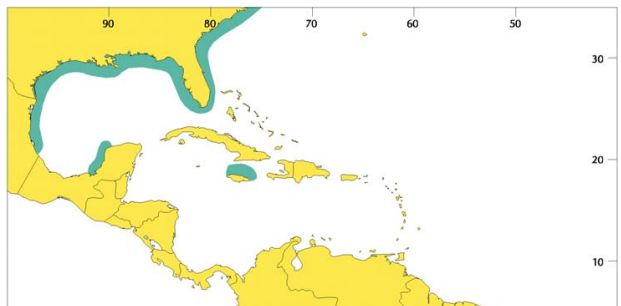


Diagnostic characters: Carapace more than twice as broad as long; **9 blunt teeth** (outer orbital tooth and strong lateral spine included) on arched anterolateral margin; **front bearing 4 teeth** (excluding inner orbital angles), **inner pair small but definitely formed**. Much of convex dorsal surface lightly and uniformly granulate in addition to transverse lines of fine granulations; central trapezoidal (metagastric) area short and wide (anterior width about 2.75 times, posterior width about 1.7 times length). Pincers dissimilar, with very fine granules on longitudinal ridges; fifth legs flattened in form of paddles. Male with sixth (penultimate) segment of T-shaped abdomen broader than telson, **flush with sternum in retracted position**; **first pleopods well separated and reaching anteriorly 2/3 length of thoracic sternite 7 or beyond, distal part slender, extending straight to tips curved slightly inward**, armed with minute retrogressive spinules (magnifying glass required). **Colour:** carapace green dorsally, irregular areas of iridescence at bases of and between anterolateral teeth, and on posterior and posterolateral borders. Chelipeds and portions of legs similar in colour or more tannish green dorsally, with iridescent areas on outer and upper edges of carpus and hands; chelae white on outer surface, blue to fuchsia on inner surface, with fuchsia on tips of fingers and teeth of opposed edges. Lateral spines and some anterolateral teeth as well as spines on chelipeds white-tipped. Walking legs grading from fuchsia distally through violet blue to light blue mottled with white proximally, pubescence on legs beige. Swimming legs variably mottled with white; all legs with stellate fuchsia markings at articulations. Underparts white and blue.

Size: Maximum width: male 122 mm; female 95 mm. An individual has been reported with carapace width of 171 mm.

Habitat, biology, and fisheries: Inhabits marine littoral water, seldom in estuaries. It has been found in salinities ranging from 24.9 to 37.4‰ and temperatures between 13 and 29°C, at depths down to 92 m, recorded occasionally to 379 m. Usually associated with *Callinectes sapidus*, often in large numbers. Gut content analysis revealed several groups of food items in the diet: plant fragments, remains of fish, polychaetes, crustaceans (*Farfantepenaeus aztecus* and *Portunus gibbesii*), micromolluscs (*Mulinia lateralis*), and detritus. Considered a potential source for human consumption in the Gulf of Mexico. Separate statistics are not collected for this species. Caught with bottom trawls, beach seines, and pots. Usually culled from catches because of small size, but marketed fresh if at all.

Distribution: Off Delaware Bay to Key West, Florida; northeastern Florida around Gulf of Mexico to off Campeche, Yucatán; Isla Providencia, Colombia; northern Jamaica.

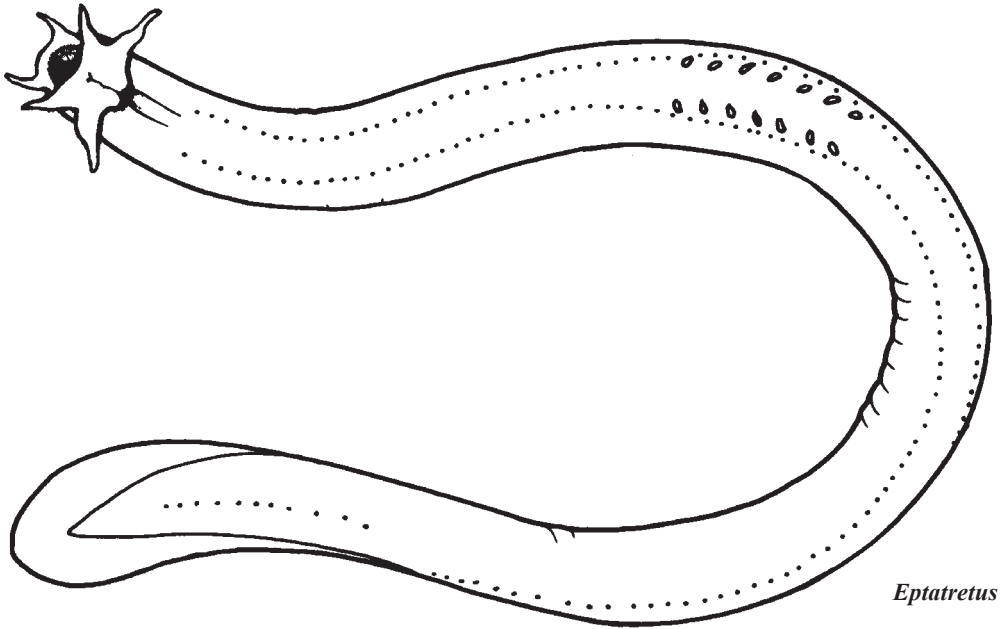


HAGFISHES

by B. Fernholm, Swedish Museum of Natural History, Stockholm, Sweden

MYXINIDAE**Hagfishes**

Diagnostic characters: Moderate-sized to large (100 cm worldwide, 72 cm in the area), very elongate with eel-shaped body. Eye reduced. **Mouth with laterally biting horny teeth; no jaws. Anterior single nostril surrounded by 4 tentacles. No operculum; 1 to 16 pairs of external gill openings. Two ventrolateral rows of slime glands. No paired fins; median fins without rays. No scales. Skeleton cartilaginous. Colour:** pink to brown.



Habitat, biology, and fisheries: Benthic fishes, often burrowing in mud, from inshore to deep sea. Feed as scavengers, often on dead or disabled fishes. Rare to common, most efficiently taken in baited traps, a few species of commercial interest for skin (eelskin) industry based in Korea.

Remarks: Two subfamilies, Eptatretinae with more than 1 pair of gill openings and Myxiniinae with 1 pair of gill openings, occur with about 60 species throughout the world's oceans in tropical and temperate latitudes; tropical species occur in deep water. In the area the genera *Eptatretus* and *Myxine* occur with about 12 species. Hagfishes generally are not frequently collected and more specimens are needed to resolve the taxonomy of the group. The best known and well-collected species in the area is *Myxine limosa* (syn. *Myxine atlanticus* Regan, 1913) which, following Wisner and McMillan (1995) against recent common practice, is here not synonymized with *M. glutinosa*. A revision of the family is needed; the best recent overview is that of Fernholm (1998).

Similar families occurring in the area

None. The laterally biting horny teeth, the single nostril, the separate external gill openings, and the absence of paired fins clearly distinguish hagfishes from any other fish in the area.

List of species occurring in the area

- Eptatretus caribbeaus* Fernholm, 1982. To 385 mm. W Caribbean.
Eptatretus mendozai Hensley, 1985. To 450 mm. SW of Puerto Rico.
Eptatretus minor Fernholm and Hubbs, 1981. To 395 mm. W of Florida.
Eptatretus multidentis Fernholm and Hubbs, 1981. To 655 mm. Off N coast of South America.
Eptatretus springeri (Bigelow and Schroeder, 1952). To 590 mm. W of Florida.
Eptatretus sp. Shimizu, 1983. To 558 mm. Off Suriname.
Eptatretus sp. A Fernholm and Hubbs, 1981. To 433 mm. N Grand Bahama Island.
Eptatretus sp. B Fernholm and Hubbs, 1981. To 308 mm. S Grand Bahama Island.
Myxine limosa Girard, 1859. To 720 mm. Around Florida north to Davis Strait.
Myxine mccoskeri Wisner and McMillan, 1995. To 286 mm. Southern Caribbean Sea.
Myxine mcmillanae Hensley, 1991. To 473 mm. W and SW Puerto Rico, St Croix, Virgin Islands.
Myxine robsorum Wisner and McMillan, 1995. To 540 mm. S Caribbean Sea.
Myxine sp. Shimizu, 1983. To 310 mm. Off Suriname.

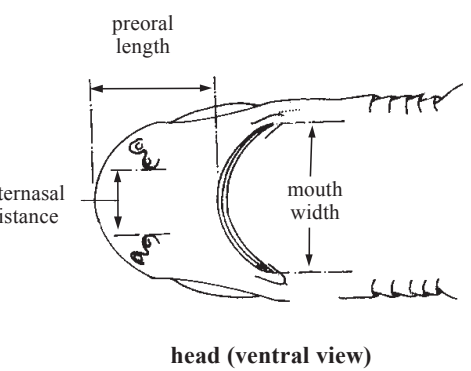
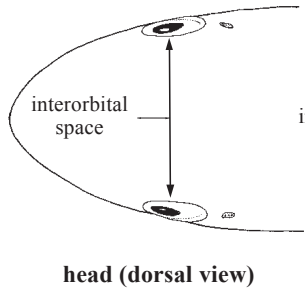
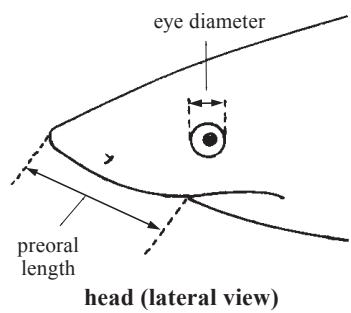
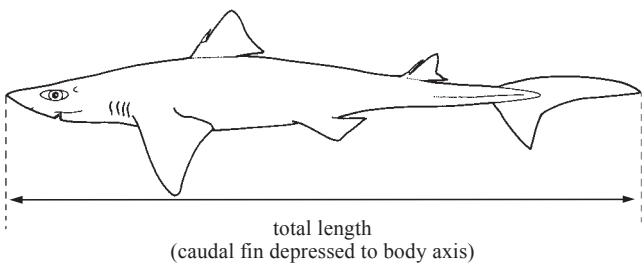
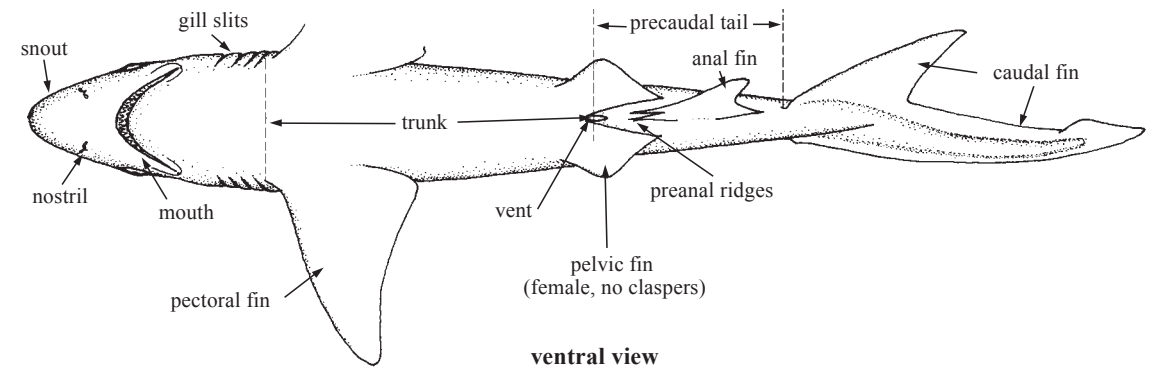
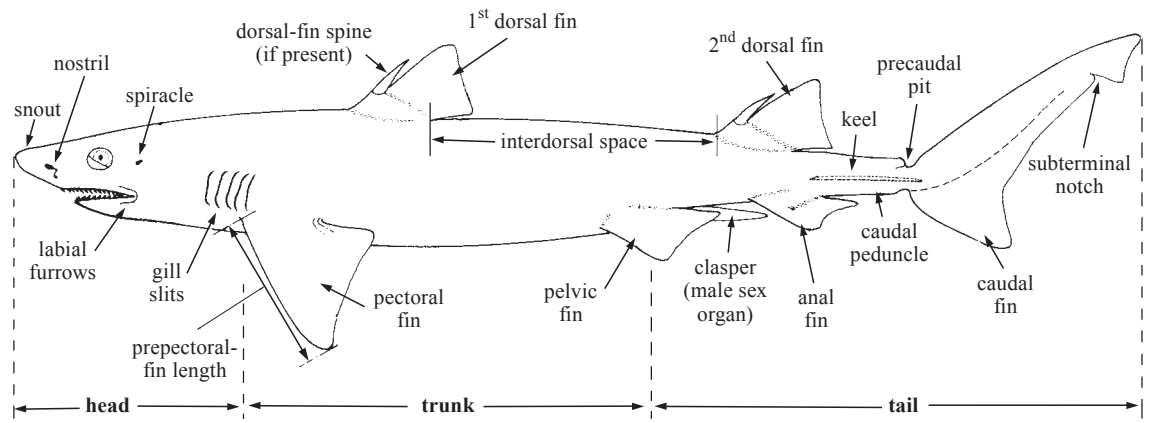
References

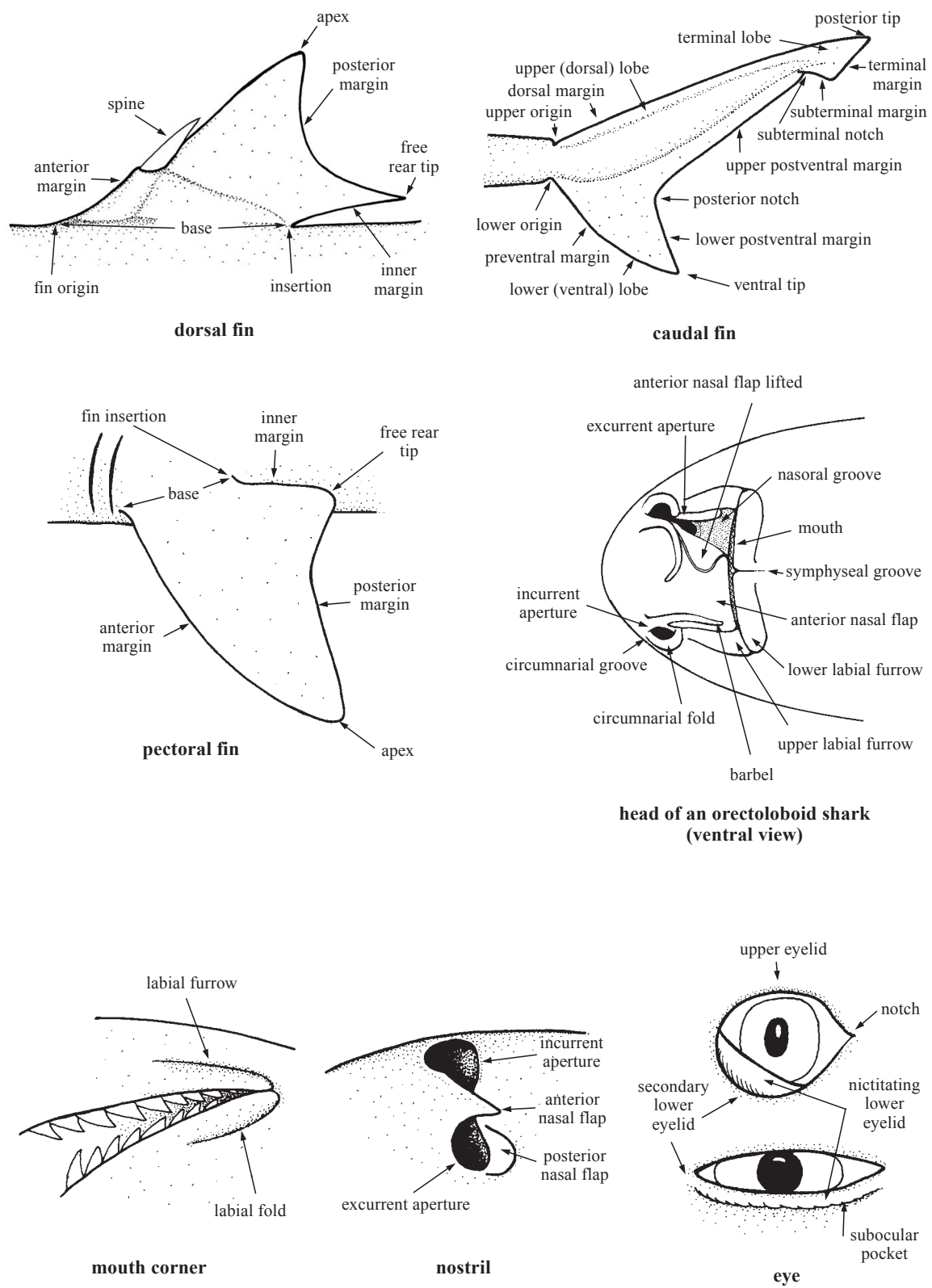
- Fernholm, B. 1998. Hagfish systematics. In *The Biology of Hagfishes*, edited by J. M. Jorgensen et al. London, Chapman and Hall, pp 34-44.
- Bigelow, H.B. and W.C. Schroeder. 1952. A new species of the cyclostome genus *Paramyxine* from the Gulf of Mexico. *Breviora*, Mus. of Comp. Zoology, Cambridge, Massachusetts, 8:1-10.
- Fernholm, B. 1982. *Eptatretus caribbeaus*: A new species of hagfish (Myxinidae) from the Caribbean. *Bull. Mar. Sci.*, 32(2):434-438.
- Fernholm, B. and C.L. Hubbs. 1981. Western Atlantic Hagfishes of the genus *Eptatretus* (Myxinidae) with description of two new species. *Fish. Bull.*, 79(1):69-83.
- Girard, C. 1859. Ichthyological Notes. *Proc. Acad. Nat. Sci. Philadelphia*, 223-225.
- Hensley, D.A. 1985. *Eptatretus mendozai*, A New Species of Hagfish (Myxinidae) From off the Southwest Coast of Puerto Rico. *Copeia*, (4):865-869.
- Hensley, D. 1991. *Myxine mcmillanae*, A New Species of Hagfish (Myxinidae) from Puerto Rico and the U.S. Virgin Islands. *Copeia*, (4):1040-1043.
- Shimizu, T. 1983. Fishes trawled off Suriname and French Guiana. *Jap. Mar. Fish. Res. Center*, 519 p.
- Regan, C.T. 1913. Revision of the Myxinioids of the Genus *Myxine*. *Ann. Mag. Nat. Hist.*, 11(8):395-398.
- Wisner, R.L. and C.B. McMillan. 1995. Review of new world hagfishes of the genus *Myxine* (Agnatha, Myxinidae) with descriptions of nine new species. *Fish. Bull.*, 93:530-550.

SHARKS

by L.J.V. Compagno, Shark Research Center, South African Museum, South Africa

TECHNICAL TERMS AND MEASUREMENTS
(Straight-line distances)





GENERAL REMARKS

Sharks include a variety of cylindrical, elongated, or depressed jawed fishes with paired pectoral and pelvic fins and relatively simple internal skeletons made of cartilage and lacking internal or external bones, plate-like bony scales, and bony-fin rays. Living sharks are members of the Class Chondrichthyes (the cartilaginous fishes or shark-like fishes), which includes the Subclass Elasmobranchii (the elasmobranchs or plate-gilled fishes, including living sharks and rays, and fossil relatives), and the Subclass Holocephali (chimaeras and fossil relatives). It is traditional to classify living elasmobranchs into 2 formal taxonomic groups, sharks (Selachii) and rays (Batoidea or batoids), but modern cladistic studies show that the rays comprise a single group of highly derived and extremely diverse 'flat' or 'winged' sharks that is closest to the small group of sawsharks (Pristiophoridae) and which nests within 1 of 2 superorders of living sharks, the Squalomorpii. Hence the traditional shark-ray dichotomy is invalid phylogenetically, but serves for simple identification as used here and in previous FAO species identification guides for various fishing areas.

Traditional 'sharks', or non-batoid sharks (hereafter referred to as sharks), differ from the rays or batoids in having **lateral gill openings (or gill slits) and the pectoral fins not fused to the sides of the head over the gill openings** (both primitive characters states with derived states in rays). The greatly depressed angel sharks (Family Squatinidae) might be mistaken for rays at first sight and are the immediate relatives of the rays and sawsharks; they have large, broad, ray-like pectoral fins that extend as triangular lobes alongside the gill openings, but are not fused to the head above them.

Sharks have eyes on the dorsal surface or sides of the head. There are usually **5 gill openings on each side of the head, rarely 6 or 7**; spiracles (when present) are on the dorsal or dorsolateral surfaces of the head between the mouth and first gill openings. **The mouth is usually ventral or subterminal on the head**, but terminal or nearly so in a few species. **The teeth on the jaws are set in numerous transverse rows and are constantly replaced from inside the mouth**. Most species of sharks are more or less **covered by small (occasionally enlarged) tooth-like placoid scales or dermal denticles**. The tail and caudal fin are always well developed and propel the animal by lateral undulations; the pectoral fins are mostly not used for propulsion through the water but aid in stabilizing and steering the shark. Most sharks have **2 (rarely 1) dorsal fins**, sometimes with spines on their front edges; **an anal fin is usually present**, but missing in several families.

Male sharks have cylindrical copulatory organs or **claspers** on their pelvic fins, used for internal fertilization of eggs in females; about 1/3 of the species of sharks have females that deposit eggs in rectangular or conical capsules, formed of a horn-like material (oviparity); the remainder are livebearers (viviparous). Some live-bearing sharks, including many houndsharks (Triakidae), most requiem sharks (Carcharhinidae), and all hammerheads (Sphyrnidae) are viviparous (placental viviparous), with yolk sacs of fetuses forming a placenta with the maternal uterus for nutrient transfer; other live-bearing sharks are ovoviviparous (aplacental viviparous), without a placenta. Ovoviviparous lamnoid sharks of the families Odontaspidae, Alopiidae, and Lamnidae practice uterine cannibalism, in which one or more fetuses in each uterus resorb their yolk sacs and then devour eggs passed down the oviducts for nutriment (oophagy) and grow to considerable size with massive yolk stomachs before birth. In the Odontaspidae (*Carcharias taurus*) the largest fetus kills and eats its siblings (adelphophagy) and only 1 fetus survives in utero, while several young may cohabit the uterus in the other families.

Mature sharks vary in total length from about 15 to 19 cm (dwarf species of Etmopteridae, Dalatiidae, and Proscylliidae) to 18 m or more (whale shark, Family Rhincodontidae) and range in weight from between 10 and 20 g to at least 30 t. Most sharks are of small or moderate size; about 50% are small, between 15 cm and 1 m; 32% between 1 and 2 m; 14% between 2 and 4 m; and only 4% are over 4 m in total length.

All sharks are predators, with a wide prey range from planktonic crustaceans and benthic invertebrates to pelagic cephalopods, small to large bony fishes, other cartilaginous fishes, marine mammals, and other marine and terrestrial vertebrates. Sharks are primarily marine, but a few requiem sharks (Carcharhinidae) have broad salinity tolerances, and one species (bull shark, *Carcharhinus leucas*) is wide-ranging in tropical lakes and rivers with sea access as well as shallow inshore waters. No sharks are known to be confined to fresh water, unlike several species of stingrays (families Dasyatidae and Potamotrygonidae). Sharks are widely distributed in all oceans, from the Arctic to subantarctic islands, and from close inshore on reefs, off beaches, and in shallow, enclosed bays to the lower continental slopes, the abyssal plains, sea mounts and ridges, and the high seas. They are most diverse in continental waters of tropical and warm-temperate seas, from inshore waters down to upper continental slopes, but are less so in colder waters, at great depths (below 1 500 to 2 000 m), in the open ocean and off oceanic islands. The richest shark faunas occur in the Indo-West Pacific from South Africa and the Red Sea to Australia and Japan.

The Western Central Atlantic (Area 31) has a moderately diverse shark fauna compared to other parts of the world, but includes at least 23 families, 42 genera, and 100 species of sharks. Worldwide there are 34 families, 104 genera, and between 397 and 488 species of sharks (estimate as of 23 January 2001). Several genera and families are poorly known and require further taxonomic study. Many species of sharks are endemic to the area and have restricted ranges within it. Several species (including inshore species) are known from 1 or a

few museum specimens only, and a wealth of new species have been collected in deep water, offshore continental, and even inshore habitats in the past forty years (some of which are still undescribed). Undoubtedly more new species and many records of described species will be discovered with further collecting in poorly known parts of the area. Knowledge of the coastal shark fauna of Area 31 is uneven, and some maritime countries need further surveys to determine which species occur there. The deep-water shark fauna is sketchily known in the area, except for the northern Gulf of Mexico and parts of the Caribbean where systematic deep-water exploration for fisheries resources has been underway for several decades under the auspices of the U.S. Bureau of Commercial Fisheries and National Marine Fisheries Service. Basic knowledge of the biology of many species, particularly deep-water taxa, is often very deficient or entirely lacking, and can be supplemented by new information gathered by fisheries workers in the area.

The 'shark attack' hazard has been grossly exaggerated over the past few decades, including almost universal use of the emotive term 'attack' for the minor phenomenon of sharks biting and occasionally killing people. Large carcharhinids, sphyrnids, and lamnids, and less frequently other sharks, may occasionally bite people in the water or bite or hit boats, but are not as hazardous as the water itself. The negative fascination of sharks to the public, and particularly to the news and entertainment media, elevates the perceived importance of shark-bite incidents beyond their modest reality of about 100 per year worldwide. An unusually high number of shark incidents off Florida in the summer of 2001 triggered a media 'feeding frenzy' of enormous proportions for several months.

Unfortunately, the 'shark attack' issue had tended to obscure the 'human attack' problem and its implications for shark conservation in the face of burgeoning fisheries driven by the expanding world human population, increasingly sophisticated fisheries technology, and enormous, increasing markets for shark products including meat, fins, liver oil, skins, and even cartilage. It was recognized over the past 4 decades that aspects of the life history strategy of sharks (long lives, long maturation times, and low fecundity, plus relatively large size) made them very vulnerable to overexploitation, and that several targeted shark fisheries had suddenly collapsed after recruitment had been impaired by overexploitation of the breeding stocks. However, only in the past 10 years has there been widespread concern about world trends in fisheries for sharks and other cartilaginous fishes. After the Second World War world fisheries for chondrichthyan fishes essentially tripled in reported catches to FAO, which has not kept pace with the approximately fourfold increases in total fisheries worldwide. Much of the shark catch worldwide is utilized and discarded as bycatch. These fisheries are driven by larger catches of exploitation-resistant bony fishes or other marine organisms such as crustaceans or cephalopods with far higher fecundity. More recent increases in demand and prices for shark products such as fins, cartilage, and flesh have encouraged targeted fisheries, greater utilization of bycatch, and greater utilization of fins and other shark products that were formerly discarded from sharks that were marketed for their meat.

World catches of shark-like fishes reported to FAO increased in the decade 1987 to 1997 from about 690 to 790 thousand t with an apparent leveling over the half-decade ending in 1997. This suggests that there is little scope for further increases in catches despite higher and sometimes inflated values for various shark products and greater incentives to develop targeted shark fisheries and promote greater utilization of shark bycatch. Some sharks have been accorded limited or total protection in a number of countries, and in the area are under comprehensive regulation in USA waters. On a world basis shark exploitation is mostly unregulated and out of control at present.

FAO proposed an International Plan of Action for managing and regulating shark fisheries and biodiversity in 1999 that requests Member Countries to draw up National Plans of Action for sharks in their territorial waters, which are due to be presented in 2001. Implementation of the plans will depend upon resources and will be available to the countries presenting them. A draft USA action plan was made available for comment in 2000. Ninety-seven species of shark-like fishes have been included on the IUCN Red List for 2000, with 17 being listed as endangered. Sharks have now been seriously proposed for listing under the CITES convention for regulation and banning of trade of threatened species, which has caused fierce political battles. One species, the basking shark, narrowly missed being listed by CITES in 2000. It is anticipated that in the next decade international agreements, including CITES listings and national and regional action plans for regulating shark catches, will be gradually implemented and will hopefully protect a variety of cartilaginous fishes from overexploitation.

In the Western Central Atlantic sharks are used primarily for human food in local fisheries; shark meat is marketed fresh, frozen, and especially dried-salted; fins are utilized on the oriental market for fins; sharks are utilized also for liver oil, fish meal, curios, leather, and medicinal cartilage, although details of utilization in the area are sketchy and vary with different countries. Directed shark fisheries were important in the area, particularly off the Atlantic coast of the USA and Gulf of Mexico, during the 1940s and early 1950s. These targeted large sharks for leather production and used very heavy gear, but the fishery eventually collapsed when expenses for catching sharks exceeded the value of the sharks landed. Currently, some countries in Area 31 follow the circumtropical pattern of primarily landing sharks as bycatch and also running targeted fisheries for local and international consumption, with fins and cartilage as an increasingly profitable export byproduct. The

USA is unique in utilizing shark meat as a high-priced luxury food for human consumption, as well as in having primarily targeted sharks for such products as hides, meat, fins, and sport.

The total catch of sharks reported from Area 31 is uncertain. Total reported catches of cartilaginous fishes (probably almost entirely elasmobranchs) reported to FAO between 1950 and 1998 increased from a low of 2 619 t (1952) to a high of 36 946 t (1994). This is an astonishing 14 times increase in catch in Area 31 compared to a 2.6 times increase in world catches during the same period between 1952 and 1994. The average catch in Area 31 between 1950 and 1998 was 15 120 t. There was a steady increase in catches in Area 31 from the 1950s to the 1980s, and a sharp increase to the mid-1990s, after which catches declined considerably (presumably due to overexploitation). The 1998 catch of 28 825 t included 9 000 t of sharks, 9 886 t of batoids (rays), and 9 939 t of mixed elasmobranchs. Batoids may be becoming more important than sharks in elasmobranch fisheries in the area as shark catches decline through overfishing (as in other parts of the world).

Most Area 31 countries report their catches as mixed sharks and rays without further breakdown, while some countries separate out rays and broad categories of sharks (eg., smooth dogfishes, requiem sharks). Species-specific fisheries data has been supplied by the USA and Portugal for a few Area 31 species in 1998, but species-specific data is unavailable for most countries that fish sharks in Area 31 at present.

Area 31 has a relatively small catch of shark-like fishes (about 3.7% of the world total in 1998), compared to Areas 27, 71, and 51 (with 12.4 to 18.5% in 1998). Countries such as India (8.2% of the world total), Indonesia (11.6%), Spain (11.3%), Pakistan (6.8%) and several others had much larger national catches in 1998 than the entire Area 31 catch. The most important shark fishing countries in the area are Cuba, Mexico, the USA, and Venezuela, with 3 072 to 14 805 t caught in 1998; all have had catch declines from peaks in the 1990s. Other countries landed less than 1 000 t in the area in 1998. Only Mexico has been consistently landing major catches of shark-like fishes (over 10 000 t/year, and ranging from 12 522 to 18 508 t) in the area over the decade 1988 to 1998. Nearly all of the Area 31 catch is reported from countries in the area, with very little (about 213 t in 1998) reported from countries located outside the area (Japan, Taiwan Province of China, Republic of Korea, Portugal). Management and conservation plans for sharks are in place in the USA sector of Area 31 as part of a long-term National Marine Fisheries Service program for the entire east coast of the USA. Many USA states regulate both sport and commercial fisheries. Mexico currently runs an extensive research programme for management of their shark fisheries in Area 31 and elsewhere.

Data on gear used in the area is sketchy, but line gear (including pelagic longlines), fixed and floating gill nets, bottom trawls, fixed fish traps, and purse seines are used to target sharks or take sharks as a bycatch. Sharks are taken in artisanal fisheries, by local inshore and offshore commercial fisheries, and by international fishing fleets in offshore waters. Sports fishing for sharks is important in some countries in the area, particularly the USA. Requiem sharks (Carcharhinidae) are especially important in fisheries, but considerable numbers of threshers (Alopiidae) and makos (Lamnidae, genus *Isurus*) are fished offshore, and a number of other families, including nurse sharks (Ginglymostomatidae), sand tigers (Odontaspidae), and hammerheads (Sphyrnidae) are commonly taken in inshore fisheries. Dogfish (Family Squalidae) are caught in offshore deep-set longline fisheries targeting sharks for liver oil.

Sharks and rays are increasingly important for ecotouristic diving in the area, particularly in the Bahamas where many dive sites are known and visited by thousands of divers yearly, but also off Belize, Turks and Caicos, and the USA. At least 13 species of sharks, mostly requiem sharks (Carcharhinidae, including the bull, Caribbean reef, lemon, blue, blacktip, Caribbean sharpnose, silky, and oceanic whitetip sharks), but also hammerheads (Sphyrnidae), sand tigers (Odontaspidae), nurse sharks (Ginglymostomatidae) and whale sharks (Rhincodontidae), as well as some batoids, are regularly observed by divers in Area 31. It is likely that ecotouristic diving for sharks is far more valuable locally than fisheries catches for the same species (as shown in the Maldives), which will presumably be a factor in future conservation and fisheries management of sharks in the Area. Ecotouristic diving and responsible underwater film-making tends to demythologize sharks and gives perspective to the relatively low risk of shark bite incidents. Many of the shark species that are popular for underwater 'shark watching' have unsavory reputations that are belied by their largely docile and inoffensive responses to divers that treat them respectfully.

KEY TO FAMILIES OCCURRING IN THE AREA

Note: Families with an asterisk (*) are not known from Area 31 at present but are included in the key because they include wide-ranging deep-water or epipelagic species likely to be recorded in the area in the future.

- 1a. No anal fin → 2
- 1b. Anal fin present → 10
- 2a. Body strongly depressed and ray-like; pectoral fins greatly enlarged, with anterior triangular lobes that overlap gill slits; mouth terminal (Fig. 1) **Squatinaidae**
- 2b. Body cylindrical, compressed, or slightly depressed, not ray-like; pectoral fins small, without anterior lobes; mouth ventral → 3

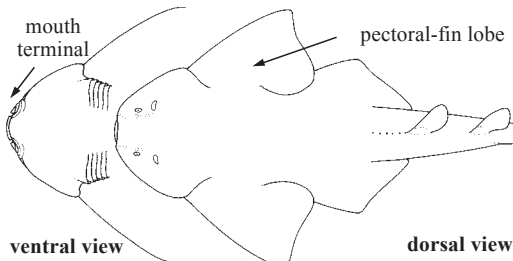


Fig. 1 Squatinidae

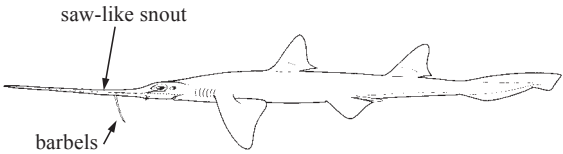


Fig. 2 Pristiophoridae

- 3a. Snout greatly elongated into a flat saw with large, pointed denticles on sides and a pair of long, tape-like barbels on the lower surface (Fig. 2) **Pristiophoridae**
- 3b. Snout normal, not saw-like; no barbels on underside of snout → 4
- 4a. Trunk very high and compressed, triangular in section; dorsal fins very high; fin spine of first dorsal fin inclined forward (Fig. 3) **Oxynotidae**
- 4b. Trunk low and cylindrical, dorsal fins lower; fin spine of first dorsal fin, when present, inclined backward → 5

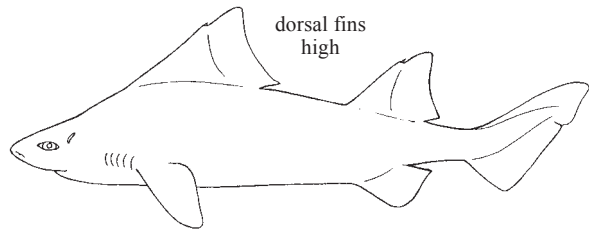


Fig. 3 Oxynotidae

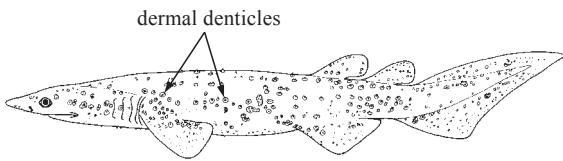


Fig. 4 Echinorhinidae

- 5a. Body set with sparse, large, plate-like denticles; spiracles small and well behind eyes; fifth pair of gill slits abruptly longer than others; first dorsal-fin origin over or posterior to pelvic-fin origins; pelvic fins much larger than second dorsal fin (Fig. 4) **Echinorhinidae**
- 5b. Fifth gill slits not abruptly larger than first to fourth; spiracles larger and close behind eyes; first dorsal-fin origin well anterior to pelvic-fin origins; pelvic fins usually about as large as second dorsal fin or smaller → 6

- 6a. Dorsal-fin spines without grooves; teeth similar and blade-like in both jaws, with a deflected horizontal cusp, a low blade, and no cusplets; caudal peduncle usually with a precaudal pit (weak or absent in *Cirrhigaleus*) and always with strong lateral caudal keels; subterminal notch absent from caudal fin (Fig. 5) **Squalidae**
- 6b. Dorsal-fin spines, where present, with lateral grooves; teeth variable but not similarly blade-like and without a deflected horizontal cusp in both jaws; caudal peduncle without precaudal pits and usually without lateral keels (weak ones in some dalatiids); subterminal notch usually present and well developed → 7

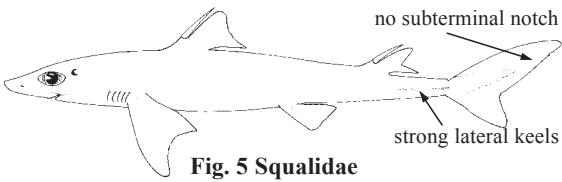


Fig. 5 Squalidae

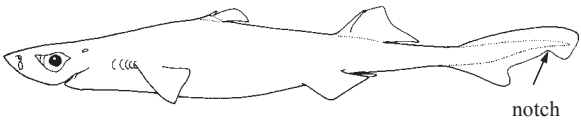


Fig. 6 Etmopteridae

- 7a. Upper teeth with a cusp and lateral cusplets; underside of body usually with more or less conspicuous dense black markings indicating the presence of numerous light organs (photophores) (Fig. 6) **Etmopteridae**
- 7b. Upper teeth with a cusp but without lateral cusplets; underside of body without conspicuous black markings and light organs → 8
- 8a. Upper teeth relatively broad and blade-like, imbricated, lowers low and wide (Fig. 7) . **Centrophoridae**
- 8b. Upper teeth relatively narrow and not blade-like, lowers high and wide → 9



Fig. 7 Centrophoridae

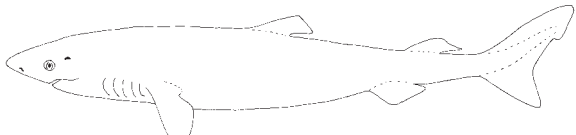


Fig. 8 Somniosidae

- 9a. Head moderately broad and somewhat flattened or conical; snout flat and narrowly rounded to elongate-rounded in dorsoventral view; abdomen usually with lateral ridges; both dorsal fins with low fin spines in species known from the area (absent in the extralimital *Scymnodalatias* and *Somniosus*) (Fig. 8) **Somniosidae**
- 9b. Head narrow and rounded-conical; snout conical and narrowly rounded to elongate-rounded in dorsoventral view; abdomen without lateral ridges; dorsal fins usually without spines (except for a small spine present on the first dorsal fin of *Squaliolus*) **Dalatiidae**
- 10a. One dorsal fin, far posterior on back; 6 or 7 gill slits on each side → 11
- 10b. Two dorsal fins; 5 gill slits on each side → 12
- 11a. Six gill slits, with the first connected across the underside of the throat; body elongated and eel-shaped; teeth tricuspidate and similar in both jaws (Fig. 9) **Chlamydoselachidae**
- 11b. Six or 7 gill slits, with the first not connected across the underside of the throat; body fairly stocky, not eel-shaped; anterior teeth unicuspidate in upper jaw and comb-shaped in lower jaw (Fig. 10) **Hexanchidae**

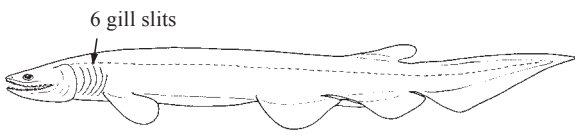


Fig. 9 Chlamydoselachidae

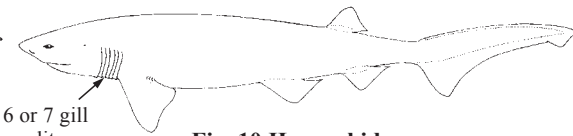
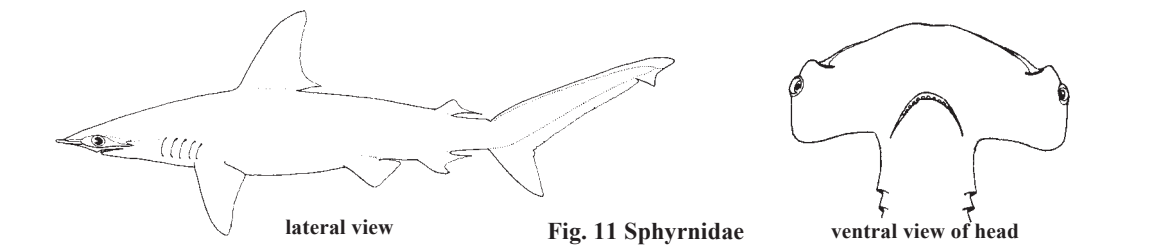


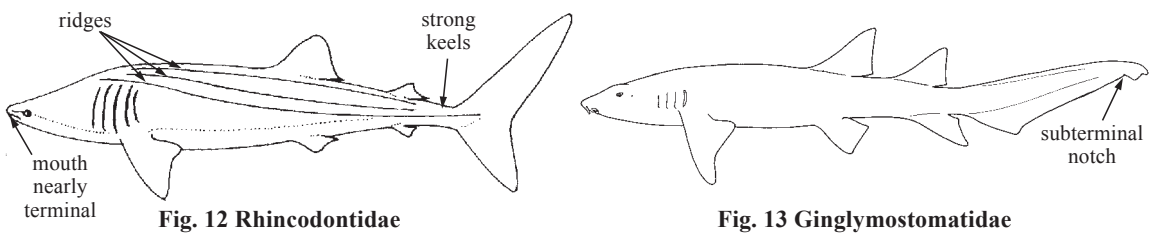
Fig. 10 Hexanchidae

- 12a. Head with lateral expansions or blades, like a double-edged axe (Fig. 11). Sphyrnidae
- 12b. Head normal, not expanded laterally. → 13



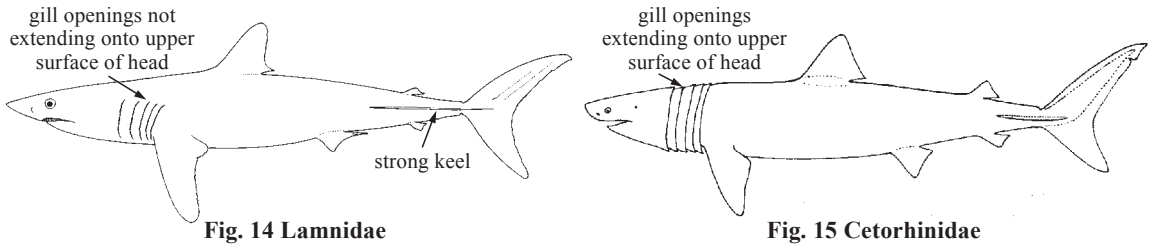
- 13a. Eyes behind mouth; deep nasoral grooves connecting nostrils and mouth → 14
- 13b. Eyes partly or entirely over mouth; nasoral grooves absent in Western Central Atlantic representatives → 15

- 14a. Mouth huge and nearly terminal; external gill slits very large, internal gill slits inside mouth cavity with filter screens; caudal peduncle with strong lateral keels; caudal fin with a strong ventral lobe, but without a strong terminal lobe and subterminal notch (Fig. 12) . . . Rhinodontidae
- 14b. Mouth smaller and subterminal; external gill slits small, internal gill slits without filter screens; caudal peduncle without strong lateral keels; caudal fin with a weak ventral lobe or none, but with a strong terminal lobe and subterminal notch (Fig. 13) Ginglymostomatidae



- 15a. A strong keel present on each side of caudal peduncle (Fig. 14,15); caudal fin crescentic and nearly symmetrical, with a long lower lobe → 16
- 15b. No keels on caudal peduncle, or weak ones; caudal fin asymmetrical, not crescentic, with ventral lobe relatively short or absent → 17

- 16a. Teeth large and few, sharp-edged; gill openings large but not extending onto upper surface of head; no gill rakers (Fig. 14) Lamnidae
- 16b. Teeth minute and very numerous, not sharp-edged; gill openings huge, extending onto upper surface of head; gill rakers present on internal gill openings in throat, sometimes absent after shedding (Fig. 15) Cetorhinidae



- 17a. Caudal fin about as long as rest of shark (Fig. 16) **Alopiidae**
17b. Caudal fin less than half the length of rest of shark → 18

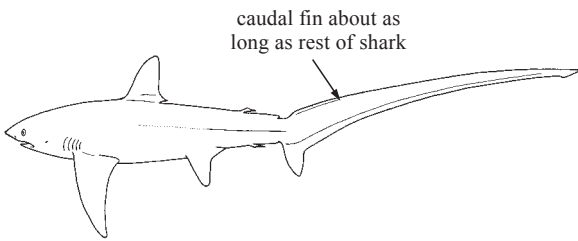


Fig. 16 Alopiidae

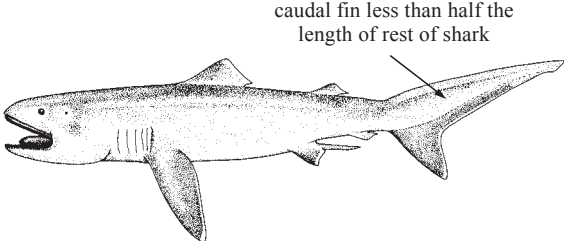


Fig. 17 Megachasmidae

- 18a. Mouth terminal on head, level with snout; internal gill openings screened by numerous long papillose gill rakers (Fig. 17) **Megachasmidae***
18b. Mouth subterminal on head, behind snout tip; internal gill openings either without gill rakers, or with a few low papillose gill rakers along their edges → 19
- 19a. No nictitating eyelids, largest teeth in mouth are 2 or 3 rows of anterior teeth on either side of lower jaw symphysis; upper anterior teeth separated from large lateral teeth at sides of jaw by a gap that may have one or more rows of small intermediate teeth; all gill slits in front of pectoral fins → 20
19b. Nictitating eyelids present; largest teeth in mouth are well lateral on dental band, not on either side of symphysis; no gap or intermediate teeth separating large anterior teeth from still larger lateral teeth in upper jaw; last 1 or 2 gill slits over pectoral-fin bases. → 22

- 20a. Snout elongated and blade-like; anal fin much larger than dorsal fins; no precaudal pits; caudal fin without ventral lobe (Fig. 18) . **Mitsukurinidae**
20b. Snout conical or flattened, short and not blade-like; anal fin subequal to dorsal fins in size or smaller than them; upper and sometimes lower precaudal pits present; caudal fin with strong ventral lobe → 21

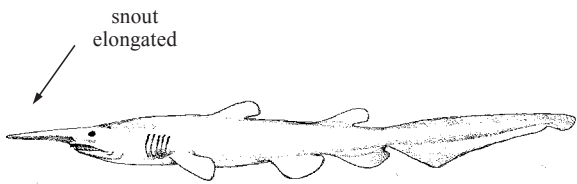


Fig. 18 Mitsukurinidae

- 21a. Eyes very large; gill slits extending onto upper surface of head; both upper and lower precaudal pits present; a low keel on each side of caudal peduncle (Fig. 19) . . **Pseudocarchariidae***
21b. Eyes smaller; gill slits not extending onto upper surface of head; lower precaudal pit absent; no keels on caudal peduncle (Fig. 20) **Odontaspidae**

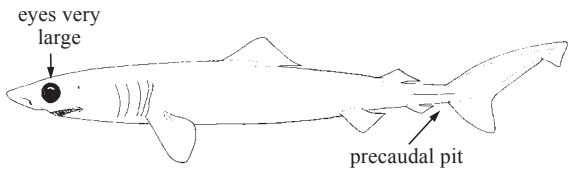


Fig. 19 Pseudocarchariidae

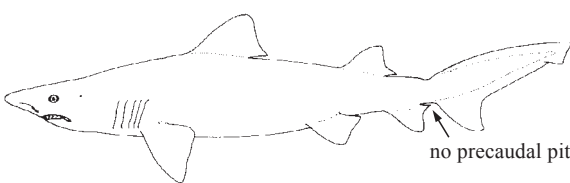


Fig. 20 Odontaspidae

- 22a. Origin of first dorsal fin over or behind pelvic-fin bases (Fig. 21) **Scyliorhinidae**
- 22b. Origin of first dorsal fin well ahead of pelvic-fin bases → 23

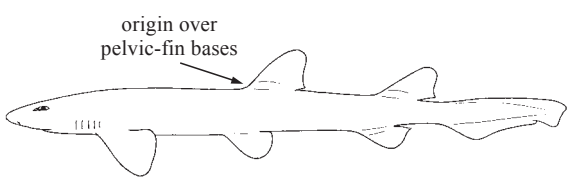


Fig. 21 Scyliorhinidae

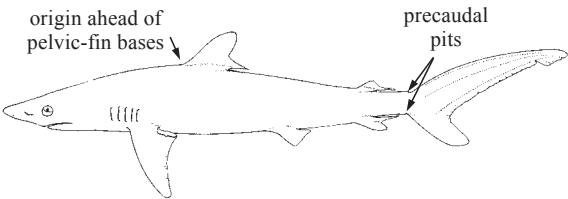


Fig. 22 Carcharhinidae

- 23a. Precaudal pits and rippled dorsal caudal-fin margin present; intestinal valve of scroll type (Fig. 22, 23a) **Carcharhinidae**
- 23b. No precaudal pits, dorsal caudal-fin margin smooth; intestinal valve of spiral type (Fig. 23b) → 24

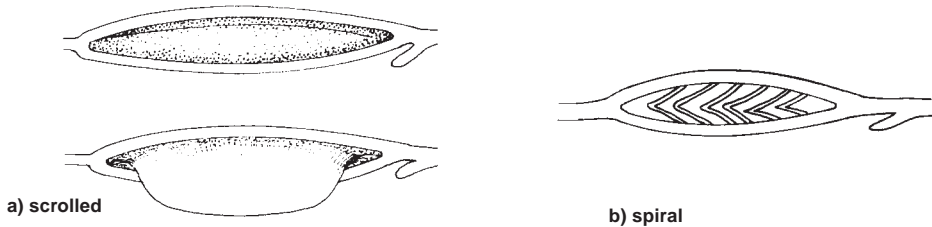


Fig. 23 intestinal valve types

- 24a. First dorsal fin long, about the length of caudal fin, and formed as a low, rounded keel; adults with over 200 rows of teeth in each jaw; spiracles nearly or quite as long as eyes (Fig. 24) **Pseudotriakidae***
- 24b. First dorsal fin short, about 2/3 of caudal fin or less, subtriangular in shape; adults with less than 110 rows of teeth in each jaw; spiracles much smaller than eyes → 25

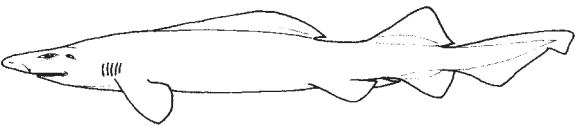


Fig. 24 Pseudotriakidae

- 25a. Labial furrows very short or absent, confined to extreme mouth corners; posterior teeth comb-like; base of first dorsal fin closer to pelvic-fin bases than to pectoral-fin bases (Fig. 25) **Proscylliidae**
- 25b. Labial furrows longer, extending anteriorly for a greater or lesser distance on lips; posterior teeth not comb-like; base of first dorsal fin either equidistant between pectoral- and pelvic-fin bases or closer to pectoral-fin bases (Fig. 26) **Triakidae**

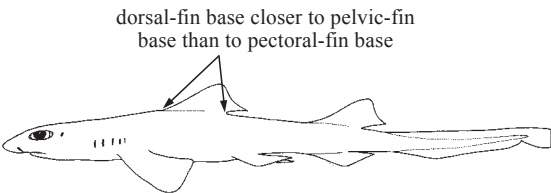


Fig. 25 Proscylliidae

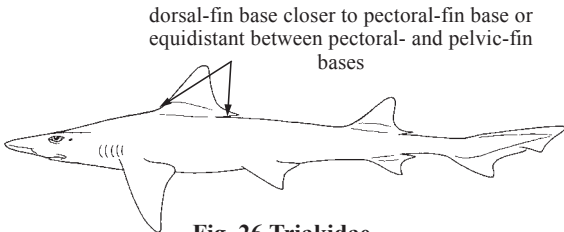




Fig. 26 Triakidae

LIST OF ORDERS, FAMILIES, AND SPECIES OCCURRING IN THE AREA


The symbol  is given when species accounts are included. A question mark indicates that presence in the area is uncertain. An asterisk (*) indicates species and families that occur near Area 31 and which are likely to be recorded in the area in the future. Family accounts are not provided for the Pseudocarchariidae, Megachasmidae, and Pseudotriakidae, but they are included in the family key above in anticipation of possible records in the future.

ORDER HEXANCHIFORMES: COW AND FRILLED SHARKS

CHLAMYDOSELACHIDAE: Frilled sharks

 *Chlamydoselachus anguineus* Garman, 1884.

HEXANCHIDAE: Sixgill and sevengill sharks, cow sharks

 *Heptanchias perlo* (Bonnaterre, 1788).

 *Hexanchus griseus* (Bonnaterre, 1788).

 *Hexanchus nakamurai* Teng, 1962.

ORDER SQUALIFORMES: DOGFISH SHARKS


ECHINORHINIDAE: Bramble sharks


 *Echinorhinus brucus* (Bonnaterre, 1788).

SQUALIDAE: Dogfish sharks


 *Cirrhigaleus asper* (Merrett, 1973).

 *Squalus acanthias* Linnaeus, 1758.

 *Squalus cubensis* Howell Rivero, 1936.

 *Squalus mitsukurii* Jordan and Snyder, in Jordan and Fowler, 1903.

CENTROPHORIDAE: Gulper sharks

 *Centrophorus acus* Garman, 1906.

 *Centrophorus granulosus* (Bloch and Schneider, 1801).

 *Centrophorus niaukang* Teng, 1959.

 *Centrophorus squamosus* (Bonnaterre, 1788).

Centrophorus sp.

 *Deania profundorum* (Smith and Radcliffe, in Smith 1912).


ETMOPTERIDAE: Lantern sharks

Centroscyllium fabricii (Reinhardt, 1825).*

 *Etmopterus bigelowi* Shirai and Tachikawa, 1993.

 *Etmopterus bullisi* Bigelow and Schroeder, 1957.


 *Etmopterus carteri* Springer and Burgess, 1985.


 *Etmopterus gracilispinis* Krefft, 1968.

 *Etmopterus hillianus* (Poey, 1861).


 *Etmopterus perryi* Springer and Burgess, 1985.


 *Etmopterus robbinsi* Schofield and Burgess, 1997.

 *Etmopterus schultzi* Bigelow, Schroeder and Springer, 1953.

 *Etmopterus virens* Bigelow, Schroeder and Springer, 1953.


SOMNIOSIDAE: Sleeper sharks

 *Centroscymnus coelolepis* Barbarosa du Bocage and Brito Capello, 1864.

 *Centroscymnus owstonii* Garman, 1906.

 *Zameus squamulosus* (Günther, 1877).

OXYNOTIDAE: Roughsharks

 *Oxynotus caribbaeus* Cervigón, 1961.

DALATIIDAE: Kitefin sharks

- ✦ *Dalatias licha* (Bonnaterre, 1788).
- ✦ *Isistius brasiliensis* (Quoy and Gaimard, 1824).
- ✦ *Isistius plutodus* Garrick and Springer, 1964.
- ✦ *Squaliolus laticaudus* Smith and Radcliffe, in Smith 1912.

ORDER SQUATINIFORMES: ANGELSHARKS**SQUATINIDAE: Angelsharks**

- ✦ *Squatina dumeril* Lesueur, 1818.

ORDER PRISTIOPHORIFORMES: SAWSHARKS**PRISTIOPHORIDAE: Sawsharks**

- ✦ *Pristiophorus schroederi* Springer and Bullis, 1960.

ORDER LAMNIFORMES: MACKEREL SHARKS**ODONTASPIDIDAE: Sand tiger sharks**

- ✦ *Carcharias taurus* Rafinesque, 1810.
- ✦ *Odontaspis ferox* (Risso, 1810).
- ✦ *Odontaspis noronhai* (Maul, 1955).

MITUKURINIDAE: Goblin sharks

- ✦ *Mitsukurina owstoni* Jordan, 1898.

PSEUDOCARCHARIIDAE: Crocodile sharks.*

- Pseudocarcharias kamoharai* (Matsubara, 1936).*

MEGACHASMIDAE: Megamouth sharks *

- Megachasma pelagios* Taylor, Compagno, and Struhsaker, 1983.*

ALOPIIDAE: Thresher sharks

- ✦ *Alopias superciliosus* (Lowe, 1839).
- ✦ *Alopias vulpinus* (Bonnaterre, 1788).

CETORHINIDAE: Basking sharks

- ✦ *Cetorhinus maximus* (Gunnerus, 1765).

LAMNIDAE: Mackerel sharks

- ✦ *Carcharodon carcharias* (Linnaeus, 1758).
- ✦ *Isurus oxyrinchus* Rafinesque, 1810.
- ✦ *Isurus paucus* Guitart Manday, 1966.
- ✦ *Lamna nasus* (Bonnaterre, 1788).

ORDER ORECTOLOBIFORMES: CARPET SHARKS**GINGLYMOSTOMATIDAE: Nurse sharks**

- ✦ *Ginglymostoma cirratum* (Bonnaterre, 1788).

RHINCODONTIDAE: Whale sharks

- ✦ *Rhincodon typus* Smith, 1828.

ORDER CARCHARHINIFORMES: GROUND SHARKS**SCYLIORHINIDAE: Catsharks**

- ✦ *Apristurus canutus* Springer and Heemstra, in Springer, 1979.
- ✦ *Apristurus laurussonii* (Saemundsson, 1922).
- ✦ *Apristurus parvipinnis* Springer and Heemstra, in Springer, 1979.
- ✦ *Apristurus profundorum* (Goode and Bean, 1896).
- ✦ *Apristurus riveri* Bigelow and Schroeder, 1944.

- ✦ *Galeus arae* (Nichols, 1927).
- ✦ *Galeus antillensis* Springer, 1979.
- ✦ *Galeus cadenati* Springer, 1966.
- ✦ *Galeus springeri* Konstantinou and Cozzi, 1998.
- ✦ *Parmaturus campechiensis* Springer, 1979.
- ✦ *Schroederichthys maculatus* Springer, 1966.
- ✦ *Schroederichthys tenuis* Springer, 1966.
- ✦ *Scyliorhinus boa* Goode and Bean, 1896.
- ✦ *Scyliorhinus haeckelii* (Miranda-Ribeiro, 1907).
- ✦ *Scyliorhinus hesperius* Springer, 1966.
- ✦ *Scyliorhinus meadi* Springer, 1966.
- ✦ *Scyliorhinus retifer* (Garman, 1881).
- ✦ *Scyliorhinus torrei* Howell Rivero, 1936.

PROSCYLLIIDAE: Finback catsharks

- ✦ *Eridacnis barbouri* (Bigelow and Schroeder, 1944).

PSEUDOTRIAKIDAE: False catsharks *

- Pseudotriakis microdon* Brito Capello, 1868.*

TRIAKIDAE: Houndsharks

- ✦ *Mustelus canis* (Mitchell, 1815).
- ✦ *Mustelus higmani* Springer and Lowe, 1963.
- ✦ *Mustelus minicanis* Heemstra, 1997.
- ✦ *Mustelus norrisi* Springer, 1939.
- ✦ *Mustelus sinusmexicanus* Heemstra, 1997.

CARCHARHINIDAE: Requiem sharks

- ✦ *Carcharhinus acronotus* (Poey, 1860).
- ✦ *Carcharhinus altimus* (Springer, 1950).
- ✦ *Carcharhinus brachyurus* (Günther, 1870).
- ✦ *Carcharhinus brevipinna* (Müller and Henle, 1839).
- ✦ *Carcharhinus falciformis* (Müller and Henle, 1839).
- ✦ *Carcharhinus galapagensis* (Snodgrass and Heller, 1905).
- ✦ *Carcharhinus isodon* (Müller and Henle, 1839).
- ✦ *Carcharhinus leucas* (Müller and Henle, 1839).
- ✦ *Carcharhinus limbatus* (Müller and Henle, 1839).
- ✦ *Carcharhinus longimanus* (Poey, 1861).
- ✦ *Carcharhinus obscurus* (Lesueur, 1818).
- ✦ *Carcharhinus perezi* (Poey, 1876).
- ✦ *Carcharhinus plumbeus* (Nardo, 1827).
- ✦ *Carcharhinus porosus* (Ranzani, 1840).
- ✦ *Carcharhinus signatus* (Poey, 1868).
- ✦ *Galeocerdo cuvier* (Péron and Lesueur, in Lesueur, 1822).
- ✦ *Isogomphodon oxyrhynchus* (Müller and Henle, 1839).
- ✦ *Negaprion brevirostris* (Poey, 1868).
- ✦ *Prionace glauca* (Linnaeus, 1758).
- ✦ *Rhizoprionodon lalandii* (Müller and Henle, 1839).
- ✦ *Rhizoprionodon porosus* (Poey, 1861).
- ✦ *Rhizoprionodon terraenovae* (Richardson, 1836).

SPHYRNIDAE: Hammerhead sharks

★ *Sphyrna lewini* (Griffith and Smith, 1834).

★ *Sphyrna media* Springer, 1940.

★ *Sphyrna mokarran* (Rüppell, 1837).

★ *Sphyrna tiburo* (Linnaeus, 1758).

★ *Sphyrna tudes* (Valenciennes, 1822).

★ *Sphyrna zygaena* (Linnaeus, 1758).

References

- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. *In* Fishes of the Western North Atlantic. *Mem. Sears Fnd. Mar. Res.*, (1)1:56-576.
- Bonfil, R.S. 1994. Overview of world elasmobranch fisheries. *FAO Fish. Tech. Pap.*, (341):1-119.
- Bonfil, R.S. 1997. Status of shark resources in the Southern Gulf of Mexico and Caribbean: implications for management. *Fish. Res. (Amsterdam)*, 29(2):101-117.
- Cadenat, J., and J. Blache. 1981. Requins de Méditerranée et d'Atlantique (plus particulièrement de la Côte Occidentale d'Afrique). *Ed. OSTROM, Faune Tropicale*, (21):330 p.
- Castro, J.I. 1983. *The sharks of North American waters*. Texas A&M University Press, 180 p.
- Castro, J.I., C.M. Woodley, and R.L. Brudek. 1999. A preliminary evaluation of the status of shark species. *FAO Fisheries Technical Paper*, (380):1-72.
- Compagno, L.J.V. 1973. Interrelationships of living elasmobranchs. *In* Interrelationships of fishes, edited by P. H. Greenwood, R. S. Miles and C. Patterson. *Zool. J. Linn. Soc., Supp.*, (1)53:15-61.
- Compagno, L.J.V. 1978. Sharks. *In* *FAO species identification sheets for fisheries purposes. Western Central Atlantic, Fishing Area 31*, edited by W. Fischer. Rome, FAO, vol. 5, 8 p.
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:250 p.
- Compagno, L.J.V. 1990. Shark exploitation and conservation. *In* Elasmobranchs as living resources: Advances in the biology, ecology, systematics, and the status of the fisheries, edited by H.L. Pratt, Jr., S. H. Gruber, and T. Taniuchi. *NOAA Tech. Rept.*, (90):397-420.
- De Carvalho, M. 1996. Higher-level elasmobranch phylogeny, basal squalians, and paraphyly. *In* *Interrelationships of Fishes*, edited by Melanie L.J. Stiassny, Lynne R. Parenti, and G. David Johnson. Academic Press, San Diego, pp 35-62.
- Garman, S. 1997. *The Plagiostoma (sharks, skates and rays)*. Benthic Press, Los Angeles, California, 515 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, vol. 1, Myxiniiformes to Gasterosteiformes. University of Texas Press, Austin, Texas, 1112 p.
- Shirai, S. 1996. Phylogenetic interrelationships of neoselachians (Chondrichthyes, Euselachii). *In* *Interrelationships of Fishes*, edited by Melanie L.J. Stiassny, Lynne R. Parenti, and G. David Johnson. Academic Press, San Diego, 9-34 pp.

Order HEXANCHIFORMES

CHLAMYDOSELACHIDAE

Frimled sharks

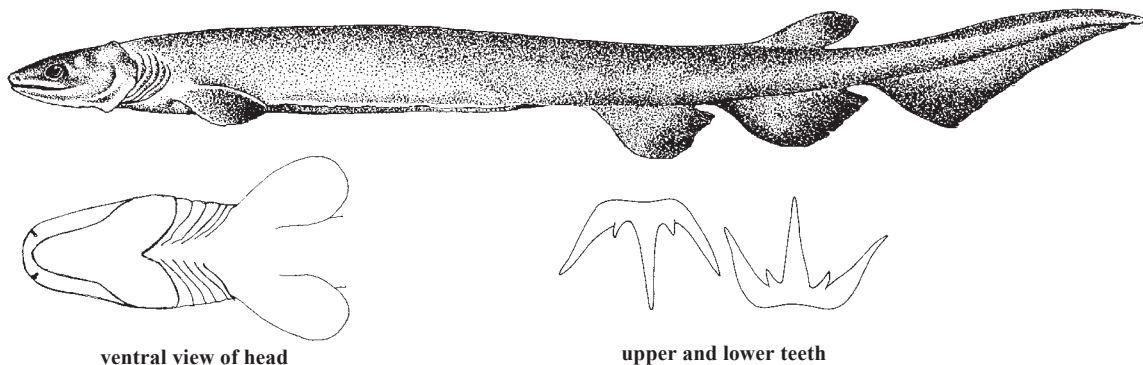
A single species in this family.

Chlamydoselachus anguineus Garman, 1884

HXC

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Frilled shark; **Fr** - Requin lézard; **Sp** - Tiburón anguila.



ventral view of head

upper and lower teeth

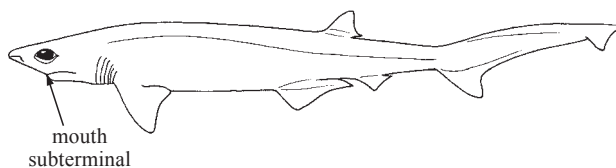
Diagnostic characters: A medium-sized shark with a long, eel-like body. Nostrils without barbels or nasoral grooves; no nictitating lower eyelids; snout very short, bluntly rounded; **mouth extremely long, extending far behind the eyes, and nearly terminal**; **teeth of upper and lower jaws alike, with 3 strong cusps and a pair of minute cusplets between them, not compressed or blade-like**. Head with 6 pairs of long and frilly gill slits, the last in front of pectoral-fin origins, **the first connected to each other across the throat by a flap of skin**; no gill rakers on inner gill slits. **A single low dorsal fin, posterior to pelvic fins**; anal fin present; caudal fin strongly asymmetrical, with subterminal notch vestigial or absent and without a ventral caudal lobe. Caudal peduncle compressed, without keels or precaudal pits. Intestinal valve of spiral type. **Colour:** grey-brown above, sometimes lighter below, fins dusky.

Similar families occurring in the area

Hexanchidae: Snout longer, mouth subterminal, body more stocky and cylindrical, comb-like cutting teeth in the lower jaw, first gill slits not connected across the throat, higher, more anterior dorsal fin, and strong subterminal notch on the caudal fin.

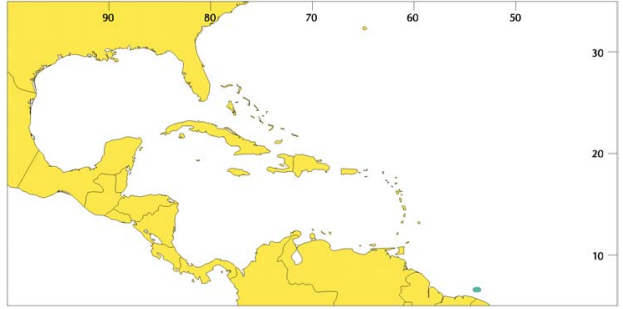
Size: Maximum about 196 cm; size at birth about 39 cm; adults common to 150 cm.

Habitat, biology, and fisheries: A relatively rare deep water, bottom-dwelling, and pelagic shark, with a depth range between 120 and 1 280 m on the continental slopes and well above them, but sometimes found at the surface and in shallow inshore waters. Ovoviviparous, number of young 8 to 12. Feeds on cephalopods, other sharks, and bony fishes. Incidentally caught offshore in deep water. Separate statistics are not reported for this species. Rarely taken in bottom trawls and other gear, not utilized in the area but used for fish meal elsewhere.



Hexanchidae

Distribution: A wide-ranging but sporadically distributed shark that occurs off Suriname, Guayana, and French Guiana in the area, but also the eastern North Atlantic and western and eastern Pacific. The southern African representative may be a distinct species.



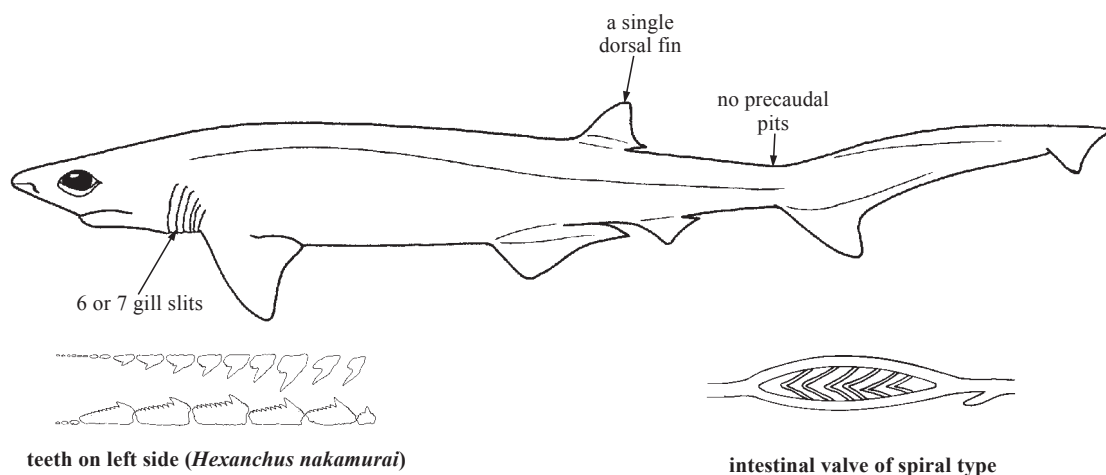
References

- Compagno, L. J. V. 1984. FAO Species Catalogue. Vol. 4. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125) Vol.4, Pt.1:250 p.
- Ebert, D.A. 1990. *The taxonomy, biogeography and biology of cow and frilled sharks (Chondrichthyes: Hexanchiformes)*. Unpub. Ph.D. thesis, Grahamstown, Rhodes University, 308 p.
- Gudger, E. W. and B. G. Smith. 1933. The natural history of the frilled shark, *Chlamydoselachus anguineus*. *Bashford Dean Memorial Volume: Archaic Fishes*, 6:245-319.

HEXANCHIDAE

Cowsharks, sixgill, and sevengill sharks

Diagnostic characters: Small to large sharks with slender to stout bodies, not eel-shaped. Head with **6 or 7 pairs of long gill slits**, the last in front of pectoral-fin origins, **the first pair not connected across throat**; no nictitating lower eyelids; snout short, acutely to bluntly pointed; nostrils without barbels or nasoral grooves; mouth very long and extending far behind the eyes; **teeth of upper and lower jaws unlike at sides of mouth**, uppers small, narrow, with a main cusp and often smaller cusplets, **lowers very large, broad, compressed, and saw-like**, with a series of cusps or large cusplets; short dermal gill rakers present on inner gill slits; spiracles present, small. **A single dorsal fin, posterior to pelvic fins**; anal fin present; caudal fin much less than half the total length, strongly asymmetrical, with a pronounced subterminal notch but the lower lobe very short. Caudal peduncle not depressed, without keels; no precaudal pits. Intestinal valve of spiral type. **Colour:** grey, blackish, or brown above, lighter below.

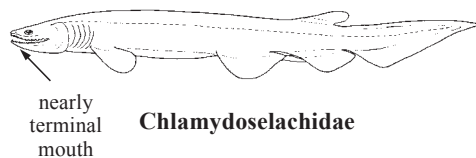


Habitat, biology, and fisheries: These are moderately abundant, inshore to deep-water sharks, found in shallow bays down to the continental slopes and submarine canyons, near the bottom or well above it. They eat a wide variety of bony fishes, other sharks, batoid fishes, marine mammals, cephalopods, and crustaceans. They are taken in deep-water line fisheries for sharks off Cuba in the area and elsewhere, and are incidentally caught in trawls. Cow sharks are relatively unimportant but regular components of targeted shark fisheries and bycatches of other fisheries. They may snap during capture or when provoked. Divers encountering the larger species underwater have found them to be docile, and at least one species is the subject of ecotouristic dive trips.

Similar families occurring in the area

Chlamydoselachidae: the wide-ranging, deep-water frill shark (*Chlamydoselachus anguineus*) has a single dorsal fin and 6 gill slits, but is distinguished by a nearly terminal mouth, first pair of gill slits connected across the throat, small, 3-cusped teeth in both jaws, and a long, almost eel-like body.

No other sharks in the area have a single dorsal fin and 6 or 7 gill slits.



Key to the species of Hexanchidae occurring in the area

- 1a. Seven gill slits (Fig. 1) . . . *Hepranchias perlo*
1b. Six gill slits (*Hexanchus*) → 2



Fig. 1 *Hepranchias perlo*

- 2a. Lower jaw with 6 rows of large comb-like teeth on each side; dorsal-fin base separated from upper caudal-fin origin by a distance about equal to or slightly greater than its length; size very large, up to 4.8 m (Fig. 2) *Hexanchus griseus*
2b. Lower jaw with 5 rows of large comb-like teeth on each side; dorsal-fin base separated from upper caudal-fin origin by a distance much greater than its length; size smaller, up to 1.8 m (Fig. 3) *Hexanchus nakamurai*



Fig. 2 *Hexanchus griseus*

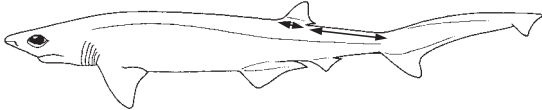






Fig. 3 *Hexanchus nakamurai*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Hepranchias perlo* (Bonnaterre, 1788).
 *Hexanchus griseus* (Bonnaterre, 1788).
 *Hexanchus nakamurai* Teng, 1962.

References

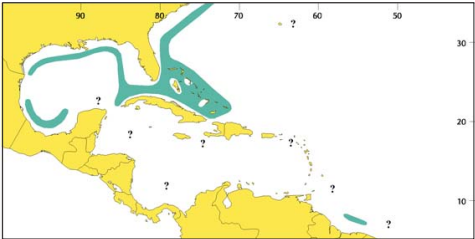
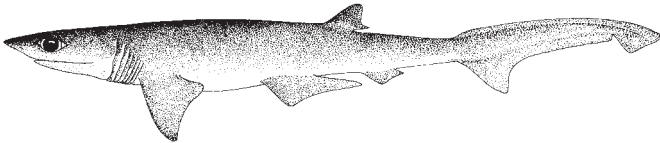
Bigelow, H.B. and W.C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.* (1):1:56-576.
Compagno, L.J.V. 1978. Hexanchidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31), Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).
Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125) Vol. 4 Pt. 1: 250 p.
Ebert, D.A. 1990. *The taxonomy, biogeography and biology of cow and frilled sharks (Chondrichthyes: Hexanchiformes)*. Unpub. Ph.D. thesis, Grahamstown, Rhodes University, 308 p.
McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, vol. 1, Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.
Springer, S. and R.A. Waller. 1969. *Hexanchus vitulus*, a new sixgill shark from the Bahamas. *Bull. Mar. Sci.*, 19(1):159-174.

Heptanchias perlo (Bonnaterre, 1788)

HXT

En - Sharpnose sevengill shark; **Fr** - Requin perlon; **Sp** - Cañabota bocadulce.

Maximum total length to about 137 cm. On bottom of outer continental and insular shelves and upper slopes in depths of 100 to 400 m, also inshore and down to 1 000 m. Feeds on wide variety of bony fishes, small elasmobranchs, crustaceans, and cephalopods. Caught as bycatch in bottom trawls, and of minor importance to fisheries. Almost circumglobal in tropical and temperate seas, except for the eastern North Pacific, with a primarily continental distribution. Sometimes placed in its own family, Heptanchidae.

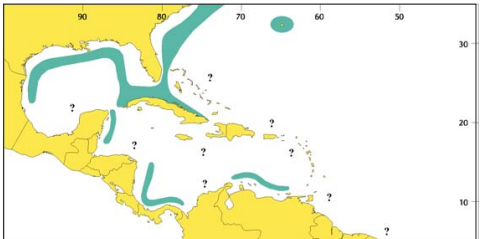
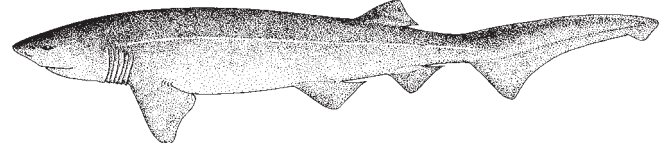


Hexanchus griseus (Bonnaterre, 1788)

SBL

En - Bluntnose sixgill shark; **Fr** - Requin grise; **Sp** - Cañabota gris (Cañabota).

Maximum total length to about 480 cm. On outer continental and insular shelves and upper slopes down to at least 1 875 m, most common between 500 and 1 100 m, occasionally at surface and close inshore. Benthic or pelagic, sluggish, bottom-dwelling; feeds on a wide range of marine organisms. Caught in bottom trawls and hook-and-line; utilized fresh, frozen, and dried salted, also for fish meal and oil. In tropical and temperate areas of western Atlantic, eastern Atlantic, Mediterranean, southern Africa, western Pacific, including Hawaii, and eastern Pacific. Almost circumglobal in tropical and temperate seas, found off continents, oceanic islands, and on seamounts.

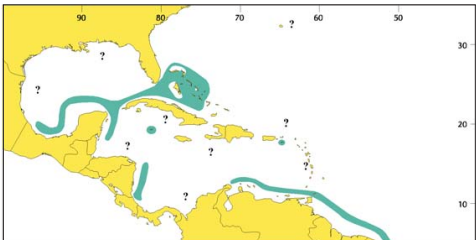
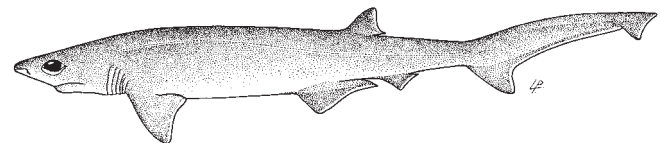


Hexanchus nakamurai Teng, 1962

HXN

En - Bigeye sixgill shark; **Fr** - Requin vache; **Sp** - Cañabota ojigrande.

Maximum total length to about 180 cm. On continental and insular shelves and upper slopes, usually near the bottom at depths from 90 to 600 m. Feeds on bony fishes and crustaceans. Western North Atlantic: Off Florida, USA and the Bahamas, northern Cuba, Cayman and Virgin Islands, Yucután and Gulf coast of Mexico, Nicaragua, Costa Rica, Venezuela, and the Guyanas; eastern Atlantic from France to Morocco, including the Mediterranean, Indo-West Pacific off eastern and southern Africa and Japan, Taiwan Province of China, Philippines, New Caledonia, Tahiti, and Australia. *Hexanchus vitulus* Springer and Waller, 1969 is a junior synonym of this species and was used in its place by Compagno (1978, 1984).



Order SQUALIFORMES

ECHINORHINIDAE

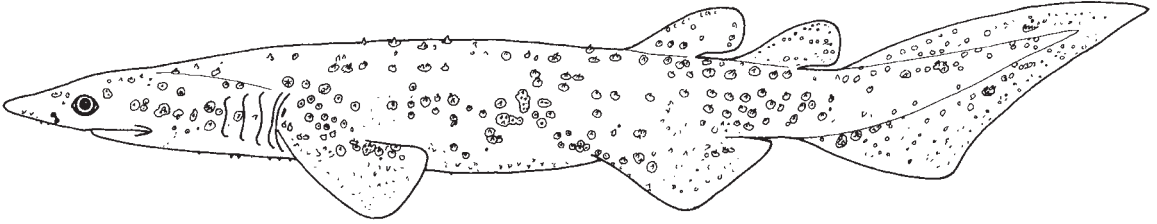
Bramble sharks

A single species occurring in the area.

Echinorhinus brucus (Bonnaterre, 1788)

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Bramble shark; **Fr** - Squalé bouclé; **Sp** - Tiburón de clavos.



Diagnostic characters: Large sharks with stout cylindrical bodies and no abdominal ridges. Head moderately depressed; last (fifth) gill slits abruptly expanded in width; spiracles present, very small, well behind eyes; nostrils far apart from each other; snout short; mouth broadly arched, **with very short labial furrows** that do not encircle mouth, lips not papillose; **teeth alike in both jaws, strongly compressed and blade-like, with a cusp and up to three side cusplets in adults**, but with a cusp only in young. **Two small spineless posterior dorsal fins, both smaller than the pelvic fins, situated close together, the origin of the first dorsal fin behind the pelvic-fin origins; anal fin absent; caudal fin without a subterminal notch. Dermal denticles very large and thorn-like.** Intestinal valve of spiral type. **Colour:** blackish to greyish brown above and below.

Similar families occurring in the area

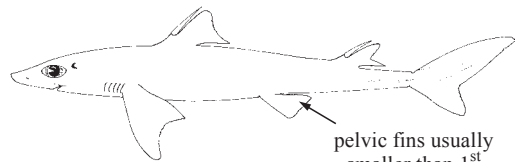
Squalidae, Centrophoridae, Somniosidae, Etmopteridae, Dalatiidae and Pristiophoridae: fifth gill slits not abruptly larger than first to fourth; spiracles larger; first dorsal-fin origin well anterior to pelvic-fin origins; pelvic fins usually about as large as second dorsal fin or smaller; Pristiophoridae also with rostral saw and barbels.

Squatinae: trunk much flattened dorsoventrally; mouth terminal; eyes on upper surface of head; teeth not blade-like, with a single cusp and no cusplets; origin of first dorsal fin posterior to pelvic-fin bases; anterior margins of pectorals expanded as triangular lobes past the gill slits and partly concealing them; both the pectoral and pelvic fins very large and wing-like; caudal fin nearly symmetrical, but with a lower lobe longer than the upper.

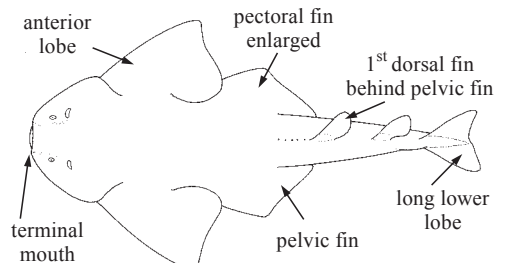
All other shark families: anal fin present.

Size: Maximum total length about 3.1 m; size at birth about 45 to 48 cm; size at maturity about 220 to 220 cm for females and near 150 cm for males.

Habitat, biology, and fisheries: Bottom-living on the continental shelves and slopes from close inshore to 900 m. Feeds on small bony fishes, other sharks and crabs. Not fished commercially in the area but utilized elsewhere; possibly caught as discarded bycatch of offshore demersal fishing fleets.

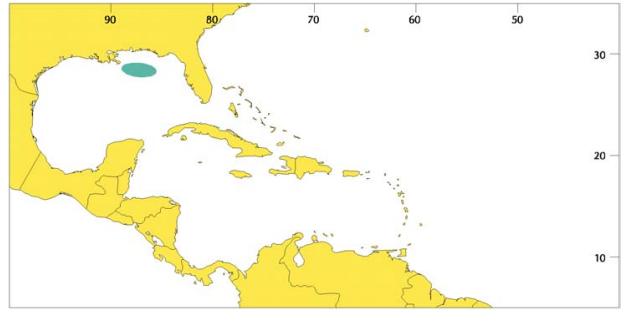


Squalidae



Squatinae

Distribution: Wide-ranging in tropical and temperate areas in the Atlantic, Mediterranean Sea, Indian Ocean, and western Pacific. In the area in the northern Gulf of Mexico and possibly the Atlantic coast of the USA (definitely known from Massachusetts to Virginia).



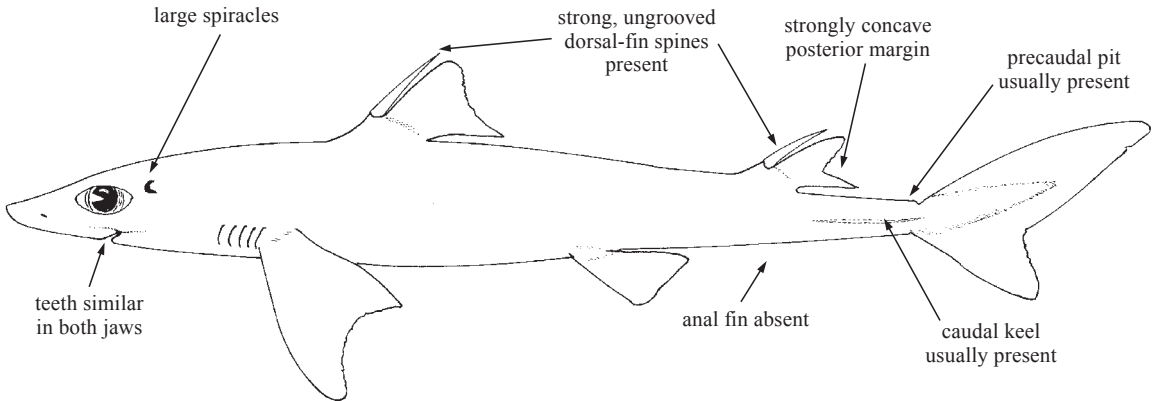
References

- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Fnd. Mar. Res.*, (1):56-576.
- Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harvard*, 117:1-150.
- Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d'Atlantique (plus particulièrement de la Côte Occidentale d'Afrique). *Ed. OSTROM, Faune Tropicale*, (21):330 p.
- Compagno, L. J. V. 1984. FAO Species Catalogue. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:250 p.
- Garrick, J. A. F. 1960. Studies on New Zealand Elasmobranchii. Part X. The genus *Echinorhinus*, with an account of a second species, *E. cookei*. *Trans. R. Soc. New Zealand*, 88(1):105-117.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, vol. 1, Myxiniiformes to Gasterosteiformes*. University of Texas Press, Austin, Texas, 1112 p.
- Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Hokkaido University Press, Sapporo, 151 p.

SQUALIDAE

Dogfish sharks

Diagnostic characters: Small to moderately large sharks, with cylindrical bodies; no ridges between pectoral and pelvic fins, caudal keels and usually precaudal pits present on caudal peduncle. **Head with 5 gill slits, all anterior to pectoral fins**, the fifth not abruptly longer than the others; **spiracles always present, large and just behind eyes; eyes on sides of head, without nictitating eyelids**. Snout short to moderately elongated, broad, flattened, not formed as a rostral saw; no barbels on snout; nostrils wide-spaced, internarial width greater than nostril width; mouth short and nearly transverse, lips smooth; **teeth strong-cusped, similar in both jaws, compressed, broad, blade-like and without cusplets, adjacent teeth imbricated, upper teeth nearly as large as lowers**. **Two dorsal fins with a long strong ungrooved spine present** on their anterior margins; dorsal fins large, angular, broad, and with **strongly concave posterior margins**; first dorsal fin larger or subequal in area to second dorsal fin; origin of first dorsal fin far in front of pelvic-fin origins, over or behind pectoral-fin insertion, and in front of or just behind pectoral-fin free rear tip; pelvic fins subequal to or smaller than second dorsal fin; **no anal fin**; caudal fin strongly asymmetrical, with subterminal notch present and with a ventral lobe varying from virtually absent to strong. Dermal denticles close-set, not greatly enlarged and plate-like. **Colour:** body and fins greyish or brownish, without conspicuous black marks and luminescent organs.

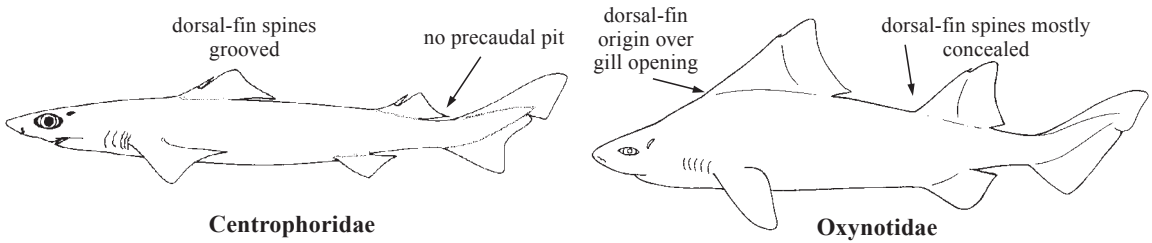


Habitat, biology, and fisheries: Spiny dogfishes mostly occur in deeper water (50 m and more) on outer shelves and uppermost slopes in warm-temperate and tropical seas such as those of Area 31; those occurring in cold-temperate and boreal water (to the north of Area 31) range close inshore and enter the intertidal zone. Spiny dogfishes often form schools and may be among the most abundant of living sharks; they feed mainly on fishes and small marine invertebrates and may cause damage to fishing gear when preying on the catch. Some species are highly appreciated as food. The family has importance as a major fishery resource for food and for liver oil and has been fished intensively in many areas both as target fisheries and as utilized and discarded bycatch. Some species have conservation problems due to overfishing despite their present (or former) abundance, because they are very long-lived, have long maturation periods, and low fecundity.

Similar families occurring in the area

Centrophoridae, Etmopteridae, Somniosidae and Dalatiidae: upper teeth conspicuously smaller than lower teeth, dorsal fin spines either absent or grooved, no precaudal pits, most species without strong precaudal keels.

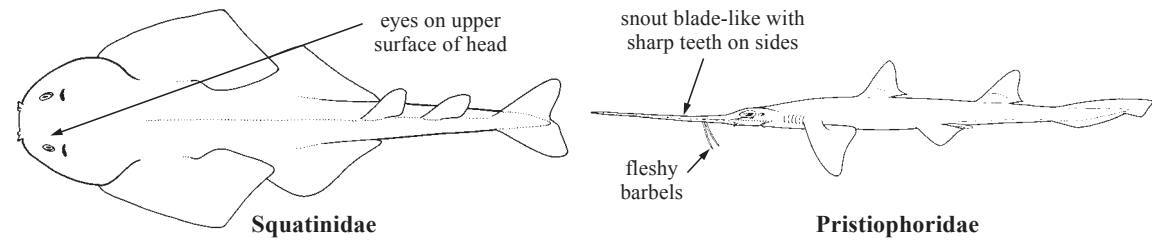
Oxynotidae: body strongly compressed, very high, and triangular in cross-section; with lateral ridges between the pectoral and pelvic-fin bases; dorsal fins broad-based, triangular, sail-like, and with large spines mostly concealed within them; first dorsal fin with its origin extending far forward over gill openings.



Squatinidae: trunk much flattened dorsoventrally; eyes on upper side of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.

Pristiophoridae: dorsal fins without spines; snout greatly elongated, blade-like, armed on either aide with sharp teeth and with a long, fleshy barbel.

All other shark families: anal fin present.



Key to the species of Squalidae occurring in the area

- 1a. Snout and head very broad; anterior nasal flap broad (Fig. 1a); first dorsal fin about as large as second; pectoral fins broad and not strongly falcate; precaudal pit absent (Fig. 1b)
..... *Cirrhigaleus asper*
- 1b. Snout and head narrower; anterior nasal flap narrow (Fig. 2a); second dorsal fin much smaller than first; pectoral fins narrow and falcate; precaudal pits well developed → 2

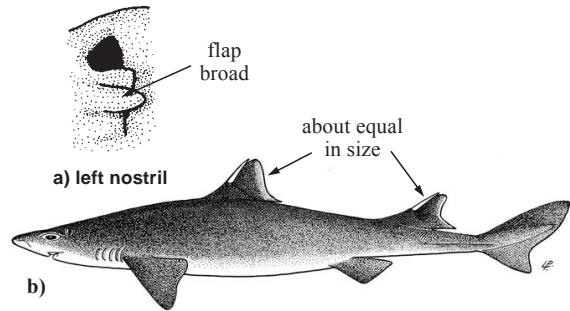


Fig. 1 *Cirrhigaleus asper*

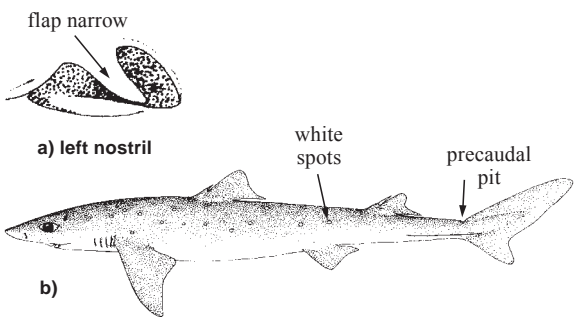


Fig. 2 *Squalus acanthias*

- 2a. First dorsal-fin spine well posterior to free rear tips of pectoral fins; white spots present on sides (occasionally absent in adults) (Fig. 2b) *Squalus acanthias*
- 2b. First dorsal-fin spine anterior to or over free rear tips of pectoral fins; no white spots → 3

- 3a. Distance from tip of snout to inner corner of nostril greater than that from inner corner of nostril to upper labial furrow; posterior margins of pectoral fins weakly concave, their free rear tips rounded; denticles broad and tricuspidate on sides of body; dorsal fins without conspicuous black apical blotches *Squalus mitsukurii*
- 3b. Distance from tip of snout to inner corners of nostrils less than that from inner corners of nostrils to upper labial furrows; posterior margins of pectoral fins deeply concave and free rear tips acutely pointed; denticles from sides of body narrow and unicuspidate; dorsal fins with conspicuous black apical blotches *Squalus cubensis*

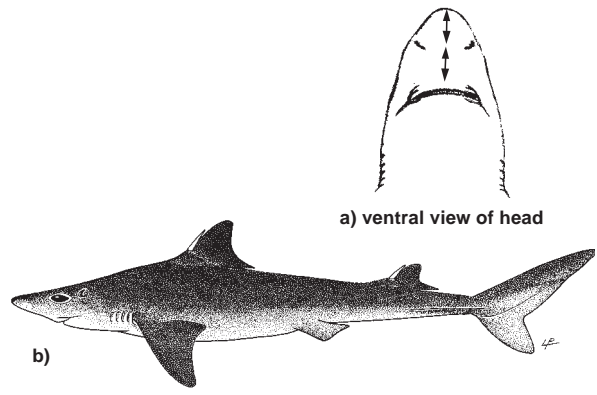


Fig. 3 *Squalus mitsukurii*

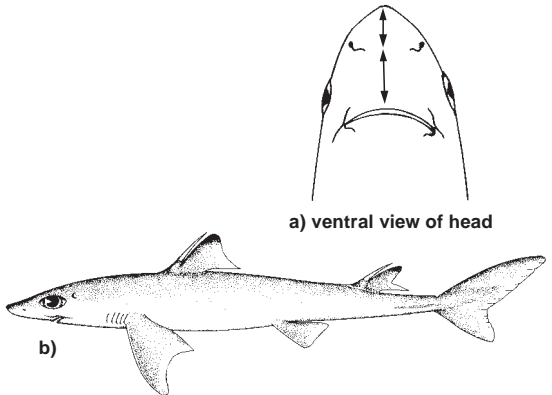







Fig. 4 *Squalus cubensis*

List of species occurring in the area

- The symbol  is given when species accounts are included.
-  *Cirrhigaleus asper* (Merrett, 1973).
 -  *Squalus acanthias* Linnaeus, 1758.
 -  *Squalus cubensis* Howell-Rivero, 1936.
 -  *Squalus mitsukurii* Jordan and Snyder, In Jordan and Fowler, 1903.

References

Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In Fishes of the Western North Atlantic. *Mem. Sears Fnd. Mar. Res.*, (1)1:56-576.

Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harvard*, 117:150 p.

Bonfil, R.S. 1997. Status of shark resources in the Southern Gulf of Mexico and Caribbean: implications for management. *Fisheries Research (Amsterdam)*, 29(2):101-117.

Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d' Atlantique (plus particulièrement de la Côte Occidentale d' Afrique). *Ed. OSTROM, Faune Tropicale*, (21):330 p.

Compagno, L.J.V. and R. Vergara R. 1978. Squalidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31) Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).

Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:250 p.

McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, vol. 1, Myxiniiformes to Gasterosteiformes. Austin, University of Texas Press, 1112 p.

Muñoz-Chapuli, R. and F. Ramos. 1989. Morphological comparison of *Squalus blainvillei* and *S. megalops* in the Eastern Atlantic, with notes on the genus. *Japanese J. Ichthyol.*, 36(1):6-21.

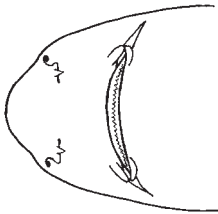
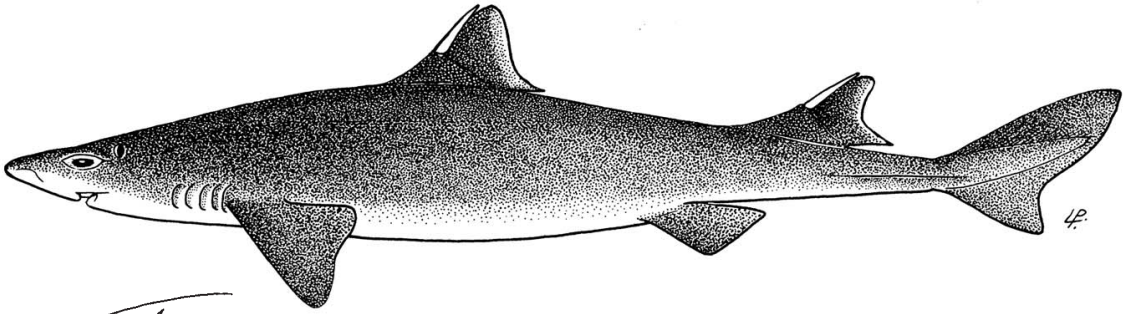
Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Sapporo, Hokkaido University Press, 151 p.

Cirrhigaleus asper (Merrett, 1973)

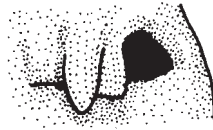
CHZ

Frequent synonyms / misidentifications: *Squalus asper* Merrett, 1973 / None.

FAO names: **En** - Roughskin spurdog (AFS: Roughskin dogfish) ; **Fr** - Aiguillat à peau rugueuse; **Sp** - Galludo raspa.



ventral view of head



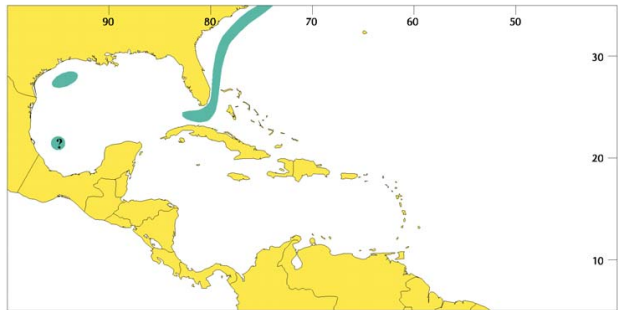
left nostril

Diagnostic characters: Body stocky and spindle-shaped. **Snout and head very broad, snout bluntly rounded; anterior nasal flap broad;** distance from tip of snout to inner corner of nostril about equal to that from inner corner of nostril to upper labial furrow; spiracle large, halfmoon-shaped; mouth only very slightly arched. **Teeth alike in both jaws, small, compressed and with a single cusp deeply notched outward end strongly oblique.** Skin very rough, denticles very broad and tricuspidate on sides of body. A strong, long spine without lateral grooves on anterior margin of both dorsal fins; origin of first dorsal-fin spine behind pectoral-fin rear tips; second dorsal fin about as large as first; pectoral fins broad and not falcate, free rear tips of pectoral fins bluntly rounded, posterior margins of fins nearly straight; midbases of pelvic fins much closer to origin of second dorsal fin than to insertion of first dorsal fin. Caudal peduncle flattened below, with an obscure longitudinal keel low down on each side; **upper precaudal pit weakly developed or absent, no lower precaudal pit. Caudal fin without a subterminal notch. Colour:** uniform light brown, grey, or brownish grey above, **no white spots on sides**, whitish below and sometimes with dark mottling; dorsal fins without black markings or with a black patch on the second dorsal-fin apex, **posterior margins of fins conspicuously whitish;** iris greyish blue.

Size: Maximum total length about 118 cm; size at birth about 25 to 28 cm; adults 85 to 118 cm.

Habitat, biology, and fisheries: Relatively common on the upper continental and insular slopes at depths of 73 to 600 m, in the area at 324 m. Ovoviparous with large litters of 10 to 22 young. Feeds on bony fishes and cephalopods. Little known, apparently without great importance to fisheries in Area 31 but probably caught as bycatch of trawl and line fisheries off the USA.

Distribution: In Area 31, this species occurs off the eastern Atlantic coast of the USA from North Carolina to Florida, and off the Gulf of Mexico coast of the USA (Texas) and Mexico; also off southern Brazil. Otherwise widely but sporadically distributed in the South Atlantic, west-central Indian Ocean, and central Pacific (Hawaiian Islands).

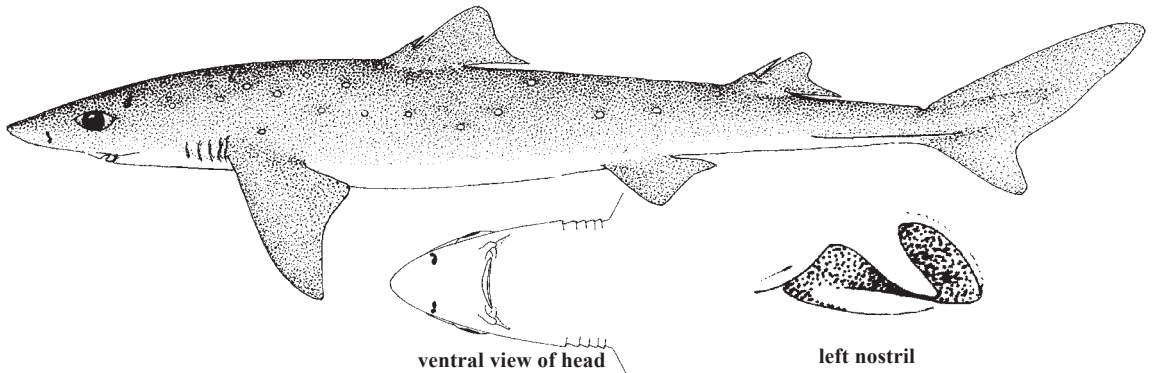


Squalus acanthias Jordan and Snyder, 1903

DGS

Frequent synonyms / misidentifications: None / None.

FAO names: En - Piked dogfish (AFS: Spiny dogfish); Fr - Aiguillat commun; Sp - Mielga.

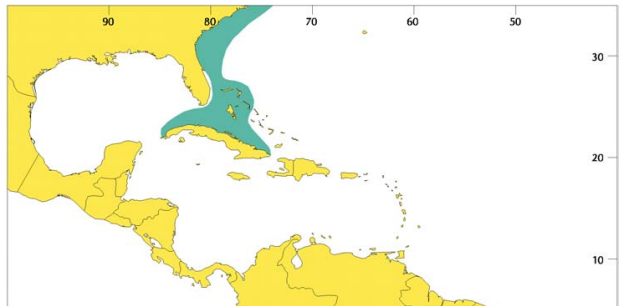


Diagnostic characters: Body elongate and spindle-shaped. **Snout and head narrow, snout pointed;** anterior nasal flap narrow; distance from tip of snout to inner corner of nostril slightly more, about equal, or slightly less than that from inner corner of nostril to upper labial furrow; spiracle large, halfmoon-shaped; mouth only very slightly arched. **Teeth alike in both jaws, small, compressed, and with a single cusp deeply notched outward end strongly oblique.** Skin smooth, denticles on sides of body narrow and unicuspid in young but broad and tricuspidate in adults. A strong, long spine without lateral grooves on anterior margin of both dorsal fins; origin of first dorsal-fin spine behind pectoral-fin rear tips; second dorsal fin much smaller than first; pectoral fins narrow and falcate or semifalcate, free rear tips of pectoral fins narrowly rounded, posterior margins of fins weakly to moderately concave; midbases of pelvic fins much closer to origin of second dorsal fin than to insertion of first dorsal fin. Caudal peduncle flattened below, with an obscure longitudinal keel low down on each side; **upper precaudal pit strongly developed**, no lower precaudal pit. **Caudal fin without a subterminal notch.** **Colour:** bluish grey or grey above and lighter grey to whitish below, **white spots or dashes often present on sides** (occasionally absent in adults); dorsal fins with black apical patches and white posterior markings in young but plain or with dusky tips in adults; iris green.

Size: Maximum total length exceptionally to about 200 cm but most adults smaller than 130 cm; size at birth 18 to 33 cm; size at maturity 52 to over 104 cm for males and 66 to over 120 cm for females, varying in different populations.

Habitat, biology, and fisheries: A common to abundant dogfish on the continental and insular shelves and upper and middle slopes of boreal to subtropical seas, at depths from the intertidal to possibly 1 446 m, with a tendency to occur close inshore in higher latitudes and in deep water closer to the equator; recorded depths in the area 8 to 619 m. Highly mobile and migratory, showing seasonal migrations along the Atlantic coast of North America. Ovoviparous, number of young 1 to 32. Feeds primarily on bony fishes, both demersal and pelagic, but also eats small cartilaginous fishes, cephalopods, crustaceans, gastropods, bivalves, polychaete worms, sea cucumbers, jellyfish, and comb jellies. Caught in bottom trawls and with limited importance to fisheries in Area 31 compared to other areas of the North Atlantic where massive catches occur. Relatively small catches of dogfish (310 to 4 500 t per year, including this species) were reported by the USA to FAO during the past decade.

Distribution: In Area 31 this dogfish occurs off the Atlantic coast of the USA from North and South Carolina, Georgia, and Florida, with an important wintering ground in deep water; occasionally caught off Cuba and the Bahamas. In the western Atlantic it ranges from Greenland and Labrador, Canada to Florida, USA, the Bahamas, and Cuba, also off Uruguay and Argentina. Widely distributed in temperate and subtropical parts of most oceans.

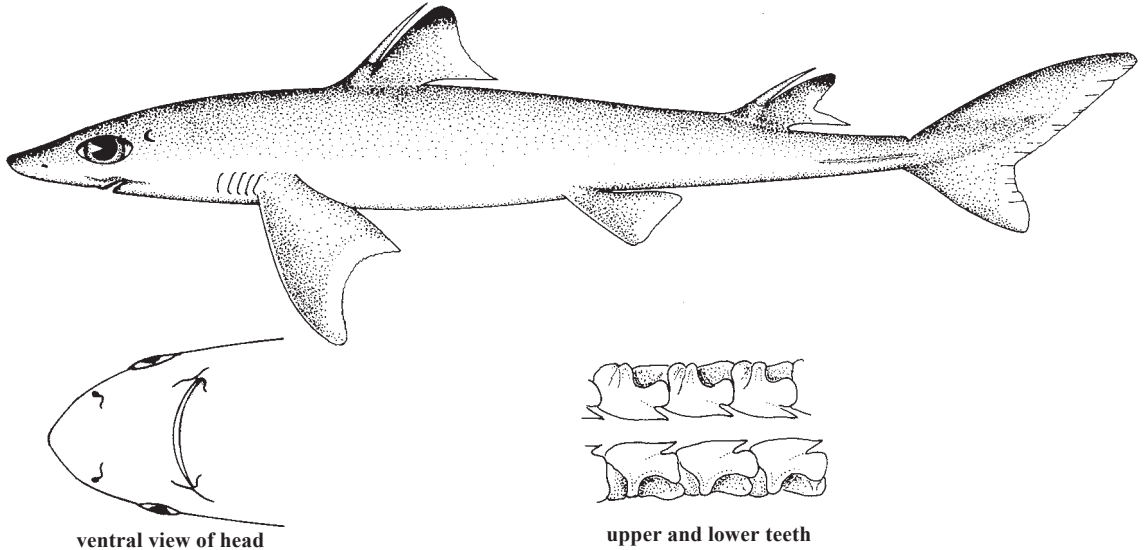


Squalus cubensis Howell Rivero, 1936

QUC

Frequent synonyms / misidentifications: None / *Squalus mitsukurii* (not Jordan and Snyder, 1903).

FAO names: En - Cuban dogfish; Fr - Aiguillat cubain; Sp - Galludo cubano.

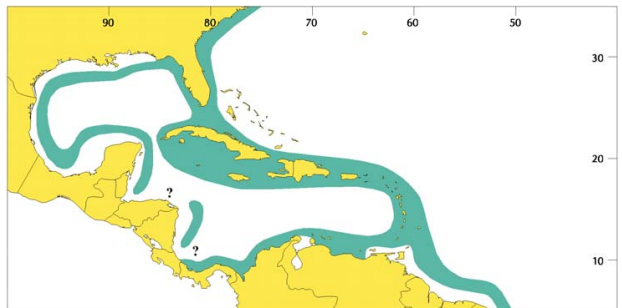


Diagnostic characters: Body elongate and spindle-shaped. Snout and head narrow, snout pointed; anterior nasal flap narrow; **distance from tip of snout to inner corner of nostril less than that from inner corner of nostril to upper labial furrow**; spiracle large, half-moon shaped; mouth only very slightly arched. **Teeth alike in both jaws, small, compressed, and with a single cusp deeply notched and outward end strongly oblique.** Skin smooth, denticles on sides of body narrow and unicuspid in young and adults. **A strong, long spine without lateral grooves on anterior margin of both dorsal fins; origin of first dorsal-fin spine over pectoral-fin inner margins and well in front of their rear tips; second dorsal fin much smaller than first; pectoral fins fairly broad but strongly falcate, free rear tips of pectoral fins angular and pointed, posterior margins of fins deeply concave; midbases of pelvic fins about equidistant between bases of dorsal fins or slightly closer to insertion of first dorsal fin than origin of second dorsal fin.** Caudal peduncle flattened below, with an obscure longitudinal keel low down on each side; **upper precaudal pit strongly developed, no lower precaudal pit. Caudal fin without a subterminal notch.** **Colour:** uniform dark grey above, paler grey to whitish below, **no white markings on sides; upper apices of both dorsal fins conspicuously black** with light posterior margins, the other fins edged with white; iris green.

Size: Maximum total length possibly to 110 cm; common to 75 cm; maturing at 50 cm or less.

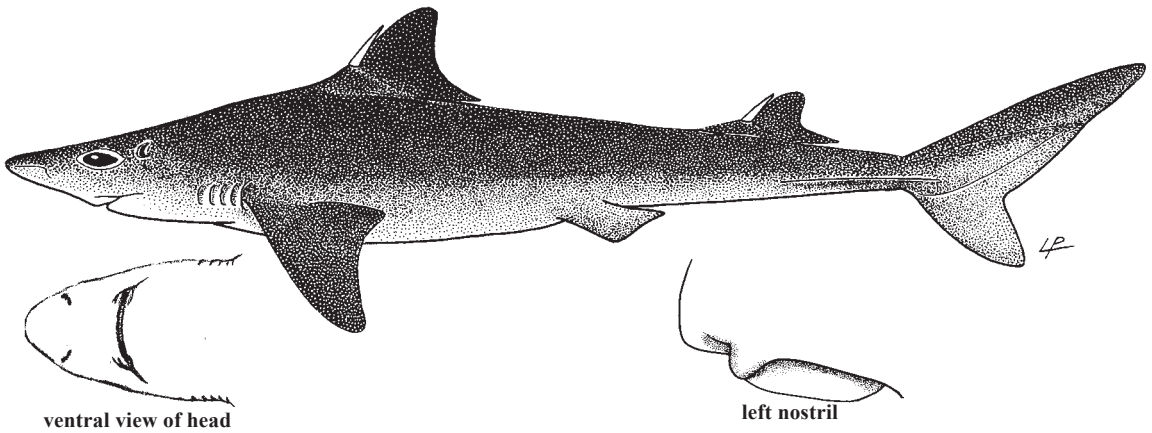
Habitat, biology, and fisheries: A bottom-living species, occurring in dense schools at depths between 60 and 380 m, never found in surface waters. Ovoviparous, number of embryos about 10. Mainly caught in the northern Gulf of Mexico. Separate statistics not reported for this species. Caught mainly with bottom trawls. Seldom used as food, although the flesh is edible. The liver is used in the preparation of oil and vitamins.

Distribution: Western Atlantic: USA (Atlantic coast from North Carolina to Florida, Gulf of Mexico coast of the USA (Florida, Alabama, Mississippi, Louisiana, and Texas), Mexico (Gulf and Atlantic coasts), Cuba, between Cuba, Florida and the Bahamas, Hispanola (Haiti and Dominican Republic), Puerto Rico, Jamaica, probably Belize, Honduras, Nicaragua, Panama, Colombia, Venezuela, Lesser Antilles off Barbados, St. Lucia, Curaçao, also possibly northern Brazil and definitely southern Brazil, Uruguay, and Argentina.



Squalus mitsukurii Jordan and Snyder, 1903

QUK

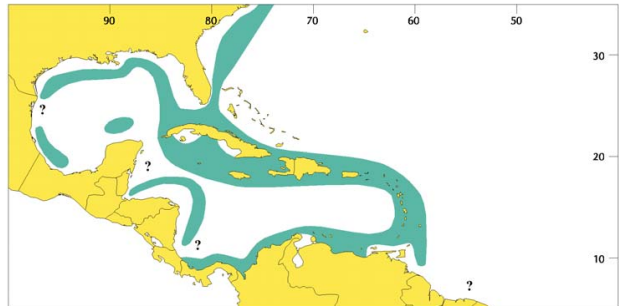
Frequent synonyms / misidentifications: None / None.**FAO names:** **En** - Shortspine spurdog (AFS: Shortspine dogfish); **Fr** - Aiguillat épinette; **Sp** - Galludo espinilla.

Diagnostic characters: Body elongate and spindle-shaped. Snout and head broad, snout parabolic; anterior nasal flap moderately wide; **distance from tip of snout to inner corner of nostril slightly greater than that from inner corner of nostril to upper labial furrow**; spiracle large, halfmoon-shaped; mouth only very slightly arched. **Teeth alike in both jaws, small, compressed, and with a single cusp deeply notched and outward end strongly oblique.** Skin smooth, denticles on sides of body broad and tricuspidate in young and adults. A strong, long spine without lateral grooves on anterior margin of both dorsal fins; **origin of first dorsal-fin spine over pectoral-fin inner margins and well in front of their rear tips; second dorsal fin much smaller than first; pectoral fins fairly broad and semifalcate**, free rear tips of pectoral fins narrowly rounded, posterior margins of fins slightly concave; midbases of pelvic fins closer to second dorsal fin insertion than first dorsal-fin insertion. Caudal peduncle flattened below, with an obscure longitudinal keel low down on each side; **upper precaudal pit strongly developed**, no lower precaudal pit. **Caudal fin without a subterminal notch.** **Colour:** grey or grey-brown above, paler grey to whitish below, **no white markings on sides; webs of both dorsal fins dusky but without conspicuous black apices**; irises green.

Size: Maximum total length about 125 cm; size at birth about 21 to 30 cm; males mature between 47 and 85 cm and females between 50 and 100 cm, with size at maturity varying in different populations.

Habitat, biology, and fisheries: On the continental and insular slopes at depths of 137 to 750 m in Area 31, and 4 to 954 m elsewhere. Ovoviviparous, with 2 to 15 young per litter. Feeds primarily on bony fishes, cephalopods, and crustaceans, also tunicates and polychaete worms. Interest to fisheries uncertain in Area 31, probably caught along with *Squalus cubensis* in bottom trawls. This species is usually termed *Squalus fernandinus* Molina, 1782 or *Squalus blainville* (Risso, 1826) in the literature and has been misidentified as *S. cubensis*, but its taxonomic and nomenclatural status is problematical. *S. fernandinus* is a junior synonym of *Squalus acanthias*. *Squalus blainville* (originally described from the Mediterranean Sea), has been identified as a spurdog with long spines and short high dorsal fins from its original description, but may be similar to or possibly even a senior synonym of the short-spined low-finned *S. mitsukurii* (described from Japan but also present in the eastern Atlantic).

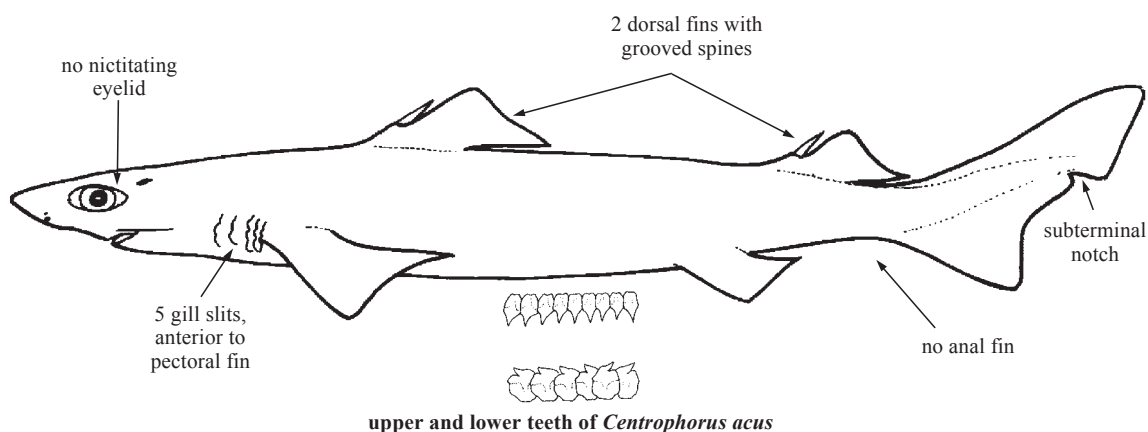
Distribution: In Area 31 this spurdog ranges from North Carolina to Florida, the northern Gulf of Mexico off Florida, Louisiana, and Texas (USA), Mexico (Yucatán), the western Caribbean off Nicaragua, Honduras and Panama, and the Antilles including Dominica, Netherlands Antilles, Martinique, and St. Kitts and Nevis; also the northeastern coast of Brazil and Argentina. Wide-ranging in the eastern Atlantic, the Indo-West Pacific, and the central Pacific.



CENTROPHORIDAE

Gulper sharks

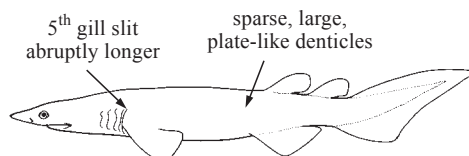
Diagnostic characters: Small to moderately large sharks, with cylindrical or slightly compressed bodies, without ridges between pectoral and pelvic fins and without precaudal pits and caudal keels. **Head with 5 gill slits, all anterior to pectoral fins**, the fifth not abruptly longer than the others; **spiracles always present, large and just behind eyes; eyes on sides of head, without nictitating eyelids**. Snout short to elongated, broad, flattened, not formed as a rostral saw; no barbels on snout; nostrils wide-spaced, internarial width greater than nostril width; mouth short and nearly transverse, lips smooth; **teeth strong-cusped, dissimilar in both jaws, compressed, broad, blade-like, and without cusplets, adjacent teeth imbricated, upper teeth much smaller than lowers**. **Two dorsal fins with a long strong grooved spine present** on their anterior margins; dorsal fins large, angular, broad, and with weakly concave posterior margins; first dorsal fin larger or subequal in area to second dorsal fin; origin of first dorsal fin far in front of pelvic-fin origins, over or just behind pectoral-fin insertions, and always in front of pectoral-fin free rear tips; **no anal fin; caudal fin** strongly asymmetrical, **with subterminal notch present** and with a lower lobe varying from virtually absent to short; pelvic fins subequal to or smaller than second dorsal fin. Dermal denticles close-set, not greatly enlarged and plate-like. **Colour:** body and fins greyish to blackish brown, without conspicuous black marks and luminescent organs.



Habitat, biology, and fisheries: Gulper sharks mostly occur in deep water near the bottom on the continental and insular slopes from 200 to at least 2 400 m, with one photographed from a bathyscaphe on the ocean floor below 4 000 m and another in the open ocean between the surface and 1 250 m depth in water nearly 4 000 m deep. Occasional individuals venture onto the continental shelves up to 50 m, and one was found by a diver in shallow water. These dogfishes are circumglobal in most seas, and range from the tropics to high latitudes up to Iceland in the North Atlantic. Some of the species form immense schools, and are among the most abundant deep-water sharks. Gulper sharks feed mostly on bony fishes and cephalopods, but also small sharks, chimaeras, shrimp, lobsters, and tunicates. Reproduction is ovoviparous, with 1 to 12 young per litter. In the Far East and the eastern Atlantic these sharks are commonly fished with line gear, demersal and pelagic trawls, and fixed bottom nets for human consumption and for their livers, which are extremely large, oily, and have a high squalene content. This is possibly the most important family of deep-water sharks for fisheries purposes.

Similar families occurring in the area

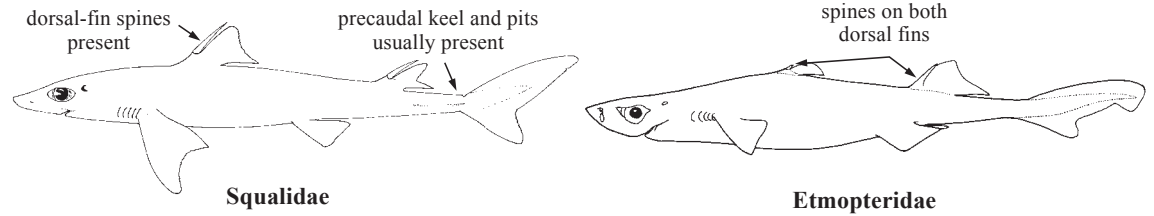
Echinorhinidae: body set with sparse, large, plate-like denticles; spiracles small and well behind eyes; fifth pair of gill slits abruptly longer than others; mouth broadly rounded; teeth not imbricated, upper teeth nearly as large as lower teeth, with cusplets present in large juveniles and adults; no dorsal-fin spines; first dorsal-fin origin over or posterior to pelvic-fin origins; pelvic fins much larger than second dorsal fin.



Echinorhinidae

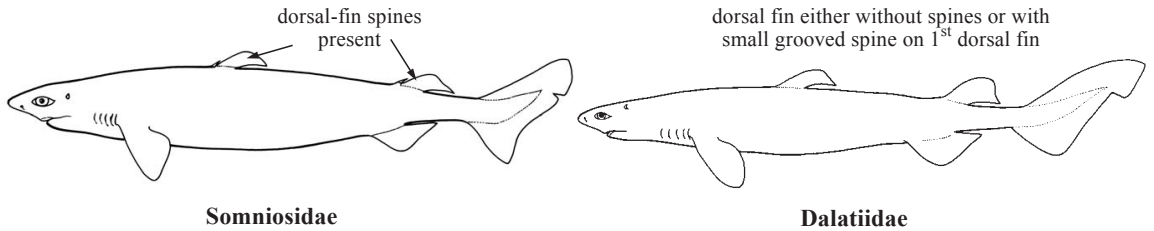
Squalidae: upper teeth nearly as large as lower teeth; precaudal keels and usually precaudal pits present; dorsal-fin spines without grooves; second dorsal fin falcate; no subterminal notch on caudal fin.

Etmopteridae: cusplets present on non-imbricated upper teeth; origin of first dorsal fin over or behind the pectoral-fin free rear tips, second dorsal fin larger than first dorsal fin and more or less falcate; body usually with conspicuous black markings and luminescent organs; most species smaller, adult at below 70 cm.



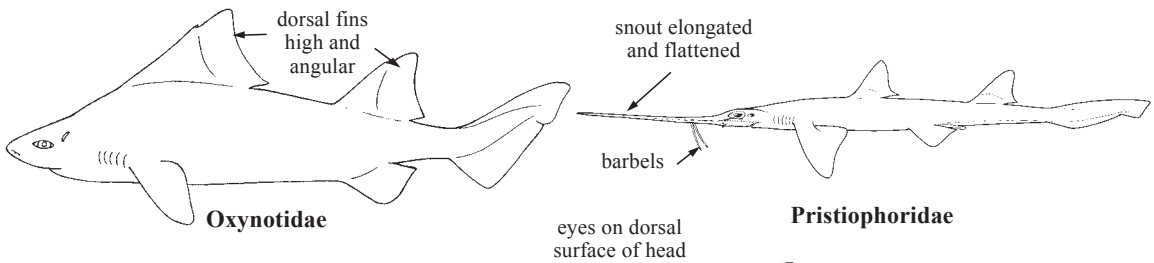
Somniosidae: upper teeth narrow and not imbricated; lateral keels present on abdomen; origin of first dorsal fin usually behind pectoral-fin free rear tips; dorsal-fin spines greatly reduced in species in the area, absent in species found elsewhere.

Dalatiidae: upper teeth narrow and not imbricated; origin of first dorsal fin behind pectoral-fin free rear tips; dorsal-fin spine either present on first dorsal fin only (*Squaliolus*) or absent.



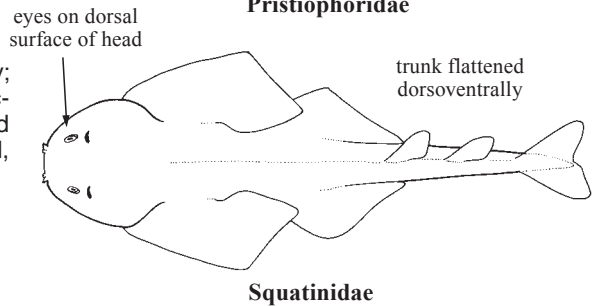
Oxynotidae: upper teeth narrow and not imbricated; body high and compressed; conspicuous lateral keels present on abdomen; dorsal fins very high and angular; dorsal-fin spines large but buried in the dorsal fins with only the tips exposed.

Pristiophoridae: snout elongated into a flattened blade with lateral teeth; barbels present in front of nostrils.



Squatinae: trunk much flattened dorsoventrally; eyes on upper side of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.

All other shark families: anal fin present.



Key to the species of Centrophoridae occurring in the area

- 1a. Snout greatly elongated, first dorsal fin very low and keel-shaped, origin over pectoral-fin bases; second dorsal-fin spine much larger than first; pectoral-fin free rear tip rounded; a low ventral keel on pelvic-caudal space in front of caudal fin (Fig. 1) *Deania profundorum*
- 1b. Snout moderately elongated; first dorsal fin high and more angular, origin over pectoral-fin inner margin (in species found in the area); second dorsal-fin spine slightly larger than first, pectoral-fin free rear tip angular to elongated; no ventral keel on pelvic-caudal space → 2

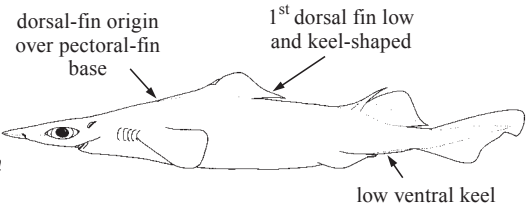


Fig. 1 *Deania profundorum*

- 2a. Lateral trunk denticles with leaf-like flattened crowns on elevated narrow to broad pedicels extending above the denticle bases, and with medial and lateral cusps on their posterior ends (Fig. 2) → 3
- 2b. Lateral trunk denticles with flat sessile crown atop the denticle bases, without separate pedicels and with or without a posterior medial cusp (Fig. 3) → 4

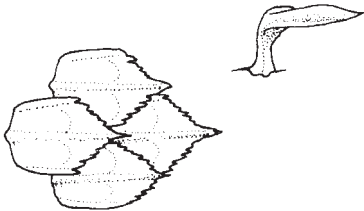


Fig. 2 dermal denticles (*Centrophorus squamosus*)

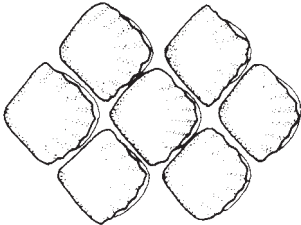


Fig. 3 dermal denticles (*Centrophorus granulosus*)

- 3a. Free rear tips of pectoral fins broadly angular and not reaching past first dorsal-fin spine origin (Fig. 4); denticles of adults with multiple lateral cusps (Fig. 2) *Centrophorus squamosus*
- 3b. Free rear tips of pectoral fins expanded into short narrow angular lobes that reach past first dorsal-fin spine origin (Fig. 5); denticles of adults with a pair of lateral cusps . . . *Centrophorus cf. acus*



Fig. 4 *Centrophorus squamosus*

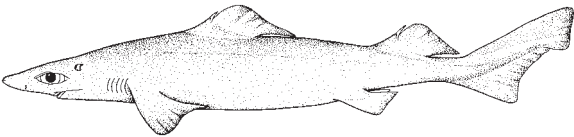


Fig. 5 *Centrophorus cf. acus*

4a. Snout moderately short and broad; free rear tips of pectoral fins slightly elongated, usually not extending behind first dorsal-fin spine (Fig. 6); lateral trunk denticles of adults fairly narrow and teardrop-shaped, with a narrow cusp (Fig. 7); postventral margin of caudal fin virtually straight in adults; a large species reaching about 161 cm. ***Centrophorus niaukang***

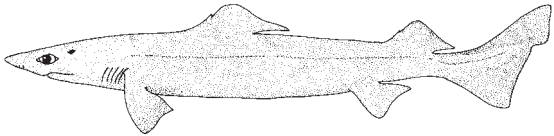


Fig. 6 *Centrophorus niaukang*

4b. Snout rather longer and narrower; free rear tips of pectoral fins greatly elongated, extending well behind first dorsal-fin spine; lateral trunk denticles of adults broad and rhomboidal (Fig. 3); postventral margin of caudal fin notched in adults; smaller species with maximum size usually below 100 cm. → 5

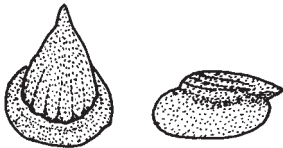


Fig. 7 dermal denticles (*Centrophorus niaukang*)

5a. Space between second dorsal-fin insertion and upper caudal-fin origin 6.1 to 8.0% of total length (Fig. 8); body dark grey or grey-brown above, slightly lighter below. . ***Centrophorus granulosus***

5b. Space between second dorsal-fin insertion and upper caudal-fin origin 8.6% of total length (Fig. 9); colour light brownish on back and flanks, white below. ***Centrophorus cf. tessellatus***

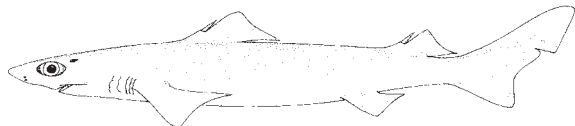


Fig. 8 *Centrophorus granulosus*

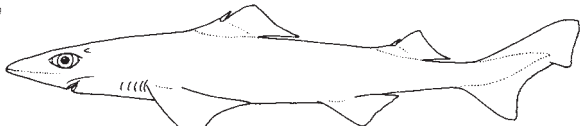









Fig. 9 *Centrophorus cf. tessellatus*

List of species occurring in the area

The shark symbol  is given when species accounts are included.

-  *Centrophorus cf. acus* Garman, 1906.
-  *Centrophorus granulosus* (Bloch and Schneider, 1801).
-  *Centrophorus niaukang* Teng, 1959.
-  *Centrophorus squamosus* (Bonnaterre, 1788).
-  *Centrophorus cf. tessellatus* Garman, 1906.
- Centrophorus* sp.
-  *Deania profundorum* (Smith and Radcliffe, 1912).

Note: The genus *Centrophorus* is of urgent need of revision in Area 31, and species recognized here are provisional. *Centrophorus acus* and *Centrophorus tessellatus* were described from Japan but later recorded in Area 31; they may represent undescribed species or possibly misidentifications of described species. In addition, there is a long-snouted species of *Centrophorus* in Area 31 (Gulf of Mexico), close to the Australian *Centrophorus harrissoni* McCulloch, 1915 but which has sometimes been confused with *Centrophorus granulosus* and termed *Centrophorus uyato*. It is not considered further here pending revision of western north Atlantic *Centrophorus*.

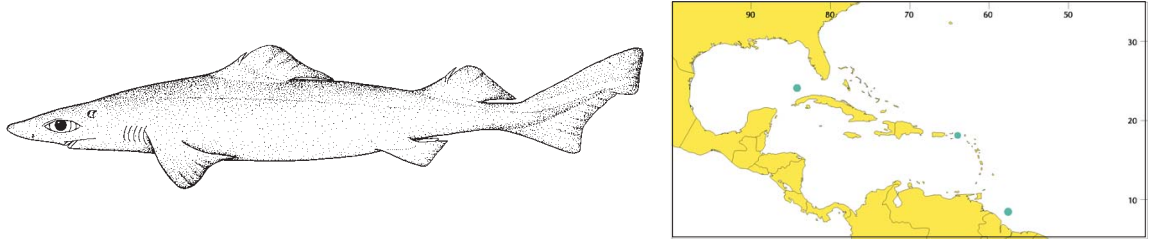
References

- Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harvard*, 117:1-150.
- Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d' Atlantique (plus particulièrement de la Côte Occidentale d' Afrique). *Ed. OSTROM, Faune Tropicale*, (21):330 p.
- Compagno, L.J.V. and R. Vergara R. 1978. Squalidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31) Volume V*, edited by W. Fischer. Rome, FAO, 10 pp.
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125) Vol.4, Pt.1:250 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, vol. 1, Myxiniformes to Gasterosteiformes. Austin, University of Texas Press 1112 p.
- Muñoz-Chapulí, R. and F. Ramos. 1989. Review of the *Centrophorus* sharks (Elasmobranchii, Squalidae) of the Eastern Atlantic. *Cybiu*, 1989 13(1):65-81.
- Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Sapporo, Hokkaido University. Press, 151 p.

***Centrophorus cf. acus* Garman, 1906**

En - Needle dogfish; **Fr** - Squale-chagrin aiguille; **Sp** - Quelvacho agujón.

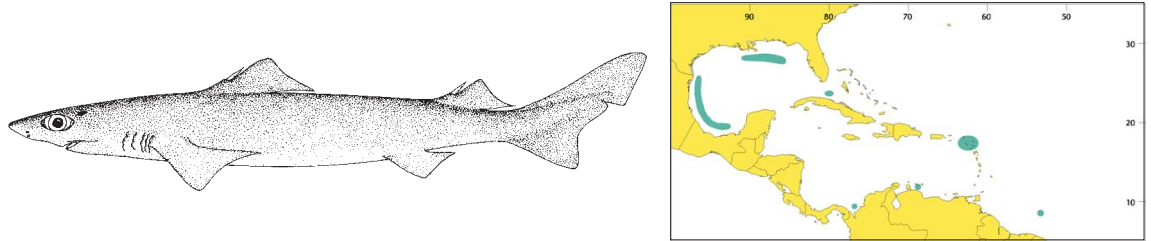
Maximum total length at least 161 cm. On the outer continental shelves and slopes near the bottom in depths of 630 to 915 m. Biology little-known. Mode of utilization and fishing gear uncertain. In Area 31, nominal from the northern Gulf of Mexico (USA), Dry Tortugas, Leeward Islands, and French Guiana; western Pacific off Japan. Identification of this species is provisional, and material referred to *Centrophorus acus* (S. Springer, pers. comm.) from the western north Atlantic may be an undescribed species.



***Centrophorus granulosus* (Bloch and Schneider, 1801)**

En - Gulper shark; **Fr** - Squale-chagrin commun; **Sp** - Quelvacho.

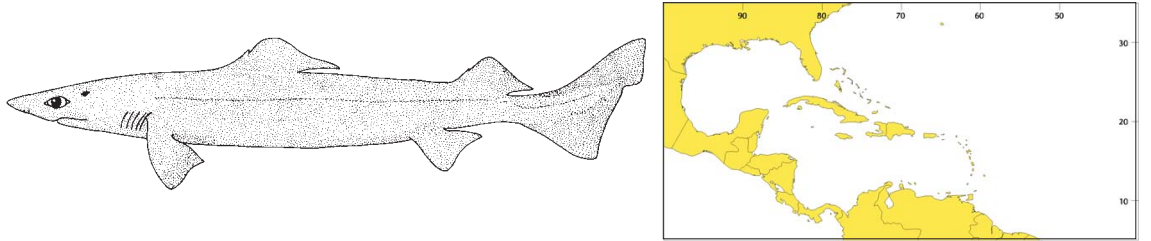
Maximum total length about 100 cm. On the outer continental shelves and slopes near the bottom in depths from 50 to 1 400 m. Feeds mainly on bony fishes. Mode of utilization and fishing gear uncertain. In the area, western north Atlantic, Gulf of Mexico; wide-ranging in the eastern Atlantic, Mediterranean, western Indian Ocean, and western Pacific. Often erroneously reported as *Centrophorus uyato* (Rafinesque, 1810), which is based on a species of *Squalus* from the Mediterranean Sea.



***Centrophorus niaukang* Teng, 1959**

En - Taiwan gulper shark; **Fr** - Squale-chagrin quelvacho; **Sp** - Quelvacho chino.

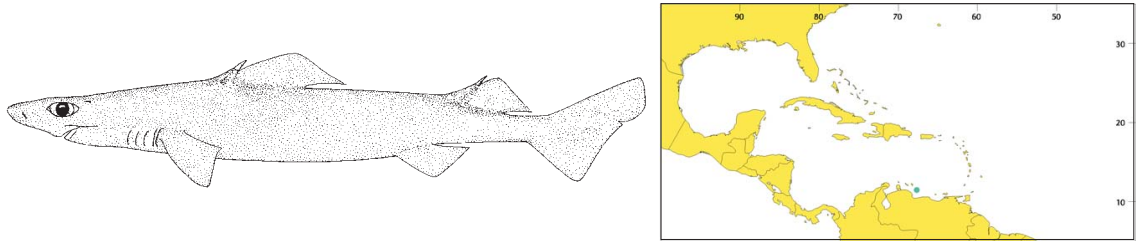
Maximum total length to at least 161 cm, one of the largest gulper sharks. Lives near the bottom on the outer continental shelves and upper slopes at depths from 250 to 720 m in Area 31 and from 250 to 1 400 m elsewhere. This shark is live-bearing, with litters of 1 to 6 young, and eats bony fishes, squids, small dogfish sharks, and lobsters. Taken in bottom trawls and on deep-set longlines; utilized for fish meal and for human consumption elsewhere. Found just north of Area 31 off northern north Carolina and Virginia, USA, and likely to occur within it. Wide-ranging but sporadically distributed in the North Atlantic and the Indo-West Pacific. Often confused with *Centrophorus granulosus* and *Centrophorus lusitanicus*. Nomenclature provisional.



***Centrophorus squamosus* (Bonnaterre, 1788)**

En - Leafscale gulper shark; **Fr** - Squalo-chagrin de l'Atlantique; **Sp** - Quelvacho negro.

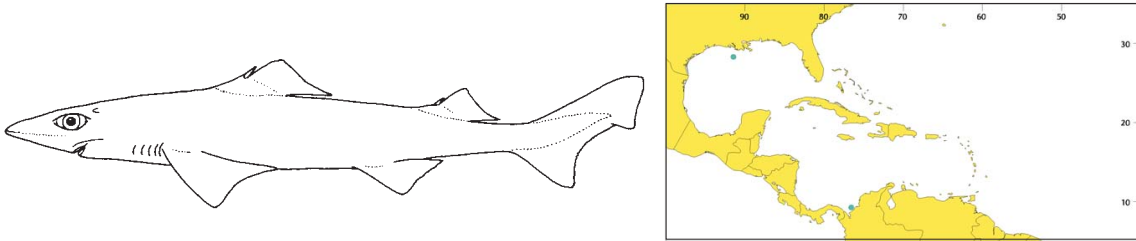
Maximum total length to about 160 cm. Occurs near the bottom on the continental slopes at depths from 229 to 2 359 m, also pelagically in the upper 1 250 m of water 4 000 m deep. This shark is live-bearing, with litters of 5 to 8 young. It eats bony fishes, cephalopods, crustaceans, and chimaeras. Caught with bottom trawls, line gear and fixed bottom nets; dried and salted for human consumption, also used for fish meal. In Area 31 collected off Venezuela but probably more widely distributed; wide-ranging in the eastern Atlantic and Indo-West Pacific.



***Centrophorus cf. tessellatus* Garman, 1906**

En - Mosaic gulper shark; **Fr** - Squalo-chagrin mosaïque; **Sp** - Quelvacho mosaico.

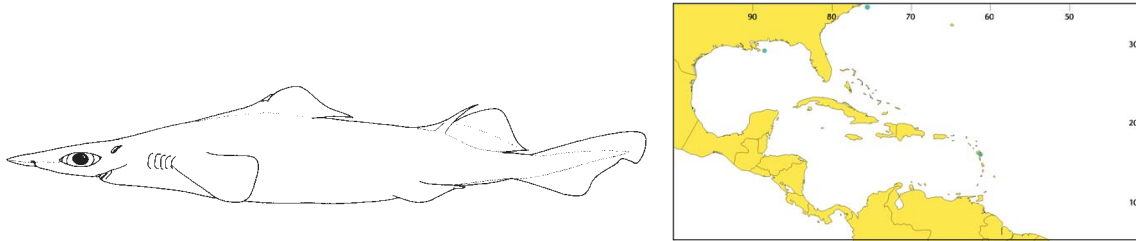
Maximum total length at least 89 cm. On the outer continental shelves and slopes near the bottom at depths from 260 to 728 m. Biology essentially unknown. Mode of utilization and fishing gear uncertain. In Area 31, nominal from northern Gulf of Mexico (USA); also, Japan and the Hawaiian Islands. Identification of this species is highly provisional, and material from the western north Atlantic referred to *Centrophorus tessellatus* may be an undescribed species.



***Deania profundorum* (Smith and Radcliffe, 1912)**

En - Arrowhead dogfish; **Fr** - Squalo-savate lutin; **Sp** - Tollo flecha.

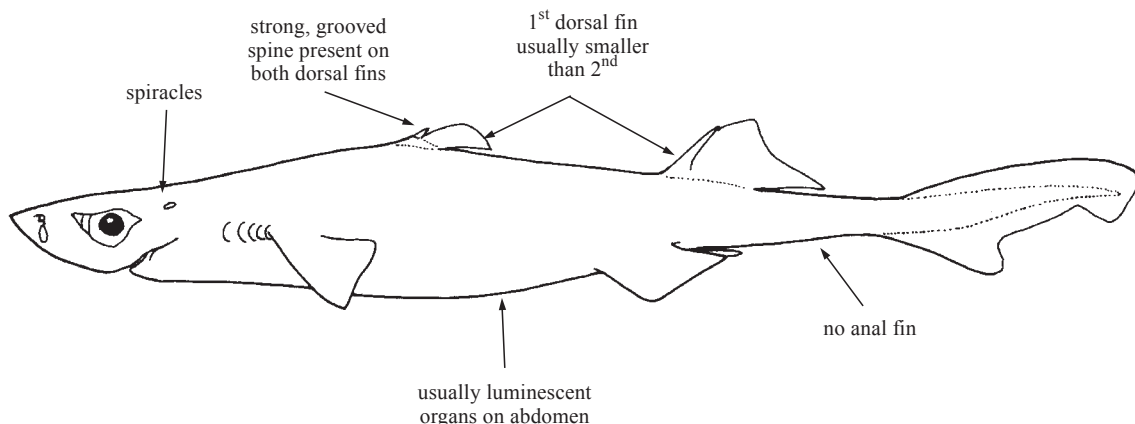
Maximum total length to 76 cm. On the upper continental and insular slopes, found on or near the bottom from 280 to 1 790 m. Eats small bony fishes, including lanternfish, squid, and crustaceans. Interest to fisheries unknown. In Area 31, Atlantic coast of the USA off North Carolina; wide-ranging in the eastern Atlantic, western Indian Ocean, and the western Pacific.



ETMOPTERIDAE

Lantern sharks (black dogfishes)

Diagnostic characters: Small sharks with cylindrical or slightly compressed bodies, without ridges between pectoral and pelvic fins and without precaudal pits and caudal keels. **Head with 5 gill slits, all anterior to pectoral fins**, the fifth not abruptly longer than the others; **spiracles always present, large and just behind eyes; eyes on sides of head, without nictitating eyelids**. Snout short, flattened or conical, not formed as a rostral saw; no barbels on snout; nostrils fairly wide-spaced, internarial width greater than or subequal to nostril width; mouth short and nearly transverse or arcuate, lips smooth; teeth strong-cusped, not blade-like in upper jaw, upper teeth with slender cusps and cusplets present; lower teeth either similar to uppers (*Centroscyllium*) or compressed, broad, blade-like, imbricated, without cusplets, and much larger than uppers. **Two dorsal fins with a long strong grooved spine present** on their anterior margins; dorsal fins small, angular, and with straight to strongly concave posterior margins; **first dorsal fin usually smaller than second dorsal fin**; origin of first dorsal fin far in front of pelvic-fin origins, well behind pectoral-fin insertions, and over or behind pectoral-fin free rear tips; pelvic fins subequal to or smaller than second dorsal fin; **no anal fin**; caudal fin strongly asymmetrical, with subterminal notch present and with a ventral lobe low or absent. **Colour:** body and fins greyish to blackish brown, **usually with conspicuous black marks and luminescent organs on abdomen, over pelvic-fin bases, on caudal peduncle, and on caudal-fin base**.

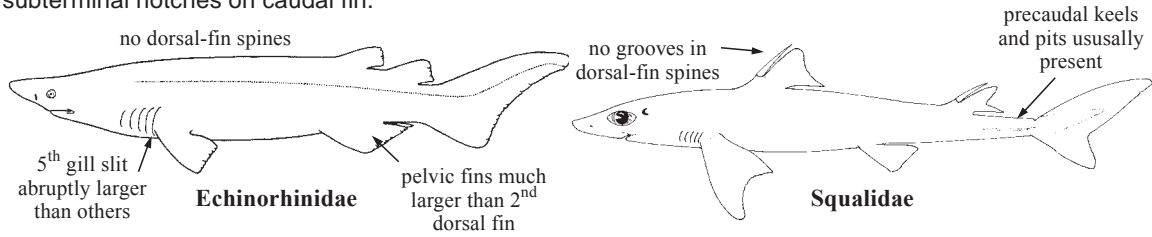


Habitat, biology, and fisheries: Mostly occur in deep water near the bottom on the continental and insular slopes between 200 to at least 2 213 m. Some species venture onto the continental shelves up to 70 m and a few species are oceanic, ranging far from land. Circumglobal in most seas, and range from the tropics to high latitudes up to Iceland in the North Atlantic. Some of the species form large schools, and can be among the most abundant deep-water sharks in limited areas. Feed on small bony fishes, cephalopods, crustaceans, and tunicates. Reproduction is ovoviparous, with 6 to 20 young per litter. In the Far East and the eastern Atlantic these sharks are commonly fished with line gear and bottom trawls for human consumption and for their livers, which are extremely large, oily, and have a high squalene content. In Area 31 they may be caught as bycatch in other fisheries but are not known to be utilized.

Similar families occurring in the area

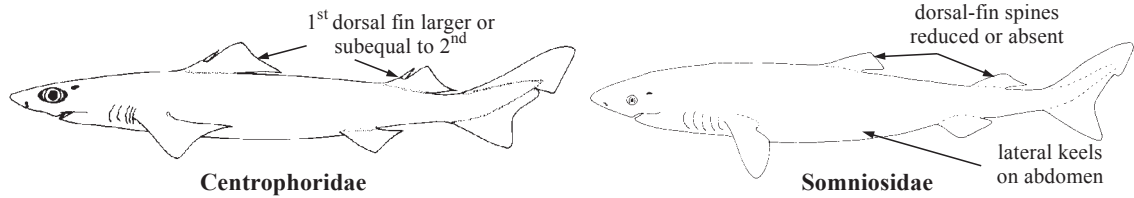
Echinorhinidae: body set with sparse, large, plate-like denticles; spiracles small and well behind eyes; fifth pair of gill slits abruptly longer than others; no dorsal-fin spines; first dorsal-fin origin over or posterior to pelvic-fin origins; pelvic fins much larger than second dorsal fin; large sharks, reaching over 2 m long.

Squalidae: both upper and lower teeth blade-like, imbricated and without cusplets; precaudal keels and usually precaudal pits present on caudal peduncle; dorsal-fin spines without grooves; second dorsal fin falcate; no subterminal notches on caudal fin.



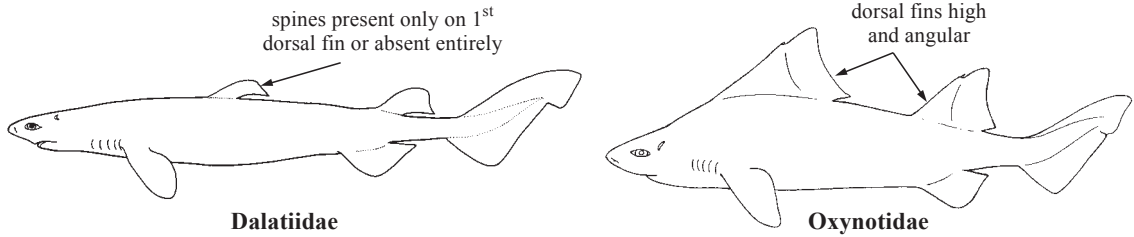
Centrophoridae: both upper and lower teeth blade-like, imbricated and without cusplets; first dorsal fin larger than second; first dorsal-fin origin over or just behind pectoral-fin bases.

Somniosidae: upper teeth narrow and without cusplets; lateral keels present on abdomen; dorsal-fin spines greatly reduced or absent.



Dalatiidae: upper teeth narrow and without cusplets; dorsal-fin spines either present on first dorsal fin only (*Squaliolus*) or absent.

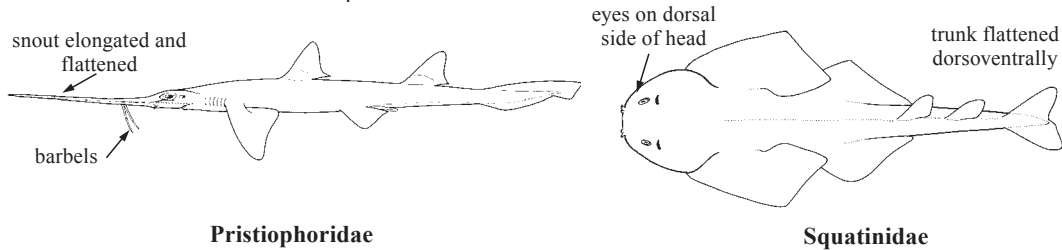
Oxynotidae: upper teeth narrow and not imbricated; body high and compressed; conspicuous lateral keels on abdomen; dorsal fins very high and angular; dorsal-fin spines large but buried in the dorsal fins with only the tips exposed.



Pristiophoridae: snout elongated into a flattened blade, with lateral teeth; barbels present in front of nostrils.

Squatinaidae: trunk much flattened dorsoventrally; eyes on upper side of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.

All other shark families: anal fin present.



Key to the species of Etmopteridae occurring in the area

- 1a. Upper and lower teeth similar, with narrow cusps and cusplets (Fig. 1)*Centroscyllium fabricii*
- 1b. Upper and lower teeth dissimilar, with a slender centre cusp and 1 or more cusplets on each side in the upper jaw and compressed and blade-like in the lower jaw(*Etmopterus*) → 2

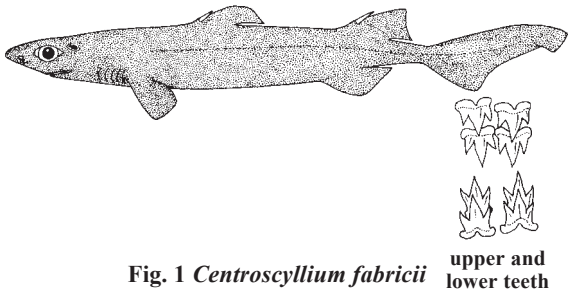


Fig. 1 *Centroscyllium fabricii*

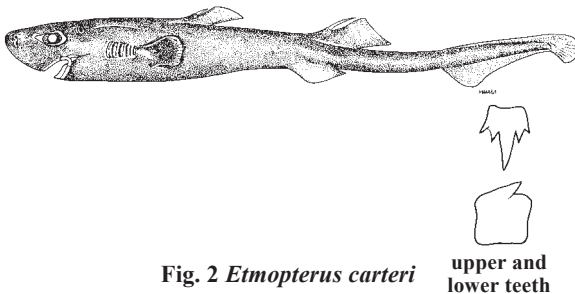


Fig. 2 *Etmopterus carteri*

- 2a. Head semicylindrical, nearly as deep as wide at eyes, snout very short and bluntly rounded; body blackish above and below, photophores diffuse, not concentrated in conspicuous black areas (Fig. 2)*Etmopterus carteri*
- 2b. Head and snout flattened, considerably wider than deep at eyes; body either uniform dark above and below or abruptly darker on under surface, photophores concentrated in darker areas on sides and lower surface→ 3
- 3a. Dermal denticles on sides of body truncated, without cusps (Fig. 3)*Etmopterus bigelowi*
- 3b. Dermal denticles on sides of body cuspidate→ 4

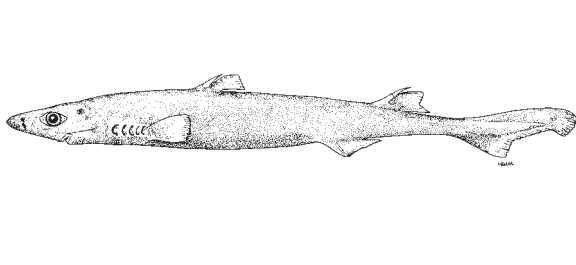


Fig. 3 *Etmopterus bigelowi*

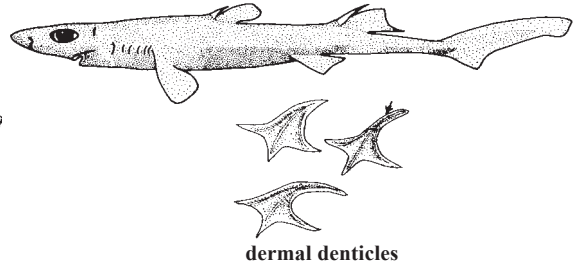


Fig. 4 *Etmopterus bullisi*

- 4a. Dermal denticles on sides in regular longitudinal rows (Fig. 4)*Etmopterus bullisi*
- 4b. Dermal denticles on sides irregularly situated, not in rows→ 5

- 5a. Underside of snout virtually naked, almost without denticles (Fig. 5)
..... *Etmopterus virens*
- 5b. Underside of snout covered with denticles→ 6
- 6a. Colour black or grey above and below, without prominent markings, obscure pelvic markings present in some species; first dorsal-fin spine well behind pectoral-fin rear tips→ 7
- 6b. Colour lighter above and with prominent black markings below; first dorsal-fin spine about opposite to pectoral-fin rear tips→ 8

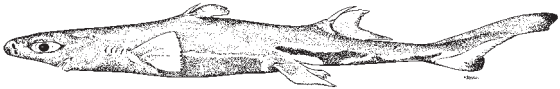


Fig. 5 *Etmopterus virens*

- 7a. Pectoral fins short and broad, anterior and posterior margins with a broad fringe of elongated ceratotrichia that are free of fin web; colour blackish with markings obscure or absent (Fig. 6) *Etmopterus schultzi*
- 7b. Pectoral fins more elongate, angular and narrower, anterior and posterior margins with a fringe of elongated ceratotrichia that are mostly connected with fin web; colour greyish to blackish with obscure darker markings visible but not prominent (Fig. 7) . . . *Etmopterus gracilispinis*



Fig. 6 *Etmopterus schultzi*

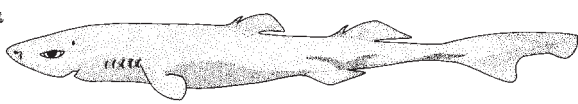


Fig. 7 *Etmopterus gracilispinis*

- 8a. Suprapelvic black marking disjunct, with separate anterior, posterior, and ventral black patches; size larger, adults 260 to 335 mm long (Fig. 8) . . . *Etmopterus robinsi*
- 8b. Suprapelvic black marking continuous, anterior, posterior, and ventral patches continuous; size smaller, adults below 300 mm long→ 9

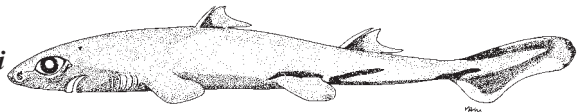


Fig. 8 *Etmopterus robinsi*

- 9a. A mid-dorsal band of white present; size larger, adults 200 to 292 mm long (Fig. 9)
..... *Etmopterus hillianus*
- 9b. No mid-dorsal band of white; size smaller, adults about 160 to 212 mm long (Fig. 10)
..... *Etmopterus perryi*

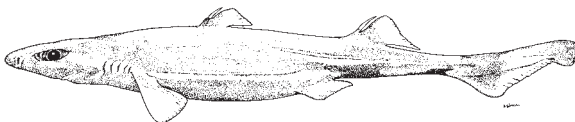


Fig. 9 *Etmopterus hillianus*

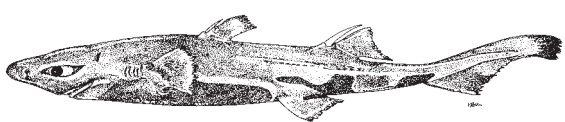












Fig. 10 *Etmopterus perryi*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Centroscyllium fabricii* (Reinhardt, 1825).
-  *Etmopterus bigelowi* Shirai and Tachikawa, 1993.
-  *Etmopterus bullisi* Bigelow and Schroeder, 1957.
-  *Etmopterus carteri* Springer and Burgess, 1985.
-  *Etmopterus gracilispinis* Krefft, 1968.
-  *Etmopterus hillianus* (Poey, 1861).
-  *Etmopterus perryi* Springer and Burgess, 1985.
-  *Etmopterus robinsi* Schofield and Burgess, 1997.
-  *Etmopterus schultzi* Bigelow, Schroeder and Springer, 1953.
-  *Etmopterus virens* Bigelow, Schroeder and Springer, 1953.

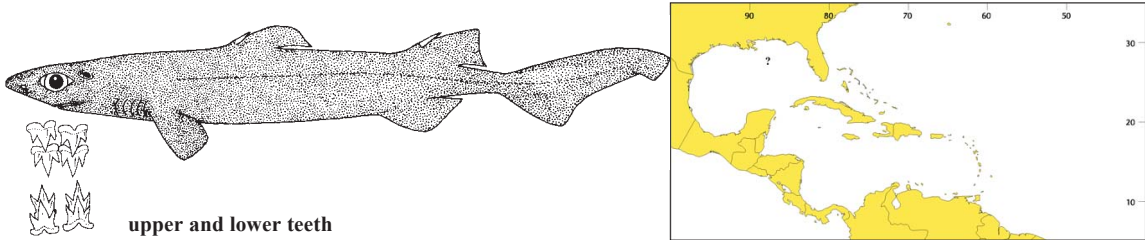
References

- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Fnd. Mar. Res.*, (1)1:56-576.
- Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harvard*, 117:150 p.
- Bigelow, H.B., W.C. Schroeder, and S. Springer. 1953. New and little known sharks from the Atlantic and from the Gulf of Mexico. *Bull. Mus. Comp. Zool. Harvard*, 109: 213-276.
- Compagno, L.J.V. and R. Vergara R. 1978. Squalidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31), Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).
- Compagno, L.J.V. 1984. FAO Species Catalogue. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,pt.1:250 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, vol. 1, Myxiniiformes to Gasterosteiformes. Austin, University of Texas Press, 1112 p.
- Schofield, P.J. and G.H. Burgess. 1997. *Etmopterus robinsi* (Elasmobranchii, Etmopteridae), a new species of deepwater lantern shark from the Caribbean Sea and Western North Atlantic, with a redescription of *Etmopterus hillianus*. *Bull. Mar. Sci.*, 60(3):1060-1073.
- Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Sapporo, Hokkaido University Press, 151 p.
- Springer, S. and G.H. Burgess. 1985. Two new dwarf dogsharks (*Etmopterus*, Squalidae), found off the Caribbean coast of Colombia. *Copeia*, 1985(3):584-591.

Centroscyllium fabricii (Reinhardt, 1825)?

En - Black dogfish; **Fr** - Aiguillat noir; **Sp** - Tollo negro merga.

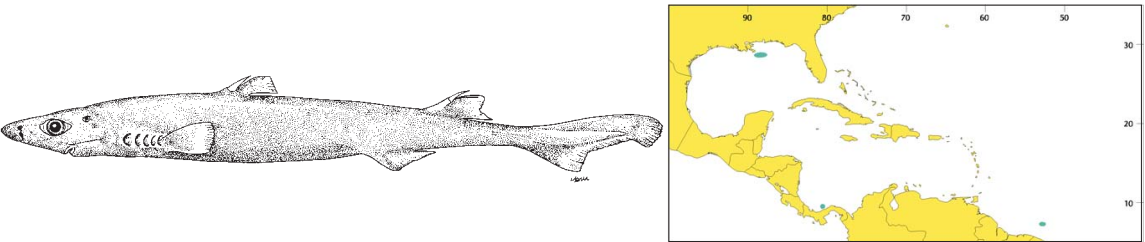
Maximum total length at least 84 cm, may reach 107 cm. A common demersal dogfish of the outermost continental shelves and upper slopes from 180 to about 1 600 m, moving to near the surface in high latitudes. Ovoviviparous, feeds on a wide variety of small crustaceans, cephalopods, small pelagic teleosts, and jelly-fish. Limited interest to fisheries, little utilized elsewhere and often a discarded bycatch of deep-water commercial fisheries. In Area 31 possibly off North Carolina and in the Gulf of Mexico; western Atlantic from South Baffin Island and Greenland to Virginia, USA, and off southern Argentina. Wide-ranging in the eastern Atlantic from Iceland to the west coast of South Africa.



Etmopterus bigelowi Shirai and Tachikawa, 1993

En - Blurred lanternshark.

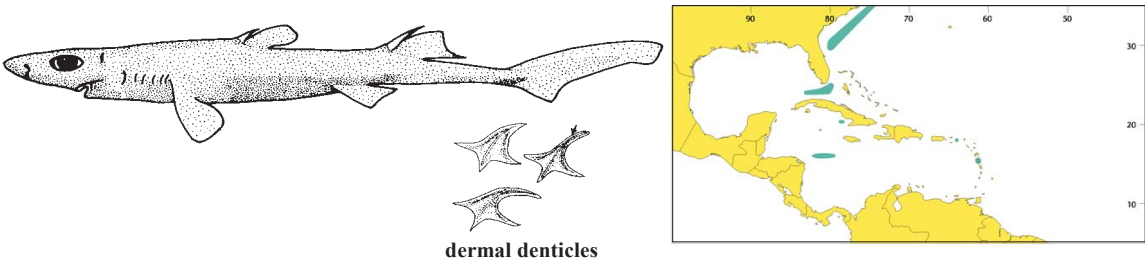
Maximum size to at least 67 cm. Occurs on continental shelves and slopes, island slopes, and submarine ridges from 163 to over 1000 m, also partly epipelagic in the open ocean. Biology little-known, ovoviviparous, eats small fish and squids. In the area, from Gulf of Mexico (Louisiana, USA), Caribbean Sea, also Suriname, Brazil, Uruguay, and Argentina in the western Atlantic; wide-ranging in the eastern Atlantic, southwestern Indian Ocean, western Pacific, and eastern South Pacific. Often confused with *Etmopterus pusillus* (Lowe, 1839), which is currently not known from the western Atlantic but could be recorded there.



Etmopterus bullisi Bigelow and Schroeder, 1957

En - Lined lanternshark; **Fr** - Sagre chien; **Sp** - Tollo lucero rayado.

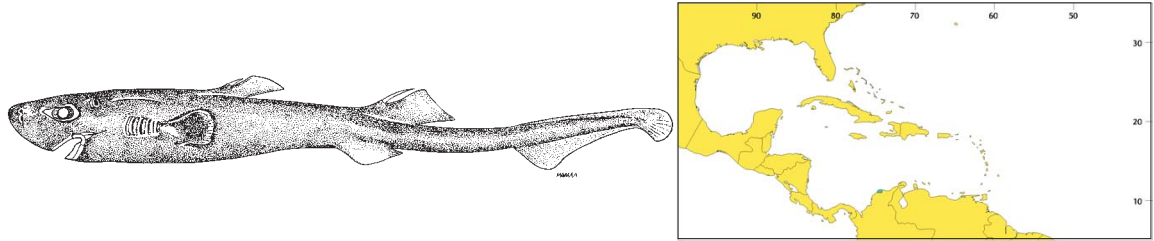
Maximum size at least 26 cm and probably larger. Occurs on continental slopes at depths of 275 to 824 m, mostly below 350 m. Biology little known. Of no interest to fisheries, probably taken as discarded bycatch of deep-water demersal fisheries. May be largely endemic to Area 31; from North Carolina to Florida (USA), the north and south coasts of Cuba, Caribbean Sea between Jamaica, Nicaragua and Honduras, Caribbean Colombia, and the lesser Antilles east of the Virgin Islands.



Etmopterus carteri Springer and Burgess, 1985

En - Cylindrical lanternshark.

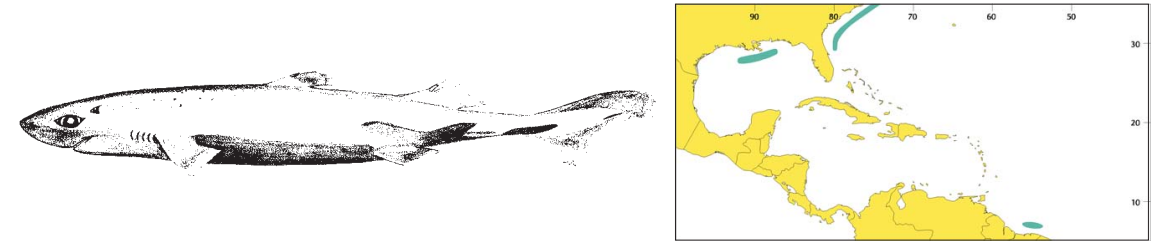
Maximum size 21 cm. Occurs on upper continental slopes at depths of 283 to 356 m. Biology little known. Of no interest to fisheries. Only known from Area 31 off the Caribbean coast of Colombia.



Etmopterus gracilispinis Krefft, 1968

En - Broadbanded lanternshark; **Fr** - Sagre rubané; **Sp** - Tollo lucero bandoneado.

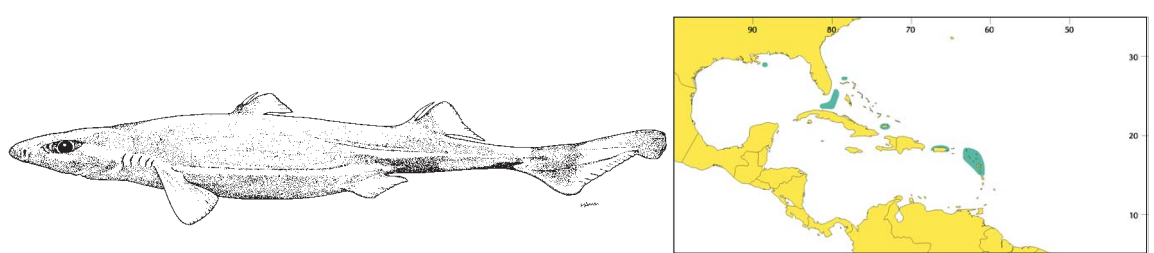
Maximum size at least 33 cm. Occurs on outer continental shelves and upper to middle slopes at depths of 100 to 1000 m, also epipelagic at depths of 70 to 480 m over water 2 240 m deep. Biology little known. Of no interest to fisheries, probably taken as discarded bycatch of deep-water demersal fisheries. Western Atlantic from the USA from New Jersey to Florida, also the Gulf of Mexico from Florida to Louisiana, Suriname, southern Brazil, Uruguay, and Argentina. Also eastern Atlantic and southwestern Indian Ocean off South Africa.



Etmopterus hillianus (Poey, 1861)

En - Caribbean lanternshark; **Fr** - Sagre antillais; **Sp** - Tollo lucero antillano.

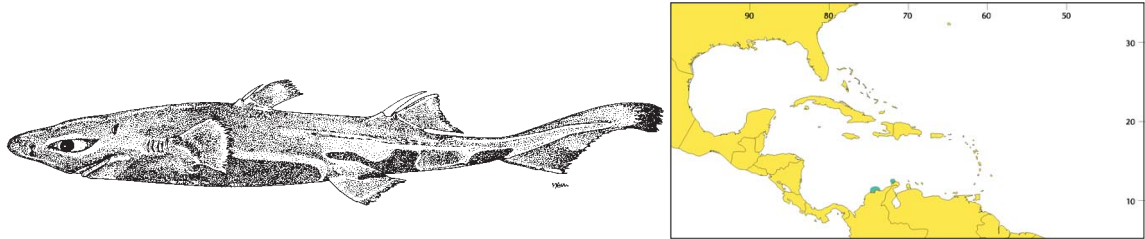
Maximum size at least 28 cm. Occurs on upper slopes at depths of 311 to 695 m. Biology little known. Interest to fisheries limited, caught off Cuba. Western North Atlantic from Virginia to southern Florida (USA), Bahamas, Cuba, Bermuda, Hispanola, and northern Lesser Antilles, not known from western or southern Caribbean.



Etmopterus perryi Springer and Burgess, 1985

En - Dwarf lanternshark.

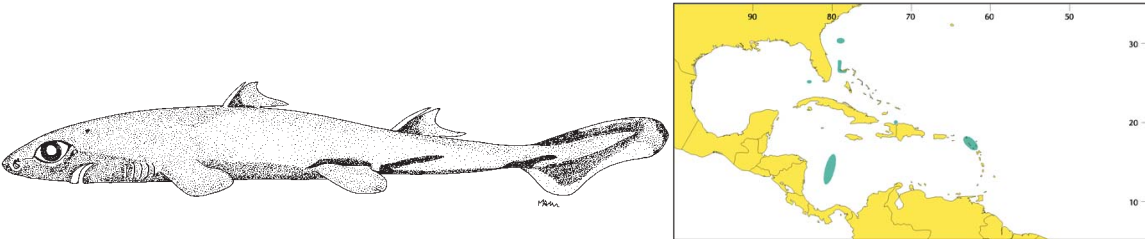
Maximum size about 21 cm. Occurs on upper continental slopes at depths of 283 to 375 m. Biology little known. Of no interest to fisheries. Only known from Area 31 off the Caribbean coast of Colombia.



Etmopterus robindsi Schofield and Burgess, 1997

En - West Indian lanternshark.

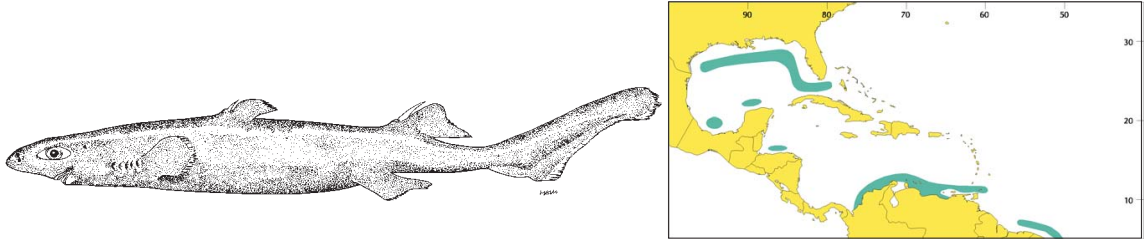
Maximum size at least 34 cm. Occurs on upper slopes at depths of 412 to 787 m. Biology little known. Of no interest to fisheries at present. Western North Atlantic from northeastern Florida (USA), straits of Florida, northern Cuba and southwards in the southern Caribbean Sea to off Nicaragua, and in the West Indies off Hispanola and the northern Lesser Antilles.



Etmopterus schultzi Bigelow, Schroeder, and Springer, 1953

En - Fringefin lanternshark; **Fr** - Sagre à nageoires frangées; **Sp** - Tollo lucero franjeado.

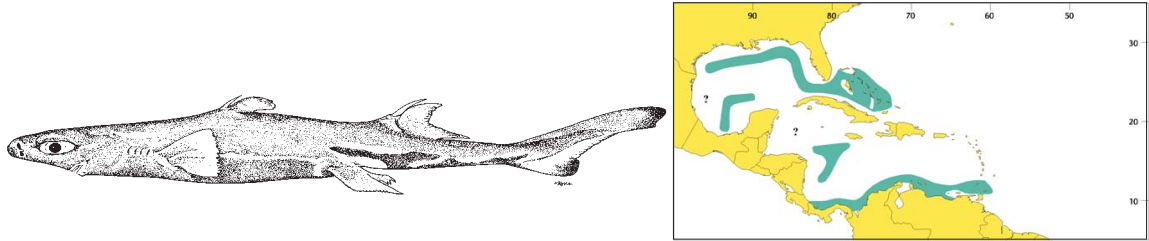
Maximum size about 30 cm. Occurs on upper and middle slopes at depths of 220 to 915 m. Biology little known. Of no interest to fisheries at present, possibly caught as discarded bycatch of demersal fisheries. Western North Atlantic, northern Gulf of Mexico (Texas to Florida), Florida Straits between Cuba and Florida, Mexico, Honduras, Colombia, Venezuela, Trinidad and Tobago, Suriname, French Guiana.



Etmopterus virens Bigelow, Schroeder, and Springer, 1953

En - Green lanternshark; **Fr** - Sagre vert; **Sp** - Tollo lucero verde.

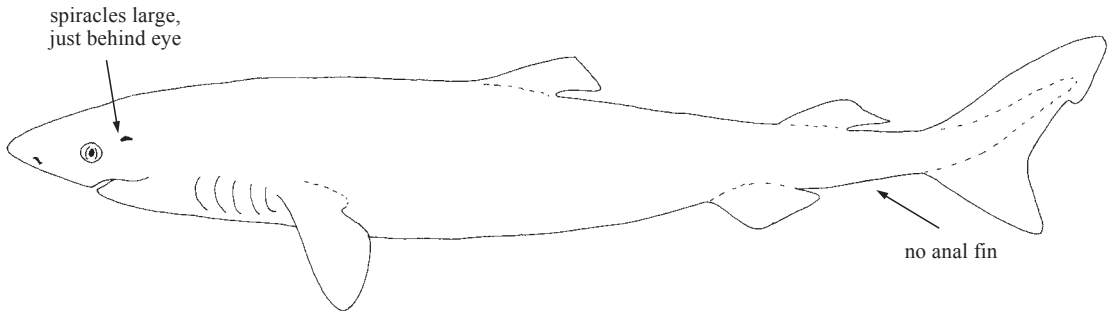
Maximum size about 26 cm. Occurs on outer shelves and upper and middle slopes at depths of 196 to 915 m, mostly below 350 m. Biology little known, probably occurs in schools; eats cephalopods. Of no interest to fisheries at present, possibly caught as discarded bycatch of demersal fisheries. Western North Atlantic, northern Gulf of Mexico (Texas to Florida), Bahamas, Cuba, Caribbean Sea between Honduras and Jamaica, Honduras, Nicaragua, Panama, Colombia, Venezuela, and Trinidad and Tobago.



SOMNIOSIDAE

Sleeper sharks

Diagnostic characters: Small to gigantic sharks, with cylindrical or slightly compressed bodies, with ridges between pectoral and pelvic fins and without precaudal pits and caudal keels. **Head with 5 gill slits, all anterior to pectoral fins**, the fifth not abruptly longer than the others; **eyes on sides of head, without nictitating eyelids**. Snout short to moderately elongated, broad, flattened, not formed as a rostral saw; no barbels on snout; nostrils wide-spaced, internarial width greater than nostril width; mouth short and nearly transverse, lips smooth; teeth dissimilar in both jaws, upper teeth narrow, needle-shaped, not imbricated, and without cusplets; lower teeth strong-cusped, blade-like, imbricated, and without cusplets. **Spiracles always present, large and just behind eyes**. **Two dorsal fins with or without spines on their anterior margins, when present spines grooved, usually small, and on both dorsal fins**; dorsal fins large, angular, broad, and with convex to weakly concave posterior margins; first dorsal fin variably slightly larger, subequal to, or slightly smaller in area to second; origin of first dorsal fin far in front of pelvic-fin origins, anterior, over, or slightly posterior to pectoral-fin free rear tips; **no anal fin**; caudal fin strongly asymmetrical, with subterminal notch present and with a lower lobe varying from virtually absent to strong; pelvic fins subequal to or larger than second dorsal. Dermal denticles close-set, not greatly enlarged and plate-like. **Colour:** body and fins greyish to blackish brown, without conspicuous black marks and luminescent organs.

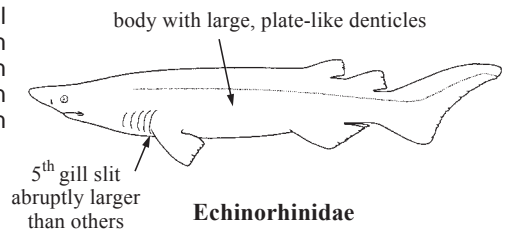


Habitat, biology, and fisheries: Sleeper sharks mostly occur near the bottom on the continental and insular slopes between 200 to at least 3 675 m; some species are apparently oceanic. In high latitudes members of the genus *Somniosus* occur on the continental shelves to the intertidal. Circumglobal in most seas, and range from the tropics to high latitudes up to the Arctic and Antarctic oceans. Feed on bony fishes, other chondrichthyans, cephalopods and other molluscs, crustaceans, seals, whale meat, carrion, sea birds, echinoderms, and jelly-fish; at least one species takes chunks of meat out of living marine mammals and bony fishes. Reproduction is ovoviparous, with 4 to 59 young per litter. In the Far East and the eastern Atlantic these sharks are fished with line gear and bottom trawls for human consumption and for their livers, which are extremely large, oily, and have a high squalene content.

Remarks: The arrangement of genera and species adopted here follows the forthcoming revision of the FAO shark catalog (Compagno, 1984) by the present author. There may be an additional, undescribed species of *Scymnodon* or possibly *Zameus* in the area (S. Springer, *pers. comm.*), from the Gulf of Mexico.

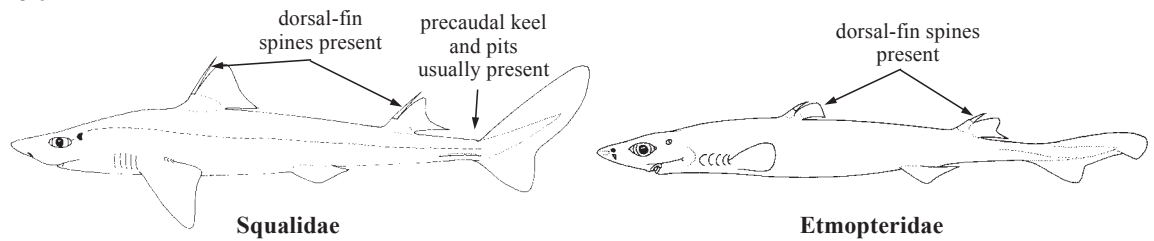
Similar families occurring in the area

Echinorhinidae: body set with sparse, large, plate-like denticles; spiracles small and well behind eyes; fifth pair of gill slits abruptly longer than others; mouth broadly rounded; teeth not imbricated, upper teeth nearly as large as lowers, with cusplets present in large juveniles and adults; first dorsal-fin origin over or posterior to pelvic-fin origins; pelvic fins much larger than second dorsal fin.



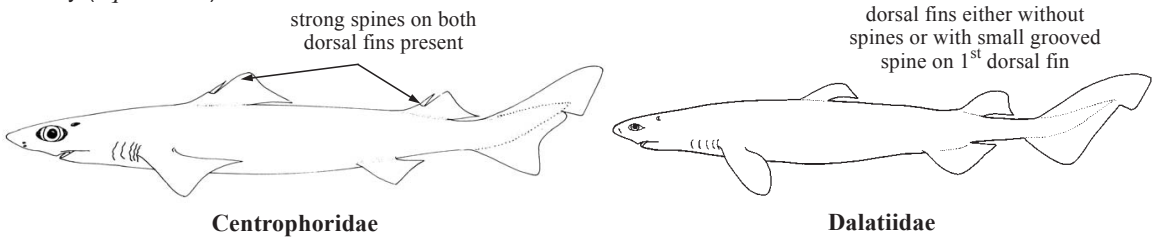
Squalidae: upper teeth nearly as large as lowers; precaudal keels and usually precaudal pits present; dorsal-fin spines very strong and without grooves, second dorsal fin falcate; no subterminal notches on caudal fin.

Etmopteridae: cusplets present on upper teeth; second dorsal fin larger than first and more or less falcate; usually with conspicuous black markings and luminescent organs; species smaller, adults usually do not reach 70 cm.



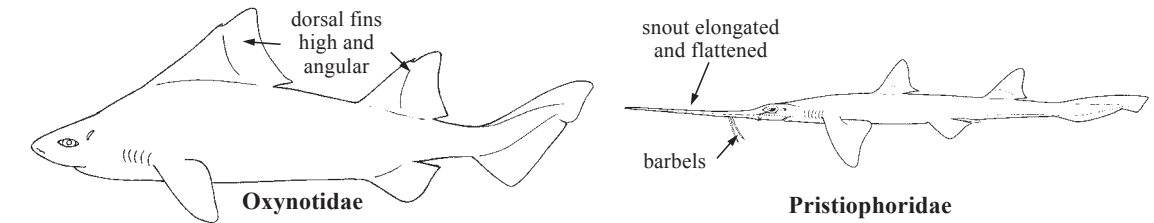
Centrophoridae: upper teeth broader and imbricated; no lateral keels on abdomen; origin of first dorsal fin in front of pectoral-fin free rear tips; dorsal-fin spines strong.

Dalatiidae: head narrower, conical; nostrils close together; dorsal-fin spines absent or present on first dorsal fin only (*Squaliolus*).

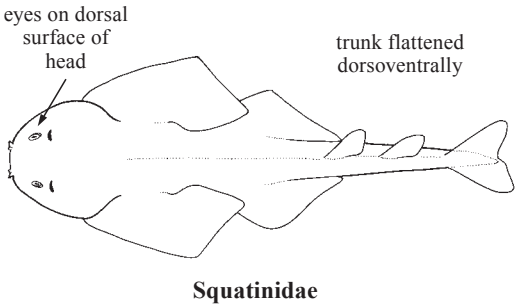


Oxynotidae: lips fringed; body high and compressed; dorsal fins very high and angular, dorsal-fin spines large but buried in the dorsal fins with only the tips exposed.

Pristiophoridae: snout elongated into a flattened blade with lateral teeth; barbels present in front of nostrils.



Squatinae: trunk much flattened dorsoventrally eyes on upper side of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.



Key to the species of Somniosidae occurring in the area

- 1a. Interdorsal space shorter than head (Fig. 1a); pectoral fins elongate, almost as long as caudal fin; lower teeth with high cusps (Fig. 1b); denticles from sides of body, in adults, with a median ridge extending the length of the crown, lateral ridges, and short transverse ridges (Fig. 1c) *Zameus squamulosus*
- 1b. Interdorsal space longer than head; pectoral fins short, much less than caudal-fin length; lower teeth with relatively low cusps (Fig. 2a); denticles from sides of body in adults either without ridges or with short medial and lateral ones on the posterior surface of crown, behind an anterior concavity (Fig. 2b) (*Centroscyrnus*) → 2

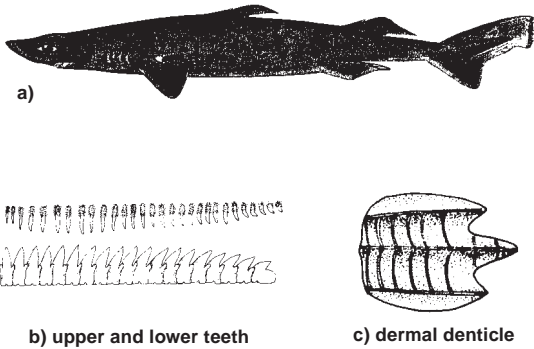


Fig. 1 *Zameus squamulosus*

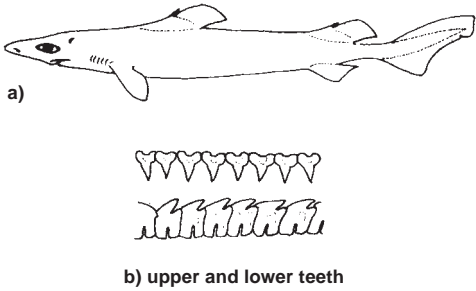


Fig. 2 *Centroscyrnus*

- 2a. Snout shorter, length in front of mouth less than distance from mouth to first gill slit (Fig. 3a); distance from fin spine to free rear tip about equal in both dorsal fins (Fig. 3b); denticles of adults without cusps and ridges (Fig. 3c) *Centroscyrnus coelolepis*
- 2b. Snout longer, length in front of mouth greater than distance from mouth to first gill slit (Fig. 4a); distance from fin spine to free rear tip greater in second dorsal fin than in first (Fig. 4b); denticles of adults with short posterior cusps and ridges (Fig. 4c) *Centroscyrnus owstonii*

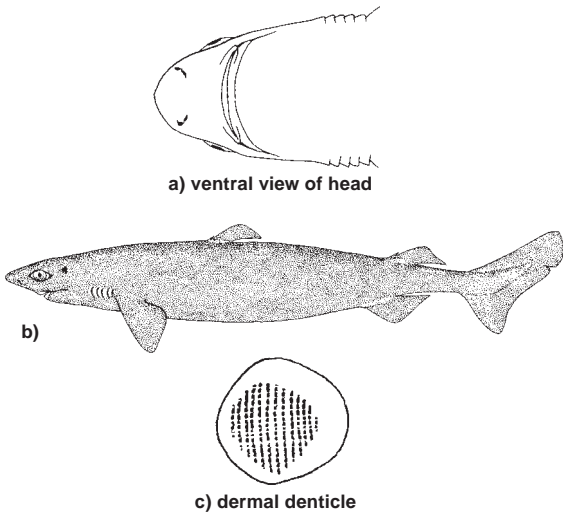


Fig. 3 *Centroscyrnus coelolepis*

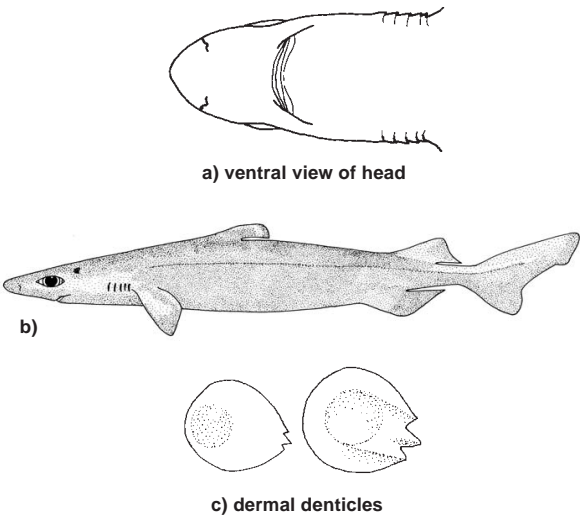



Fig. 4 *Centroscyrnus owstonii*

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Centroscymnus coelolepis* Barbosa du Bocage and Brito Capello, 1864.

 *Centroscymnus owstonii* Garman, 1906.

 *Zameus squamulosus* (Günther, 1877).

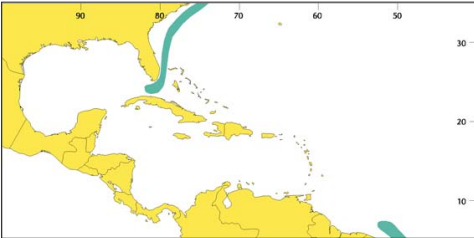
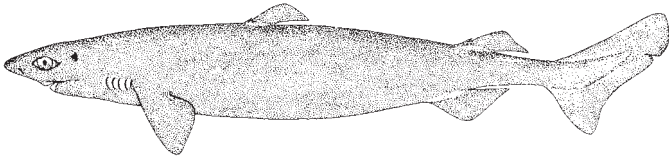
References

- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1)1:56-576.
- Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harvard*, 117:1-150.
- Compagno, L.J.V. and R. Vergara R. 1978. Squalidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31) Volume V*, edited by W. Fischer. Rome, FAO, 10 pp.
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,pt.1:250 p.
- McEachran, J.D. and J.D. Fechehelm. 1998. *Fishes of the Gulf of Mexico, vol. 1, Myxiniiformes to Gasterosteiformes*. Austin, University of Texas Press, 1112 p.
- Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Sapporo, Hokkaido University Press, 151 p.
- Taniuchi, T. and J.A.F. Garrick. 1986. A new species of *Scymnodalatias* from the Southern Oceans, and comments on other squaliform sharks. *Japanese J. Ichthyol.*, 33(2):119-134.
- Yano, K. and S. Tanaka. 1984. Review of the deep sea squaloid genus *Scymnodon* of Japan, with a description of a new species. *Japanese J. Ichthyol.*, 30(4):341-360.

Centroscyrnus coelolepis Barbaros du Bocage and Brito Capello, 1864

En - Portugese dogfish (AFS: Portugese shark); **Fr** - Pailona commun; **Sp** - Pailona.

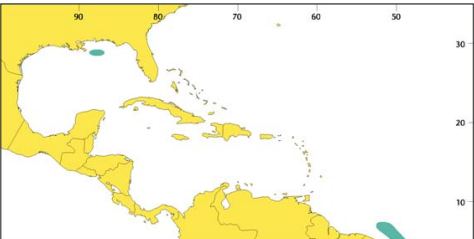
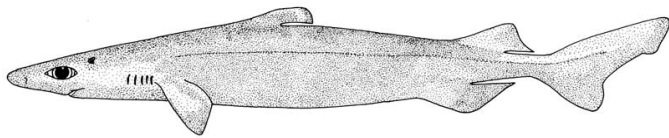
Maximum total length at least 114 cm. Demersal on outer continental shelves, slopes, rises, and seamounts in depths of 160 to 3 675 m, mostly below 600 m. Without interest to fisheries in the area but fished elsewhere with bottom trawls, fixed deep-water nets, and line gear for fish meal and human consumption. Western Atlantic from Grand Banks and Newfoundland, Canada to USA (Massachusetts to Florida), Florida Straits between Florida and Cuba, and off French Guiana. Wide-ranging in the eastern Atlantic, western Mediterranean Sea, Indian Ocean, and western Pacific.



Centroscyrnus owstonii Garman, 1906

En - Roughskin dogfish; **Fr** - Pailona rapeux; **Sp** - Sapata lija.

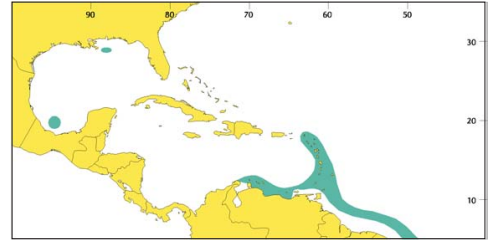
Maximum total length at least 82 cm, presumably to about 1 m. Demersal or pelagic near continental slopes and seamounts in depths of 500 to 1 459 m. Without interest to fisheries in the area, fished elsewhere. Western Atlantic from northern Gulf of Mexico off USA (Alabama), French Guiana; also Uruguay. Wide-ranging in the eastern Atlantic, western Pacific, and eastern South Pacific. S. Springer (pers. comm.) recorded *C. owstoni* from the Gulf of Mexico, which otherwise has been reported in the Pacific. The western Atlantic species has also been identified as *Centroscyrnus cryptacanthus* Regan, 1906, which otherwise occurs in the eastern Atlantic. Examination of western and eastern Atlantic, New Zealand, Australian, and Japanese material referred to both of these species suggests that they comprise a single species, and that *Centroscyrnus cryptacanthus* is a junior synonym of *C. owstonii*.



***Zameus squamulosus* (Günther, 1877)**

En - Velvet dogfish; **Fr** - Squale-grogneur velouté; **Sp** - Bruja terciopelo.

Maximum total length at least 84 cm. Demersal or pelagic near continental slopes and seamounts in depths of 550 to 2 000 m. Without interest to fisheries in the area but utilized elsewhere. Western Atlantic from Gulf of Mexico and Caribbean, including USA (Alabama, Mississippi), Mexico, Venezuela, Suriname, Guyana, French Guiana, and the Lesser Antilles east of the Virgin Islands; also southern Brazil. Wide-ranging in the eastern Atlantic, Indian Ocean, and western Pacific. Atlantic representatives of this species were often placed in *Scymnodon obscurus* (as in Compagno and Vergara, 1978), but *S. obscurus* is a junior synonym of *Z. squamulosus* (Yano and Tanaka, 1984). This species is often placed in the genus *Scymnodon* but was transferred to *Zameus* by Taniuchi and Garrick (1986).



OXYNOTIDAE**Rough sharks**

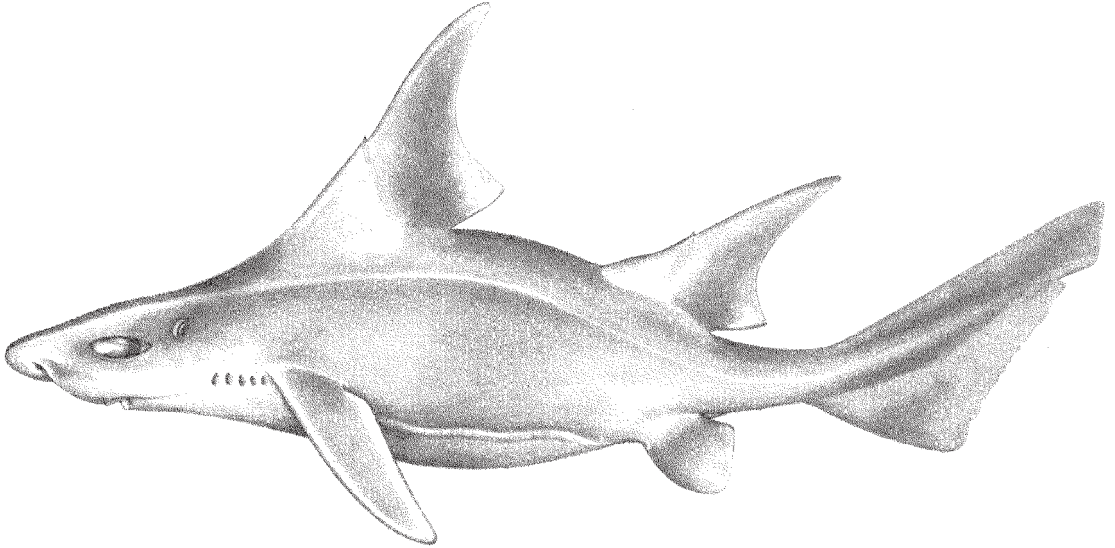
A single species occurring in the area.

Oxynotus caribbaeus Cervigón, 1961

OXC

Frequent synonyms / misidentifications: None / None.

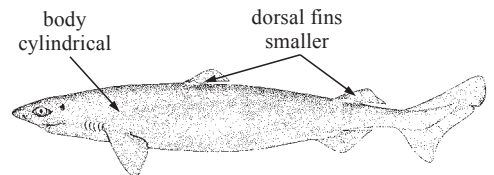
FAO names: En - Caribbean roughshark; Fr - Centrine antillaise; Sp - Tiburón ojimoto.



Diagnostic characters: A small shark. **Body strongly compressed, very high, and triangular in cross section**, with a horizontal ridge between pectoral-fin and pelvic-fin bases on each side. Denticles on body large, skin rough. Head with 5 minute gill slits, the last in front of pectoral-fin origins; nostrils close-spaced, internarial width less than nostril width, without barbels or nasoral grooves; snout moderately long, flattened; **mouth very small, transverse, and with large papillose lips**, well behind snout tip and beneath eyes; lower teeth very few, moderately large, flat, narrow, blade-like, serrated, imbricated, and with triangular cusps, upper teeth very small, not blade-like, and with narrow, needle-like cusps; very short papillose gill rakers present on internal gill slits. **Two large, broad-based, triangular dorsal fins, each with a large fin spine mostly concealed within dorsal fin, the first dorsal fin with its origin extending far forward over gill openings; pectoral fins narrow and elongated; anal fin absent; caudal fin much less than half the total length, asymmetrical, with a subterminal notch and a weak lower lobe.** No keels or precaudal pits on caudal peduncle. **Colour:** dark grey or brownish above, lighter below, with light and dark blotches, no conspicuous black marks or luminescent organs.

Similar families occurring in the area

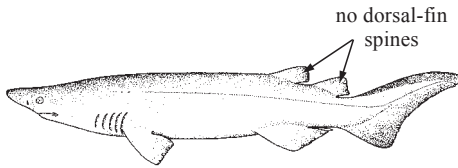
Squalidae, Centrophoridae, Somniosidae, Etmopteridae, and Dalatiidae: body more cylindrical, dorsal fins smaller, lower, and not sail-like, first dorsal fin not extending over gill openings, pectoral fins broader and more paddle-shaped.



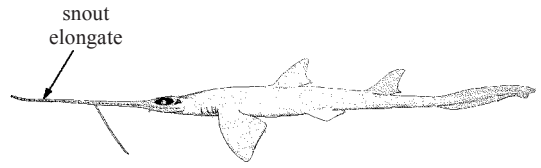
Dalatiidae

Echinorhinidae: body set with sparse, large, plate-like denticles; spiracles small and well behind eyes; fifth pair of gill slits abruptly longer than others; mouth broadly rounded; teeth not imbricated, upper teeth nearly as large as lower teeth, with cusplets present in large juveniles and adults; no dorsal-fin spines; first dorsal-fin origin over or posterior to pelvic-fin origin; pelvic fins much larger than second dorsal fin.

Pristiophoridae: snout elongated into a flattened blade with lateral teeth; barbels present in front of nostrils.



Echinorhinidae



Pristiophoridae

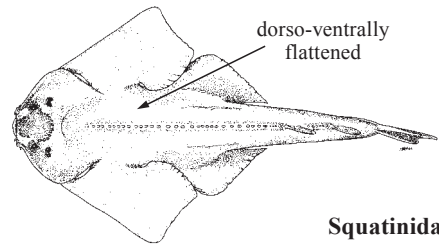
Squatinae: trunk much flattened dorso-ventrally; eyes on upper side of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.

All other shark families: anal fin present.

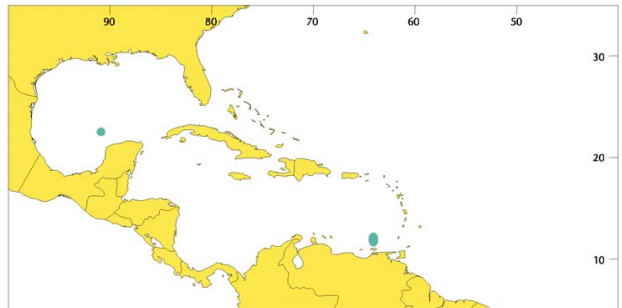
Size: Maximum total length about 49 cm.

Habitat, biology, and fisheries: Bottomliving on the continental slopes in water about 402 to 457 m deep. Biology essentially unknown. Not fished commercially, but possibly discarded bycatch of offshore demersal fishing fleets.

Distribution: So far only reported in the area from off Venezuela and Mexico.



Squatinae



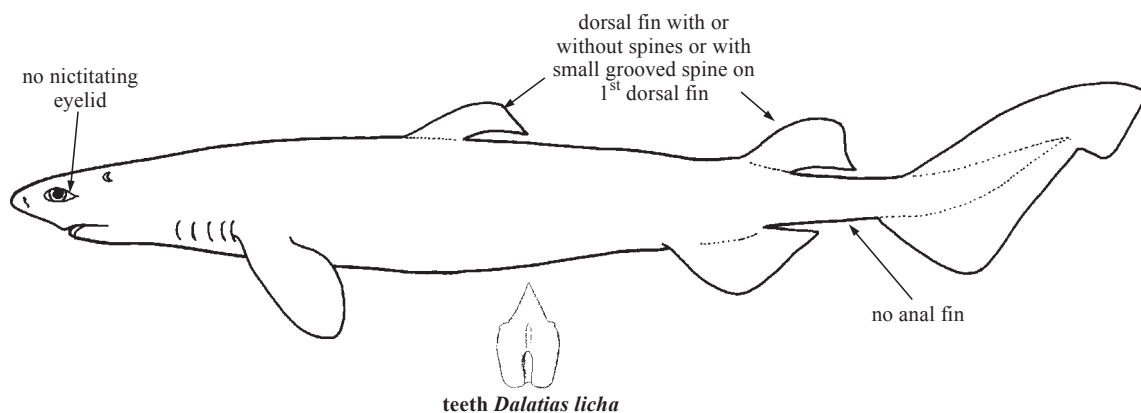
References

- Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harvard*, 117:1-150.
- Carpenter, J.S. 1966. Capture of immature *Oxynotus caribbaeus* Cervign from the type locality. *Copeia*, (1966):356-357.
- Cervignón, M.F. 1961. Una nueva especie de *Oxynotus* de la costas de Venezuela. *Cont. Fund. La Salle Cien. Nat. Set. Invest. Mar. Margarita*, (3):3-10.
- Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d'Atlantique (plus particulièrement de la Côte Occidentale d'Afrique). *Ed. OSTROM, Faune Tropicale*, (21):330 p.
- Compagno, L.J.V. 1978. Oxynotidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31)*, edited by W. Fischer. Vol. 5. Rome, FAO (unpaginated).
- Compagno, L.J.V. 1984. *FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. FAO Fisheries Synopsis*, (125)Vol.4,Pt.1 (noncarcharhinoids):1-250.
- Pérez, H.E. and L.H. Campos. 1995. Nuevos registros de tiburones en México. *Rev. Soc. Mex. Hist. Nat.*, 46:113-120.
- Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Hokkaido University Press, Sapporo, 151 p.
- Yano, K. and M. Murofushi. 1985. A new prickly dogfish, *Oxynotus japonicus*, from Japan. *Japan. J. Ichthyol.*, 32(2):129-135.

DALATHIDAE

Kitefin sharks

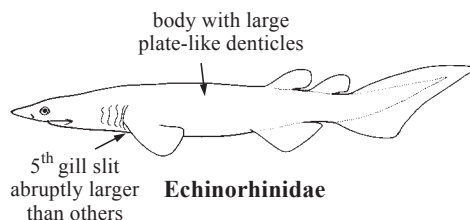
Diagnostic characters: Dwarf to moderately large sharks, with cylindrical or slightly compressed bodies, with lateral ridges absent between pectoral and pelvic fins and without precaudal pits, caudal keels present or absent. **Head with 5 gill slits, all anterior to pectoral fins**, the fifth not abruptly longer than the others; **spiracles always present, large and just behind eyes; eyes on sides of head, without nictitating eyelids**. Snout short to moderately elongated, narrow, conical, not flattened and not formed as a rostral saw; no barbels on snout; nostrils fairly wide-spaced, internarial width greater than or subequal to nostril width; mouth short and nearly transverse, lips smooth or papillose; **teeth strong-cusped, dissimilar in both jaws, upper teeth narrow, and needle-like, without cusplets; lower teeth compressed, broad, blade-like, and without cusplets, adjacent teeth imbricated, upper teeth much smaller than lowers**. **Two dorsal fins either without spines on their anterior margins or with a small grooved spine present on first dorsal fin**; dorsal fins small, rounded, narrow, and with weakly concave posterior margins; first dorsal fin subequal in area to second or smaller; origin of first dorsal fin close to or well in front of pelvic-fin origins, behind pectoral-fin insertions and opposite or (usually) behind pectoral-fin free rear tips; **no anal fin**; caudal fin strongly asymmetrical to nearly symmetrical, with subterminal notch present and with a lower lobe varying from virtually absent to very strong; pelvic fins variably smaller to larger than second dorsal fin. Dermal denticles close-set, not greatly enlarged and plate-like. **Colour:** body greyish to blackish brown, fins either colour of body or with transparent webs, body without conspicuous black marks, luminescent organs present or absent.



Habitat, biology, and fisheries: Occurs in deep water near the bottom on continental and insular slopes between 200 to at least 1 800 m, but most species are dwarf oceanic sharks and occur in the epipelagic, mesopelagic, and probably bathypelagic zones. Occasional individuals occur in shallow water on the continental shelves, and may wash up on beaches. Circumglobal in temperate to tropical seas and may range into higher latitudes. Feed on a wide variety of bony fishes, other elasmobranchs, cephalopods, crustaceans, worms, and tunicates; some species are partially ectoparasitic and take chunks out of larger marine animals, including bony fishes, elasmobranchs, and cetaceans. Reproduction is ovoviviparous, with 6 to 16 young per litter. In the Far East and the eastern Atlantic one kitefin shark, *Dalatias licha*, is commonly fished with line gear and bottom trawls, and fixed bottom nets for human consumption and for their livers, which are extremely large, oily, and have a high squalene content.

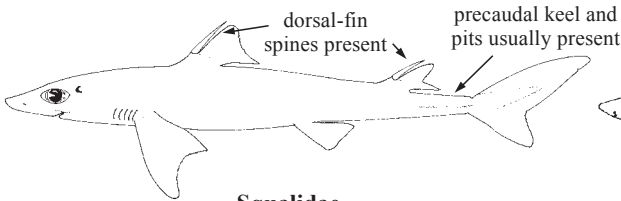
Similar families occurring in the area

Echinorhinidae: body set with sparse, large, plate-like denticles; spiracles small and well behind eyes; fifth pair of gill slits abruptly longer than others; mouth broadly rounded; teeth not imbricated, upper teeth nearly as large as lower teeth, with cusplets present in large juveniles and adults.

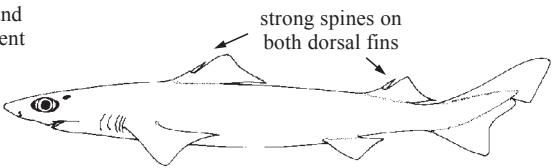


Squalidae: snout flattened; nostrils far apart; upper teeth nearly as large as lowers, both upper and lower teeth imbricated and blade-like; precaudal keels and usually upper precaudal pits present; fin spines present on both dorsal fins, second dorsal fin falcate; no subterminal notches on caudal fin.

Centrophoridae: snout flattened; nostrils far apart; both upper and lower teeth compressed, imbricated and blade-like; dorsal fins larger and with origin of first anterior to pectoral-fin rear tips; strong fin spines present on both dorsal fins.



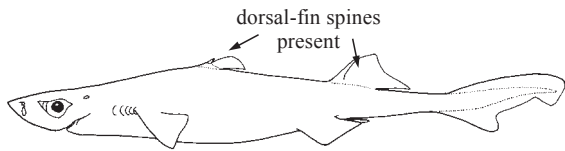
Squalidae



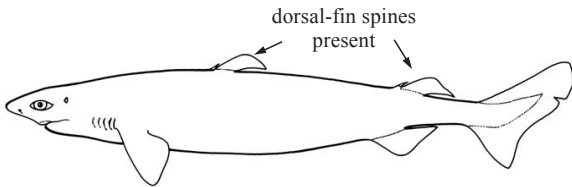
Centrophoridae

Etmopteridae: snout flattened; nostrils far apart; cusplets present on upper teeth; fin spines present on both dorsal fins; origin of first dorsal fin over or behind the pectoral-fin free rear tips; second dorsal fin more or less falcate; body usually with conspicuous black markings and luminescent organs.

Somniosidae: snout broader and more flattened; nostrils far apart; species in the area with fin spines on both dorsal fins.



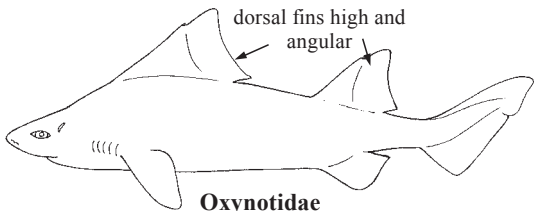
Etmopteridae



Somniosidae

Oxynotidae: body high and compressed; conspicuous lateral keels present on abdomen; dorsal fins very high and angular, large dorsal-fin spines present but buried in the dorsal fins with only the tips exposed.

Pristiophoridae: snout elongated into a flattened blade with lateral teeth; barbels present in front of nostrils.



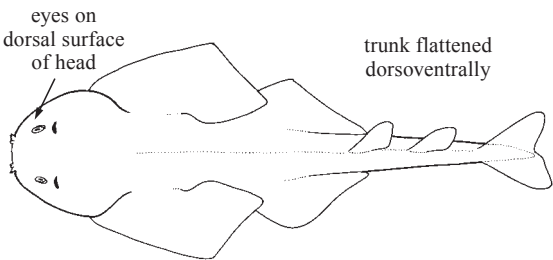
Oxynotidae



Pristiophoridae

Squatinae: trunk much flattened dorsoventrally; eyes on dorsal surface of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.

All other shark families: anal fin present.



Squatinae

Key to the species of Dalatiidae occurring in the area

- 1a. First dorsal fin with a spine; second dorsal-fin base about twice as long as first (Fig. 1) *Squaliolus laticaudus*
- 1b. Both dorsal fins spineless; dorsal-fin bases subequal in length → 2

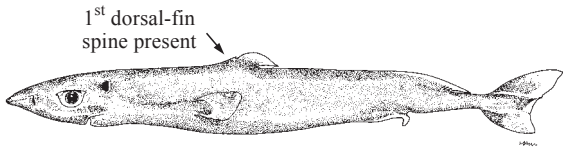


Fig. 1 *Squaliolus laticaudus*

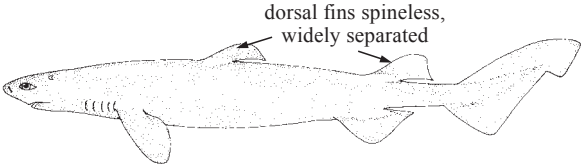


Fig. 2 *Dalatias licha*

- 2a. Lips fringed; edges of lower teeth serrated; dorsal fins widely separated, the first dorsal fin closer to the pectoral fins than to the pelvic fins (Fig. 2) *Dalatias licha*
- 2b. Lips not fringed; edges of lower teeth smooth; dorsal fins far back on body and close together, the first dorsal fin closer to the pelvic fins than the pectoral fins → 3
- 3a. Ventral lobe of caudal fin very long, about 2/3 the length of dorsal lobe; lower teeth smaller and more numerous, in 25 to 31 rows (Fig. 3) *Isistius brasiliensis*
- 3b. Ventral lobe of caudal fin shorter, about half the length of dorsal lobe; lower teeth larger and fewer, in 19 rows (Fig 4) *Isistius plutodus*

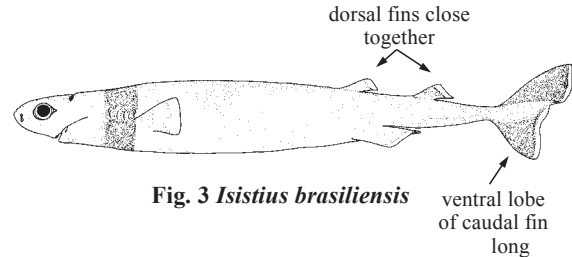







Fig. 3 *Isistius brasiliensis*



Fig. 4 *Isistius plutodus*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Dalatias licha* (Bonnaterre, 1788).
-  *Isistius brasiliensis* (Quoy and Gaimard, 1824).
-  *Isistius plutodus* Garrick and Springer, 1964.
-  *Squaliolus laticaudus* Smith and Radcliffe, 1912.

References

Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Fnd. Mar. Res.*, (1)1:56-576.

Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harvard*, 117:150 p.

Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d'Atlantique (plus particulièrement de la Côte Occidentale d'Afrique). Ed. OSTROM, *Faune Tropicale*, (21):330 p.

Compagno, L.J.V. and R. Vergara R. 1978. Squalidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31) Volume V*, edited by W. Fischer. Rome, FAO, 10 pp.

Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:250 p.

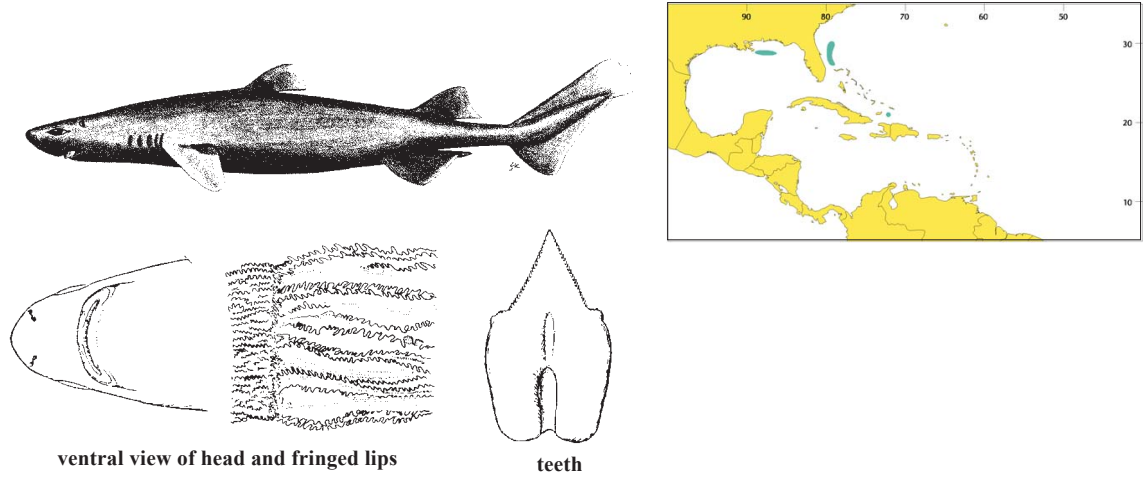
McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, vol. 1, Myxiniformes to Gasterosteiformes. Austin, University of Texas Press, 1112 p.

Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Sapporo, Hokkaido University Press, 151 p.

***Dalatias licha* (Bonnaterre, 1788)**

En - Kitefin shark; **Fr** - Squalé liche; **Sp** - Carochó.

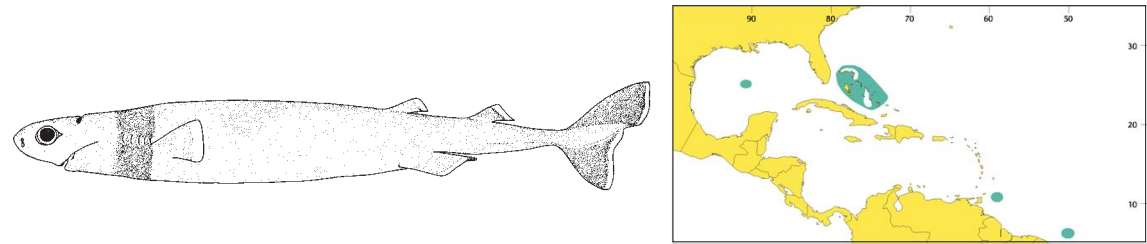
Maximum total length to at least 160 cm. Occurs on the bottom and in the midwater of the outer continental and insular shelves from 40 to 1 800 m depth. Feeds on bony fishes, as well as sharks, skates, cephalopods, and crustaceans. Caught for its squalene-rich liver, leather, and meat, also for fish meal. Western Atlantic (Georges Bank and Gulf of Mexico), eastern Atlantic, Mediterranean, western Indian Ocean, and western and central Pacific.



***Isistius brasiliensis* (Quoy and Gaimard, 1824)**

En - Cookiecutter shark; **Fr** - Squalelet féroce; **Sp** - Tollo cigarro.

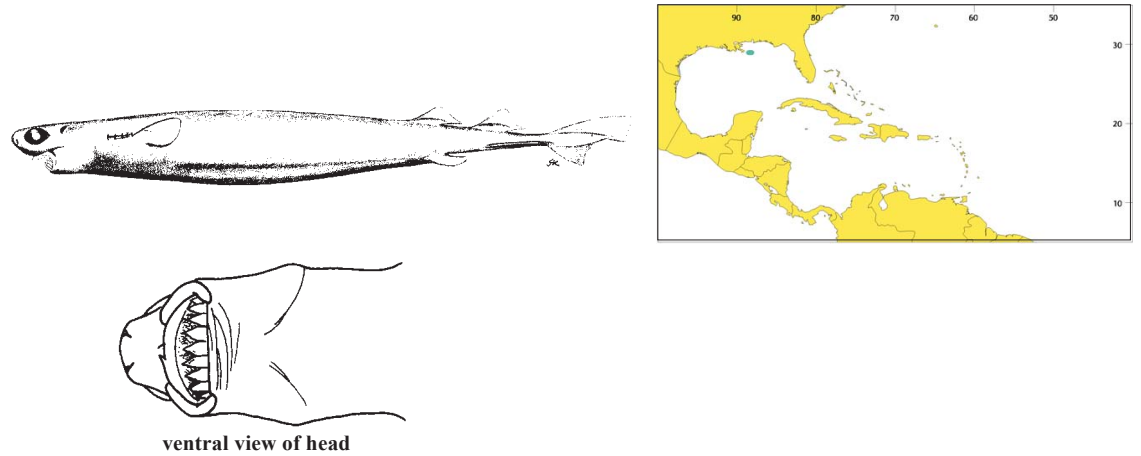
Maximum total length at about 50 cm. Makes diurnal vertical migrations probably from below 1 000 m in the day to or near the surface at night. Feeds on free living deep-water prey, but is also a facultative ectoparasite on larger marine organisms. Of no importance to fisheries in the area. A widespread oceanic shark in temperate and tropical oceans.



Isistius plutodus Garrick and Springer, 1964

En - Largetooth cookiecutter shark; **Fr** - Squalelet dentu; **Sp** - Tollo cigarro dentón.

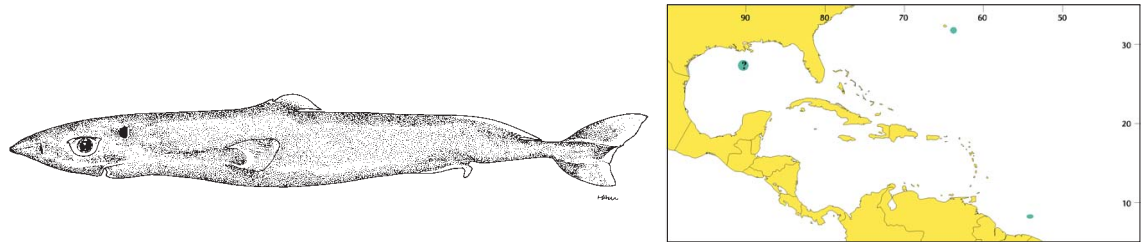
Maximum total length at least 42 cm. Oceanic, found off the bottom and sometimes near the surface over the slopes and trenches in water 800 to 6 440 m deep. An ectoparasite on larger marine organisms. No importance to fisheries in the area. A rare, and sporadically distributed shark in the western Atlantic and western Pacific, in the area in the northern Gulf of Mexico (USA), also off Brazil, Sahara Republic, Australia, and Okinawa, Japan.



Squaliolus laticaudus Smith and Radcliffe, 1912

En - Spined pygmy shark; **Fr** - Squale nain; **Sp** - Tollo pigmeo espinudo.

Maximum total length to about 25 cm. Epipelagic near continental and island land masses, usually over the slopes at depths of 200 to 500 m. Feeds on deep-water squids and bony fishes. Of no interest to fisheries. Oceanic and nearly circumtropical.



Order SQUATINIFORMES

SQUATINIDAE

Angel sharks (sand devils)

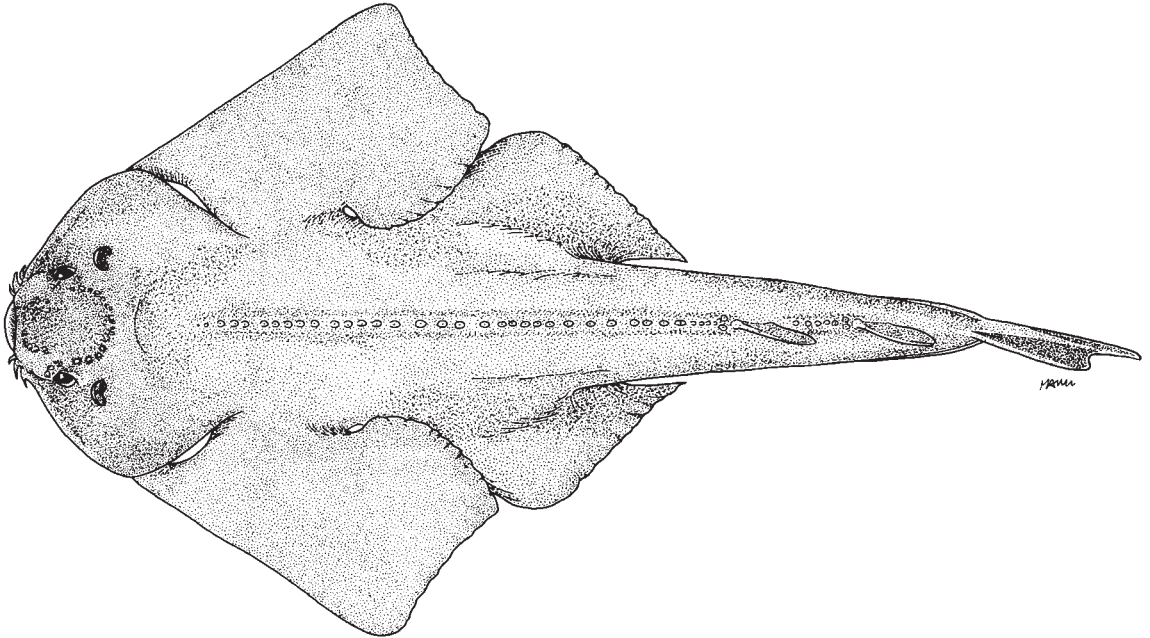
A single species occurring in the area.

Squatina dumeril (Lesueur, 1818)

SUD

Frequent synonyms / misidentifications: None / Uncertain.

FAO names: En - Sand devil (AFS: Atlantic angel shark); Fr - Ange de mer de sable; Sp - Tiburón ángel.

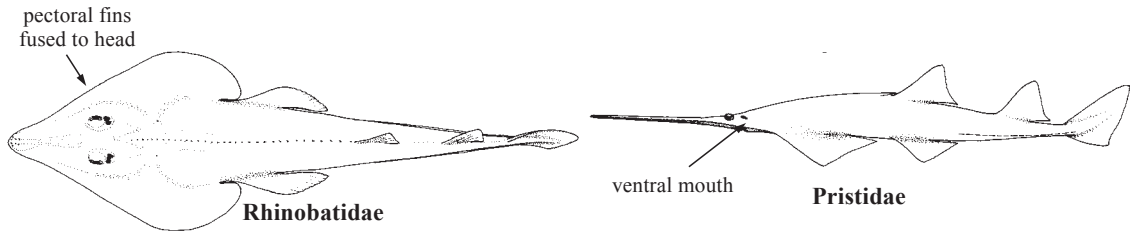


Diagnostic characters: A moderately large, flattened, ray-like shark. Head and body greatly depressed; head transversely oval, with a distinct neck at bases of pectoral fins; no nictitating lower eyelids; nostrils at tip of snout, each with a bifid nasal barbel; mouth short, angular, and terminal on head, extending under front of eyes; teeth small, similar in both jaws, with a single, strong, needle-sharp cusp, and no cusplets; 5 moderately long gill openings ventrolaterally situated and not visible dorsally; no gill rakers. Spineless dorsal fins situated far rearward on tail, the first originating behind free rear tips of pelvic fins. Caudal fin very short, much less than half the total length, nearly symmetrical but not lunate, with the lower lobe slightly longer than the upper and with the vertebral axis extending ventrally into it (hypocercal caudal fin); peduncle moderately depressed, with a low longitudinal keel on each side; no precaudal pits. Pectoral fins greatly enlarged and triangular, with a large triangular lobe extending from their bases on each side to parallel the gill openings (but not fused to sides of head above them as in rays); 2 equally small, anal fin absent. **Colour:** back blue-grey or light grey, underside white, with irregular reddish markings above and below.

Similar families occurring in the area

The combination of characters such as terminal mouth, greatly flattened head and body, ventrolateral gill openings, free anterior lobes of the very large, triangular pectoral fins, dorsal fins posterior in position, absence of anal fin, and long lower caudal-fin lobe with vertebral axis bent into it, readily distinguishes this shark from all other sharks (including rays) in the area.

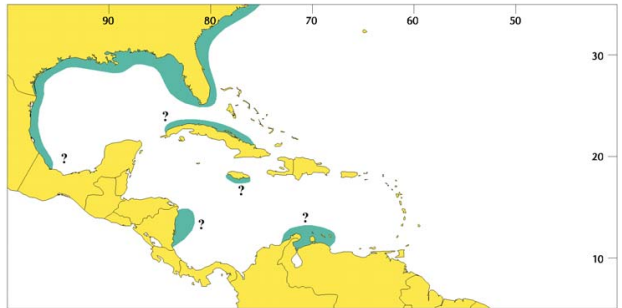
Guitarfishes (Rhinoobatidae) and sawfishes (Pristidae) are rays that are superficially similar to *Squatina dumeril*, but have the pectoral fins fused to the head over the ventral gill openings, ventral mouths, small cusplike teeth, and a heterocercal caudal fin with the lower lobe of caudal fin, when present, shorter than the upper lobe and with the vertebral axis extending into the upper lobe.



Size: Maximum to about 155 cm, maturing between 90 and 120 cm. Size at birth 28 to 30 cm.

Habitat, biology, and fisheries: Often occurring close inshore but descending to considerable depths on the outer continental shelf and even the upper slope, down to 450 and even 1 390 m. On the Atlantic coast of the USA it appears in shallow water in summer but disappears in winter, possibly by retreating into deep water. A little-known bottom-dweller, probably burying itself in mud and sand and feeding on bottom fishes including skates and bony fishes, crustaceans, and molluscs. Harmless unless provoked; will snap when captured and can inflict severe lacerations with its trap-like jaws and pointed teeth. It is caught mostly as bycatch of demersal trawl fisheries targeting other fishes in continental waters. Separate statistics are not reported for this species; it is not utilized to any extent. As this species is recorded in a wide range of habitats over a broad area, and as the western south Atlantic angel sharks comprise 3 species rather than 1 (Vooren and da Silva, 1991), specimens of *Squatina dumeril* need to be critically compared to determine if only a single species is involved.

Distribution: Western north Atlantic: Atlantic coast of the USA (Massachusetts to the Florida Keys); entire Gulf of Mexico from off the USA (Florida, Alabama, Mississippi, Louisiana, and Texas) and Mexico (Tamaulipas and Veracruz); also Caribbean off Cuba, Nicaragua, Jamaica, and Venezuela.



References

- Bigelow, H.B. and W.C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1):56-576.
- Compagno, L.J.V. 1978. Squatinidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31)*, edited by W. Fischer. Vol. 5. Rome, FAO (unpaginated).
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fisheries Synop.*, (125)Vol.4.Pt.1:249 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1, Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.
- Roux, C. 1977. Les anges de mer (Squatinidae) de l'Atlantique et de la Méditerranée. *Bull. Off. Nat. Pêches Tunisie*, 1 (2):159-168.
- Vooren, C.M. and K.G. da Silva. 1991. On the taxonomy of the angel sharks from southern Brazil, with the description of *Squatina occulta* sp. nov. *Rev. Brasil. Biol.*, 51(3):589-602.

Order PRISTIOPHORIFORMES
PRISTIOPHORIDAE

Sawsharks

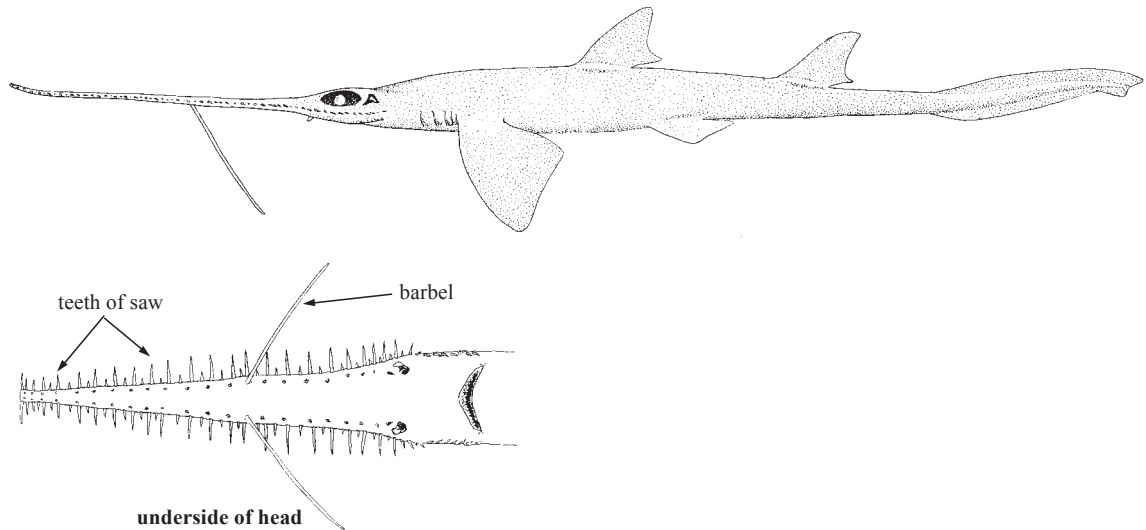
A single species occurring in the area.

Pristiophorus schroederi Springer and Bullis, 1960

PPH

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Bahamas sawshark; **Fr** - Requin scie d'Amérique; **Sp** - Tiburón sierra americano.

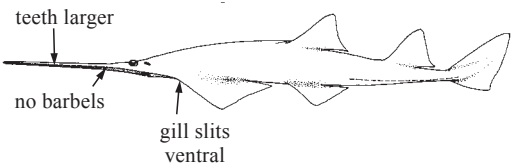


Diagnostic characters: A small shark. Body moderately depressed. **Snout extremely long, greatly flattened, with enlarged pointed dermal denticles along sides forming the teeth of a rostral saw and a pair of long barbels on its ventral surface in front of nostrils;** nostrils without barbels or nasoral grooves; mouth small, short, and angular, located far posterior, mostly behind eyes; teeth very small, not blade-like, with 1 conical cusp, alike in both jaws. Head with 5 small lateral gill slits, the last in front of pectoral-fin origins; no gill rakers. Two moderately large dorsal fins, without spines, the first on back just ahead of pelvic fins; caudal fin much less than half the total length, asymmetrical, with a subterminal notch and no ventral lobe; pectoral fins broad and moderately large; **anal fin absent**. No precaudal pits, but a long low dermal keel extending on tail from behind pelvic fins to base of caudal fin on each side. **Colour:** light grey or brownish above, whitish below.

Similar families occurring in the area

No other non-batoid sharks have rostral saws and elongated barbels on the snout.

Sawfishes (Pristidae, a family of 'flat' sharks or batoid fishes) also have a rostral saw, but differ from the sawsharks in having the pectoral fins expanded anteriorly over the gill openings and fused to the sides of the head, so that the head and pectoral fins form a distinct pectoral disc with the gill openings ventral (as in other batoids); additionally, the trunk is shorter and more depressed, the first dorsal fin is partially or entirely above the pelvic-fin bases, the rostral saw has relatively few, uniformly large teeth (small and varying in size along the rostrum in Pristiophoridae) and no barbels. Furthermore, the species of sawfishes are much larger, reaching 6 m or more.

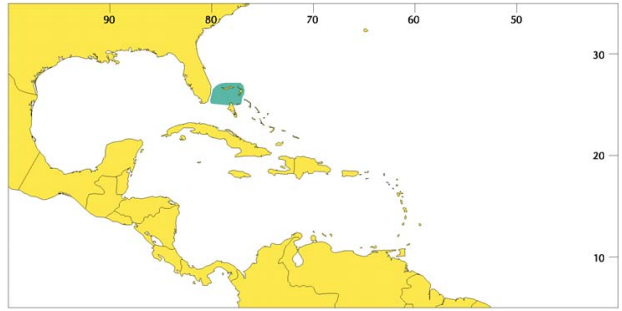


Pristidae

Size: Reported to reach about 81 cm in total length.

Habitat, biology, and fisheries: Occurs on the bottom on the upper and middle insular slopes at depths of 438 to about 952 m. Biology poorly known. Not fished presently, but possibly a discarded bycatch of deep-water demersal fisheries.

Distribution: Only known from off the Bahamas region, between Cuba, Florida, and the Bahamas.



References

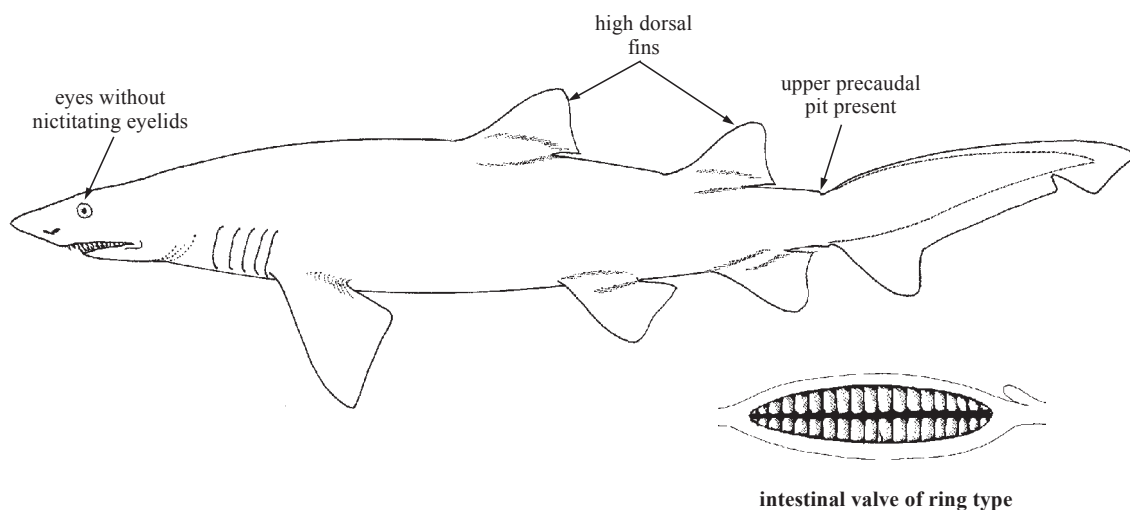
- Bullis, H. R., Jr. and J. R. Thompson. 1965. Collections by the exploratory fishing vessels *Oregon*, *Silver Bay*, *Combat*, and *Pelican* made during 1956 to 1960 in the southwestern North Atlantic. *U.S. Fish. Wildl. Serv. Spec. Sci. Rep. Fish.*, (510), 130 p.
- Compagno, L. J. V. 1978. Pristiophoridae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31), Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).
- Compagno, L. J. V. 1984. FAO Species Catalogue. Vol. 4. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:250 p.
- Springer, S. and H. R. Bullis, Jr. 1960. A new species of sawshark, *Pristiophorus schroederi*, from the Bahamas. *Bull. Mar. Sci. Gulf Caribbean*, 10(2):241-254.

Order LAMNIFORMES

ODONTASPIDIDAE

Sand tiger sharks

Diagnostic characters: Large sharks. Head with 5 medium-sized gill slits, all in front of pectoral-fin bases, **their upper ends not extending onto dorsal surface of head; eyes small or moderately large, without nictitating eyelids; no nasal barbels or nasoral grooves;** snout conical or moderately depressed, not blade-like; mouth very long and angular, extending well behind eyes when jaws are not protruded; **lower labial furrows present at mouth corners;** anterior teeth enlarged, with long, narrow, sharp-edged but unserrated cusps and small basal cusplets (absent in young of at least 1 species), the upper anteriors separated from the laterals by a gap and tiny intermediate teeth; gill arches without rakers; spiracles present but very small. Two moderately large **high dorsal fins, the first dorsal fin originating well in advance of the pelvic fins,** the second dorsal fin as large as or somewhat smaller than the first dorsal fin; anal fin as large as second dorsal fin or slightly smaller; caudal fin short, asymmetrical, with a strong subterminal notch and a short but well marked ventral lobe. Caudal peduncle not depressed, **without keels; a deep upper precaudal pit present but no lower pit.** Intestinal valve of ring type, with turns closely packed like a stack of washers. **Colour:** grey or grey-brown to blackish above, blackish to light grey or white, with round or oval dark spots and blotches variably present on 2 species.



Habitat, biology, and fisheries: Wide-ranging, tropical to cool-temperate sharks, found inshore and down to moderate depths on the edge of the continental shelves and around some oceanic islands, and in the open ocean. Development is ovoviparous (aplacental viviparous) as far as known. They feed on bony fishes, other sharks, squids, and occasionally bottom crustaceans. Normally inoffensive, occasionally biting people, 2 species are popular as subjects of ecotouristic diving and 1 as an aquarium exhibit. In Area 31, *Carcharias taurus* is regularly caught for food, liver oil, and processed for fish meal. Two species of *Odontaspis* are rarely caught in the area and are not utilized commercially.

Similar families occurring in the area

Pseudocarchariidae: the wide-ranging oceanic crocodile shark (*Pseudocarcharias kamoharai*) is virtually circumtropical in distribution. It is currently not known from Area 31 but is likely to occur here as it has been caught off northern Brazil and in the eastern Atlantic. It differs from Odontaspidae in having a slimmer body, gill slits higher and reaching onto dorsal sides of head, eyes larger, no true labial furrows, dorsal and anal fins lower, a weak lateral keel on caudal peduncle, both upper and lower precaudal pits present, and in reaching a size of less than 1.3 m.

Megachasmidae: the rare but wide-ranging oceanic megamouth shark (*Megachasma pelagios*) may be circumtropical in distribution but is currently known from spotty records in the Pacific (Japan, California, Indonesia, Philippines, and Hawaii), South Africa, Indian Ocean off Australia, and in the Atlantic off Senegal and southern Brazil. This giant plankton-feeding shark is currently not known from Area 31 but is to be expected here. It differs from Odontaspidae in having a very short, broadly rounded snout, huge terminal mouth with numerous small, hooked teeth in both jaws, very long head, gill-raker papillae on its internal gill slits, narrow leaf-shaped pectoral fins with origins under third gill slits, a soft, flabby body, and in attaining a larger size, 4.5 to 5.4 m long.

Proscylliidae, Triakidae, and Carcharhinidae: nictitating eyelids present, anterior teeth not greatly enlarged, no intermediate teeth between anteriors and laterals, intestinal valve of spiral or scroll type.

Key to the species of Odontaspidae occurring in the area

- 1a. Snout short and somewhat flattened; eyes very small; 3 rows of anterior teeth on either side of upper symphysis; dorsal and anal fins about equal in size, first dorsal fin closer to pelvic-fin than to pectoral-fin bases (Fig. 1) *Carcharias taurus*
- 1b. Snout longer, bulbous and conical; eyes large; 2 rows of large anterior teeth on either side of upper symphysis; first dorsal fin markedly larger than the second, closer to pectoral-fin than to pelvic-fin bases; second dorsal fin larger than anal fin (Fig. 2) (*Odontaspis*) → 2

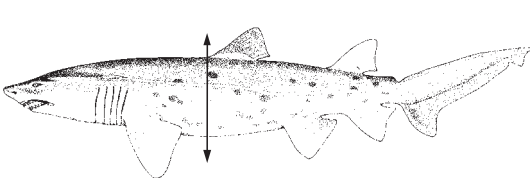
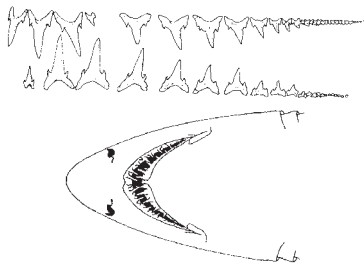


Fig. 1 *Carcharias taurus* teeth, ventral view of head, and lateral view of body

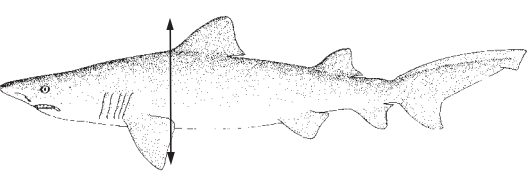
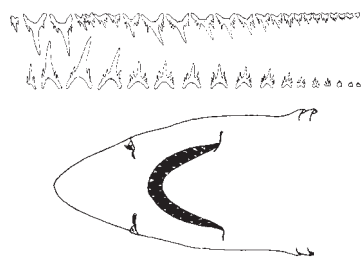
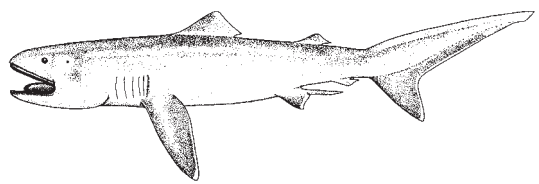


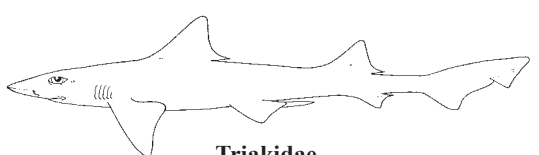
Fig. 2 *Odontaspis* teeth, ventral view of head, and lateral view of body



Pseudocarchariidae



Megachasmidae



Triakidae

- 2a. Anal fin high; teeth with mostly 2 or 3 cusplets on each side; 3 to 5 pairs of intermediate teeth present; ventral caudal lobe short but strong; colour grey or grey-brown above, lighter below, often with darker spots on sides, no light patch on first dorsal fin (Fig. 3) *Odontaspis ferox*
- 2b. Anal fin lower; teeth usually with a single cusplet on each side; 1 to 3 pairs of intermediate teeth present; ventral caudal lobe hardly developed; colour blackish or brownish black above and below, often with a light patch on the first dorsal fin *Odontaspis noronhai*

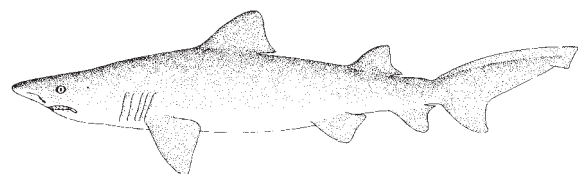


Fig. 3 *Odontaspis ferox*

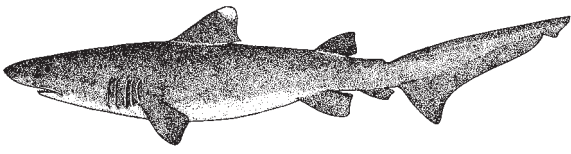






Fig. 4 *Odontaspis noronhai*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Carcharias taurus* Rafinesque, 1810.
-  *Odontaspis ferox* (Risso, 1810).
-  *Odontaspis noronhai* (Maul, 1955).

References

Bigelow, H.B. and W.C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1):1:56-576.

Bonfil, R. 1995. Is the ragged-tooth shark cosmopolitan? First record from the Western North Atlantic. *J. Fish Biol. (London)*, 47(2):341-344.

Branstetter, S. and J.E. McEachran. 1986. A first record of *Odontaspis noronhai* (Lamniformes: Odontaspidae) for the Western North Atlantic, with notes on two uncommon sharks from the Gulf of Mexico. *NE Gulf Sci.*, 8(2):153-160.

Compagno, L.J.V. 1978. Odontaspidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31), W. Fischer, ed. Volume V. Rome, FAO (unpaginated).*

Compagno, L.J.V. 1984. *FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. FAO Fish. Synop.*, (125)Vol.4,Pt.1:250 p.

Menni, R., C. Fabio H.V. Hazin, and R.P.T. Lessa. 1995. Occurrence of the ragged-tooth shark, *Odontaspis ferox*, in the western equatorial Atlantic. *Chondros*, 5(4):3-4.

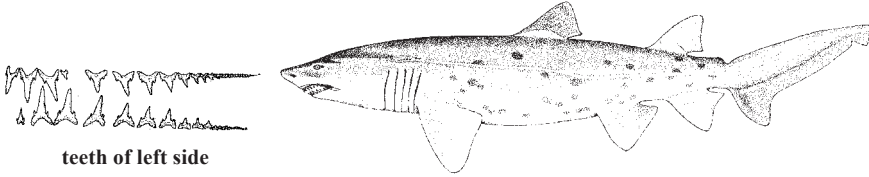
Sadowsky, V., A.F. de Amorim, and C.A. Arfelli. 1984. Second occurrence of *Odontaspis noronhai*. *Bol. Inst. Pesc. (Sao Paulo)*, 11(1):69-79.

Sheehan, T.F. 1998. First record of the ragged-tooth shark, *Odontaspis ferox*, off the U.S. Atlantic Coast. *Mar. Fish. Rev.*, 60(1):33-34.

Carcharias taurus* Rafinesque, 1810*CCT**

Frequent synonyms / misidentifications: *Odontaspis taurus* (Rafinesque, 1810), *Eugomphodus taurus* (Rafinesque, 1810) / None.

FAO names: **En** - Sand tiger shark (AFS: Sand tiger); **Fr** - Requin taureau; **Sp** - Toro bacota.

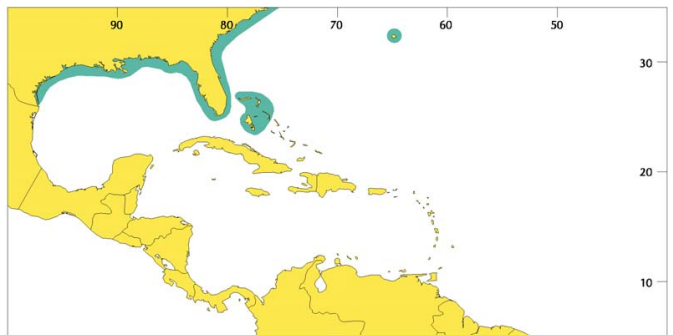


Diagnostic characters: A large shark. Head with 5 medium to large gill slits, all in front of pectoral-fin bases, no gill rakers; **snout very short, moderately flattened; eyes small, without nictitating eyelids**; no nasal barbels or nasoral grooves; mouth very long and angular, extending well behind eyes; upper anterior teeth in **3 rows on either side of symphysis**, large, with long, narrow, hooked, sharp-edged but non-serrated cusps and usually 1 short cusplet on each side; upper anterior teeth separated from the smaller lateral teeth by **a single row of tiny intermediate teeth** (lacking in lower jaw); lower anterior teeth separated at front by 2 rows of small symphyseal teeth (generally lacking in upper jaw). Two dorsal fins, the base of first dorsal fin **just in front of pelvic-fin bases and well posterior to pectoral fins**; **second dorsal fin about as large as first dorsal fin and anal fin**; caudal fin short, strongly asymmetrical, with a pronounced subterminal notch and a short but strong ventral lobe. No keels on caudal peduncle, but with a strong upper precaudal pit and no lower pit. Intestinal valve of ring type. **Colour:** light grey-brown above, white below, often with round or oval, yellow or yellow-brown spots and blotches.

Size: Maximum total length to about 318 cm, possibly up to 430 cm; size at birth 95 to 120 cm; males maturing at about 190 to 195 cm, females at 220 cm or more.

Habitat, biology, and fisheries: Common littoral shark found inshore from surf zone and in shallow bays to at least 191 m on outer continental shelves. Commonly lives near or on bottom but occurs at midwater and at surface. A slow but strong swimmer that can readily halt and hover motionless in midwater, and is only known shark to gulp and store air in its stomach to maintain neutral buoyancy. It occurs singly, in pairs, or in large schools or aggregations and is migratory in higher latitudes. In northern part of its range it migrates south for the winter. Ovoviviparous (aplacental viviparous), with litters of 2 or occasionally 1 young recorded. Only 1 fetus survives out of several fertilized eggs deposited in each uterus; fetuses resorb their yolk sacs at a small size, with the largest killing smaller rivals and subsisting on additional, nutritive eggs for an 8 to 9 month gestation period. Feeds on a wide variety of bony fishes, small sharks, rays, squids, crabs, and lobsters. Jaws can be protruded to a considerable distance from mouth. Occasionally may bite divers without attempting to feed. A favourite with ecotouristic divers as well as public aquaria. Caught throughout its range along with other shark species, but of little importance recently for commercial fisheries. Caught primarily by line gear in Area 31 and has been utilized for its flesh, liver oil, fins, and hides for leather. Exceptionally vulnerable to overexploitation because of its very low fecundity, and is now protected in the USA.

Distribution: In temperate and tropical continental waters; all warm seas except perhaps the eastern Pacific. Most abundant in warm-temperate waters but relatively uncommon and sporadically distributed in the tropics. Mostly absent from oceanic islands, and apparently does not readily cross ocean basins. In the area occurs off the east coast of the USA from Cape Cod to eastern Florida, but rarer and more localized north to New Brunswick, southwest in the Gulf of Mexico to western Florida, Louisiana, and Texas, and east to the northern Bahamas. Also occurs off southern Brazil, Uruguay, and Argentina; the eastern Atlantic from the Mediterranean to South Africa, the western Indian Ocean from South Africa to Mozambique, the Red Sea, and possibly India, and the eastern Indian Ocean and western Pacific from Japan, China, Taiwan Province of China, Viet Nam, Indonesia, and Australia.

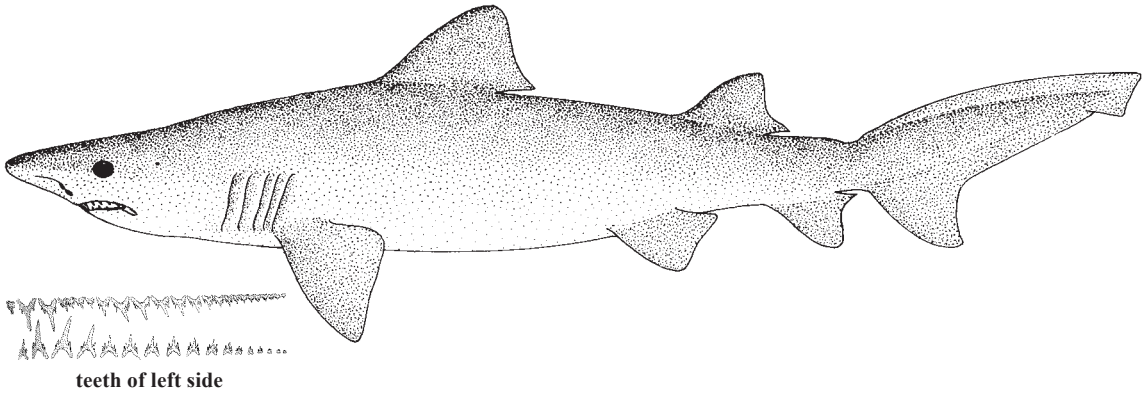


***Odontaspis ferox* (Risso, 1810)**

LOO

Frequent synonyms / misidentifications: *Carcharias ferox* (Risso, 1810), *Odontaspis herbsti* Whitley, 1950 / None.

FAO names: **En** - Smalltooth sand tiger (AFS: Ragged-tooth shark); **Fr** - Requin féroce; **Sp** - Solrayo.

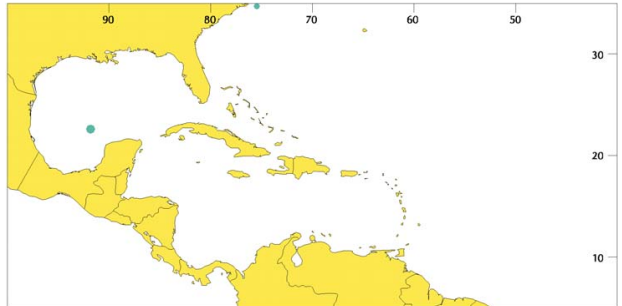


Diagnostic characters: A large shark. Head with 5 medium to large gill slits, all in front of pectoral-fin bases; **eyes large, without nictitating eyelids**; no gill rakers; **snout moderately elongated, bulbously conical**; no nasal barbels or nasoral grooves; mouth very long and angular, extending well behind eyes; anterior teeth moderate-sized, with long, narrow, straight, sharp-edged, non-serrated cusps and **2 or 3 moderately long cusplets on each side**, separated in front by **2 rows of small symphyseal teeth in both jaws**; **upper anteriors set in 2 rows on either side of symphysis and separated from the smaller laterals by 2 to 5 (usually 4) rows of tiny intermediate teeth**; lower anteriors set in 3 rows on either side of symphysis and not followed by small intermediate teeth. Two dorsal fins, the first dorsal fin large and situated closer to the pectoral fins than to the pelvic fins, its free rear tip **well ahead of pelvic-fin origins**, the **second dorsal fin smaller than the first dorsal fin and larger than anal fin or about equally large**; caudal fin short, strongly asymmetrical, with a pronounced subterminal notch and a short but strong ventral lobe. No keels on caudal peduncle, but a strong upper precaudal pit. Intestinal valve of ring type. **Colour: medium grey or grey-brown on the upper surface, lighter below**, sometimes with darker dusky spots on side, fins dusky in adults but black-edged in young, **first dorsal fin without a light blotch at its apex**.

Size: Maximum total length to at least 410 cm and possibly larger; size at birth above 105 cm; males adult at 275 cm, females at 364 cm.

Habitat, biology, and fisheries: A rare to uncommon offshore and deep-water species on continental and insular shelves and slopes from 13 to 420 m, and possibly also the epipelagic zone in 140 to 180 m over the ocean floor. Biology sketchily known, presumably ovoviparous (aplacental viviparous), feeds on bony fishes, squid, and shrimp. An incidental and rare bycatch of fisheries in Area 31. Caught in bottom gill nets, on longlines, and in bottom trawls, but possibly too large to be a regular trawl catch. Mostly fished in the Mediterranean Sea and Japan. Recently the subject of ecotouristic diving in the Mediterranean Sea and the eastern Pacific, apparently docile but inquisitive around divers.

Distribution: In Area 31 it occurs in the northern Gulf of Mexico off Mexico, and on the Atlantic coast of the USA (North Carolina) but is likely to be more widely distributed; also present in the South Atlantic off Brazil (Natal). Possibly circumglobal in all warm seas but sporadically distributed in the Atlantic, Mediterranean Sea, Indian Ocean, and the western and eastern Pacific Ocean.

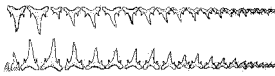
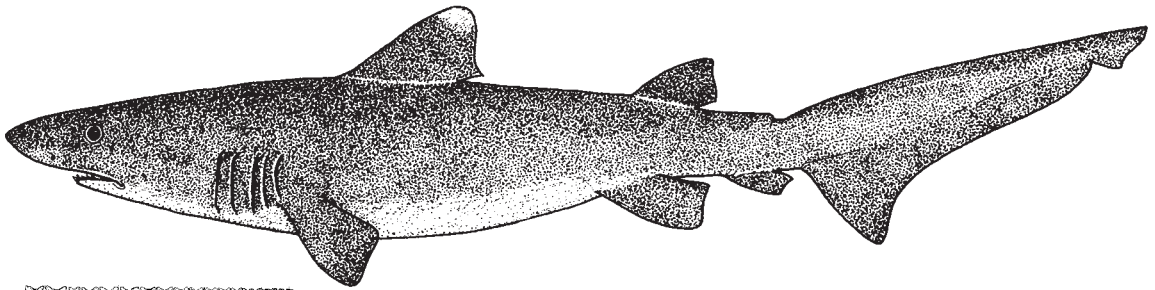


***Odontaspis noronhai* (Maul, 1955)**

ODH

Frequent synonyms / misidentifications: *Carcharias noronhai* Maul, 1955 / None.

FAO names: En - Bigeye sand tiger; Fr - Requin noronhai; Sp - Solrayo ojigrande.



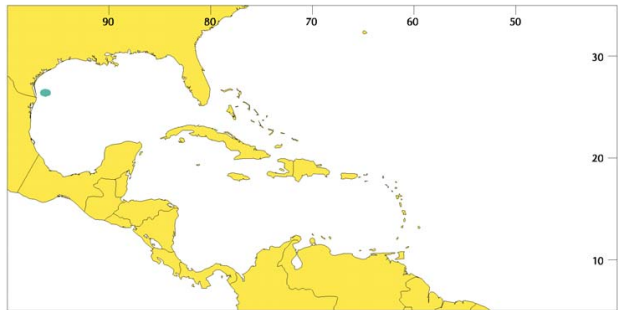
teeth of left side

Diagnostic characters: A large shark. Head with 5 medium to large gill slits, all in front of pectoral-fin bases; no gill rakers; **eyes very large, without nictitating eyelids; snout moderately elongated, bulbously conical**; no nasal barbels or nasoral grooves; mouth very long and angular, extending well behind eyes; anterior teeth moderate-sized, with long, narrow, straight, sharp-edged, non-serrated cusps and **a single moderately long cusplet on each side**, separated in front by **2 (sometimes 1 or none) rows of small symphyseal teeth in the upper jaw and 4 to 8 rows in the lower jaw; upper anterior teeth set in 2 rows on either side of symphysis and separated from the smaller laterals by 1 or 2 rows of tiny intermediate teeth**; lower anterior teeth set in 3 rows on either side of symphysis and not followed by small intermediate teeth. Two dorsal fins, the first dorsal fin large and situated **closer to the pectoral fins than to the pelvic fins**, its free rear tip **well ahead of pelvic fin origins, the second dorsal fin smaller than the first and noticeably larger than anal fin**; caudal fin short, strongly asymmetrical, with a pronounced subterminal notch and the **ventral caudal-fin lobe hardly developed**. No keels on caudal peduncle, but a strong upper precaudal pit. Intestinal valve of ring type. **Colour:** glossy black, brownish black, or dark reddish black on entire body and fins, usually a grey or whitish patch on first dorsal fin, no spots on body.

Size: Maximum total length to at least 360 cm; size at birth unknown; males maturing above 217 cm and females above 321 cm.

Habitat, biology, and fisheries: A rare deep-water and oceanic species that occurs on continental and insular slopes near the bottom at 600 to 1 000 m or more, well off the bottom at 100 m in water 640 m deep, and in the epipelagic and mesopelagic zone in water between 4 500 and 5 300 m. Biology poorly known, presumably ovoviviparous (aplacental viviparous). Feeds on cephalopods and fishes. An incidental and rare bycatch of oceanic and deep benthic fisheries using pelagic and vertical longlines but little utilized; may live mostly below the depths fished by horizontal pelagic longlines and purse seines, and possibly too large to be a regular pelagic or benthic trawl catch.

Distribution: Possibly circumglobal in all warm seas but sporadically distributed and with very few records in the Atlantic and central Pacific currently known. In Area 31 it occurs in the northern Gulf of Mexico off Texas. Also occurs in the South Atlantic off Brazil, the central Atlantic near the equator, the eastern Atlantic off Madeira, the Indian Ocean and possibly off the Seychelles, and in the central Pacific near the Hawaiian and Marshall Islands.



MITSUKURINIDAE

Goblin sharks

A single species in this family.

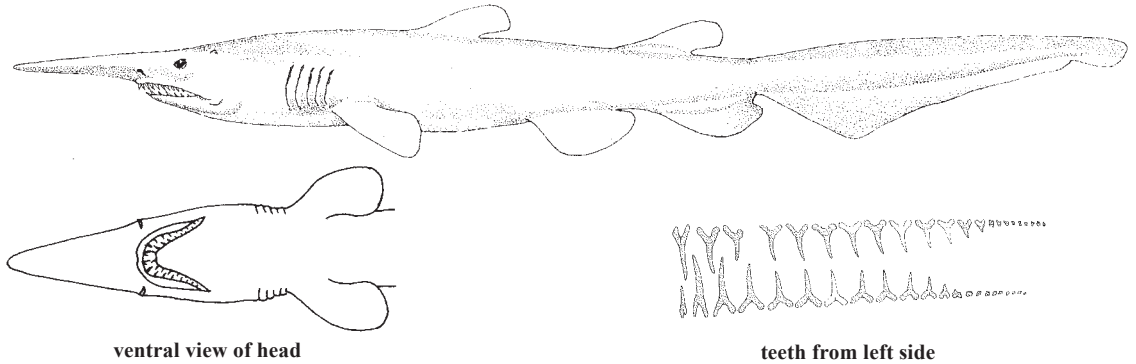
Mitsukurina owstoni Jordan, 1898

LMO

Frequent synonyms / misidentifications: *Scapanorhynchus owstoni* (Jordan, 1898) / None.

FAO names: En - Goblin shark; Fr - Requin lutin; Sp - Tiburón duende.

Diagnostic characters: A moderately large, very soft-bodied, flabby shark. Head with 5 medium-sized gill slits, all in front of pectoral-fin bases, their upper ends not extending onto dorsal sides of head; eyes very small on sides of head, without nictitating eyelids; **snout very long and flat, formed as a narrow, pointed blade**; mouth long and angular, extending well behind eyes when jaws are not protruded, but mouth extends in front of eyes when jaws are thrust forward to level of snout tip; lower labial furrows present; **anterior teeth large, with long, extremely narrow, hooked, sharp-edged, but unserrated cusps**, set in 3 rows on either side of symphysis in both jaws; upper anterior teeth separated from the smaller lateral teeth by a gap without small intermediate teeth; cusplets absent on most teeth; no gill rakers; spiracles present but very small; no nasal barbels or oronasal valves. Two low, equal-sized, small dorsal fins, the first dorsal fin closer to the pectoral fins than the pelvic fins; first dorsal-fin base well in front of the pelvic fins and much shorter than caudal fin; **anal fin low, rounded, and much larger than dorsal fins**; caudal fin long but much less than half the total length, strongly asymmetrical, without a well-developed ventral lobe. Caudal peduncle compressed and without keels or precaudal pits. Intestinal valve of ring type, with the turns closely packed like a stack of washers. **Colour:** pinkish white to light grey on body in life, fin webs and gill region dusky; often brown in preservative.

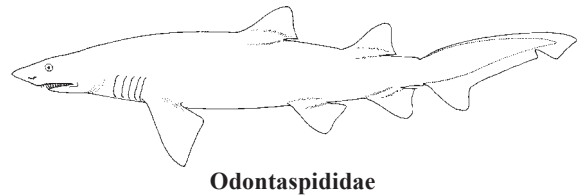


Similar families occurring in the area

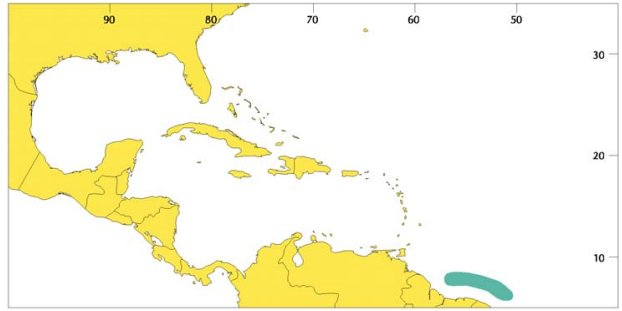
Odontaspidae: Snout conical and short; small intermediate teeth present in upper jaw, teeth mostly with prominent cusplets; first dorsal fin larger, anal fin angular and about as large as the dorsal fins or smaller than them; caudal fin with short but strong ventral lobe; caudal peduncle not compressed and with well-developed upper precaudal pit; colour not pinkish white in life.

Size: Maximum total length 360 cm.

Habitat, biology, and fisheries: An uncommon, deep-water, bottom-dwelling, and possibly semioceanic shark with a spotty but wide distribution on the outer continental shelves and upper slopes down to at least 1 300 m. Most records are between 270 and 960 m deep but rarely taken in shallow water. Biology little known, probably ovoviparous. Preys on small fishes and possibly squids and crustaceans. Separate statistics are not reported for this species. It is caught as bycatch of other fisheries in fixed bottom nets, with hook-and-line, and possibly in purse seines. Not utilized in the area, discarded or utilized dried-salted for human consumption elsewhere.



Distribution: Wide-ranging but sporadically distributed in all temperate and tropical seas, in the area off French Guiana and Suriname but probably more wide-ranging; also in the eastern Atlantic, southeastern Indian Ocean, western Pacific, and eastern North Pacific.



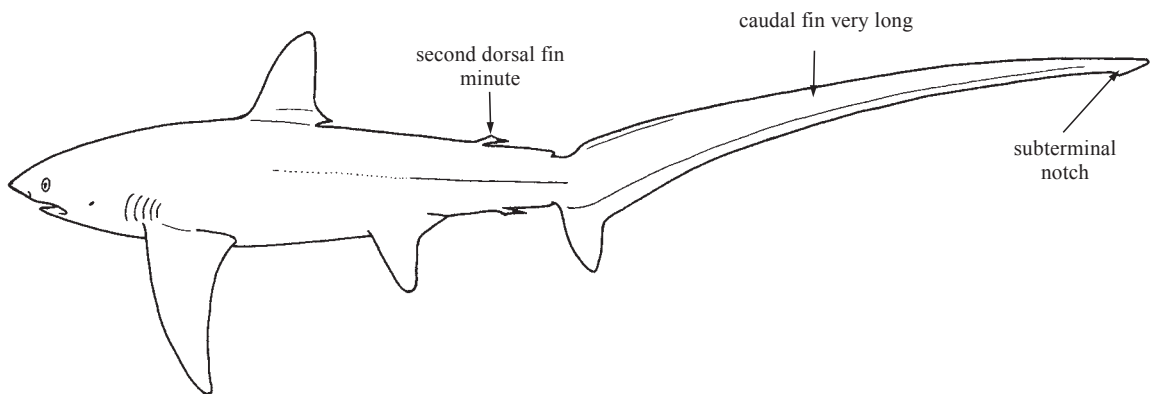
References

- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. *In* Fishes of the Western North Atlantic. *Mem. Sears Fnd. Mar. Res.*, (1):56-576.
- Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d'Atlantique (plus particulièrement de la Côte Occidentale d'Afrique). *Ed. OSTROM, Faune Tropicale*, (21):330 p.
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:250 p.
- Stevens, J.D. and J.R. Paxton. 1985. A new record of the goblin shark, *Mitsukurina owstoni* (Family Mitsukurinidae), from eastern Australia. *Proc. Linn. Soc. New South Wales*, 108(1):38-45.
- Uyeno, T.K. Matsuura and E. Fujii. (eds). 1983. *Fishes trawled off Suriname and French Guiana*. Tokyo, Japan Mar. Fish. Resour. Res. Cen., 519 p.

ALOPIIDAE

Thresher sharks

Diagnostic characters: Large sharks. Trunk and precaudal tail cylindrical, not depressed and without lateral ridges; **precaudal tail much shorter than trunk**. Head not expanded laterally, not depressed. Eyes on sides of head, without nictitating lower eyelids. Snout moderately long, bluntly conical, not flattened, and without lateral teeth or barbels; nostrils without barbels, nasoral grooves, or circumnarial grooves, well separated from mouth. Mouth small but arched and elongated, extending well behind eyes; labial furrows present on lower jaw only or absent, when present not reaching front of mouth. Teeth small, blade-like, and compressed, with erect to oblique cusps and cusplets very small or absent; anterior teeth in upper jaw slightly larger than lateral teeth and sometimes separated from them by a row of smaller intermediate teeth on each side. Five small to medium-sized **gill slits** present, **the last 2 behind pectoral-fin origins**, their upper ends not expanded onto upper surface of head; no gill rakers or sieves on internal gill slits; spiracles present and minute. Two dorsal fins, without spines, the first moderately large, high and angular, much shorter than the caudal fin, and with its base located over the interspace between pelvic- and pectoral-fin bases; second dorsal fin low, minute, and less than 1/10 the size of the first dorsal fin; anal fin present, very small, with its origin under or behind the second dorsal-fin insertion; caudal fin strongly asymmetrical, **the upper lobe enormously enlarged, about half the total length and with a subterminal notch**, and an undulated or rippled dorsal margin, the lower lobe short but strong; vertebral axis of caudal fin raised above body axis. Caudal peduncle not depressed, without keels; precaudal pits present. Intestinal valve of ring type. **Colour:** bluish, blackish, grey, or brown above, shading to white or grey below.



Habitat, biology, and fisheries: These are active, strong-swimming, pelagic, coastal and deep-water sharks, with the young of 1 species occurring close inshore and inside bays. They feed mainly on small to moderately large schooling fishes and squids, which may be herded and stunned by the long, strap-like tail. Threshers are circumtemperate and tropical in all warm oceans. This monogeneric family comprises only 3 or 4 species worldwide, 2 of which occur in the area. These occur along the Atlantic coast of the USA, on the north coast of Cuba, and in the Gulf of Mexico. In Area 31 considerable numbers of bigeye threshers have been taken in longline fisheries off the north coast of Cuba and off the USA. Thresher sharks form an important component of the world oceanic shark fishery, particularly because of their high-quality meat which is utilized fresh, frozen, smoked, and dried-salted. Their fins are used for shark-fin soup, livers for vitamin extraction, and hides for leather. Primarily captured by offshore longline fisheries but also offshore and near shore with line gear (including rod-and-reel) and fixed bottom gill nets.

Remarks: The pelagic thresher, *Alopias pelagicus* Nakamura, 1935, is a poorly known oceanic species presently known from Southeast Africa, Madagascar, northwestern Indian Ocean, Taiwan Province of China, the central Pacific, and the tropical eastern Pacific. It has not been taken in the Atlantic but should be watched for, as it has been mistaken for *Alopias vulpinus* elsewhere. It differs in having the eyes placed more ventrally, the forehead less convex, the snout more elongated, the head narrower, no labial furrows, teeth more oblique, pectoral fin less falcate and broad-tipped, and white colour from belly not expanding over pectoral-fin base.

Similar families occurring in the area

No other sharks in the area have the caudal fin about half the total length.

Key to the species of Alopiidae occurring in the area

- 1a. Head nearly flat between eyes; a deep horizontal groove on nape of each side above gills; eyes very large, with orbits expanded onto dorsal surface of head; labial furrows rudimentary; teeth larger, less than 25 rows in each jaw; first dorsal-fin base closer to pelvic-fin bases than pectoral-fin bases (Fig. 1); pectoral fins broad-tipped; sides above pectoral bases dark, without an extension of the white abdominal area *Alopias superciliosus*
- 1b. Head strongly arched between eyes; no horizontal groove or an inconspicuous one on nape of each side; eyes smaller, with orbits not expanded onto dorsal surface of head; lower labial furrows well developed; teeth smaller, usually more than 29 rows in each jaw; first dorsal-fin base about equidistant between pectoral- and pelvic-fin bases or closer to pectoral-fin bases (Fig 2); pectoral fins falcate and narrow-tipped; sides above pectoral bases marked with a white patch extending forward from the abdominal area *Alopias vulpinus*

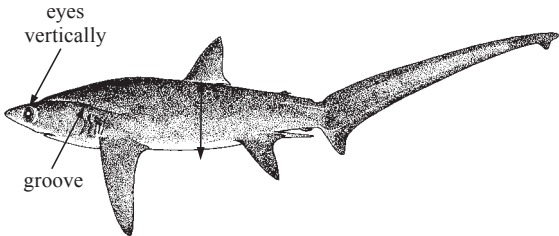


Fig. 1 *Alopias superciliosus*

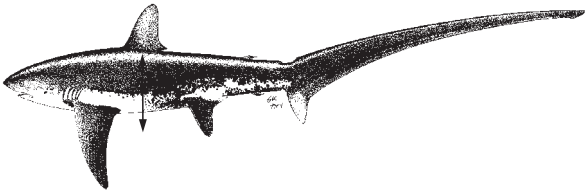



Fig. 2 *Alopias vulpinus*

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Alopias superciliosus* (Lowe, 1839).

 *Alopias vulpinus* (Bonnaterre, 1788).

References

Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Fnd. Mar. Res.* (1)1:56-576.

Compagno, L.J.V. 1984. *FAO Species Catalogue. Vol. 4. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. FAO Fish. Synop., (125)Vol.4,Pt.1:249 p.*

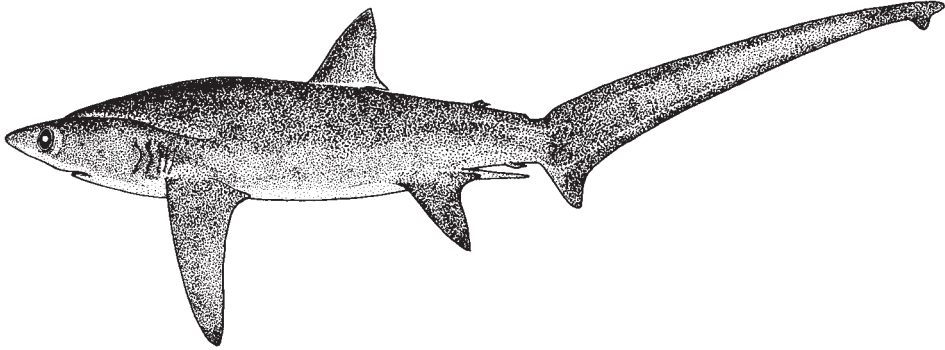
Compagno, L.J.V. and L. Vergara. 1978. Alopiidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31), Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).

Alopias superciliosus (Lowe, 1839)

BTH

Frequent synonyms / misidentifications: *Alopias profundus* Nakamura, 1935 / *Alopias pelagicus* (Nakamura, 1935); *Alopias vulpinus* (Bonnaterre, 1788).

FAO names: **En** - Bigeye thresher; **Fr** - Renard à gros yeux; **Sp** - Zorro ojón.

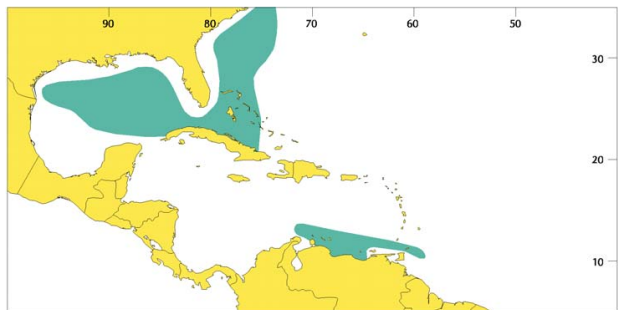


Diagnostic characters: A large shark. Head with 5 medium-sized gill slits, the last 2 above pectoral-fin bases; a deep horizontal groove on nape on each side from the level of mouth to pectoral fins; profile of forehead distinctly indented over eyes; interorbital space nearly flat. Eyes very large, expanding onto dorsal surface of head, permitting upward vision; no nictitating eyelids. Snout moderately long and conical; no nasal barbels or nasoral grooves on nostrils. Mouth moderately long and semicircular, placed below the eyes, with rudimentary labial furrows. Teeth moderately large, less than 25 rows in upper or lower jaws, sharp-edged, with a single, broad, straight or posteriorly curved cusp and no cusplets; anterior teeth not greatly enlarged, uppers not separated from the large laterals by smaller intermediate teeth. Two dorsal fins, the first moderately large and located just in front of pelvic-fin origins, closer to pelvic fins than to pectoral fins; second dorsal fin minute and positioned well ahead of the small anal fin; pectoral fins very narrow, long and falcate, broad-tipped; upper lobe of caudal fin very long and strap-like, almost or quite equal to the length of rest of shark; lower lobe short but well developed. Upper precaudal pit present but caudal keels absent. Intestinal valve of ring type. **Colour:** purplish grey above, cream below, posterior edges of pectoral fins, pelvic fins, and sometimes first dorsal fin dusky; light colour of abdomen not expanded over pectoral-fin bases.

Size: Maximum total length to about 4.6 m, said to reach 5.5 m but possibly erroneous; commonly between 3 and 4 m. Size at birth between 100 and 140 cm; size at maturity between 2.8 and 3.5 m.

Habitat, biology, and fisheries: Found in coastal waters over the continental shelves, sometimes close inshore in shallow waters, and on the high seas far from land, in deep water down to at least 500 m. Apparently strong-swimming. Ovoviviparous, with uterine cannibalism, number of young usually 2 per litter, but sometimes up to 4. Feeds on pelagic fishes (lancetfishes, clupeoids, scombroids, and small billfishes) and bottom fishes (hakes); also squids. Apparently stuns its prey with its long caudal fin, as individuals are often tail-hooked on longlines. Apparently harmless to people. Generally caught in oceanic longline fisheries operated by Cuba, the USA, and probably also Japan, Korea, and Taiwan Province of China; especially important areas for these fisheries were the Atlantic coast of the USA and Cuba. The species is also taken in fixed bottom and pelagic gill nets, in trawls, and with sportsfishing gear (rod-and-reel). Its meat is utilized fresh, smoked, and dried-salted for human consumption, its liver oil is processed for vitamins, its skin for leather, and fins for shark-fin soup. Separate statistics are not reported for this species, but it ranked fourth in weight of catch (average for 1971 through 1973) in the oceanic shark fishery off Cuba.

Distribution: Virtually circumglobal in tropical and warm temperate seas. In the area from Nassau and the northern coast of Cuba northward to off New Jersey and Long Island, and the Gulf of Mexico south to Venezuela. Also off southern Brazil and the eastern Atlantic, Mediterranean, and Indo-Pacific. In the Western Central Atlantic, concentrations have occurred off Cape Hatteras and the north coast of Cuba.

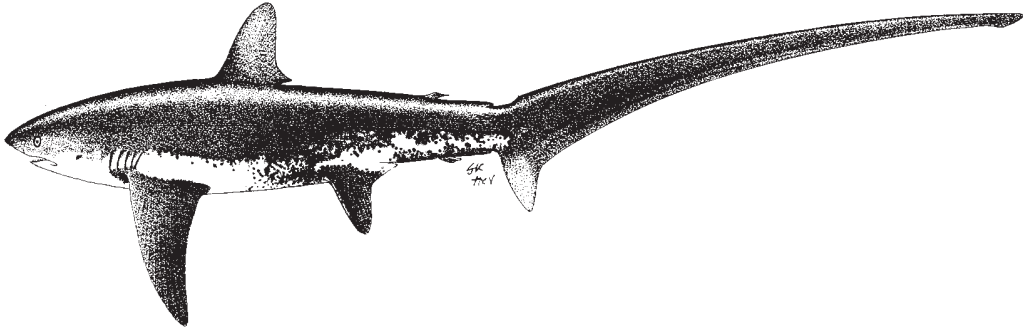


Alopias vulpinus (Bonnaterre, 1788)

ALV

Frequent synonyms / misidentifications: None / *Alopias pelagicus* (Nakamura, 1935); *Alopias superciliosus* (Lowe, 1840).

FAO names: En - Thresher shark; Fr - Renard; Sp - Zorro.

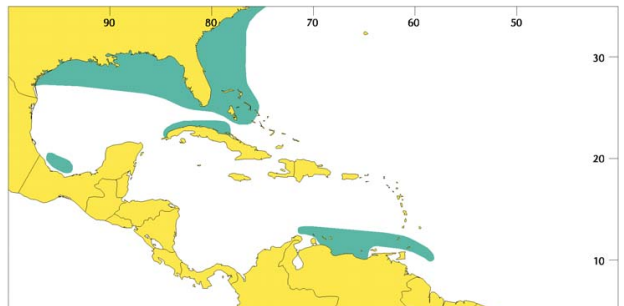


Diagnostic characters: A large shark. Head with 5 medium-sized gill slits, the last 2 above pectoral-fin bases; **no grooves on nape**; forehead broadly convex in lateral view, not indented at nape. **Eyes moderately large, not expanded onto the dorsal surface of head**; no nictitating eyelids. **Snout short and conical**; no nasal barbels or nasoral grooves on nostrils. Mouth short and semicircular, below eyes, with short lower labial furrows. Teeth small, **usually over 29 rows in upper and lower jaws**, sharp-edged, with a single, broad, straight or posteriorly curved cusp and usually no cusplets; anterior teeth not greatly enlarged, **uppers usually separated from the laterals by a small intermediate tooth**. No gill rakers. Two dorsal fins, the first moderately large, **with its base well ahead of the pelvic-fin bases and farther from them than from the pectoral-fin bases**; second dorsal fin minute and positioned just in front of the small anal fin; upper lobe of caudal fin very long and strap-like, about as long as, or longer than, rest of shark; lower lobe short but well developed; **pectoral fins very long and falcate, with narrowly rounded (small juveniles) to acutely pointed, narrow tips**. Upper precaudal pit present but caudal keels absent. Intestinal valve of ring type. **Colour:** brown, grey, blue-grey, or blackish on back and underside of snout, lighter on sides, and abruptly white below; **a white area extends from the abdomen over the pectoral-fin bases**; pectoral, pelvic, and dorsal fins blackish, white dots sometimes present on pectoral-, pelvic-, and caudal-fin tips.

Size: Maximum total length between 5 and 6.1 m; commonly between 4.3 and 4.9 m. Size at birth between about 114 and 160 cm; size at maturity between 288 and 400 cm.

Habitat, biology, and fisheries: Coastal over the continental and insular shelves and epipelagic far from land in cold-temperate to tropical waters; young often close inshore and in shallow bays, from the surface to 370 m. An active, strong-swimming shark, sometimes leaping out of the water. Ovoviviparous and apparently a uterine cannibal, number of young 2 to 4 per litter (usually 2). Feeds mostly on small schooling fishes, including mackerels, bluefishes, clupeids, needlefishes, lancetfishes, and lanternfishes; also squids, octopuses, and pelagic crustaceans, and rarely seabirds. Herds and stuns its prey with its long, whiplike caudal fin, and is often caught on longlines by being tail-hooked. Uncommon, although concentrations are sometimes present among the Florida Keys; apparently rare off Cuba; a spring to autumn visitor in the northern part of its range in the western Atlantic, but absent in winter. Caught in oceanic longline fisheries; important in the northwestern Indian Ocean and the central Pacific. Also fished with anchored bottom and surface gill nets, floating gill nets, and sportfishing gear (rod-and-reel). The meat is highly prized fresh but also eaten smoked and dried-salted; fins are valuable for shark-fin soup; hide is usable for leather and liver oil can be processed for vitamins. Apparently harmless to people; a few attacks on boats are attributed to this species.

Distribution: Virtually circumglobal in temperate to tropical waters. In the western Atlantic from Newfoundland south to Florida, Cuba, and the Gulf of Mexico; also off Brazil and Argentina. Wide-ranging in the eastern Atlantic, Mediterranean, and Indo-Pacific. Some western Pacific and Indian Ocean records of this species may be based on *A. pelagicus*.



CETORHINIDAE

Basking sharks

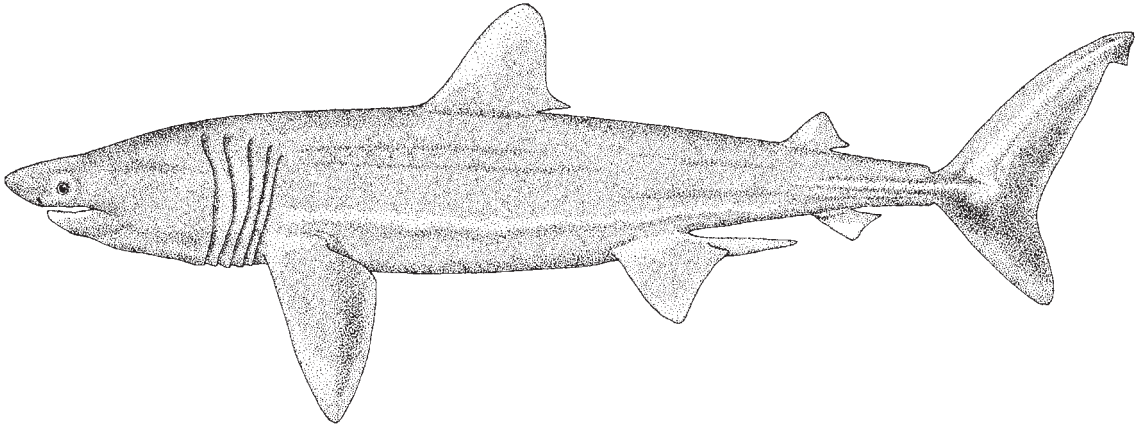
A single species occurring in the area.

Cetorhinus maximus (Gunnerus, 1765)

BSK

Frequent synonyms / misidentifications: None / None.

FAO names: En - Basking shark; Fr - P  lerin; Sp - Peregrino.



Diagnostic characters: A very large shark. Head with **5 extremely long gill slits, almost meeting at the midline above and below**, the last in front of pectoral fins. No nictitating lower eyelid. Snout long, conical or hooked (in young); nostrils without barbels or nasoral grooves. Teeth very small, extremely numerous, not blade-like, and with a single cusp. **Unique, long, bristle-like gill rakers formed from modified dermal denticles, in rows along the internal gill openings** and serving as plankton strainers (occasionally absent in individuals in which they have been shed and new rakers have not yet developed). Two dorsal fins, the first on the back above the space between pectoral and pelvic fins, the second less than 1/3 the size of first; anal fin present; **caudal fin much less than half total length, nearly symmetrical and crescentic, with a strong lower lobe. Caudal peduncle strongly depressed, with strong keels on sides**; precaudal pits present. Intestinal valve of ring type. **Colour:** blackish, slate grey, blue-grey, or greyish brown above, similar below or slightly lighter, often with white patches and bands on snout and belly.

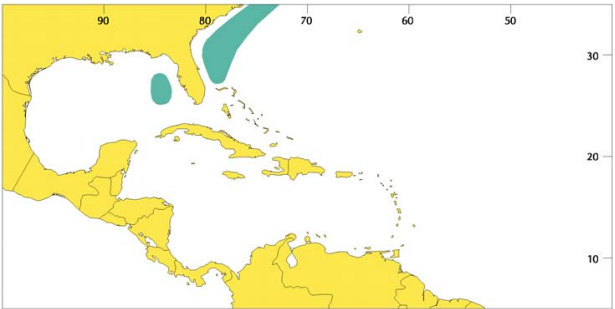
Similar families occurring in the area

No other sharks in the area have the combination of gigantic gill slits, gill rakers, small numerous hooked teeth, strong caudal keels, and nearly symmetrical caudal fin.

Size: Maximum total length at least 9.8 m.

Habitat, biology, and fisheries: A temperate-boreal, harmless species that usually is seen at or near the surface, singly or in groups up to 100 or more. A plankton-feeding, slow but strong swimming migratory shark occurring well offshore and close inshore, sometimes in large bays and right off beaches. Caught only incidentally in Area 31, but this species has been subject to small and irregular fisheries in the North Atlantic north of Area 31 and the North Pacific.

Distribution: The basking shark barely enters Fishing Area 31, with a few records from Florida (east and west coasts) and Georgia, possibly of waifs from more northern waters. Found in the North Atlantic and Mediterranean, the South Atlantic coasts of South America and South Africa, the eastern Pacific, and the western Pacific.



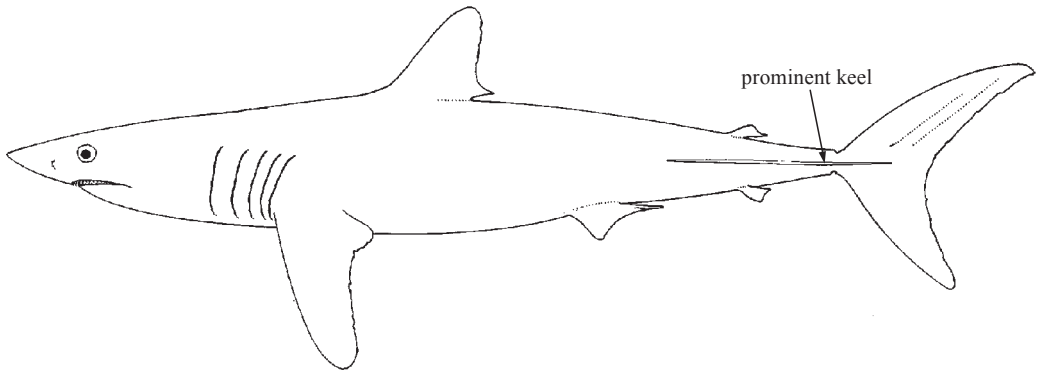
References

- Bigelow, H. B. and W. C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1):56-576.
- Compagno, L. J. V. 1978. Cetorhinidae. In *FAO species Identification sheets for fisheries purposes, Western Central Atlantic Fishing Area 31*, edited by W. Fischer. Vol. 5. Rome, FAO (unpaginated).
- Compagno, L. J. V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125) Vol.4,Pt.1:249 p.
- Matthews, L. H. and H. W. Parker. 1950. Notes on the anatomy and biology of the basking shark (*Cetorhinus maximus* (Gunner)). *Proc. Zool. Soc. London*, 120:535-576.
- Springer, S. and P.W. Gilbert. 1976. The basking shark, *Cetorhinus maximus*, from Florida and California, with comments on its biology and systematics. *Copeia*, (1):47-54.

LAMNIDAE

Mackerel sharks, makos, white sharks, porbeagles

Diagnostic characters: Large-sized sharks with fusiform body. Head with 5 gill slits, **all in front of pectoral-fin origins**; no nictitating eyelids; **teeth long and few in number**, awl- or blade-like, with a single cusp; gill arches without rakers. **Two dorsal fins, the first dorsal fin much shorter at base than caudal fin and far in advance of pelvic fins; second dorsal fin and anal fin much smaller than first dorsal fin, with narrow, pivoting bases; caudal fin lunate**, less than 1/3 of total length. **Caudal peduncle strongly depressed dorsoventrally and expanded laterally, with a prominent keel on each side, extending well out on caudal fin.** Intestinal valve of ring type. **Colour:** back pale grey, greyish blue, purplish blue, brownish, blackish grey or black; underside white to lighter grey.

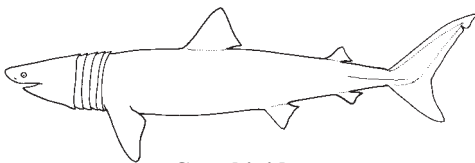


Habitat, biology, and fisheries: Inhabits temperate and tropical waters (oceanic as well as coastal) throughout the world. Very fast swimmers and voracious predators, feeding mainly on bony fishes and cephalopods, but also on other sharks, batoids, chimaeras, marine mammals, sea birds, turtles, crustaceans, and carrion; some species, particularly the white shark, infrequently bite and rarely feed on people, but are also of growing interest for ecotouristic diving and film-making. Most species are important for commercial fisheries and for sports angling. Mackerel sharks are often used for food or for production of liver oil, fish meal, fins, jaws, teeth, and other shark products.

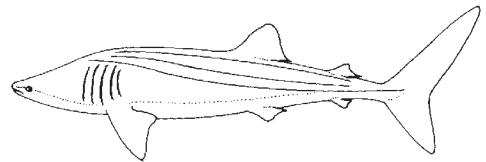
Similar families occurring in the area

Cetorhinidae: much longer gill openings, extending from upper surface of head to throat; gill rakers well developed on internal gill openings; teeth minute and hooked, not blade-like; anal and second dorsal fin larger; and size of adults larger, 7 to 10 m or more.

Rhincodontidae: body with several prominent dermal ridges on either side; last gill slit well behind pectoral-fin origin; snout squared off anteriorly; mouth nearly terminal; at least half of first dorsal-fin base posterior to pelvic-fin origins; gill arches connected by masses of spongy tissue; a spotted and striped colour pattern; and size of adults larger, 7 to 18 m or more.



Cetorhinidae



Rhincodontidae

All other shark families: caudal fin strongly asymmetrical and not lunate, the upper lobe extending far beyond lower lobe; caudal peduncle not greatly flattened dorsoventrally. Also, fifth gill opening somewhat behind pectoral-fin origin in Alopiidae, Triakidae, Carcharhinidae, Scyliorhinidae and Ginglymostomatidae (in front of pectoral-fin origin in Lamnidae).

Key to the species of Lamnidae occurring in the area

- 1a. Teeth with small side cusplets (except in specimens less than 1 m) (Fig. 1a); origin of second dorsal fin above that of anal fin; caudal fin with a small but strong secondary keel below the rear end of the primary keel (Fig 2); free rear tip of first dorsal fin abruptly white. *Lamna nasus*
- 1b. Teeth without side cusplets (except in *Carcharodon* less than 2 to 3 m which always have serrations on some teeth); origin of second dorsal fin in advance of anal-fin origin; caudal fin without a secondary keel (Fig. 3, 4); free rear tip of first dorsal fin not abruptly white → 2

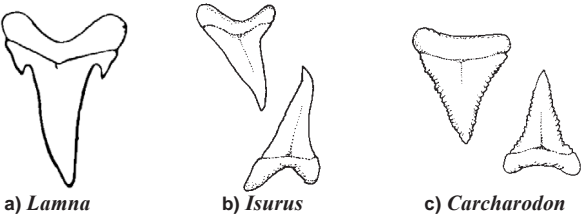


Fig. 1 teeth

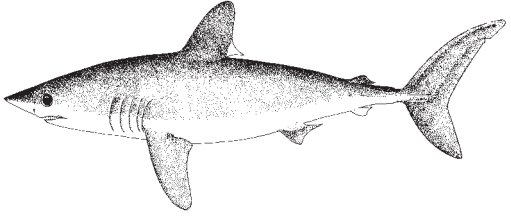


Fig. 2 *Lamna nasus*

- 2a. Upper teeth triangular with serrated edges (Fig. 1b); origin of first dorsal fin opposite or slightly anterior to inner corners of pectoral fins when the latter are laid back; anal-fin origin posterior to second dorsal-fin base (Fig. 3) *Carcharodon carcharias*
- 2b. Upper teeth with smooth-edged cusps; origin of first dorsal fin posterior to inner corners of pectoral fins when the latter are laid back; anal-fin origin below midbase or insertion of second dorsal-fin base (Fig. 4, 5, 6) → 3

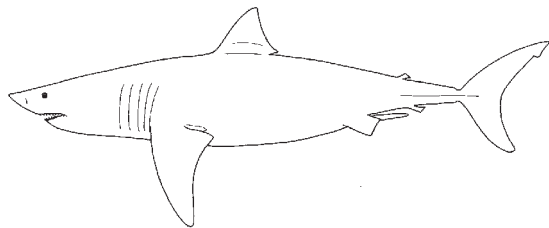


Fig. 3 *Carcharodon carcharias*

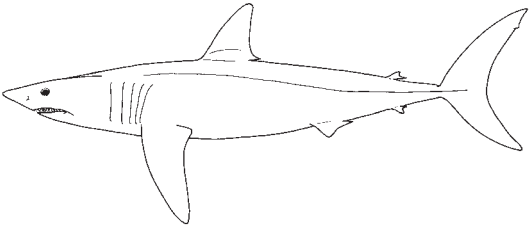


Fig. 4 *Isurus oxyrinchus*

- 3a. Snout usually acutely pointed (Fig. 5a); cusps of upper and lower anterior teeth recurved at bases but with tips reversed and curving outward; pectoral fins considerably shorter than head, relatively narrow-tipped in young, acutely pointed in adults; origin of anal fin about under midbase of second dorsal fin; underside of snout and mouth white in adults and subadults in the area (Fig. 4) *Isurus oxyrinchus*
- 3b. Snout narrowly to bluntly (usually not acutely) pointed (Fig. 5b); cusps of upper and lower anterior teeth straighter, with tips not reversed; pectoral fins about as long as head, relatively broad-tipped in young and adults; origin of anal fin about under insertion of second dorsal fin; underside of snout and mouth dusky in adults and subadults (Fig. 6) *Isurus paucus*

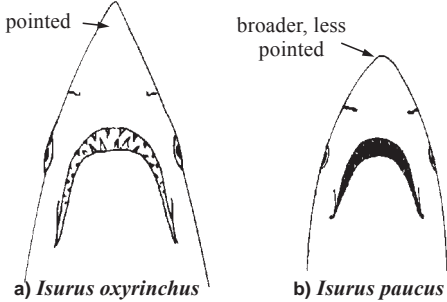


Fig. 5 ventral view of head

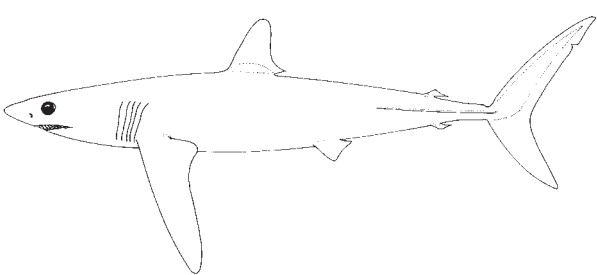


Fig. 6 *Isurus paucus*


List of species occurring in the area

The symbol  is given when species accounts are included.

 *Carcharodon carcharias* (Linnaeus, 1758).

 *Isurus oxyrinchus* Rafinesque, 1810.

 *Isurus paucus* Guitart Manday, 1965.

 *Lamna nasus* (Bonnaterre, 1788).

References

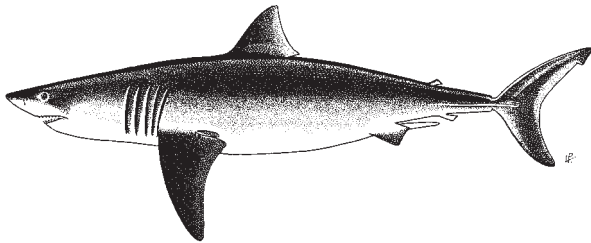
- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1):56-576.
- Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d' Atlantique (plus particulièrement de la Côte Occidentale d' Afrique). Ed. *OSTROM, Faune Tropicale*, (21):330 p.
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fisheries Synopsis*, (125)Vol.4,Pt.1:250 p.
- Compagno, L.J.V and R. Vergara. 1978. Lamnidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31) Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).
- Farquhar, G.B. 1963. *Sharks of the family Lamnidae*. U.S. Navy Technol. Off., pp. 1-16.
- McEachran, J.D. and J.D. Fechtel. 1998. *Fishes of the Gulf of Mexico*, vol. 1, Myxiniiformes to Gasterosteiformes. Austin, Texas, University of Texas Press, 1112 p.

Carcharodon carcharias (Linnaeus, 1758)

WSH

Frequent synonyms / misidentifications: None / None.**FAO names:** En - Great white shark (AFS: White shark); Fr - Grand requin blanc; Sp - Jaquenton flameo.

ventral view of head



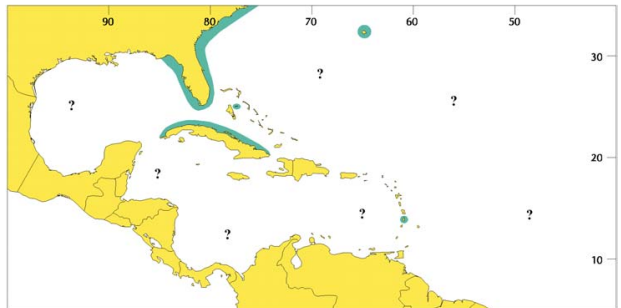
teeth on left side

Diagnostic characters: A very large shark with a fusiform, usually heavy body and a moderately long, **bluntly pointed snout**. Head with 5 **very long gill slits**, all in front of pectoral-fin origins; gill arches without rakers; spiracles very small; mouth long and broadly rounded. **Teeth very large** and relatively few, narrower in the lower than in the upper jaw, pointed backwards, with a **single broad cusp and with strong serrations** at most sizes (serrations irregular in newborn individuals below 1.5 m length); cusplets present on teeth of sharks up to about 2 to 3 m length, but lost in larger individuals; anterior teeth greatly enlarged in both jaws, in 2 rows on either side of symphysis, **broadly triangular and compressed (especially in the upper jaw)**, not recurved; **single intermediate tooth and first few lateral teeth a little smaller than anterior teeth, the intermediate tooth larger and less differentiated from the anterior and lateral teeth than in other members of the family, cusp of intermediate tooth directed ventromedially**. Two dorsal fins, the first dorsal fin large, originating over inner margins of pectoral fins, the second dorsal fin very small; pectoral fins shorter than head and falcate; anal-fin origin posterior to rear end of second dorsal-fin base; caudal fin **lunate**, its lower lobe strongly developed. Caudal peduncle very much flattened dorsoventrally, expanded laterally, **with a prominent keel on either side extending well out on caudal fin** but with no secondary keel on the fin. **Colour:** grey-brown, dark grey, blue-grey, blackish, light grey or grey-white above, white below, fins with dusky margins below, usually with black tips on underside of pectoral fins and a conspicuous black spot present at pectoral-fin axils.

Size: Maximum total length to almost 6 m and possibly 6.4 m; adults commonly to between 5 and 6 m; size at birth between 100 and 165 cm; males maturing between 350 and 410 cm, females between 400 and 500 cm.

Habitat, biology, and fisheries: Littoral and epipelagic, often occurring close inshore and entering shallow bays and salty estuaries but also found in the open ocean and off oceanic islands. Recorded from the surface and intertidal down to 1 280 m on the continental slopes. Ovoviviparous (aplacental viviparous), litter size 2 to possibly 14. A strong swimmer, often jumping entirely out of the water. A powerful predator, feeding on a wide variety of marine animals, including other sharks, rays, chimaeras, bony fishes, seals and sea lions, dolphins and porpoises, sea birds, turtles, crabs, and squid, as well as carrion. A bold, inquisitive, social shark. Uncommonly but regularly biting swimmers, divers, surfers, and boats, but rarely eating people. Of limited interest to commercial fisheries, mostly taken as bycatch with longlines, hook-and-line, fixed bottom gill nets, fish traps, herring weirs, purse seines, trammel nets, harpoons, and even bottom and pelagic trawls. Prized by sports anglers but also by ecotouristic shark divers. Much photographed by documentary film-makers. Vulnerable to overfishing because of its low abundance, slow growth, notoriety, and ease of capture, and is protected in several countries at present. Utilized fresh, dried-salted, and smoked; the liver oil is extracted for vitamins; the carcass is used for fish meal; the skin used for leather; the fins are highly valued for shark-fin soup; and the teeth and jaws for decorations.

Distribution: Cosmopolitan in cold-temperate to tropical seas, but most commonly recorded in cool to warm-temperate waters. In the western Atlantic, from Newfoundland and Nova Scotia to Florida, the Bahamas, Cuba, and the northern Gulf of Mexico; also Brazil and Argentina. Probably more wide-ranging in Area 31 and may occur anywhere within it, but apparently rare and sporadic in the tropics.

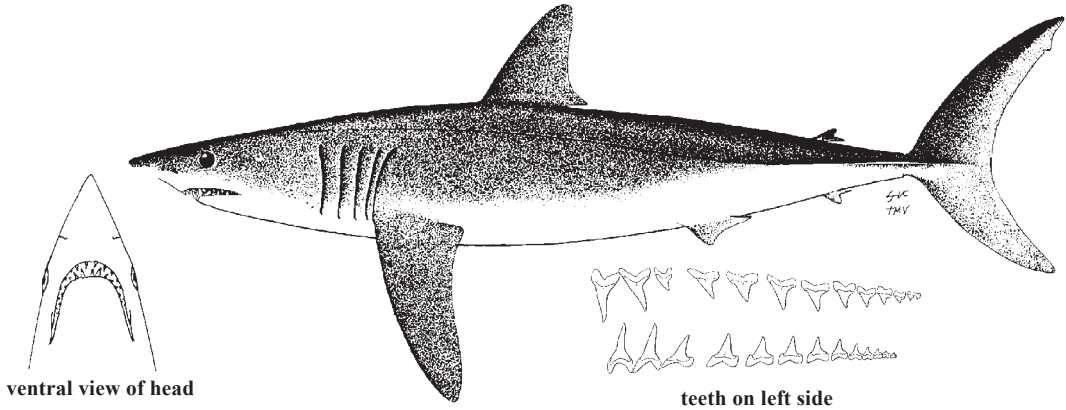


***Isurus oxyrinchus* Rafinesque, 1810**

SMA

Frequent synonyms / misidentifications: *Oxyrhina glauca* Müller and Henle, 1839 / *Isurus paucus* (Guitart Manday, 1966).

FAO names: En - Shortfin mako; Fr - Taupe bleu; Sp - Alecrín.

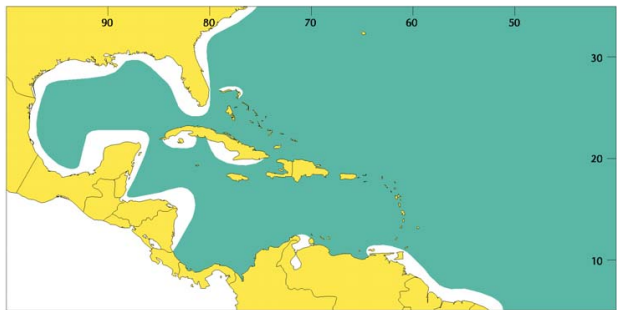


Diagnostic characters: A large shark with fusiform and moderately slender body and long and **acutely pointed snout**. Head with 5 long gill slits, all in front of pectoral-fin origins; gill arches without rakers; spiracles very small. Mouth broadly rounded and notably long. **Teeth large and relatively few**, alike in both jaws, backward-pointing, **somewhat flexuous in outline, smooth-edged, with a single cusp**; the first 2 anterior teeth in each jaw the largest, recurved at base but with the curve reversed at tips; a small intermediate tooth between the upper anterior and lateral teeth, this with a ventrolaterally directed cusp. Two unequal-sized dorsal fins, the first dorsal fin large and with its origin posterior to inner corners of pectoral fins when latter are laid back, its apex bluntly rounded (young) to acutely pointed (adults); pectoral fins moderately long (shorter than head) and falcate; anal-fin origin below about middle of second dorsal-fin base; caudal fin lunate, its lower lobe strongly developed. Caudal peduncle very flattened dorsoventrally, but expanded laterally, with a prominent keel on each side extending well out on caudal fin. **Colour:** back grey-blue to purplish or deep blue; belly white.

Size: Maximum total length to about 4 m; commonly to 2.7 m; size at birth about 60 to 70 cm; males maturing between 203 and 215 cm, females between 275 and 293 cm.

Habitat, biology, and fisheries: Oceanic and coastal, usually in surface waters, approaching close inshore, but also in deeper water to at least 500 m. Perhaps the most active and strong-swimming of sharks, renowned for leaping out of the water, especially when hooked. Ovoviviparous, number of young in a litter 4 to 30. Feeds heavily on schooling fishes (mackerels, jacks, herrings, etc.), also eats small sharks, larger bony fishes such as tunas and swordfishes, and rarely dolphins. A bold shark, occasionally biting swimmers and boats; hooked individuals fight very hard and may leap into the boats of anglers attempting to subdue them. An important species for longline fisheries, because of its high-quality meat. Highly prized by sport anglers. Viewed by ecotouristic divers off California and in the western Indian Ocean. Caught commercially mostly with pelagic longlines, also gill nets and hook-and-line. The meat is utilized fresh, frozen, smoked, and dried-salted; the oil is extracted for vitamins; the fins used for shark-fin soup; the hides processed into leather and the jaws and teeth used for ornaments. This species was an important fisheries species off Cuba in the 1970s and averaged second in weight of sharks caught in 1971 to 1973. Conservation status is of concern because of declines in Area 31 and elsewhere due to overfishing, and catches are regulated and limited in the USA.

Distribution: Cosmopolitan in warm-temperate and tropical seas. western Atlantic from the Gulf of Maine to Brazil and Argentina; occurs throughout Area 31, more common in the Caribbean Sea, rare around Bermuda.

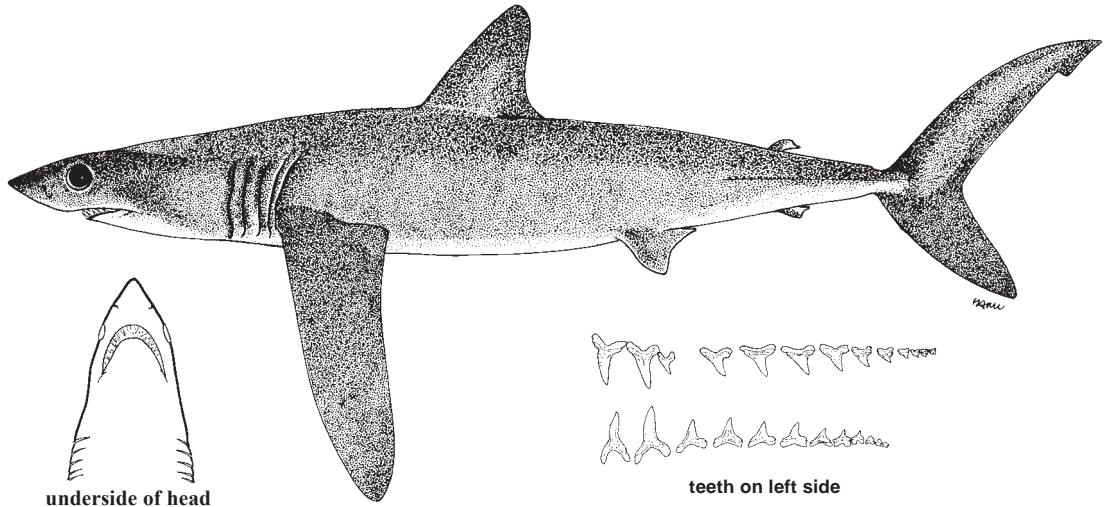


Isurus paucus Guitart Mandy, 1965

LMA

Frequent synonyms / misidentifications: *Isurus alatus* Garrick, 1967 / *Isurus oxyrinchus* (Rufinesque, 1810).

FAO names: **En** - Longfin mako; **Fr** - Petit taupe; **Sp** - Marrajo carite.

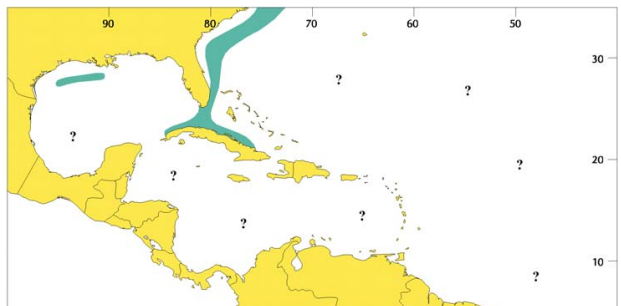


Diagnostic characters: A large shark with a fusiform and moderately slender body and a long, pointed snout. Head with 5 long gill slits, all in front of pectoral-fin origins; gill arches without rakers; spiracles very small. Mouth long and broadly rounded. Teeth large and relatively few, alike in both jaws, pointed backward, not greatly flexed, with a single cusp, but **without cusplets or serrations; anterior teeth greatly enlarged in both jaws**, in 2 rows on each side, **cusps recurved at bases but not reversed at tips; a small intermediate tooth between the upper anterior and lateral teeth, this with a ventrolaterally directed cusp**. Two unequal-sized dorsal fins, the first large, originating posterior to free rear tips of pectoral fins, with a bluntly rounded apex, the second dorsal fin very small; anal fin very small, originating about under rear end of second dorsal-fin base; pectoral fins about as long or longer than head, straight to falcate, and broad-tipped; caudal fin lunate, with a very long lower lobe. Caudal peduncle strongly flattened dorsoventrally and expanded laterally, with a prominent keel on each side extending well onto caudal fin. **Colour:** back and sides darker slaty blue or grey-black, undersides white in young but partly to entirely dusky in adults and subadults.

Size: Maximum total length at least 4.17 m, common at 2.8 and 3.0 m; size at birth between 97 and 120 cm; adults 245 cm or larger.

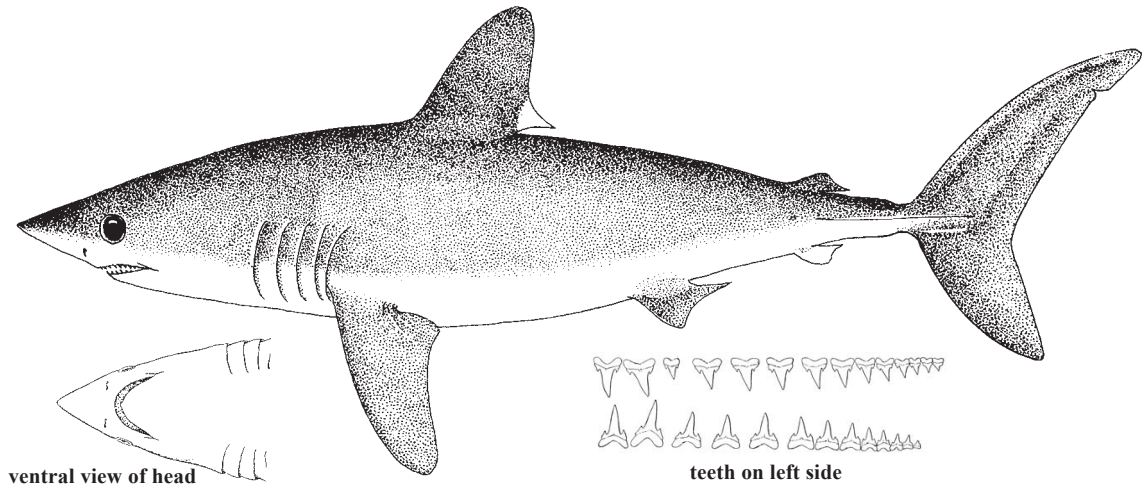
Habitat, biology, and fisheries: A little-known oceanic shark, possibly approaching land to give birth. Ovoviparous (aplacental viviparous), number of young 2 to 8 per litter. Probably feeds on oceanic schooling fishes and other pelagic animals as does *I. oxyrinchus*, but its large broad fins and slender body suggest that it is a slower, less active shark than that species. It is not known to have bitten people or boats. Separate statistics are mostly not reported for this species, except by the USA (over the last decade). Taken with longlines, hook-and-line, and anchored gill nets. In 1971 to 1972 this shark averaged sixth in weight of sharks caught off the north coast of Cuba. It is utilized fresh, frozen and dried-salted. Conservation status uncertain, but of concern because of its scarcity in most areas and exposure to fisheries that may have caused declines in catches of the far more abundant *I. oxyrinchus*.

Distribution: Western North Atlantic from the east coast of the USA to Cuba, the Gulf of Mexico, and southern Brazil; also wide-ranging in the eastern Atlantic and Indo-Pacific.



Lamna nasus (Bonnaterre, 1788)

POR

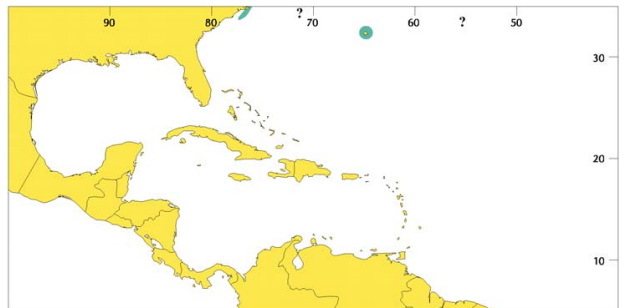
Frequent synonyms / misidentifications: None / None.**FAO names:** En - Porbeagle; Fr - Requin-taupe commun; Sp - Marrajo sardinero.

Diagnostic characters: A moderately large shark with a **fusiform and very stout, tuna-like body and a moderately long pointed snout**. Head with **5 long gill slits, all in front of pectoral-fin origin**; gill arches without rakers; spiracles very small. Mouth broadly rounded in front and moderately long. **Teeth moderately large and relatively few in number, alike in both jaws, erect, smooth-edged, with a single cusp and side-cusplets**; the first 2 anterior teeth in each jaw moderately large and straight-cusped; a small intermediate tooth between the upper anterior and lateral teeth, this with a ventrolaterally directed cusp. **Two unequal-sized dorsal fins, the first dorsal fin large, its origin anterior to inner corner of pectoral fin when latter is laid back, its apex bluntly or narrowly rounded, the second dorsal fin very small**; pectoral fin moderately long, much shorter than head and not strongly falcate; anal-fin origin below origin of second dorsal fin; caudal fin lunate, its lower lobe strongly developed. **Caudal peduncle very much flattened dorsoventrally, but expanded laterally, with a prominent keel on each side extending well out on caudal fin and a secondary keel below its posterior end on the caudal base**. **Colour:** back, dorsal fins, and caudal fins bluish grey, **free rear tip of first dorsal fin abruptly white**, underside of head white or dusky, abdomen white.

Size: Maximum total length to possibly 3.7 m but most adults smaller and below 3 m; size at birth between 60 and 75 cm; males maturing at about 150 to 200 cm, females at 200 to 250 cm.

Habitat, biology, and fisheries: Coastal and oceanic, amphitemperate; common in cold seas north of Area 31 but marginal in the area. Most common on continental offshore fishing banks but coming close inshore and found on the high seas far from land. It ranges from the surface to at least 700 m depth. This is an active, strong-swimming shark, often in schools and feeding aggregations. Ovoviviparous (aplacental viviparous), number of young 1 to 5 per litter, gestation period possibly about 8 months. Feeds on small pelagic schooling fishes, demersal fishes, smaller sharks, squid and cuttlefish, and scavenged fishes from longlines. Heavily fished in the cold-temperate North Atlantic, with stocks severely depleted. An uncommon fisheries catch in the area, possibly primarily caught as bycatch.

Distribution: This species has centres of distribution in the North Atlantic and in a circumtemperate band of the southern Atlantic, southern Indian Ocean, and southern Pacific and Antarctic Oceans. Western Atlantic: Newfoundland and Gulf of St. Lawrence to New Jersey, possibly South Carolina (USA), and Bermuda; also southern Brazil to southern Argentina.



Order ORECTOLOBIFORMES

GINGLYMOSTOMATIDAE

Nurse sharks (tawny sharks)

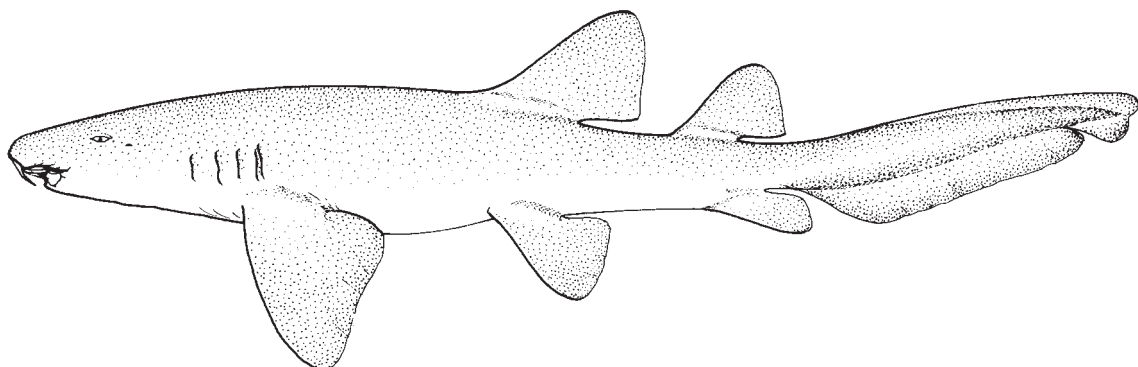
A single species occurring in the area.

Ginglymostoma cirratum (Bonnaterre, 1788)

GNC

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Nurse shark; **Fr** - Requin nourrice; **Sp** - Gata nodriza.



Diagnostic characters: A large shark. No nictitating lower eyelid; nostrils close to front of snout, **with long barbels and nasoral grooves connecting them with mouth**; snout very short, broad, and bluntly rounded; **mouth short, nearly transverse, and far forward on head, well in front of eyes**; teeth small, poorly differentiated in different regions of the mouth, with short medial cusps and large cusplets on sides of teeth; head with 5 small gill slits, the last 2 behind pectoral-fin origins and very close to each other; no gill rakers. Two dorsal fins, the base of the first dorsal fin over pelvic-fin bases, the second dorsal fin about 1/2 to 2/3 the size of first dorsal fin; anal fin present; caudal fin much less than half the total length, strongly asymmetrical, with a pronounced subterminal notch but with ventral lobe hardly developed. Caudal peduncle not strongly depressed, without keels; no precaudal pits. Intestinal valve of ring type. **Colour:** back yellow, yellow-green, or reddish brown, underside yellowish, dark spots and dorsal saddles in young.

Similar families occurring in the area

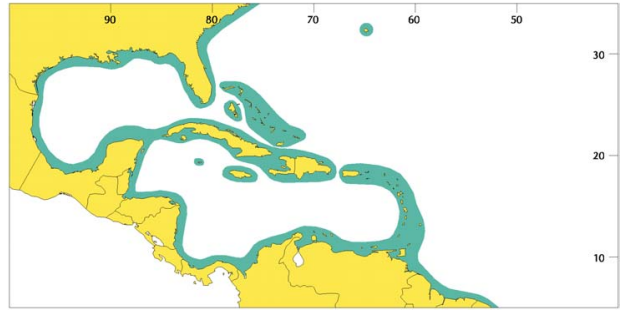
The combination of characters including nasoral grooves, barbels, anterior mouth, posterior portion of first dorsal fin, absence of caudal keels and precaudal pits, and asymmetrical caudal fin readily distinguishes this shark from all others in Area 31.

Size: Maximum total length said to be 430 cm but most less than 300 cm; size at birth about 27 to 29 cm; males maturing at about 210 cm and females maturing mostly between 230 and 240 cm.

Habitat, biology, and fisheries: Very common or formerly common inshore in waters from the intertidal down to 130 m. Found around mangrove keys, on rocky and coral reefs, and on sand flats. A sluggish social, nocturnal bottom dweller, sometimes seen mating in shallow water. Rests in favoured caves and crevices during the day and returns to these shelters repeatedly after feeding during the night. Ovoviparous, with litters of 20 to 30 young. Feeds mostly on bottom invertebrates, including shrimps, crabs, lobsters, squid, octopi, sea urchins, marine snails, and bivalves, but also a variety of small bottom and pelagic bony fishes and occasionally stingrays. Fished in inshore waters throughout its range. Separate statistics for this species are not reported to FAO except by the USA, which reported 214 t caught in 1995. Caught on handlines, on longline gear, in gill nets, in fixed bottom nets, and bottom trawls, and also speared and caught with rod-and-reel. Meat marketed fresh or salted; the extremely thick and tough hides are used for leather; and the livers are used for liver oil. Normally inoffensive and permitting close approaches by divers, but may bite if provoked and sometimes bites without provocation. A popular shark for ecotouristic viewing by divers in the area, particularly in the Bahamas but also Belize, Turks and Caicos, and off Florida, USA. Kept for public display in many aquaria, and by private aquarists; important for the commercial aquarium trade. The nurse shark is vulnerable to overexploitation because of its shallow habitat, ready access to fisheries, and slow maturation (matures at 10 to 20 years old). It

may be declining in some parts of Area 31 due to overfishing, and needs protection particularly in breeding areas. Overfishing of this shark may be short-sighted as it probably is far more valuable live for ecotouristic diving than as fisheries products.

Distribution: Throughout the area including Bermuda and the Bahamas, extending northward to Rhode Island, USA (rare), and southward to southern Brazil including the Gulf of Mexico and the Caribbean Sea. Also found in the eastern Atlantic from France, Senegal and the Cape Verde Islands south to Gabon, and in the eastern Pacific from the Gulf of California to Peru.



References

- Bigelow, H. B. and W. C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1):56-576.
- Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d'Atlantique (plus particulièrement de la Côte Occidentale d'Afrique). Ed. *OSTROM, Faune Tropicale*, (21):330 p.
- Carrier, J. C. 1990. Growth and aging: Life history studies of the nurse shark. In S. H. Gruber, ed., *Discovering sharks. A volume honoring the work of Stewart Springer. Underw. Nat., Bull. American Littor. Soc.*, 19-20(4/1):68-69.
- Carrier, J. C., H. L. Pratt, Jr., and L. K. Martin. 1994. Group reproductive behaviors in free-living nurse sharks, *Ginglymostoma cirratum*. *Copeia*, 1994(3):646-656.
- Compagno, L. J. V. 1978. Ginglymostomatidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, Fishing Area 31 Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).
- Compagno, L. J. V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125) Vol.4,Pt.1:249 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, vol. 1, Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.

RHINCODONTIDAE

Whale sharks

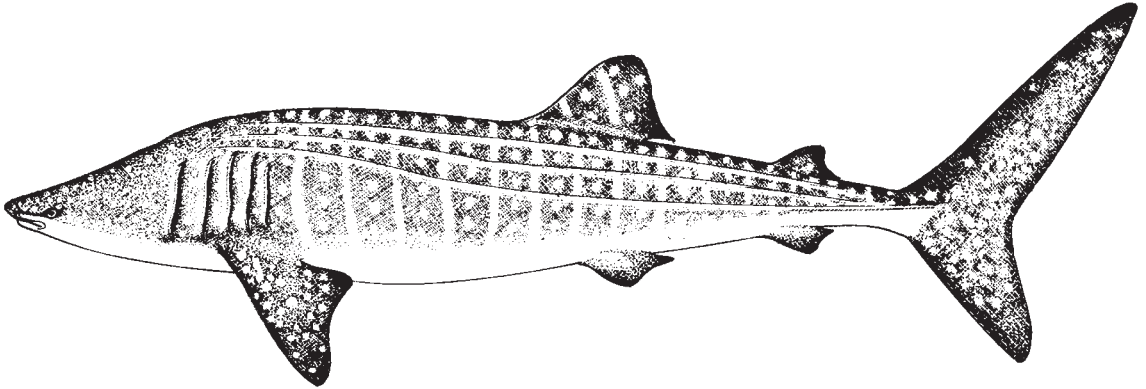
A single species in this family.

Rhincodon typus Smith, 1828

RHN

Frequent synonyms / misidentifications: *Rhiniodon typus* Smith, 1828 / None.

FAO names: En - Whale shark; Fr - Requin baleine; Sp - Tiburón ballena.



Diagnostic characters: A very large shark with cylindrical or moderately depressed body. **Head very broad and flattened**, with 5 large gill slits, posterior 3 over pectoral-fin bases; no dermal denticle or papillose gill rakers but **filter grids of transverse bars and lobes across the internal gill slits**; spiracles much smaller than eyes; nostrils with short, quadrate anterior nasal flaps, **minute barbels**, and **shallow nasoral grooves**; no nictitating eyelids; **snout extremely short, truncated**; mouth nearly subterminal, very wide, **transverse on front of head** and short, not reaching backward to eyes; **teeth very small and extremely numerous**, similar in both jaws, not blade-like and **with hooked cusps**. Two dorsal fins, the first with rear 1/3 of base over pelvic-fin bases, the second less than half the size of first; anal fin present; **caudal fin asymmetrical, crescentic, with a strong lower lobe but no subterminal notch**; caudal fin much less than half total length. Caudal peduncle depressed, **with a strong keel on each side continuing forward onto the back and over the gill slits as a low ridge and flanked by 2 additional ridges above it**; upper precaudal pit present. Supraorbital crests present on cranium, these laterally expanded. Valvular intestine of ring type. **Colour:** dark grey, reddish, or greenish grey above, **with white or yellow spots and transverse stripes**; white or yellowish below.

Similar families occurring in the area

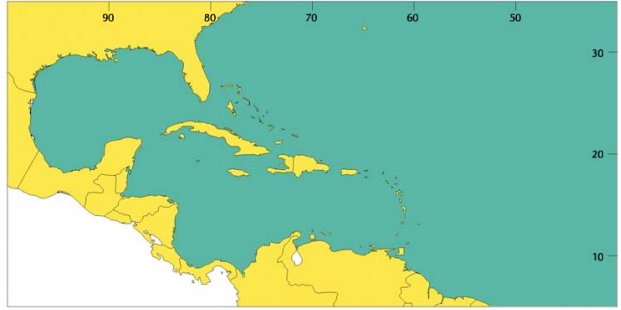
The combination of characters such as the truncated snout, the transverse mouth in front of eyes, the numerous small teeth, the lateral ridges, the precaudal keels, and the colour pattern distinguishes the whale shark from all other sharks in the area.

Size: Maximum total length to at least 12 to 18 m; possibly to 21.4 m.

Habitat, biology, and fisheries: This huge pelagic filter feeder occurs singly or in schools, often at or near the surface, near shore or on the open sea. Normally ovoviviparous and occasionally oviparous, females found with about 300 young inside but young in large, football-sized cases have been found on the substrate. Feeds on small pelagic crustaceans, schooling fishes including anchovies, sardines, and even albacores, and squids. Often seen in a vertical position with head at or near the surface when feeding. Harmless and permitting close approach by divers; rarely butting small boats, possibly when excited by fish hooked from the boats, but more often struck by ships while basking at the surface. Taken only incidentally in the area, but of growing interest for targeted fisheries because of a major market for its flesh in the Orient. Captured as bycatch in floating gill nets, in fixed fish traps, sometimes in trawls, and often fished by harpoon; flesh utilized dried-salted and fresh for human consumption; liver processed for oil; fins for the oriental-fin trade; other parts probably also

used for fish meal and for human consumption. This shark is an increasingly popular subject of ecotouristic shark diving in the Indo-Pacific because it migrates close inshore, concentrates off reefs to feed during part of the year, and is readily accessible to touristic divers. This shark is listed on the IUCN Red List of Threatened Animals (data deficient) and was recently protected in the Philippines after targeted fisheries caused its depletion. It is also protected off Honduras and the USA.

Distribution: Circumglobal in all tropical and warm-temperate seas, oceanic and coastal. Widespread in Area 31.



References

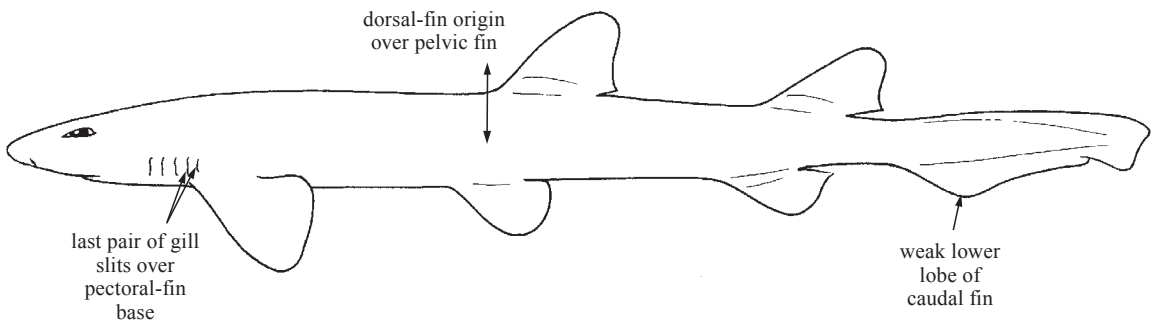
- Bigelow, H.B. and W.C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.* (1):56-576.
- Compagno, L.J. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fisheries Synopsis*, (125) Vol.4Pt.1:249p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, vol. 1, Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.
- Wolfson, F.H. 1986. Occurrences of the whale shark, *Rhincodon typus* Smith. *Proc. 2nd. Int. Conf. Indo-Pacific Fishes*, 1986: 208-226.
- Wolfson, F.H. and G. Notarbartolo di Sciara. 1981. The whale shark, *Rhiniodon typus* Smith, 1828: an annotated bibliography (Selachii Rhinodontidae). *Atti Soc. Ital. Sci. Nat. Museo Civ. Stor. Nat. Milano*, 122 (3-4):171-203.

Order CARCHARHINIFORMES

SCYLIORHINIDAE

Catsharks

Diagnostic characters: Small sharks with slender and elongated to moderately stout bodies. Head with 5 gill slits, **the last 2 posterior to pectoral-fin origins**; gill arches with or without small papillose rakers; nostrils with or without barbels and lacking deep nasoral or circumnarial grooves; eyes horizontally oval, elongated, **with weakly differentiated nictitating lower eyelids** delimited below by a variably developed subocular pouch; mouth moderately large, with rear corners behind front margins of eyes; labial furrows present or absent (present in species from the area); **teeth very small, numerous, teeth near the centre of the mouth with a single medial cusp and usually 1 or more cusplets on each side**, the rear teeth often comb-like. Two dorsal fins, **the first dorsal fin originating over or posterior to pelvic-fin bases**, the second dorsal fin smaller, as large, or larger than first dorsal fin, but never greatly reduced; anal fin usually considerably longer than second dorsal fin, and originating in advance of the second dorsal-fin origin; caudal fin strongly asymmetrical, with a subterminal notch, **its lower lobe absent or only weakly indicated, its upper edge unrippled, sometimes with a denticulated crest**; ventral caudal lobe usually weak or absent. Caudal peduncle not flattened dorso-ventrally, **without lateral keels or precaudal pits**. Intestine with a corkscrew-shaped spiral valve, with 5 to 22 turns. **Colour:** grey, brown, yellowish, or black, often with light or dark spots and dark blotches, bars, and saddles.



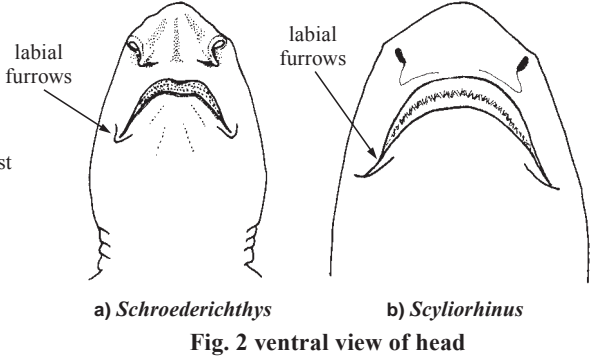
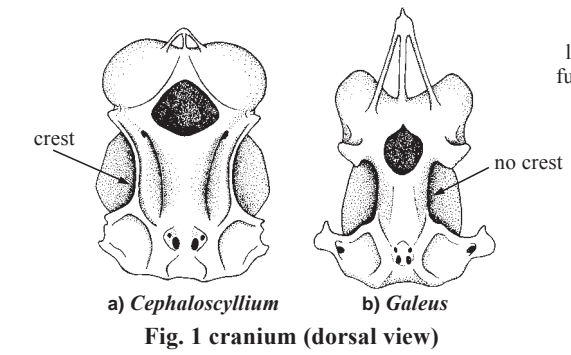
Habitat, biology, and fisheries: This is by far the largest family of sharks, with small to moderate-sized species (rarely surpassing 100 cm total length) from tropical and temperate latitudes. Catsharks range from the intertidal to depths greater than 2 000 m on continental or insular slopes, but in Area 31 they are mostly found on the continental slopes between 200 and 1 600 m (with a few *Scyliorhinus* species ranging on the continental shelves up to 37 m). They are generally poor swimmers and do not migrate over great distances. Most species live on or near the bottom. Reproduction usually oviparous (egg-laying), but ovoviviparous in a few species. These sharks feed chiefly on invertebrates and small fishes. Catsharks are not known to be utilized in Area 31, although they may be a minor bycatch of large, deep-fishing offshore trawlers. Elsewhere some species are moderately common and are regularly taken as bycatch in trawl fisheries, and are used for meat, fish meal and oil. Some catsharks are caught by sport anglers or viewed by ecotouristic divers, but not in Area 31. Some species of catsharks including *Scyliorhinus retifer* are hardy and are kept in public and private aquaria.

Similar families occurring in the area

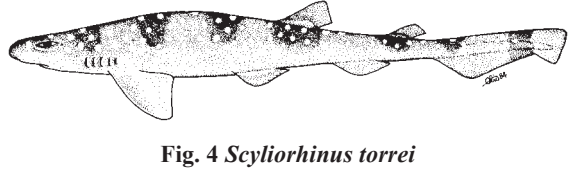
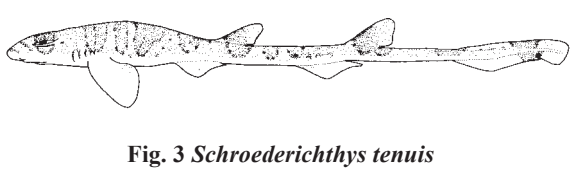
The catsharks are easily distinguished from superficially similar families of sharks by the combination of characters such as their small size, the location of the last 2 gill slits behind the pectoral-fin origins, the posterior position of the first dorsal fin, the comparatively large anal fin, the strongly asymmetrical caudal fin, the absence of keels or precaudal pits on the caudal peduncle, and the presence of a spiral intestinal valve.

Key to the species of Scyliorhinidae occurring in the area

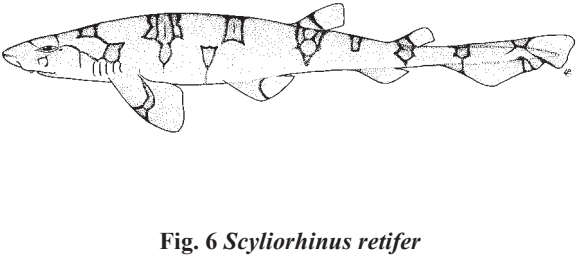
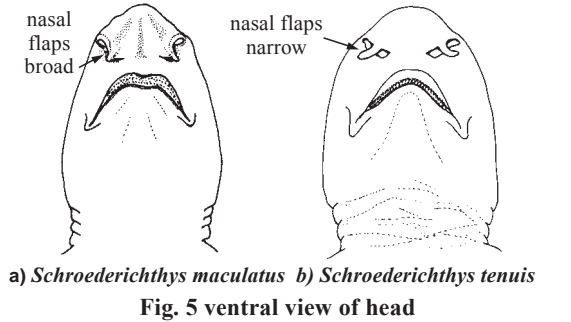
- 1a. Supraorbital crests present on cranium above eyes (Fig. 1a)→ 2
- 1b. Supraorbital crest absent from cranium (Fig. 1b)→ 9



- 2a. Second dorsal fin about as large as first; labial furrows present on both jaws (Fig. 2a, 3) (*Schroederichthys*) → 3
- 2b. Second dorsal fin considerably smaller than first; lower labial furrows present, uppers absent (Fig. 2b, 4). (*Scyliorhinus*) → 4



- 3a. Anterior nasal flaps broad and triangular (Fig. 5a); dorsal saddles weakly defined on back, no dark spots; body covered with small white spots *Schroederichthys maculatus*
- 3b. Anterior nasal flaps narrow and lobate (Fig. 5b); dorsal saddles strongly marked and outlined by numerous dark spots; body usually without white spots. *Schroederichthys tenuis*



- 4a. Colour pattern of black lines in a reticular pattern (Fig. 6) *Scyliorhinus retifer*
- 4b. Colour pattern variable, but not formed as reticular black lines→ 5
- 5a. Numerous white spots present on back→ 6
- 5b. Usually no light spots, or few.→ 7

- 6a. Dark saddle marks not conspicuous, white spots scattered on back (Fig. 7) *Scyliorhinus torrei*
- 6b. Dark saddle marks conspicuous, white spots confined to saddle marks (Fig. 8)
..... *Scyliorhinus hesperius*

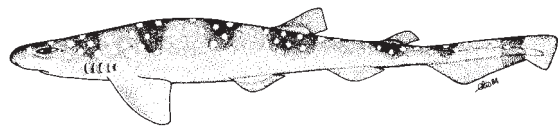


Fig. 7 *Scyliorhinus torrei*

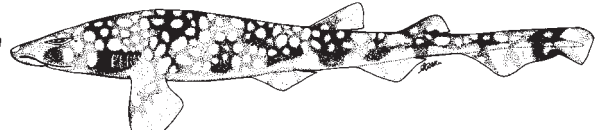


Fig. 8 *Scyliorhinus hesperius*

- 7a. Dark saddle marks outlined by borders of black spots or broken black lines (Fig. 9) *Scyliorhinus boa*
- 7b. Dark saddle marks not outlined by black spots or lines → 8

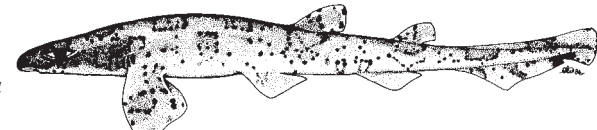


Fig. 9 *Scyliorhinus boa*

- 8a. Ground colour light with slightly darker saddle and numerous black spots (Fig. 10)
..... *Scyliorhinus haeckelii*
- 8b. Ground colour dark with darker saddles but dark spots few or absent (Fig. 11) . . . *Scyliorhinus meadi*

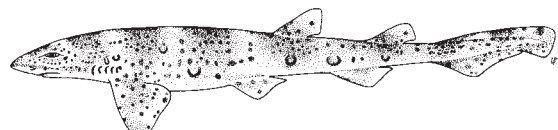


Fig. 10 *Scyliorhinus haeckelii*

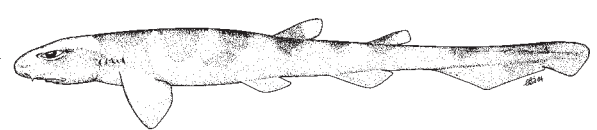


Fig. 11 *Scyliorhinus meadi*

- 9a. Head moderately or little-flattened, not spatulate, snout equal or usually less than mouth width; labial furrows shorter, not reaching upper symphysis (Fig. 12a, b) → 10
- 9b. Head broadly flattened and spatulate, snout elongated and usually greater than mouth width; labial furrows very long, uppers reaching upper symphysis (Fig. 12c) (*Apristurus*) → 14

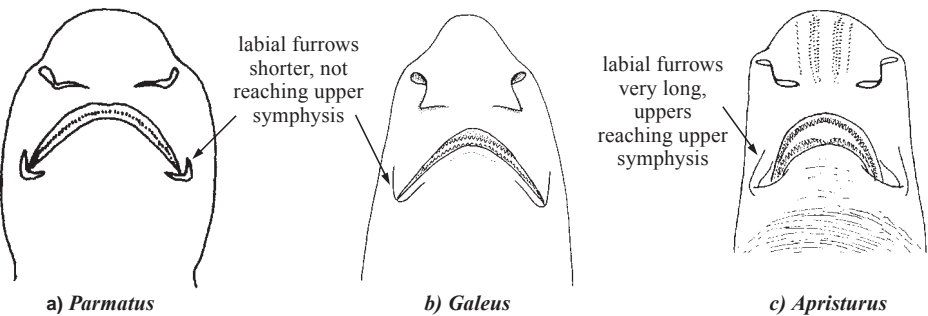


Fig. 12 ventral view of head

- 10a. Pectoral fins relatively small, width of their posterior margins usually smaller than mouth width; subocular ridges well-developed, eyes dorsolateral; body soft; colour plain, no pattern (Fig. 13)
..... *Parmaturus campechensis*
- 10b. Pectoral fins relatively large, width of their posterior margins usually larger than mouth width; subocular ridges obsolete or nearly so, eyes lateral; body firm; colour pattern of blotches and spots often present (*Galeus*) → 11

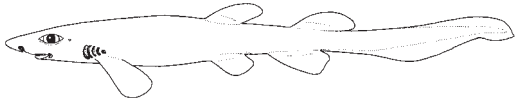


Fig. 13 *Parmaturus campechensis*

- 11a. Subcaudal crest present on ventral caudal margin; dorsolateral surface of body with longitudinal striped pattern (Fig. 14) *Galeus springeri*
- 11b. Subcaudal crest absent from ventral caudal margin; dorsolateral surface of body with marbled pattern of spots and saddles → 12

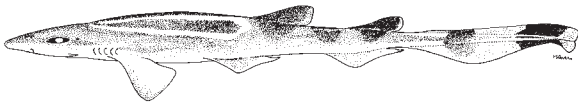


Fig. 14 *Galeus springeri*

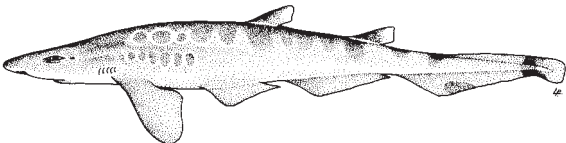


Fig. 15 *Galeus cadenati*

- 12a. Anal fin elongated, length of base usually equal or greater than 13% total length in males and 14% in females (Fig. 15) *Galeus cadenati*
- 12b. Anal fin shorter, length of base usually less than 14% total length → 13

- 13a. Usually 38 to 43 (mean 40.5) diplospondylous precaudal vertebrae; size smaller, mature at 27 to 33 cm (Fig. 16) *Galeus arae*
- 13b. Usually 41 to 48 (mean 44.1) diplospondylous precaudal vertebrae; size larger, mature at 33 to 46 cm (Fig. 17) *Galeus antillensis*

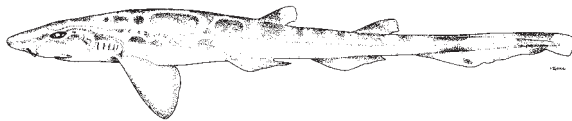


Fig. 16 *Galeus arae*

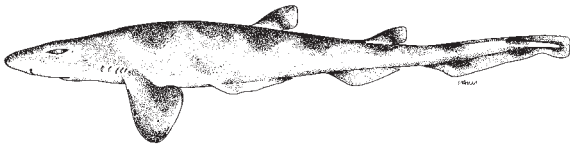
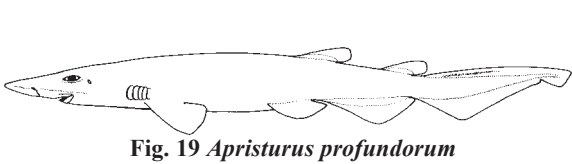
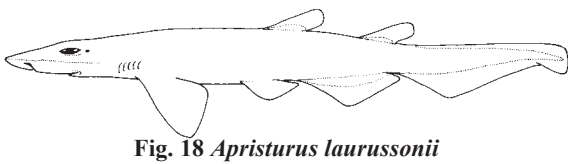


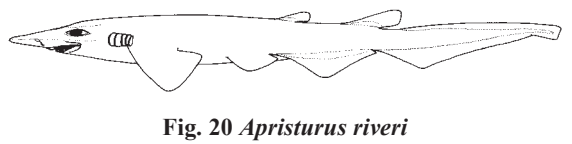
Fig. 17 *Galeus antillensis*

- 14a. First dorsal fin nearly or quite as large as second, 2/3 to equal its area, with its origin usually about opposite pelvic-fin midbases but more posterior and about opposite last third or fourth of pelvic-fin bases in a few species → 15
- 14b. First dorsal fin much smaller than second, about half its area or less, with its origin usually behind pelvic-fin insertions but over last fourth of pelvic-fin bases in some species → 16

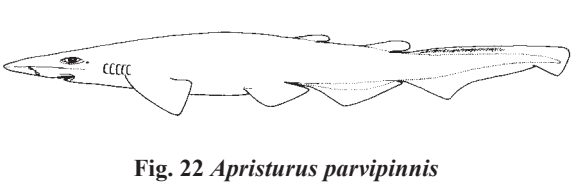
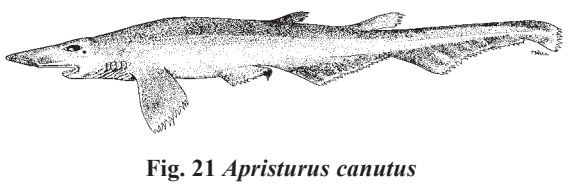
- 15a. Caudal fin without a crest of enlarged denticles (Fig. 18) *Apristurus laurussonii*
15b. Caudal fin with a crest of enlarged denticles (Fig. 19) *Apristurus profundorum*






















- 16a. Origin of first dorsal fin somewhat in front of pelvic-fin insertions (Fig. 20) *Apristurus riveri*
16b. Origin of first dorsal fin behind pelvic-fin insertions → 17



- 17a. Distance between pectoral and pelvic bases short, 6 to 9% of total length; anal-fin base 2.5 to 3 times fin height *Apristurus canutus*
17b. Distance between pectoral and pelvic bases longer, 10 to 14% of total length; anal-fin base 4 to 5 times fin height *Apristurus parvipinnis*



List of species occurring in the area

- The symbol  is given when species accounts are included.
-  *Apristurus canutus* Springer and Heemstra, in Springer, 1979.
 -  *Apristurus laurussonii* (Saemundsson, 1922).
 -  *Apristurus parvipinnis* Springer and Heemstra, in Springer, 1979.
 -  *Apristurus profundorum* (Goode and Bean, 1896).
 -  *Apristurus riveri* Bigelow and Schroeder, 1944.
 -  *Galeus antillensis* Springer, 1979.
 -  *Galeus arae* (Nichols, 1927).
 -  *Galeus cadenati* Springer, 1966.
 -  *Galeus springeri* Konstantinou and Cozzi, 1998.
 -  *Parmaturus campechiensis* Springer, 1979.
 -  *Schroederichthys maculatus* Springer, 1966.
 -  *Schroederichthys tenuis* Springer, 1966.
 -  *Scyliorhinus boa* Goode and Bean, 1896.
 -  *Scyliorhinus haeckelii* (Mirando-Ribeiro, 1907).
 -  *Scyliorhinus hesperius* Springer, 1966.
 -  *Scyliorhinus meadi* Springer, 1966.
 -  *Scyliorhinus retifer* (Garman, 1881).
 -  *Scyliorhinus torrei* Howell Rivero, 1936.

References

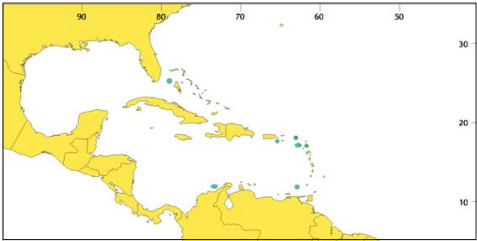
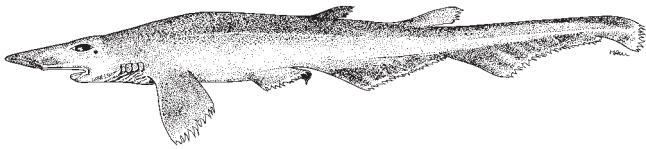
- Bigelow, H.B. and W.C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Fnd. Mar. Res.*, (1):56-576.
- Compagno, L.J.V. 1978. Sharks. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31)*, edited by W. Fischer. Vol. 5. Rome, FAO (unpaginated).
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.*, (125)Vol.4Pt.2:251-655.
- Compagno, L. J. V. 1988. *Sharks of the Order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572p.
- Konstantinou, H. and J.R. Cozzi. 1998. *Galeus springeri*, a new species of sawtail catshark from the Caribbean Sea (Chondrichthyes, Scyliorhinidae). *Copeia*, (1):151-158.
- Konstantinou, H., J.D. McEachran, and J.B. Woolley. 2000. The systematics and reproductive biology of the *Galeus arae* subspecific complex (Chondrichthyes, Scyliorhinidae). *Env. Biol. Fishes*, 57(2):117-129.
- Soto, J.M.R. 2001. *Galeus minicaronei* sp. nov. (Carcharhiniformes: Scyliorhinidae), a new species of sawtail catshark from southern Brazil. *Mare Magnum*, 1(1):11-18.
- Soto, J.M.R. 2001. *Schroederichthys saurisqualus* sp. nov. (Carcharhiniformes: Scyliorhinidae), a new species of catshark from southern Brazil, with further data on *Schroederichthys* species. *Mare Magnum*, 1(1):37-50.
- Springer, S. 1966. A review of Western Atlantic cat sharks, Scyliorhinidae, with descriptions of a new genus and five new species. *Fish. Bull.*, 65:581-624.
- Springer, S. 1979. A revision of the catsharks, family Scyliorhinidae. NOAA Tech. Rep., *NMFS Circ.*, (422):1-152.

Apristurus canutus Springer and Heemstra, 1979

CSA

En - Hoary catshark; **Fr** - Holbiche grise; **Sp** - Pejegato cano.

Maximum total length to 46 cm. Occurs on the upper and middle continental slopes on or near the bottom at 521 to 915 m. Biology essentially unknown. As presently known confined to the area from near Cay Sal Bank, Straits of Florida, Leeward Islands off Antigua and Anguilla, west of the Virgin Islands, Netherlands Antilles, Caribbean coast of Colombia, and Venezuela.

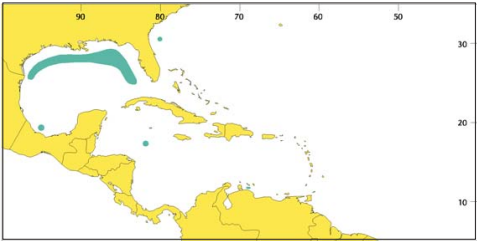
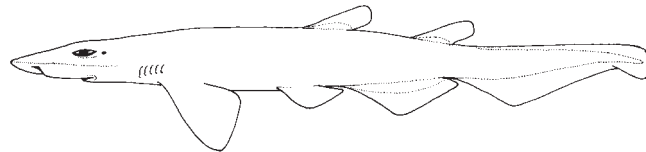


Apristurus laurussonii (Saemundsson, 1922)

APQ

En - Iceland catshark; **Fr** - Roussette d'Islande; **Sp** - Pejegato isl ndico.

Maximum total length to 68 cm. Occurs on the upper and middle continental slopes on or near the bottom at 560 to 1 464 m. Biology essentially unknown, relatively common. Western Atlantic, Massachusetts, Delaware, and northern Gulf of Mexico, USA (Florida, Louisiana, Mississippi, Alabama, Texas), Mexico, Honduras, and Venezuela. Eastern North Atlantic, Iceland, southwestern Ireland, Canary Islands, Madeira, nominal from Indian Ocean seamounts.

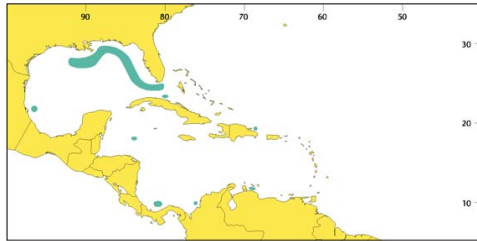


Apristurus parvipinnis Springer and Heemstra, 1979

APK

En - Smallfin catshark; **Fr** - Holbiche petites ailes; **Sp** - Pejegato mocho.

Maximum total length to at least 52 cm. Occurs on the upper and middle continental slopes on or near the bottom at 622 to 1 135 m. Biology essentially unknown, relatively common. As presently known possibly confined to the area, to USA (northeastern Gulf of Mexico off Florida, Texas, Louisiana, Mississippi, Alabama), Mexico (Gulf of Campeche), Honduras, Caribbean Panama and Colombia, Suriname, and off French Guiana. Nominal records from Indian Ocean are of uncertain validity.

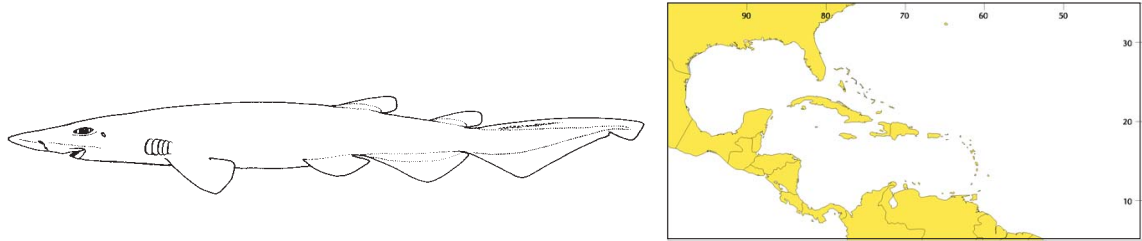


Apristurus profundorum (Goode and Bean, 1896)

APP

En - Deepwater catshark; **Fr** - Holbiche papoila; **Sp** - Pejegato abisal.

Maximum total length to at least 51 cm. Occurs on the continental slopes on or near the bottom at 1 300 to 1 600 m. Biology essentially unknown. Interest to fisheries none at present. Peripheral to the area off Delaware Bay, possibly in eastern Atlantic. Nominal records from Indian Ocean of uncertain validity.

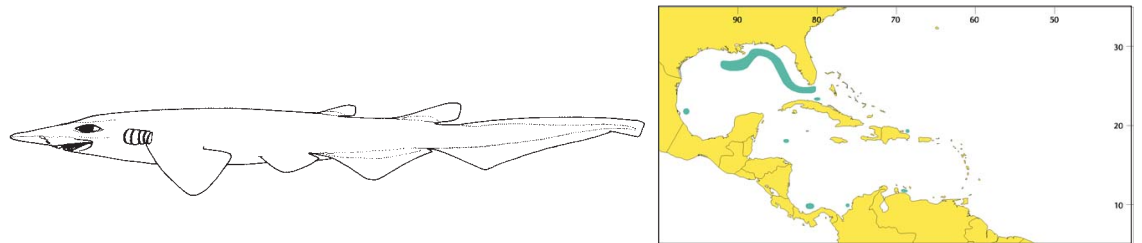


Apristurus riveri Bigelow and Schroeder, 1944

CSV

En - Broadgill catshark; **Fr** - Holbiche grandes oreilles; **Sp** - Pejegato agallón.

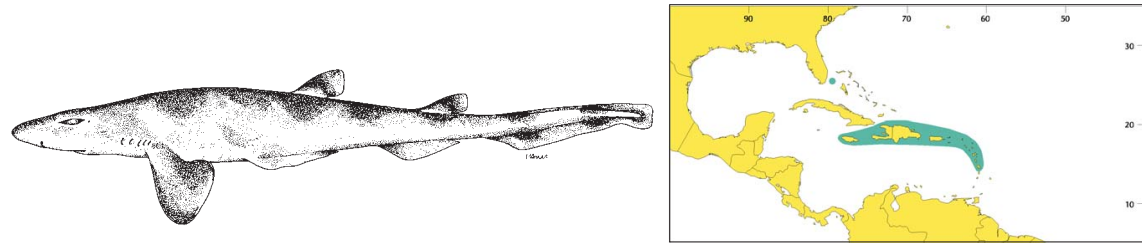
Maximum total length to 46 cm. Occurs on the upper and middle continental slopes on or near the bottom at 732 to 1 461 m. Development oviparous. Interest to fisheries none at present. Confined to the area, off Cuba, the northern Gulf of Mexico off the USA (Florida, Mississippi, Alabama), Mexico, Honduras, Panama, Colombia, Venezuela, and Dominican Republic.



Galeus antillensis Springer, 1979

En - Antilles sawtail catshark.

Maximum total length about 46 cm. Occurs on the upper insular slopes on or near the bottom at 293 to 658 m. Reproduction oviparous. No known fisheries at present. Endemic to Area 31, in the Straits of Florida and the Caribbean from Hispaniola, Puerto Rico, Jamaica, and many of the Leeward Islands of the Caribbean southward to Martinique. Originally proposed as a subspecies of *G. arae*, but apparently a separate species.

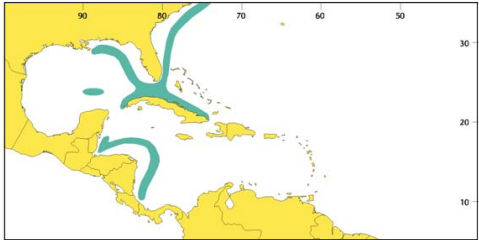
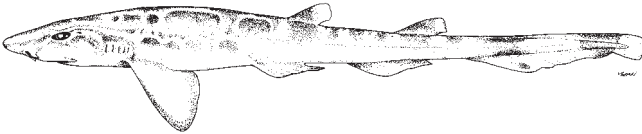


***Galeus arae* (Nichols, 1927)**

GAA

En - Roughtail catshark (AFS: Marbled cat shark); **Fr** - Chien à queue rude; **Sp** - Pintarroja rabolija.

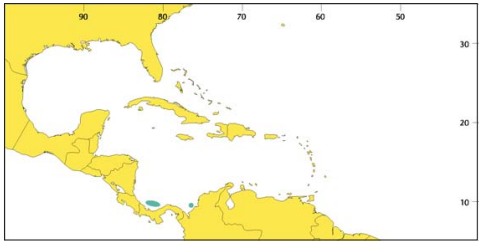
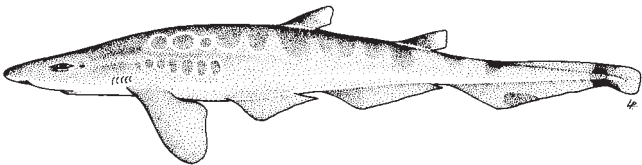
Maximum total length about 36 cm. A common small deep-water shark. Occurs on the upper continental and insular slopes on or near bottom at 292 to 732 m. Reproduction oviparous, eats mostly deep-water shrimp. No known fisheries at present, probably discarded bycatch of deep-water demersal fisheries. Virtually confined to Area 31, with two separate populations: a northern one from the Atlantic and Gulf of Mexico coasts of the USA (North Carolina to Florida and the Mississippi Delta), Mexico (northern Yucatán), and the northern Coast of Cuba; and a southern one from the Caribbean coast off Belize, Honduras, Nicaragua, Costa Rica, and adjacent islands.



***Galeus cadenati* Springer, 1966**

En - Longfin sawtail catshark.

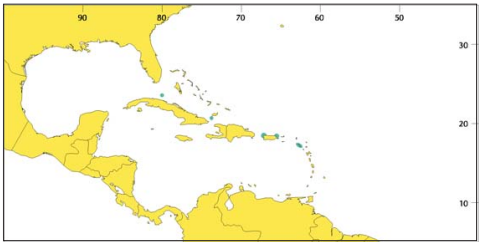
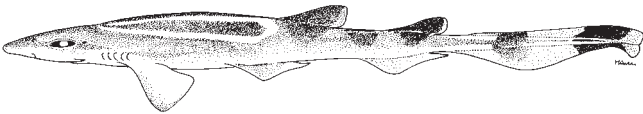
Maximum about 35 cm. Occurs on the upper continental slopes on or near bottom at 439 to 548 m. Biology little-known, reproduction oviparous. No known fisheries at present, possibly discarded bycatch of deepwater demersal fisheries. Only known from Area 31, off the Caribbean coasts of Panama and Colombia. Sometimes ranked as a subspecies of *G. arae*, but apparently a separate species.



***Galeus springeri* Konstantinou and Cozzi, 1998**

En - Striped sawtail catshark.

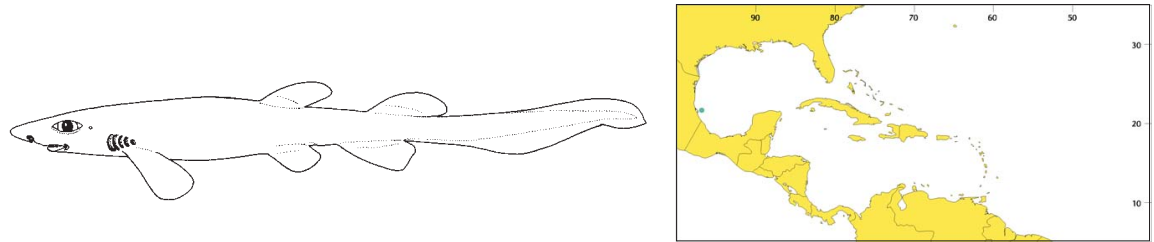
Maximum total length about 44 cm. Occurs on the upper continental slopes on or near the bottom at 457 to 699 m. Biology little-known, reproduction oviparous. No known fisheries at present. Only known from the area, from the northern coast of Cuba, Bahamas, Puerto Rico, and the Leeward Islands. Formerly identified as *G. arae* or *G. antillensis*, but apparently a separate species.



Parmaturus campechiensis Springer, 1979

PAH

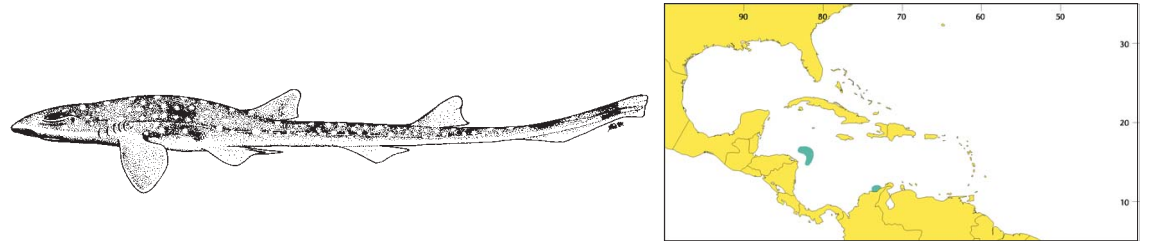
En - Campeche catshark; **Fr** - Holbiche campêchoise; **Sp** - Pejegato campechano.
Maximum total length at least 16 cm and probably larger. Occurs on the middle slope at 1 097 m depth. Biology unknown. Interest to fisheries none at present. Confined to the area, off Mexico in the Bay of Campeche, Gulf of Mexico.



Schroederichthys maculatus Springer, 1966

SHU

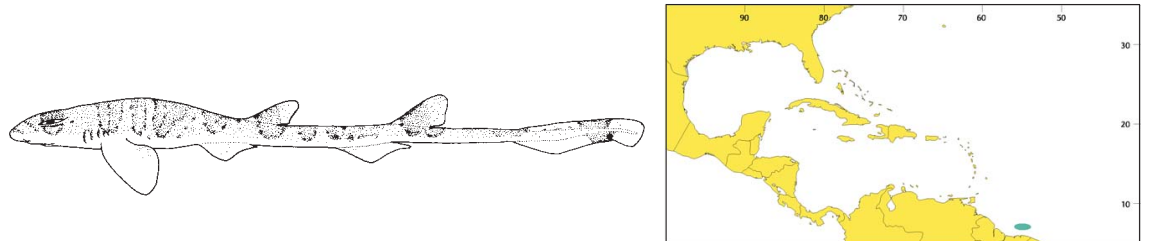
En - Narrowtail catshark; **Fr** - Holbiche petite queue; **Sp** - Pejegato rabo fino.
Maximum total length 34 cm. Occurs on the outer shelf and upper slope at 190 to 410 m depth. Reproduction oviparous, feeds on small bony fishes and cephalopods. Interest to fisheries none at present. Confined to the area, off Honduras and Nicaragua.



Schroederichthys tenuis Springer, 1966

SHN

En - Slender catshark; **Fr** - Holbiche mannequin; **Sp** - Pejegato menudo.
Maximum total length 43 cm. Occurs on the outer shelf and upper slope at 72 to 450 m depth. Development oviparous, feeds on small bony fishes, possibly other small sharks, crustaceans, cephalopods, gastropods, sponges, cephalopods, and foraminifera. Interest to fisheries none at present. Western Atlantic, Suriname, and north-central Brazil.

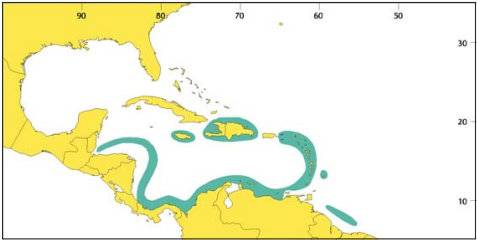
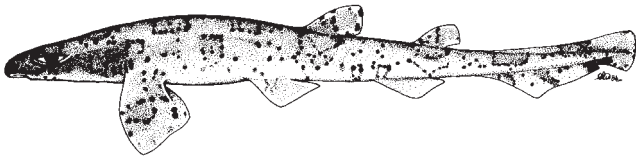


Scyliorhinus boa Goode and Bean, 1896

SYA

En - Boa catshark; **Fr** - Roussette boa; **Sp** - Alitán boa.

Maximum total length at least 54 cm. Occurs on the upper continental and insular slopes on or near the bottom at 229 to 676 m. Biology little-known. Interest to fisheries none. Caribbean off Barbados, Hispanola, Jamaica, Leeward Islands, Windward Islands, Nicaragua, Honduras, Panama, Colombia, Venezuela, Suriname.

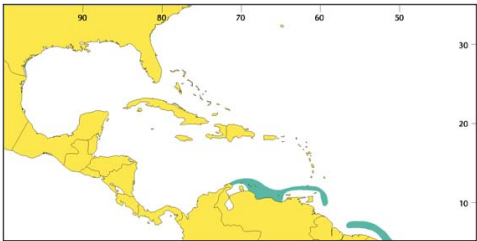
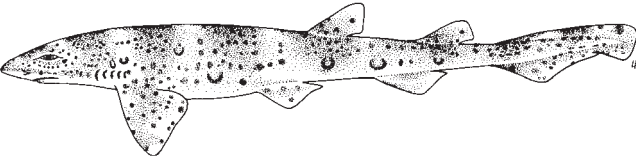


Scyliorhinus haeckelii (Miranda-Ribeiro, 1907)

SYH

En - Freckled catshark; **Fr** - Roussette taches de son; **Sp** - Alitán pecoso.

Maximum total length at least 50 cm. Occurs on the lower continental shelf and upper slope on or near the bottom at depths of 37 to 439 m. Development oviparous. Interest to fisheries none. Western Atlantic off Venezuela, Suriname, French Guiana, Brazil, and Uruguay.

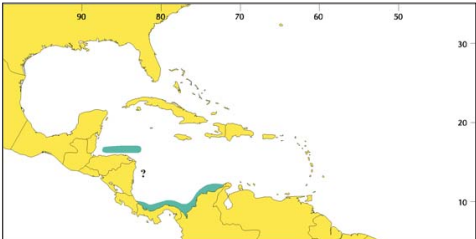
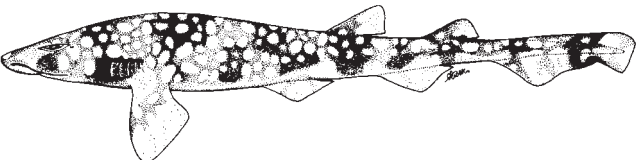


Scyliorhinus hesperius Springer, 1966

SYU

En - Whitesaddled catshark; **Fr** - Roussette selle blanche; **Sp** - Alitán ensillado.

Maximum total length at least 47 cm. Occurs on the upper continental slope on or near the bottom at depths of 274 to 457 m. Biology virtually unknown. Interest to fisheries none. Known only from the area, off Honduras, Panama, and Colombia.

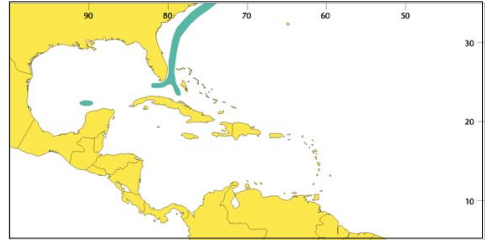
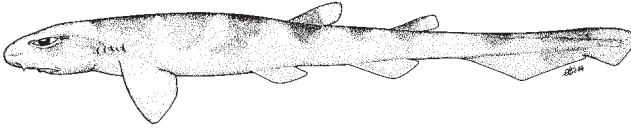


Scyliorhinus meadi Springer, 1966

SYM

En - Blotched catshark; **Fr** - Roussette cloquée; **Sp** - Alitán pintarrajo.

Maximum total length at least 49 cm. Occurs on the upper continental slope on or near the bottom at depths of 329 to 548 m. Biology virtually unknown. Interest to fisheries none. Known only from the area, off the USA (North Carolina south to Florida), in the Santaren Channel between Cuba and the Bahamas Bank, and Mexico (Gulf of Mexico and northern Yucatán Peninsula).

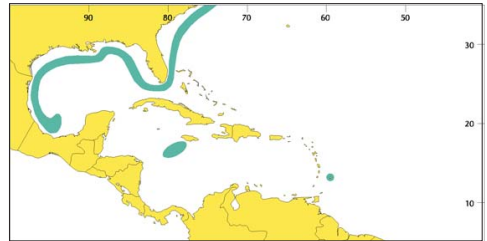
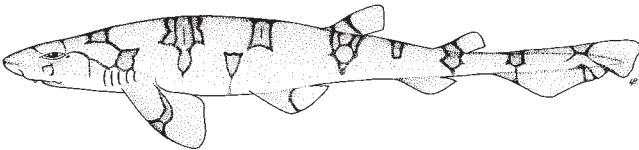


Scyliorhinus retifer (Garman, 1881)

SYF

En - Chain catshark (AFS: Chain dogfish); **Fr** - Roussette maille; **Sp** - Alitán mallero.

Maximum total length 47 cm. Occurs on the outer continental shelf and upper slope on or near the bottom at depths of 73 to 754 m. In the northern part of its range it occurs in shallow water but is a deep-water shark in the tropics. Reproduction oviparous, feeds on cephalopods, bony fishes, crustaceans, and polychaetes. A common catshark, but spottily distributed in its range. Interest to fisheries none, probably discarded bycatch of demersal fisheries. Western north Atlantic from the USA (Massachusetts to Florida, northern Gulf of Mexico), Mexico (Campeche Gulf), Barbados, Caribbean between Jamaica and Honduras, Nicaragua.

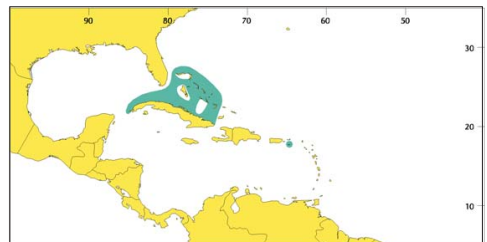
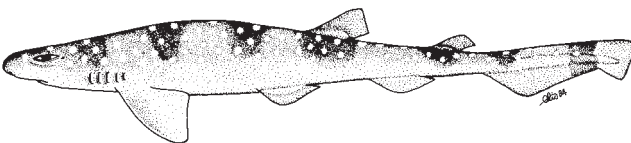


Scyliorhinus torrei Howell Rivero, 1936

SYI

En - Dwarf catshark; **Fr** - Roussette naine; **Sp** - Alitán enano.

Maximum total length 32 cm. Occurs on the upper slope on or near the bottom at depths of 229 to 550 m, mostly below 366 m. Biology virtually unknown. Interest to fisheries none. Localized in the area from the USA (southern Florida), the Bahamas, northern Cuba, and the Virgin Islands.



PROSCYLLIIDAE

Finback (ribbontail catsharks)

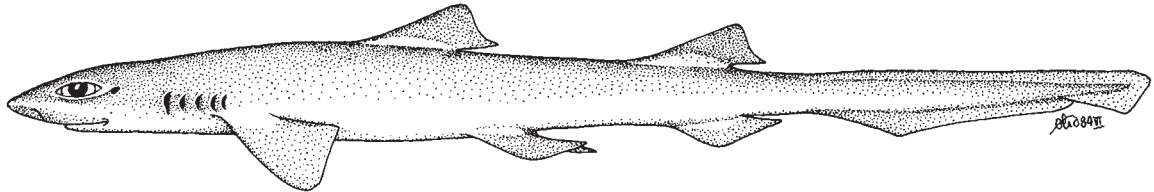
A single species occurring in the area.

Eridacnis barbouri (Bigelow and Schroeder, 1944)

PEB

Frequent synonyms / misidentifications: None / None.

FAO names: En - Cuban ribbontail catshark; Fr - Requin chat cubain; Sp - Tollo coludo cubano.



Diagnostic characters: A very small shark. Head with 5 small gill slits, the last 2 over pectoral-fin bases; very short **dermal gill rakers (not dermal-denticle rakers) present on internal gill slits**; nostrils without barbels or nasoral grooves; **nictitating lower eyelids present, weakly differentiated externally, delimited below the eye by shallow subocular pouches**; snout moderately long, narrowly rounded, or subtriangular; mouth moderately wide and long, reaching past front ends of eyes, triangular in shape; **teeth very small and numerous, similar in both jaws and not blade-like, with a needle-like primary cusp and usually 2 or more cusplets, becoming comb-like in rear of mouth**; anterior teeth of upper jaw smaller than lateral teeth and not separated from them by small intermediate teeth. Two dorsal fins, **the first dorsal-fin base just ahead of pelvic-fin base, the second dorsal fin about as large as first**; anal fin present; caudal fin much less than half the total length, but relatively narrow and elongated, asymmetrical, with lower lobe hardly developed; subterminal notch present. Caudal peduncle compressed, without keels or precaudal pits. Intestinal valve of spiral type. **Colour:** greyish or tan above, sometimes lighter below, caudal fin with obscure transverse bands.

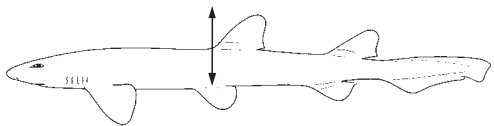
Similar families occurring in the area

Scyliorhinidae: first dorsal fin over or behind pelvic-fin bases.

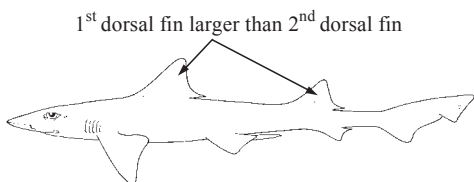
Triakidae (genus *Mustelus*): no dermal gill rakers; teeth mostly with no cusps (or poorly differentiated ones), no cusplets, and flattened crowns, not comb-like at rear of mouth; first dorsal fin somewhat larger than second dorsal fin; caudal fin not elongated.

Carcharhinidae: nictitating lower eyelid inside aperture of eyes; teeth larger and blade-like, not comb-like at rear of mouth; caudal fin with a strong lower lobe; precaudal pits present.

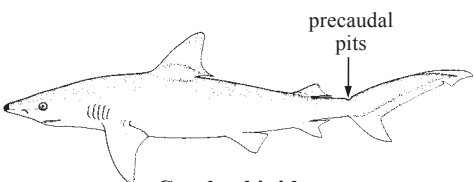
Other shark families: no nictitating lower eyelids.



Scyliorhinidae



Triakidae

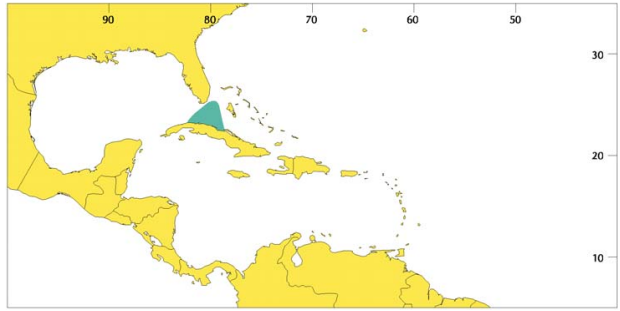


Carcharhinidae

Size: Maximum total length about 34 cm; size at birth near 10 cm; females maturing at about 28 cm and males at 27 cm.

Habitat, biology, and fisheries: A localized but common deep-water shark that occurs on or near the bottom on the continental slopes at depths of 430 to 613 m. Ovoviviparous. Not commercially fished.

Distribution: Occurs in the Florida Straits region from southern Florida to Cuba. Endemic to the area.



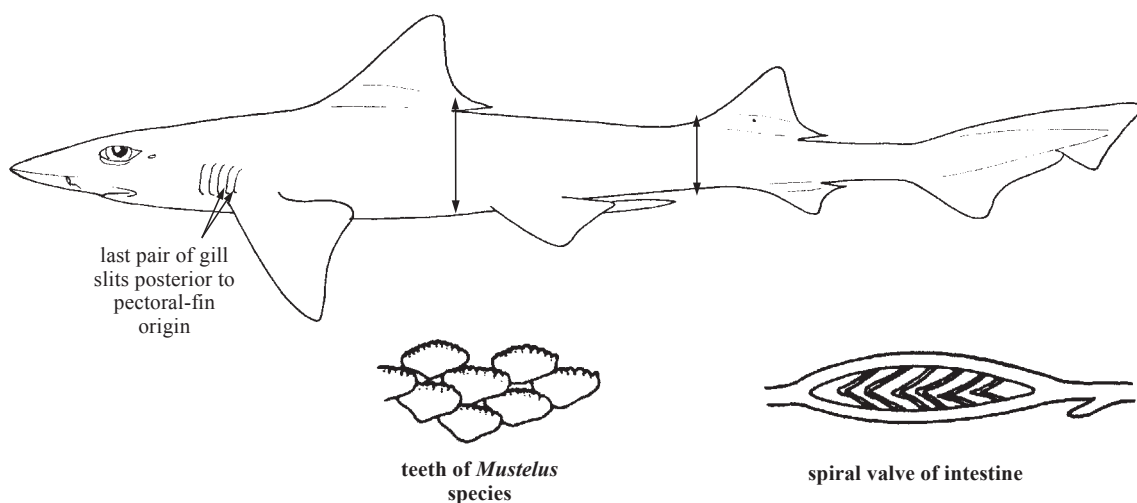
References

- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1)1:56-576.
- Compagno, L.J.V. 1978. Proscylliidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31)*, edited by W. Fischer. Vol. 5. Rome, FAO (unpaginated).
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fisheries Synopsis*, (125) Vol.4 Pt. 2:251-655.
- Compagno, L.J.V. 1988. *Sharks of the Order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

TRIAKIDAE

Houndsharks (smoothhounds, topes)

Diagnostic characters: Body elongated and slender to moderately stout. Head with **5 gill slits, the last pair posterior to pectoral-fin origins**; small spiracles present; gill arches without rakers; eyes horizontally oval, situated above sides of head in species in the area, **with a nictitating eyelid partly or entirely within the eye opening**; anterior nasal flaps of nostrils either broadly to narrowly expanded or greatly reduced, **but not in the form of slender barbels**; mouth ending below or behind eyes; labial furrows moderately long; teeth usually similar in both jaws, but differentiated in a few species found elsewhere; in *Mustelus* (the only genus in Area 31), **the teeth are numerous, small, cuspless (or weak-cusped), and arranged in a pavement**, while species found elsewhere have compressed blade-like teeth with one cusp and sometimes one or more minor cusps or cusplets. Two dorsal fins, the **first dorsal fin much shorter than caudal fin** (about as long as caudal fin in one New Guinean species), and with its **base entirely anterior to pelvic fins**; **second dorsal fin somewhat smaller than the first dorsal fin, originating ahead of anal fin**; **anal fin as large as or smaller than second dorsal fin**; caudal fin asymmetrical, its ventral lobe varying from virtually absent to strong, **its upper edge not rippled**. Caudal peduncle not flattened dorsoventrally or expanded laterally, **without keels or precaudal pits. Intestine with a corkscrew-shaped spiral valve**, with 6 to 10 turns. **Colour:** back usually greyish brown, belly white. Some species are capable of undergoing slow colour changes.

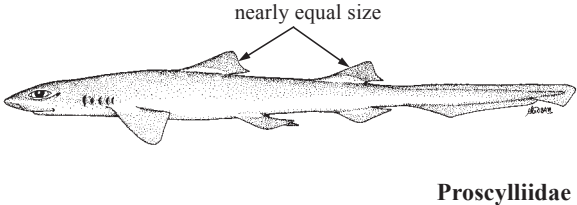
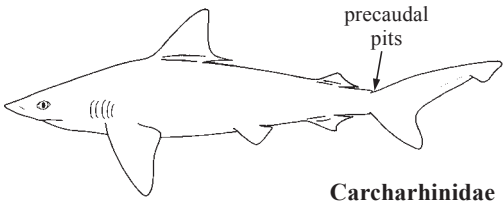


Habitat, biology, and fisheries: Houndsharks are widely distributed in tropical and warm-temperate waters ranging from the intertidal to the upper continental slopes (to 300 m or more). The species are variably ovoviviparous (aplacental viviparous) or viviparous (placental viviparous) and either have a yolk sac placenta (including all species known from Area 31) or lack one. They feed on a wide variety of small to medium-sized bony fishes (both demersal and pelagic) and fish eggs, small sharks (including batoids), chimaeroids, crustaceans (including brachyurid crabs, hermit crabs, lobsters, slipper lobsters, mantis shrimp, ghost shrimp, shrimp and prawns, and isopods), king crabs, gastropods, bivalves (whole bivalves and their siphons), cephalopods (squids and octopi), tunicates, cephalochordates, polychaete worms, echiuroid worms, sipunculoid worms, holothurians, coelenterates, and rarely garbage. None of the species are injurious to people. Many species are used for human consumption (fresh, frozen, smoked, or dried-salted) as well as in the preparation of various subproducts such as shark fins, liver oil, and fish meal. Houndsharks include important fisheries species, particularly smoothhounds (*Mustelus*) and tope sharks (*Galeorhinus*), because of their abundance in inshore areas and because they are readily captured with light line and net gear. Several species of houndsharks are caught by sports fishers and by spearfishing divers. Some species are displayed in public aquaria and are often hardy and attractive, active animals that do well in captivity.

Similar families occurring in the area

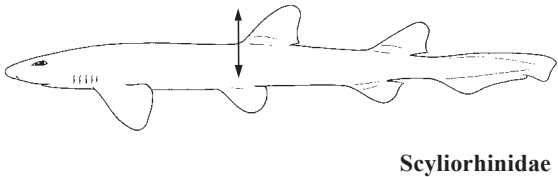
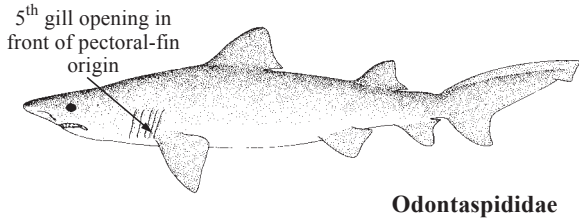
Carcharhinidae: species in the area with blade-like teeth with one strong cusp, not in mosaic or pavement but with 1 to 4 series functional in sides of jaw; lower caudal-fin lobe always strong; precaudal pits present; intestine with a scroll-valve, like a rolled bib.

Proscylliidae: species in the area with small teeth with 1 slender cusp and mostly 2 or more minor cusps or cusplets, teeth comblike at mouth angles; second dorsal fin about as large as first dorsal fin, with its origin about opposite anal-fin origin.



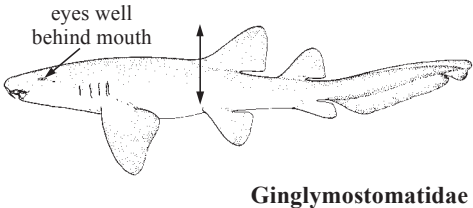
Odontaspidae: fifth gill opening well in front of pectoral-fin origin; eye without nictitating eyelids; teeth blade-like.

Scyliorhinidae: first dorsal-fin base over or behind pelvic-fin base.



Ginglymostomatidae: origin of first dorsal-fin base over or posterior to pelvic-fin bases; nostril connected with mouth by a deep nasoral groove, its anterior margin with a long, cylindrical barbel; eyes well behind mouth (eyes over mouth in triakids).

Other shark families: either caudal fin very long (Alopiidae), or head with 'hammer-like' lateral projections (Sphyrnidae), or caudal fin lunate and size of adults much larger (Cetorhinidae, Rhincodontidae, Lamnidae), or a single dorsal fin and 6 gill slits (Hexanchidae), or anal fin absent (Squalidae, Centrophoridae, Etmopteridae, Somniosidae, Oxynotidae, Dalatiidae, Squatinidae, and Pristiophoridae).



Key to the species of Triakidae occurring in the area

- 1a. Upper labial furrows longer than lower furrows and 1.6 to 2.7% of total length (Fig. 1); larger species, maturing at 75 to over 80 cm and reaching 122 to 140 cm → 2
- 1b. Upper labial furrows about as long as lower furrows and 0.8 to 1.8% of total length (Fig. 2); smaller species, maturing at 47 to 60 cm and reaching 90 cm → 3

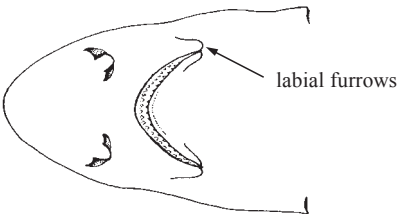


Fig. 1 ventral view of head

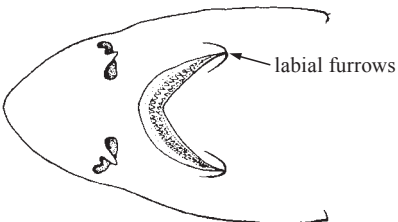







Fig. 2 ventral view of head

- 2a. Denticles on back mostly or entirely lanceolate; monospondylous precaudal vertebral centra 34 to 42, precaudal centra 85 to 100 *Mustelus canis*
- 2b. Lateral trunk denticles on back between pectoral and pelvic fins tricuspidate; monospondylous precaudal vertebral centra 26 to 29, precaudal centra 65 to 72 *Mustelus sinismexicanus*
- 3a. Lateral trunk denticles on back between pectoral and pelvic fins tricuspidate; preoral snout longer, 6.9 to 9.6% total length *Mustelus higmani*
- 3b. Denticles on back mostly or entirely lanceolate; preoral snout slightly shorter, 4.2 to 7.3% total length → 4
- 4a. Eyes larger, length 3.2 to 4.3% of total length; internarial width broader, 2.7 to 3.1% of total length; mouth broader, width 5.4 to 6.9% of total length; monospondylous precaudal vertebral centra 42 to 47. *Mustelus minicanis*
- 4b. Eyes smaller, length 2.3 to 3.4% of total length; internarial width narrower, 2.3 to 2.8% of total length; mouth narrower, width 4.6 to 5.6% of total length; monospondylous precaudal vertebral centra 33 to 38. *Mustelus norrisi*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Mustelus canis* (Mitchill, 1815).
-  *Mustelus higmani* Springer and Lowe, 1963.
-  *Mustelus minicanis* Heemstra, 1997.
-  *Mustelus norrisi* Springer, 1939.
-  *Mustelus sinismexicanus* Heemstra, 1997.

References

Bigelow, H.B. and W.C. Schroeder. 1940. Sharks of the genus *Mustelus* in the western Atlantic. *Proc. Boston Soc. Nat. Hist.*, 41:417-438.

Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Fnd. Mar. Res.*, (11):56-576.

Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fisheries Synopsis*, (125)Vol.4,Pt.2:251-655.

Compagno, L.J.V. 1988. *Sharks of the Order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

Compagno, L.J.V and R. Vergara. 1978. Triakidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31)*, edited by W. Fischer. Vol. 5. Rome, FAO (unpaginated).

Heemstra, P.C. 1973. A revision of the shark genus *Mustelus* (Squaliformes: Carcharhinidae). *Univ. Miami unpub. Ph.D. thesis*, 187 p.

Heemstra, P.C. 1997. A review of the smooth-hound sharks (genus *Mustelus*, Family Triakidae) of the western Atlantic Ocean, with descriptions of two new species and a new subspecies. *Bull. Mar. Sci.*, 60(3):894-928.

Springer, S. 1939. Two new Atlantic species of dog sharks, with a key to the species of *Mustelus*. *Proc. U. S. Natn. Mus.*, 86(3058):461-468.

Springer, S. and R.H. Lowe. 1963. A new smooth dogfish, *Mustelus higmani*, from the equatorial Atlantic coast of South America. *Copeia*, 1963(2):245-251.

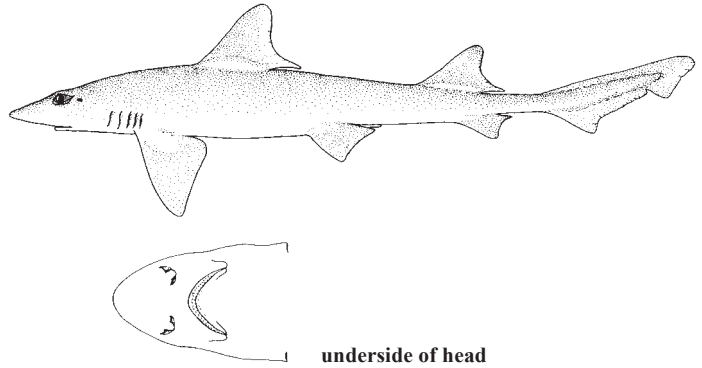
***Mustelus canis* (Mitchill, 1815)**

CTI

Frequent synonyms / misidentifications: *Allomycter dissutus* Guitart Mandy, 1972, *Mustelus canis insularis* Heemstra, 1997 / *M. sinusmexicanus*, Heemstra, 1997.

FAO names: **En** - Dusky smooth-hound (AFS: Smooth dogfish); **Fr** - Emissole douce; **Sp** - Musola dentuda (Area 31: Mamón dentado).

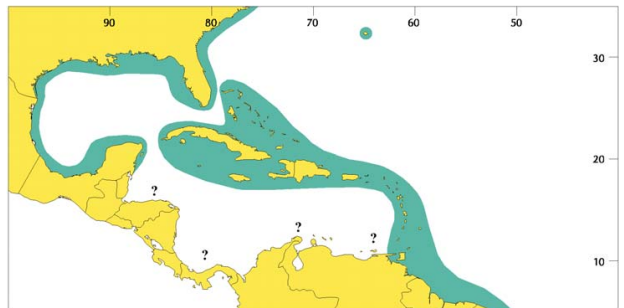
Diagnostic characters: A moderate-sized shark with an elongate and slender body, moderately flat on its ventral surface; a low sharp-edged dermal ridge on midline of back, particularly conspicuous between the 2 dorsal fins. Head flattened above and ending in a thin-tipped snout; snout moderately long, **preoral length 5.5 to 8.0% of total length**; 5 gill slits, the fourth above pectoral-fin origin; **eyes moderately large, length 2.2 to 4.2% of total length**; eyes with longitudinal external nictitating lower eyelids; spiracles small but prominent; **space between nostrils broad, internarial width 2.7 to 3.6% total length**; **mouth relatively broad, width 4.7 to 6.8% of total length**; **labial furrows of upper jaw longer than those of lower jaw, length 1.6 to 2.7% of total length**. **Teeth small, ovate, low, arranged in several rows in a mosaic or pavement pattern, their cutting edges bluntly rounded**. First dorsal fin higher than the second dorsal fin, base of first dorsal-fin anterior to pelvic-fin origins; both dorsal fins with rounded apices, deeply concave rear margins and acute rear corners; anal-fin origin about under mid-point of second dorsal-fin base; caudal fin rising only slightly above longitudinal axis of trunk, with a truncate tip and a well-marked subterminal notch, its ventral lobe small and rounded, but well defined; pectoral fins broad, their posterior margins nearly straight; pelvic-fin bases below interdorsal space. Caudal peduncle slightly compressed laterally, without keels or precaudal pits. **Dermal denticles on backs usually with a single cusp. Monospondyloous precaudal vertebral centra 34 to 42, precaudal centra 85 to 100. Colour:** back uniformly olive grey or slaty grey, the colour tone changing with the substrate; belly yellowish or whitish grey; posterior margin of first dorsal fin white in younger specimens.



Size: Maximum total length to 150 cm, common to 100 cm; size at birth between 34 and 39 cm; males maturing at about 82 cm, females at about 90 cm.

Habitat, biology, and fisheries: An active bottom shark inhabiting coastal waters, especially on muddy bottoms; rarely down to 150 m; occasionally found in fresh water but not ascending rivers very far above their mouths. Migrates north and south with the seasons in the northern part of its range. Viviparous (placental viviparous), with 4 to 20 young per litter. Feeds mainly on crustaceans (crabs, lobsters, shrimps); also, on a variety of small demersal and pelagic bony fish, king crabs, squid, bivalves, gastropods, polychaete worms, and occasionally garbage. Kept in aquaria for public viewing. Fished in coastal waters, an important fisheries catch off Cuba, Mexico, and northeastern Venezuela, but probably caught wherever it occurs. Separate statistics are not reported for this species which is apparently abundant in some localities. Caught mainly with bottom longlines; also with floating longlines, probably gill nets, and occasionally with bottom trawls. Marketed fresh and salted, not highly esteemed as a food-fish in some places.

Distribution: Western Atlantic; Canada south along the eastern coast of the USA to Florida and the Gulf Coast to Texas, Mexico, Bermuda, the Bahamas, Cuba, Jamaica, Puerto Rico and the Lesser Antilles to Venezuela, Suriname, French Guiana, Brazil, Uruguay, and Argentina; possibly absent from the Atlantic coast of Central America and northwestern South America. There are 2 allopatric subspecies, *M. canis canis* from continental waters from Canada to Argentina, and an insular form, *M. canis insularis*, from the islands of the Caribbean.

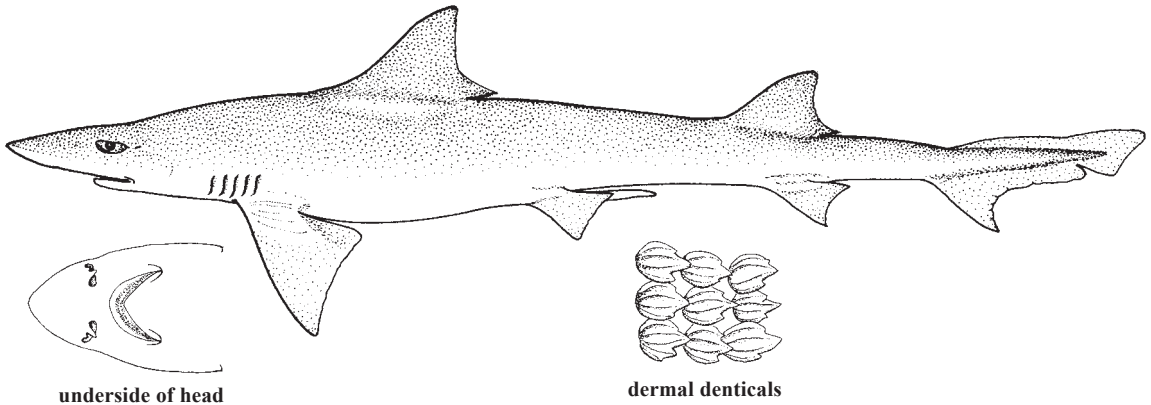


Mustelus higmani Springer and Lowe, 1963

CTJ

Frequent synonyms / misidentifications: None / *Mustelus minicanis*, Heemstra, 1997.

FAO names: **En** - Smalleye smooth-hound; **Fr** - Emissole tiyeux; **Sp** - Musola amarilla (Area 31: Mamón amarillo).

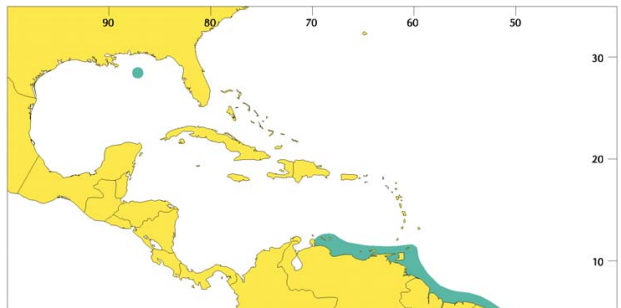


Diagnostic characters: A small shark (the smallest *Mustelus* species along with *M. minicanis*) with an elongate and slender body, moderately flat on ventral surface; a low, sharp-edged dermal ridge on midline of back, particularly conspicuous between the 2 dorsal fins. Head flattened above and ending in a thin-tipped snout; **snout moderately long, preoral length 6.9 to 9.6% of total length**; 5 gill slits, the fourth above pectoral-fin origin; **eyes small, eye length 2.2 to 3.4% of total length**; eyes with longitudinal external nictitating lower eyelids; spiracles small but prominent; space between nostrils broad, **internarial width 2.7 to 3.8% total length**; **mouth relatively broad, width 5.1 to 7.3% of total length**; labial furrows about equal in length on both jaws, length of uppers 0.8 to 1.8% of total length and about as long as lower furrows. **Teeth small, low, oval, arranged in several rows in a mosaic or pavement pattern, their cutting edges bluntly rounded, crenulated, and with low blunt cusps.** First dorsal fin higher than the second dorsal fin, base of first dorsal fin anterior to pelvic-fin origins; both fins with moderately pointed apices, deeply concave posterior margins and acute free rear tips; anal-fin origin about under midpoint of second dorsal-fin bases; caudal fin very low with a truncate tip and a well marked subterminal notch, its ventral lobe small and pointed; pectoral fins short and broad, their posterior margins slightly concave; pelvic-fin bases below interdorsal space. Caudal peduncle slightly compressed laterally, without keels or precaudal pits. **Dermal denticles of back mostly tricuspidate. Monospondylous precaudal vertebral centra 34 to 39, precaudal centra 80 to 90. Colour:** back and upper sides pale grey with golden to brassy reflections (some specimens have a more uniform bronze colour); belly whitish.

Size: Maximum total length to about 65 cm, common to 55 cm; size at birth between 21 and 24 cm; males maturing at about 43 cm and females about 48 cm.

Habitat, biology, and fisheries: An active bottom shark inhabiting coastal waters down to the edge of the continental shelf and the upper and middle slopes, especially on muddy bottoms; close inshore to about 900 m. Enters brackish estuaries and lagoons. Viviparous (placental viviparous), number of young 1 to 7 per litter. Feeds mainly on crustaceans (crabs, shrimps, stomatopods), also on cephalopods and fishes. Mainly caught on shrimp grounds off the Guyanas. Separate statistics are not reported for this species. Caught mainly with bottom longlines, beam trawls, and shrimp seines. Marketed fresh and salted in limited quantities.

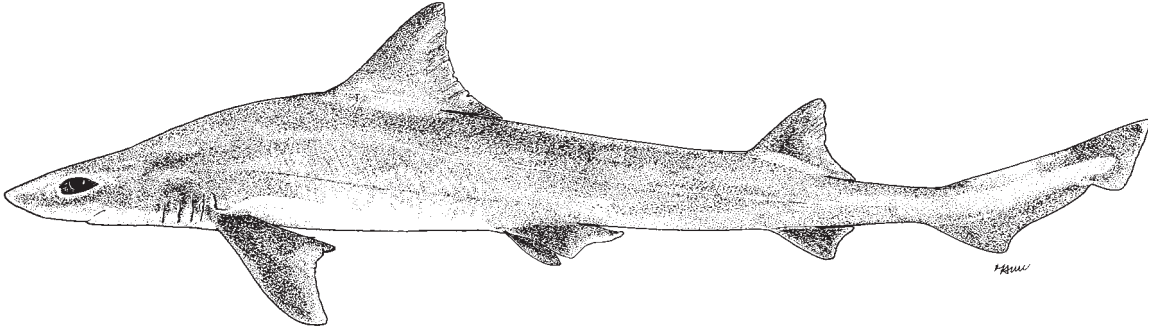
Distribution: Western Atlantic: northern Gulf of Mexico (USA), also Curaçao, Venezuela, Trinidad, Guyana, Suriname, French Guiana, and Brazil.



***Mustelus minicanis* Heemstra, 1997**

Frequent synonyms / misidentifications: None / *Mustelus canis* (Mitchell, 1815); *M. norrisi* Springer, 1940; *M. higmani* Springer and Lowe, 1963.

FAO names: En - Dwarf smooth-hound; Sp - Mamón enano.

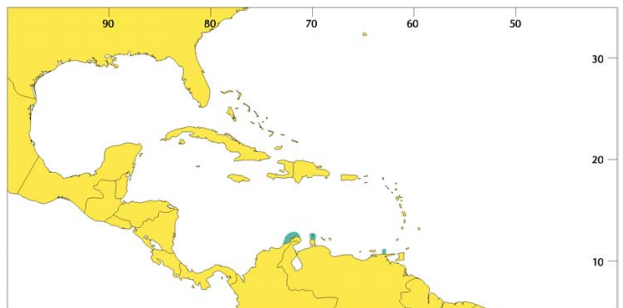


Diagnostic characters: A small shark with an elongate and slender body, moderately flat on ventral surface and with a low sharp-edged dermal ridge on midline of back, particularly conspicuous between the 2 dorsal fins. Head flattened above and ending in a thin-tipped snout; snout moderately long, **preoral length 6.1 to 7.3% of total length**; 5 gill slits, the fourth above pectoral-fin origin; **eyes large, length 3.2 to 4.3% of total length**; eyes oval, with longitudinal external nictitating lower eyelids; spiracles small but prominent; space between nostrils broad, **internarial width 2.7 to 3.1% total length**; **mouth relatively broad, width 5.4 to 6.9% of total length**; **small, low teeth arranged in several rows in a mosaic pattern, their cutting edges bluntly rounded with a low weak cusp and no cusplet**; labial furrows of upper jaw about as long as those of lower jaw, **length 1.3 to 1.7% of total length**. First dorsal fin higher than second dorsal fin, base of first dorsal fin anterior to pelvic-fin origins; both dorsal fins with narrowly rounded apices, deeply concave posterior margins and acute rear corners; anal-fin origin about under midpoint of second dorsal-fin base; caudal fin rising only slightly above longitudinal axis of trunk, with a truncate tip and a well marked subterminal notch, its ventral lobe poorly developed; pectoral fins moderately broad, their distal margins shallowly concave; pelvic-fin origin considerably closer to anal fin than to pectoral-fin origin. Caudal peduncle slightly compressed laterally, without keels or precaudal pits. **Dermal denticles on back primarily lanceolate but with some tricuspidate. Monospondylous precaudal vertebral centra 42 to 47, precaudal centra 85 to 100. Colour:** dorsal surface grey above, light below, juveniles usually with dusky spots on dorsal-fin apices and tip of caudal fin.

Size: Maximum size about 57 cm; size at birth about 21 to 22 cm; males maturing at about 47 cm and females adult at 57 cm.

Habitat, biology, and fisheries: An uncommon tropical bottom-dwelling shark, found at depths of 71 to 183 m. Biology poorly known. Viviparous (placental viviparous), young 5 per litter. Interest to fisheries minimal; possibly caught as bycatch in offshore trawl fisheries for shrimp and bony fishes.

Distribution: In the western north Atlantic off Colombia and Venezuela (Cape La Vela, Colombia, to Rio Caribe, Venezuela).

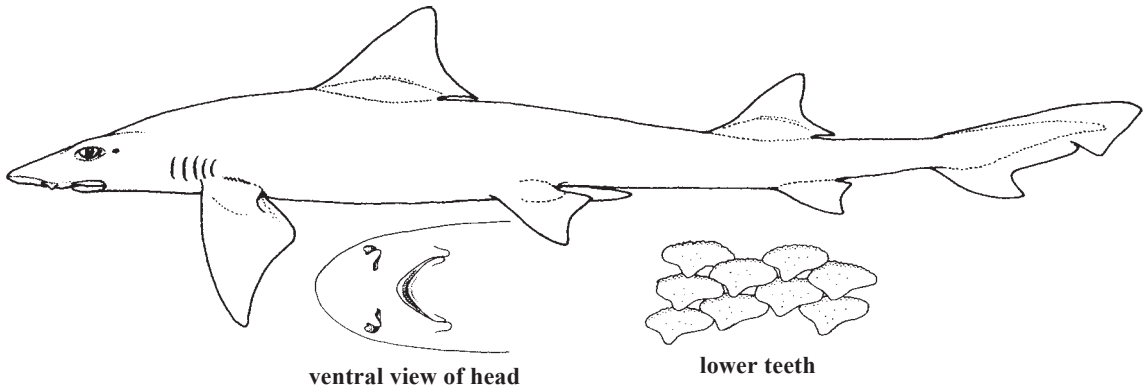


Mustelus norrisi Springer, 1939

MTR

Frequent synonyms / misidentifications: None / *Mustelus canis*, (Mitchell, 1815); *M. sinismexicanus*, Heemstra, 1997.

FAO names: **En** - Narrowfin smooth-hound (AFS: Florida smoothhound); **Fr** - Emissole veuve; **Sp** - Musola viuda (Area 31: Mamón viudo).

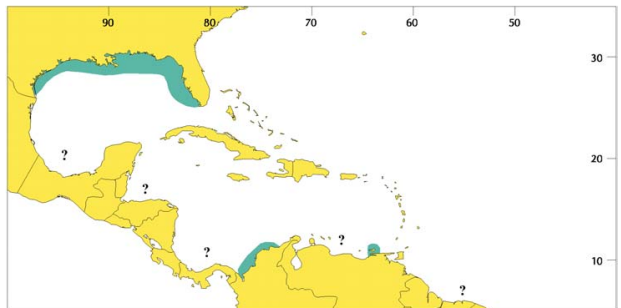


Diagnostic characters: A moderate-sized shark with an elongate and slender body, rather flat on ventral surface; a low sharp-edged dermal ridge on midline of back, particularly conspicuous between the 2 dorsal fins. Head flattened above and ending in a thin-tipped snout; snout moderately long, **preoral length 4.2 to 6.5% of total length**; 5 gill slits, the fourth above pectoral-fin origin; **eyes small, length 2.3 to 3.4% of total length**; eyes oval, with longitudinal external nictitating lower eyelids; spiracles small but prominent; **space between nostrils broad, internarial width 2.3 to 2.8% of total length**; **mouth relatively narrow, width 4.6 to 5.6% of total length**; labial furrows of upper jaw as long as those of lower jaw, length 1.0 to 1.7% of total length. **Teeth small, low, and oval, arranged in several rows in a mosaic or pavement pattern, their cutting edges with low blunt cusps.** First dorsal fin higher than second dorsal fin, base of first dorsal fin anterior to pelvic-fin origins; both dorsal fins with rounded apices, deeply concave posterior margins and acute free rear tips; anal-fin origin about under midpoint of second dorsal-fin base; caudal fin rising only slightly above longitudinal axis of trunk, with a truncate tip and a well-marked subterminal notch, its ventral lobe moderately large and falcate in adults; pectoral fins narrow, their posterior margins concave; pelvic-fin bases below interdorsal space. Caudal peduncle slightly compressed laterally, without keels or precaudal pits. **Dermal denticles on backs usually with a single cusp. Monospondylous precaudal vertebral centra 33 to 38, precaudal centra 87 to 100. Colour:** grey or greyish brown above, pale below, some individuals with light apex and posterior margin on first dorsal fin.

Size: Maximum total length about 98 cm; size at birth 29 to 30 cm; males maturing at 57 to 61 cm, females at about 65 cm.

Habitat, biology, and fisheries: A common tropical-subtropical bottom shark of the continental shelves, found on sandy and mud bottom from close inshore to at least 84 m depth, but with most records shallower than 55 m. Migratory in the Gulf of Mexico, moving inshore in water shallower than 55 m in the winter months and apparently retreating into deeper water in other seasons. Viviparous (placental viviparous), with number of young 7 to 14 per litter. Eats mostly crabs and shrimp, but also small bony fishes. Probably regularly taken within its range, but details of commercial fisheries are lacking.

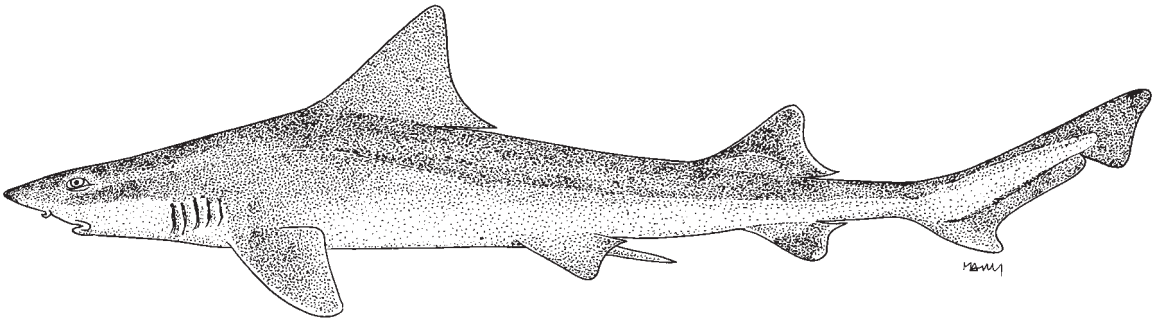
Distribution: Western Atlantic: Gulf of Mexico coast of USA (west coast of Florida, Alabama, Texas), southern Caribbean coast of Colombia and Venezuela, and southern Brazil (Recife, Vitoria and Cananeia).



Mustelus sinuamexicanus Heemstra, 1997

Frequent synonyms / misidentifications: None / *Mustelus canis* (Mitchell, 1815); *M. norrisi* Springer, 1939.

FAO names: En - Gulf smooth-hound; Sp - Mamón del Golfo.

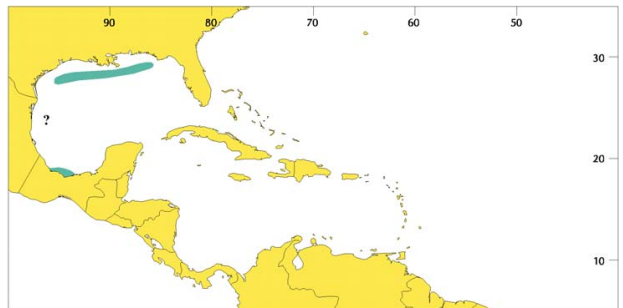


Diagnostic characters: A moderate-sized shark with an elongate and slender body, moderately flat on ventral surface; a low sharp-edged dermal ridge on midline of back, particularly conspicuous between the 2 dorsal fins. Head flattened above and ending in a thin-tipped snout; **snout moderately long, preoral length 4.8 to 6.3% of total length**; 5 gill slits, the fourth above pectoral-fin origin; **eye moderately large, length 1.9 to 3.1% of total length**; eyes oval, with longitudinal external nictitating lower eyelids; spiracles small but prominent; **space between nostrils broad, internarial width 2.6 to 3.3% total length**; **mouth relatively broad, width 4.7 to 6.1% of total length**; **labial furrows of upper jaw longer than those of lower jaw, length of upper labial furrows 1.9 to 2.5% of total length**. **Teeth, small, low, arranged in several rows in a mosaic or pavement pattern, their cutting edges bluntly rounded with a relatively strong low cusp and weak cusplet.** First dorsal fin higher than second dorsal fin, base of first dorsal fin anterior to pelvic-fin origins; both dorsal fins with rounded apices, deeply concave posterior margins and acute free rear tips; pectoral fins broad, their posterior margins nearly straight; pelvic-fin bases below interdorsal space; anal-fin origin about under midpoint of second dorsal-fin base; caudal fin rising only slightly above longitudinal axis of trunk, with a truncate tip and a well marked subterminal notch, its ventral lobe small and rounded, but well developed. Caudal peduncle slightly compressed laterally, without keels or precaudal pits. **Dermal denticles on back primarily tricuspidate. Monospondylous precaudal vertebral centra 26 to 29, precaudal centra 65 to 72. Colour:** dorsal surface grey or grey-brown above, light below, juveniles usually with dusky spots on dorsal-fin apices and tip of caudal fin.

Size: Maximum total length to about 140 cm; size at birth about 39 to 43 cm; males maturing at about 80 cm, size at maturity uncertain for females but mature at 118 cm.

Habitat, biology, and fisheries: Offshore continental shelf and uppermost slope at depths of 36 to 229 m, with most records between 42 and 91 m. This species does not occur inshore in shallow water. Biology little-known, viviparous (placental viviparous), with litter of 8 young. Probably a bycatch of offshore line and trawl fisheries for sharks, bony fishes, and crustaceans, but utilization uncertain.

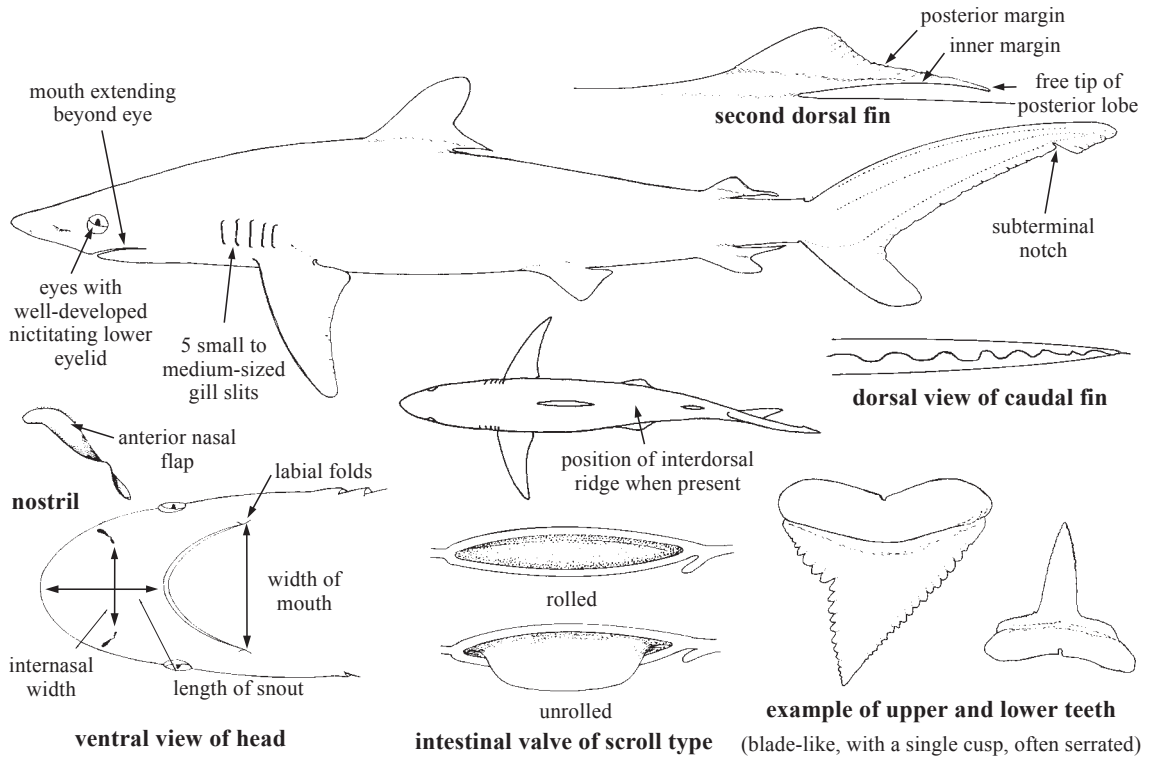
Distribution: Western North Atlantic: Gulf of Mexico coast of the USA and Mexico (Panama City, Florida, Alabama, Louisiana, Mississippi, and Texas, USA, also Bay of Campeche, Mexico).



CARCHARHINIDAE

Requiem sharks (ground sharks, blue sharks, sharpnose sharks)

Diagnostic characters: Small to large sharks. Body cylindrical or slightly compressed, not depressed and without lateral ridges; precaudal tail much shorter than trunk. Head not expanded laterally, conical to moderately depressed; **eyes on sides of head, with a well-developed nictitating lower eyelid**; snout short to moderately long, conical and slightly pointed to depressed and broadly rounded, usually not blade-like (except *Isogomphodon*) and without lateral teeth and barbels; nostrils well separated from mouth, nostrils without barbels, nasoral grooves, or circumnasal grooves; mouth usually large, arched and elongated, and **extending well behind eyes**; labial furrows usually present on both jaws but generally greatly reduced, confined to mouth corners, and barely visible when mouth is closed (*Galeocerdo* and *Rhizoprionodon* species in Area 31 have well-developed labial furrows that are visible when mouth is closed); upper labial furrows usually not reaching front of mouth (except in *Galeocerdo*); **teeth small to large, blade-like**, with a single cusp and with cusplets variably developed; **anterior teeth in upper jaw smaller than lateral teeth; upper anterior and lateral teeth not separated by a gap with smaller intermediate teeth on each side**; 5 small to medium-sized gill slits present, the last 1 to 3 over or behind pectoral-fin origins, their upper ends not expanded onto dorsal surface of head; no gill sieves and usually no gill rakers on internal gill slits (short dermal gill rakers present in *Prionace*); spiracles usually absent (but always present in *Galeocerdo*). Two dorsal fins, without spines, the **first dorsal fin** moderately large, high and angular or subangular, its base much shorter than the caudal fin and **located over the interspace between the pectoral and pelvic-fin bases and entirely anterior to origins of pelvic fins** (free rear tip of first dorsal fin may reach or extend posterior to pelvic origins in *Negaprion* and *Rhizoprionodon*); second dorsal fin varying from less than 0.2 of the height of the first dorsal fin to almost as high as it (*Negaprion*); anal fin present and moderately large, with its origin varying from somewhat anterior to the second dorsal-fin origin to about under its insertion; **caudal fin strongly asymmetrical**, much less than half of total length, **with a rippled or undulated dorsal margin**, a well-marked subterminal notch, and **a short but well-defined ventral caudal lobe**; vertebral axis of caudal fin raised above body axis. Caudal peduncle not strongly depressed dorsoventrally or widely expanded laterally, usually without longitudinal keels but with weak keels present in 2 genera (*Prionace* and *Galeocerdo*); **precaudal pits present and well developed. Intestinal valve of scroll type. Colour:** brown, grey, yellowish, or bluish above, white to cream or yellowish below, some species with prominent dark or light markings on fins and a dark line on flanks; body usually without a prominent colour pattern (except for *Galeocerdo*).



Habitat, biology, and fisheries: The Carcharhinidae or requiem sharks are one of the largest families of non-batoid sharks and are the dominant sharks on the continental and insular shelves in warm-temperate and tropical waters, and generally have high diversity and abundance as well as high biomass in these waters. Small to very large species often occur close inshore in waters less than 100 m deep, but most large requiem sharks are more abundant well offshore on the outer shelves, but still occur near or over the continental and insular shelves. A few species, including the blue, silky, and oceanic whitetip sharks are oceanic, while others, including the night shark (*Carcharhinus signatus*), are semi-oceanic in deep water (183 to 366 m) off the continental slopes. Several very large species, including bull, lemon, and tiger sharks are common close inshore in bays, off beaches, and on rocky and coral reefs. Several inshore requiem sharks enter enclosed estuaries or river mouths and may occur in brackish or fresh water; in Area 31 the bull shark (*Carcharhinus leucas*) penetrates far up rivers to the fall lines (or to the nearest dams blocking rivers) and may be found in fresh-water lakes including Lake Nicaragua. Most requiem sharks are found from the surface and the intertidal to the lower shelves and the open ocean down to 200 m, but the bignose shark (*Carcharhinus altimus*) is unusual in extending its range to near the bottom on the upper continental and insular slopes between 200 and 440 m.

Requiem sharks are active, strong swimmers, occurring singly or in small to large schools or aggregations. Some species may be more or less continually active, while others can rest motionless on the bottom for extended periods. Many are more active at night or at dawn and dusk than daytime. Except for the possibly ovoviviparous (aplacental viviparous) or semiplacental tiger shark (*Galeocerdo cuvier*), all species are viviparous (placental viviparous) with a yolk-sac placenta, and have litters of young from 1 or 2 to 135. All are capable predators, feeding heavily on a wide variety of bony fishes, other sharks (including batoids), squid, octopi, cuttlefishes, crabs, lobsters, and shrimp but also birds, turtles, sea snakes, marine mammals, gastropods, bivalves, and carrion.

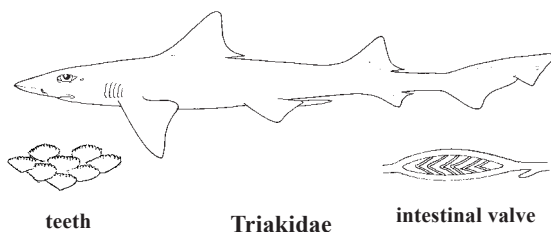
The Carcharhinidae is by far the most important shark family for fisheries in the tropics and in warm-temperate waters, and various species figure prominently in catches within the area. Requiem sharks are utilized primarily for human food, and marketed fresh, dried-salted, and frozen; but requiem sharks are also utilized for the preparation of various subproducts, including oil and Vitamin A from the liver, gelatine, fish meal, cartilage for medicinals, leather, and sandpaper from the skin, and fins for the oriental soup market. Several species are the subjects of recreational or sports fisheries including international big-game angling. Separate statistics by species are mostly not available and several of the Western Central Atlantic carcharhinids are often misidentified. The catch of carcharhinid sharks (as 'requiem sharks') reported from Area 31 in between 1995 and 1999 ranged from 6 278 t to 12 215 t.

Many carcharhinids are negatively affected by fisheries and habitat degradation in the area and worldwide. Larger species generally have long maturation times and relatively low fecundity, and are particularly vulnerable to overfishing at all growth stages through targeted and bycatch fisheries. They are also threatened by degradation of inshore nursery areas through development and pollution. Several species of requiem sharks are now protected in USA waters following dramatic declines in fisheries catches, and several species have been placed on the latest (Year 2000) IUCN (World Conservation Union) Red List of threatened organisms by the IUCN Shark Specialist Group.

The larger carcharhinids make up an important fraction of shark species known to have bitten people, although shark incidents are relatively few each year. Ironically, requiem sharks are also the most important family for ecotouristic shark diving worldwide. Several species in Area 31, including the bull, silky, oceanic whitetip, tiger, lemon, blacktip, Caribbean reef sharks, and even Caribbean sharpnose sharks, are important subjects of observational diving tours in the area, particularly in the Bahamas but also off Turks and Caicos and the USA (Florida). The commercial value of these sharks alive in places such as the Bahamas may be far greater than their value dead as fisheries products. Several species of requiem sharks that occur in Area 31 are displayed for public viewing in large aquaria and oceanaria.

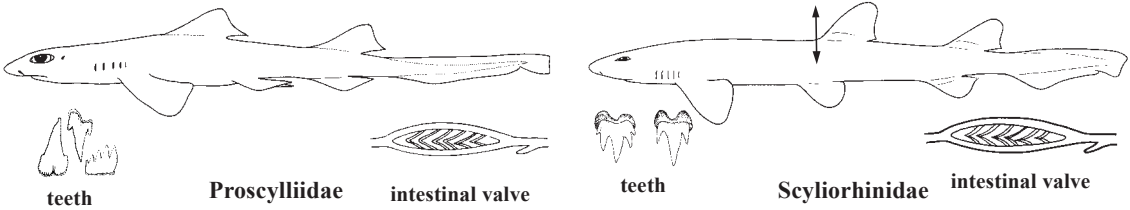
Similar families occurring in the area

Triakidae: species in the area with eyes dorsolateral on head; numerous small, blunt or single-cusped crushing teeth in several functional rows along jaws that form a mosaic pattern or pavement; precaudal pits absent; dorsal caudal margin not undulated; intestine with a corkscrew or auger-like spiral valve.



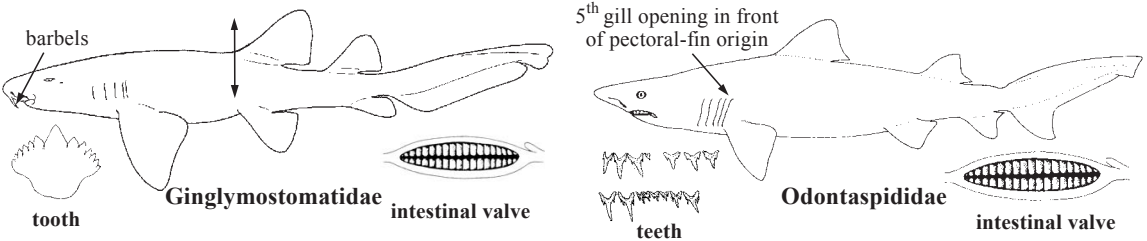
Proscylliidae: the single species (*Eridacnis barbouri*) in the area with eyes dorsolateral on head; teeth small and with 1 slender cusp and mostly 2 or more minor cusps or cusplets, teeth comb-like at mouth angles; precaudal pits absent; dorsal caudal margin not undulated; intestine with a spiral valve.

Scyliorhinidae: first dorsal-fin base over or posterior to pelvic-fin bases; teeth usually comb-like at mouth angles; precaudal pits absent; dorsal caudal margin not undulated; intestine with a spiral or spiral-ring valve.



Ginglymostomatidae: origin of first dorsal-fin base over or partly posterior to pelvic-fin bases; nostrils connected with mouth by deep nasoral grooves; anterior margins of nostrils with long, cylindrical barbels; eyes well behind mouth.

Odontaspidae: fifth gill opening in front of pectoral-fin origin; eyes without nictitating eyelids; largest teeth in front part of jaw on either side of symphysis; large upper anterior teeth separated from smaller lateral teeth at sides by a gap and 1 to 5 rows of intermediate teeth.



Other shark families: either caudal fin very long (Alopiidae), or head with hammer-like lateral projections (Sphyrnidae), or caudal fin lunate and and with a strong caudal keel (Cetorhinidae, Lamnidae, Rhinodontidae), or a single dorsal fin and 6 or 7 gill slits (Chlamydoselachidae, Hexanchidae), or anal fin absent (Echinorhinidae, Squalidae, Centrophoridae, Etmopteridae, Somniosidae, Oxynotidae, Dalatiidae, Pristiophoridae, and Squatinidae).

Key to the species of Carcharhinidae occurring in the area

- 1a. Upper labial furrows very long, extending to eyes; spiracles present and relatively large; low but conspicuous lateral keels present on caudal peduncle (Fig. 1); narrow vertical dark bars present on back, bold in young but obscure or absent in adults *Galeocerdo cuvier*
- 1b. Upper labial furrows long to very short, not extending to eyes; spiracles usually absent; lateral keels usually absent (except for weak keels in *Prionace glauca*) (Fig. 2) → 2

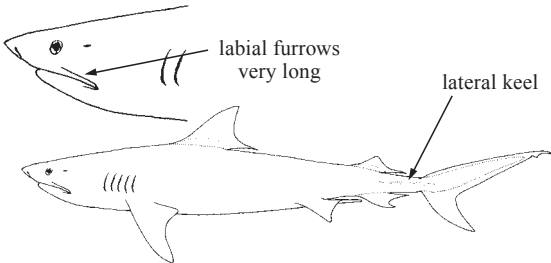


Fig. 1 *Galeocerdo cuvier*

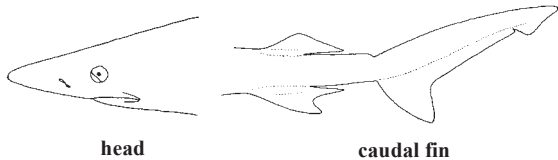


Fig. 2 other species

- 2a. Second dorsal fin nearly as large as first, second dorsal-fin height 0.8 to 1.0 times first dorsal-fin height (Fig. 3) *Negaprion brevirostris*
- 2b. Second dorsal fin considerably smaller than first, height 0.2 to 0.5 times first dorsal-fin height → 3

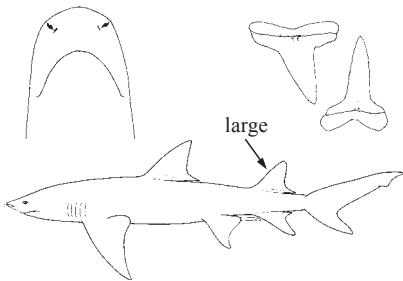


Fig. 3 *Negaprion*

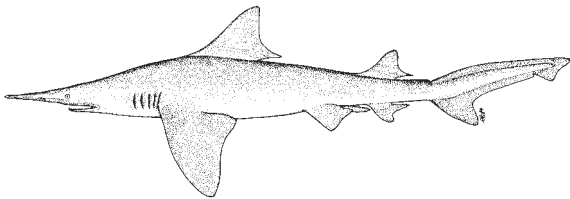


Fig. 4 *Isogomphodon oxyrinchus*

- 3a. Snout very long, narrow and triangular in dorsal or ventral view; teeth very numerous, over 45 rows in each jaw (Fig. 4) *Isogomphodon oxyrinchus*
- 3b. Snout short to very long, thick and broadly rounded to narrowly rounded or pointed in dorsal or ventral view, not triangular; tooth rows always less than 40 and usually less than 35 in each jaw → 4

- 4a. Midlength of first dorsal-fin base considerably closer to pelvic-fin origins than to pectoral-fin insertions; inner gill openings with short gill rakers; back dark blue, fading to purple-black after death (Fig. 5) *Prionace glauca*
- 4b. Midlength of first dorsal-fin base usually closer to pectoral-fin insertions than to pelvic-fin origins, sometimes equidistant between pectoral and pelvic-fin bases; no gill rakers; back grey, blue-grey, or brownish → 5

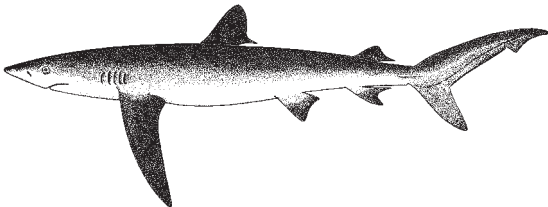


Fig. 5 *Prionace glauca*

- 5a. Upper labial folds long and prominent, horizontal on upper lip; anal-fin base expanded anteriorly by a very long pair of preanal ridges (Fig. 6) (*Rhizoprionodon*) → 6
- 5b. Upper labial folds short to rudimentary, almost vertical at mouth corners; preanal ridges very short or absent (Fig. 7) (*Carcharhinus*) → 8

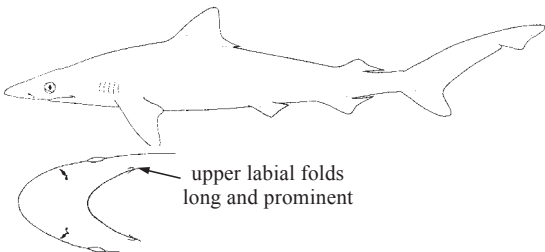


Fig. 6 *Rhizoprionodon*

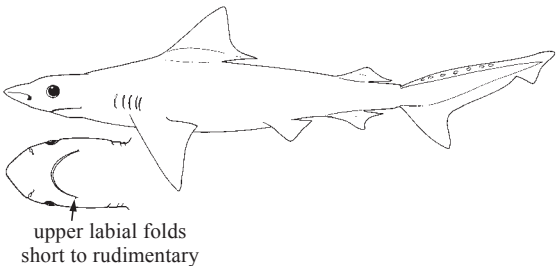


Fig. 7 *Carcharhinus*

- 6a. Smaller sharks, attaining 64 cm total length or less; appressed pectoral-fin apex falling anterior to first dorsal-fin midbase; precaudal vertebral centra 79 to 90 and mostly above 84, outnumbering caudal centra by 5 to 20 centra; transition between monospondylous and diplospondylous vertebral centra with last monospondylous centrum only slightly longer and larger than first diplospondylous centrum (Fig. 8) *Rhizoprionodon lalandii*
- 6b. Larger sharks, reaching over 100 cm total length; appressed pectoral-fin apex falling opposite or behind first dorsal-fin midbase; precaudal vertebral centra 55 to 79 and equal to or less in number than caudal centra; transition between monospondylous and diplospondylous vertebral centra prominent, with last monospondylous centrum much longer and larger than first diplospondylous centrum → 7

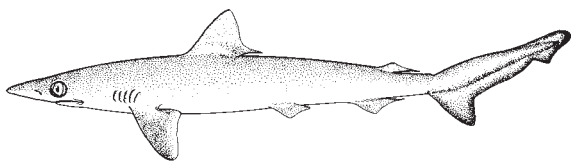


Fig. 8 *Rhizoprionodon lalandii*

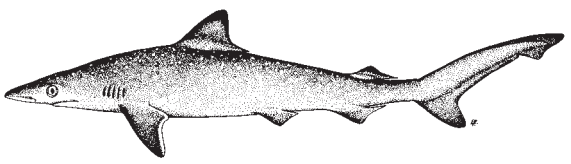


Fig. 9 *Rhizoprionodon terraenovae*

- 7a. Precaudal vertebrae fewer, 58 to 66, mostly below 66; body usually with white spots (Fig. 9)
 *Rhizoprionodon terraenovae*
- 7b. Precaudal vertebrae more numerous, 66 to 75, mostly above 66; body without white spots (Fig. 10)
 *Rhizoprionodon porosus*

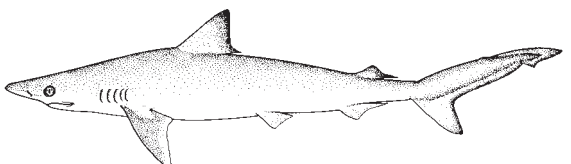


Fig. 10 *Rhizoprionodon porosus*

- 8a. Pectoral and first dorsal fins very broad distally and broadly rounded apically, only slightly tapering toward their apices; most fin tips mottled white in adults, also black-tipped and with black dorsal saddle-marks on the caudal peduncle in juveniles (Fig. 11)
 *Carcharhinus longimanus*
- 8b. Pectoral and first dorsal fins tapering distally and usually pointed or narrowly rounded; fins not mottled white, often black tipped but without black saddles on the caudal peduncle → 9

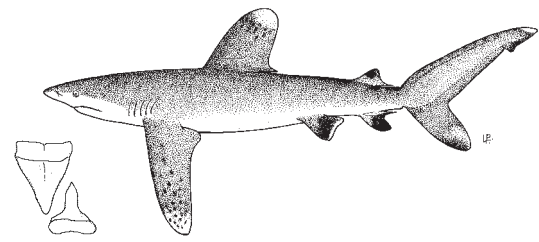


Fig. 11 *Carcharhinus longimanus*

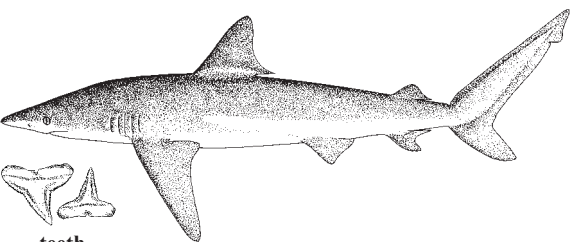
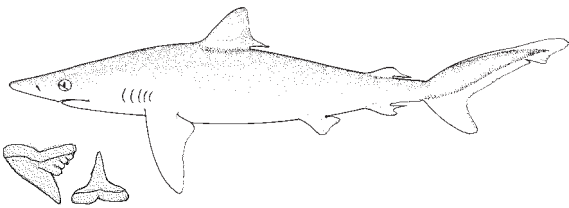


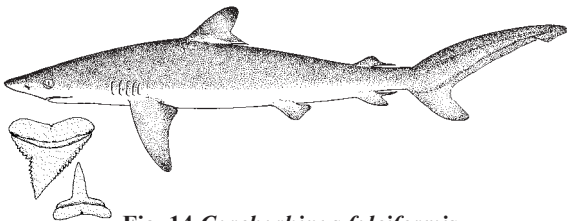
Fig. 12 *Carcharhinus brachyurus*

- 9a. Upper anterolateral teeth with bent, hooked, narrow cusps (Fig. 12) *Carcharhinus brachyurus*
- 9b. Upper anterolateral teeth variably shaped, and broad or narrow, but with cusps nearly straight → 10
- 10a. Interdorsal ridge present → 11
- 10b. Interdorsal ridge absent → 17

- 11a. Snout very long, narrow and pointed, preoral length 1.7 to 1.9 times internarial width; cusps of upper anterolateral teeth smooth-edged or weakly serrated (Fig. 13) . *Carcharhinus signatus*
- 11b. Snout shorter, narrowly to broadly rounded, preoral length less than 1.6 times internarial width; cusps of upper anterolateral teeth regularly serrated→ 12



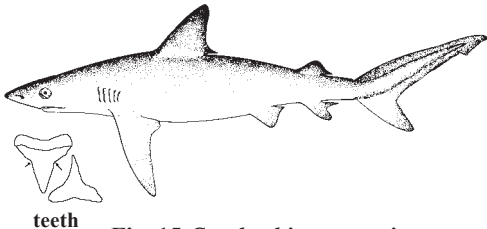
teeth Fig. 13 *Carcharhinus signatus*



teeth Fig. 14 *Carcharhinus falciformis*

- 12a. Very coarse serrations or small cusplets on feet of upper anterolateral teeth; first dorsal-fin origin well behind pectoral-fin free rear tips; inner margin of second dorsal fin very long, usually over twice fin height but occasionally down to 1.6 times fin height (Fig. 14) *Carcharhinus falciformis*
- 12b. Serrations on feet of upper anterolateral teeth small and fine; first dorsal-fin origin over or anterior to pectoral-fin free rear tips; inner margin of second dorsal fin shorter and generally less than twice fin height, but up to 2.1 times it in *Carcharhinus obscurus*→ 13

- 13a. Upper anterolateral teeth with narrow cusps; anteroposterior teeth in 12 to 13/11 to 12 rows on each side (Fig. 15) . *Carcharhinus perezii*
- 13b. Upper anterolateral teeth with broad-based cusps, triangular in form; anteroposterior teeth in 13 to 16/12 to 16 rows on each side but usually at least 14/13 rows→ 14



teeth Fig. 15 *Carcharhinus perezii*

- 14a. First dorsal-fin origin in front or over pectoral-fin insertions or at least nearer to the pectoral-fin insertions than to pectoral-fin free rear tips→ 15
- 14b. First dorsal-fin origin opposite or somewhat in front of pectoral-fin rear tips but closer to them than pectoral-fin insertions→ 16

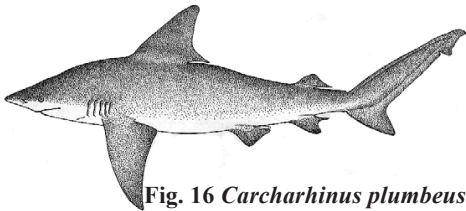
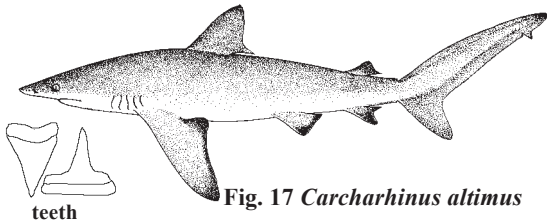


Fig. 16 *Carcharhinus plumbeus*



teeth Fig. 17 *Carcharhinus altimus*

- 15a. Anterior nasal flaps usually low and inconspicuous; distance from nostrils to mouth more than 2.4 times in mouth width; upper anterolateral teeth moderately high and broad; upper anterolateral teeth in 13 to 15 rows on each side but usually in 14 rows; first dorsal fin very high, with height about half predorsal space from snout tip to first dorsal origin in adults; interdorsal ridge low (Fig. 16) *Carcharhinus plumbeus*
- 15b. Anterior nasal flaps usually high and triangular; distance from nostrils to mouth less than 2.4 times in mouth width; upper anterolateral teeth very high and narrow; upper anterolateral teeth in 14 to 16 rows on each side (usually in 15 rows); first dorsal fin lower, with height much less than half predorsal space in adults; interdorsal ridge high (Fig. 17) *Carcharhinus altimus*

- 16a.** Upper anterolateral teeth relatively high and narrow; pectoral fins nearly straight; first dorsal fin higher and with a nearly straight anterior margin, height 8.3 to 11.9% of total length; second dorsal fin higher and less elongated, with height 2.1 to 3.3% of total length and inner margin length 1.3 to 1.7 times its height; precaudal vertebral centra 103 to 109 (Fig. 18) *Carcharhinus galapagensis*
- 16b.** Upper anterolateral teeth relatively low and broad; pectoral fins more falcate; first dorsal fin lower and with a more rounded anterior margin, height 6.0 to 9.1% of total length; second dorsal fin lower and more attenuated, with height 1.5 to 2.3% of total length and inner margin 1.6 to 2.1 times the height; precaudal vertebral centra 89 to 95 (Fig. 19). . *Carcharhinus obscurus*

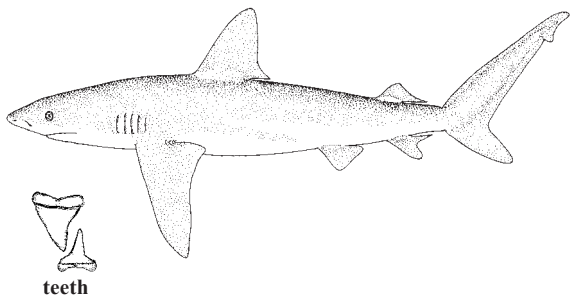


Fig. 18 *Carcharhinus galapagensis*

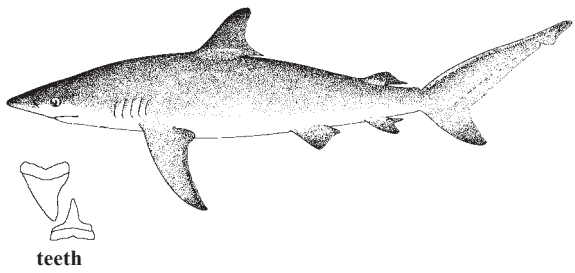


Fig. 19 *Carcharhinus obscurus*

- 17a.** Snout very short and broadly rounded, preoral length 0.7 to 1.0 times internarial width; upper anterolateral teeth with very broad, triangular cusps and straight to concave distal margins; lower anterolateral teeth with strongly arched roots (Fig. 20) *Carcharhinus leucas*
- 17b.** Snout longer and parabolic or wedge-shaped to pointed, preoral length 1.1 to 1.8 times internarial width; upper anterolateral teeth with narrow cusps and strongly notched distal margins; lower anterolateral teeth with nearly transverse roots → 18

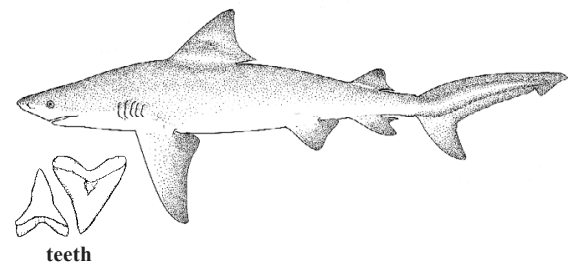


Fig. 20 *Carcharhinus leucas*

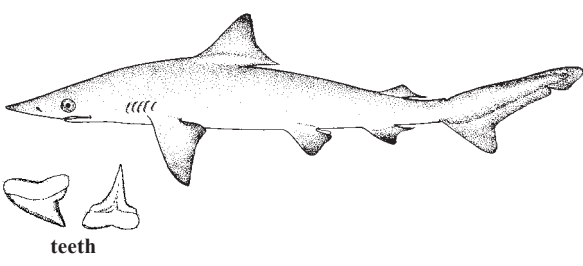


Fig. 21 *Carcharhinus porosus*

- 18a.** Origin of second dorsal fin well behind anal-fin origin, about opposite its midbase (Fig. 21) *Carcharhinus porosus*
- 18b.** Origin of second dorsal fin about over anal-fin origin. → 19

- 19a. Only 12 or 13 rows of upper anteroposterior teeth; upper anterolateral teeth with oblique cusps; lower anterolateral teeth with mostly oblique cusps; gill slits shorter, third gill slit 2.4 to 3.2% of total length; snout tip with a dusky or black blotch, fins not black-tipped (Fig. 22)
..... *Carcharhinus acronotus*
- 19b. Twelve to 18 rows of upper anteroposterior teeth, but usually in 14 or more rows; upper anterolateral teeth with erect or nearly erect cusps; lower anterolateral teeth with mostly erect cusps; gill slits longer, third gill slit 3.8 to 6.5% of total length; snout tip without a dark blotch, fins often black-tipped. → 20

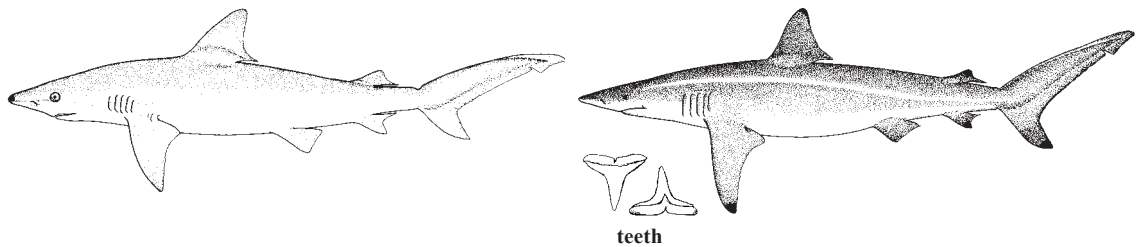


Fig. 22 *Carcharhinus acronotus*

Fig. 23 *Carcharhinus brevipinna*

- 20a. Upper labial furrows noticeably elongated and prominent; 15 to 18 rows of upper anteroposterior teeth on each side, usually at least 16 rows; first dorsal fin lower, its height about 6.0 to 8.8% of total length and less than 0.45 times the interdorsal space; first dorsal-fin origin over or just behind pectoral-fin free rear tips (Fig. 23) *Carcharhinus brevipinna*
- 20b. Upper labial furrows shorter and less noticeable; 12 to 16 rows of anteroposterior teeth on each side, usually 15 or fewer; first dorsal fin higher, its height 7.5 to 12.4% of total length and at least 0.45 times the interdorsal space; first dorsal-fin origin over or just behind pectoral-fin insertions → 21
- 21a. Teeth with smooth edges in both jaws, except for weakly and irregularly serrated upper teeth of adults; gill slits longer, third gill slit 4.8 to 6.5% of total length; no black tips on fins (Fig. 24). *Carcharhinus isodon*
- 21b. Teeth with serrated edges in both jaws; gill slits shorter, third gill slit 3.8 to 4.9% of total length; fins usually black-tipped (Fig. 25). *Carcharhinus limbatus*

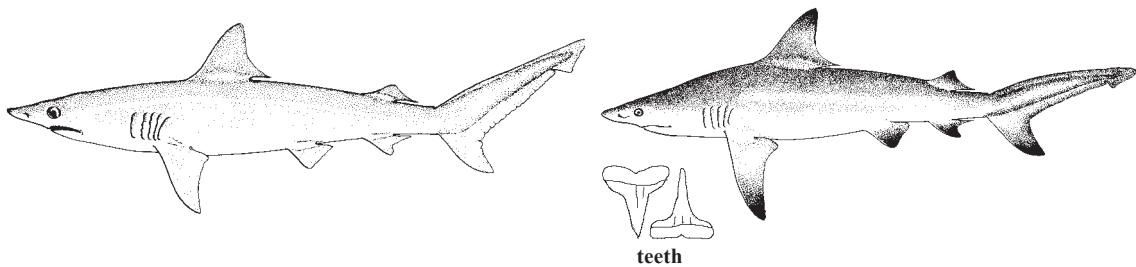


Fig. 24 *Carcharhinus isodon*

Fig. 25 *Carcharhinus limbatus*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Carcharhinus acronotus* (Poey, 1860).
-  *Carcharhinus altimus* (Springer, 1950).
-  *Carcharhinus brachyurus* (Günther, 1870).
-  *Carcharhinus brevipinna* (Müller and Henle, 1839).
-  *Carcharhinus falciformis* (Müller and Henle, 1839).
-  *Carcharhinus galapagensis* (Snodgrass and Heller, 1905).
-  *Carcharhinus isodon* (Müller and Henle, 1839).
-  *Carcharhinus leucas* (Müller and Henle, 1839).
-  *Carcharhinus limbatus* (Müller and Henle, 1839).
-  *Carcharhinus longimanus* (Poey, 1861).
-  *Carcharhinus obscurus* (Lesueur, 1818).
-  *Carcharhinus perezii* (Poey, 1876).
-  *Carcharhinus plumbeus* (Nardo, 1827).
-  *Carcharhinus porosus* (Ranzani, 1840).
-  *Carcharhinus signatus* (Poey, 1868).
-  *Galeocerdo cuvier* (Péron and Lesueur, in Lesueur, 1822).
-  *Isogomphodon oxyrhynchus* (Müller and Henle, 1839).
-  *Negaprion brevirostris* (Poey, 1868).
-  *Prionace glauca* (Linnaeus, 1758).
-  *Rhizoprionodon lalandii* (Müller and Henle, 1839).
-  *Rhizoprionodon porosus* (Poey, 1861).
-  *Rhizoprionodon terraenovae* (Richardson, 1836).

References

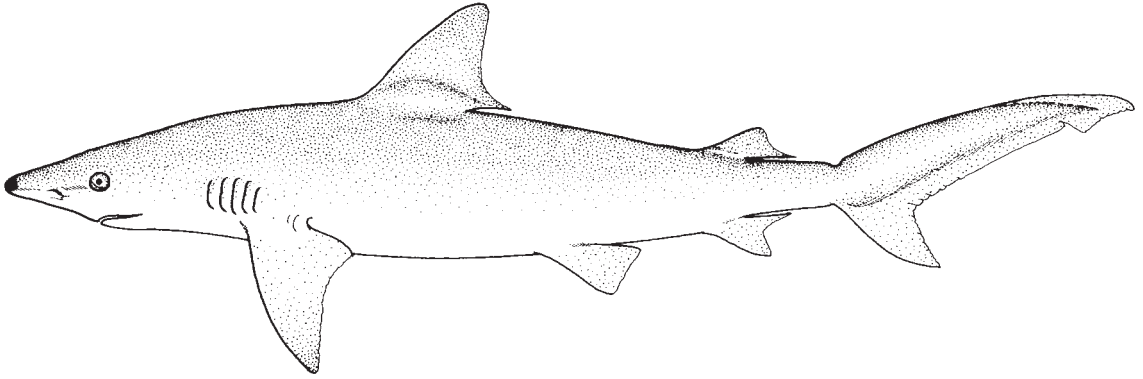
- Bigelow, H.B. and W.C. Schroeder. 1948. Chapter three, Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Found. Mar. Res.*, (1):56-576.
- Bonfil, R.S. 1997. Status of shark resources in the Southern Gulf of Mexico and Caribbean: implications for management. *Fish. Res.*, (Amsterdam), 29(2):101-117.
- Cadenat, J. and J. Blache. 1981. Requins de Méditerranée et d'Atlantique (plus particulièrement de la Côte Occidentale d'Afrique). *Ed. OSTROM, Faune Tropicale*, (21):330 p.
- Castro, J.I. 1983. *The sharks of North American waters*. Texas A&M University Press, 180 p.
- Castro, J.I., C.M. Woodley, and R.L. Brudek. 1999. A preliminary evaluation of the status of shark species. *FAO Fisheries Technical Paper* (380):1-72.
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fisheries Synopsis* United Nations Development Programme/Food and Agriculture Organization of the United Nations, 125(4)Pt. 2:251-655.
- Compagno, L.J.V. 1988. *Sharks of the Order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.
- Compagno, L.J.V and R. Vergara R. 1978. Carcharhinidae. In W. Fischer, ed. *FAO species identification sheets for fisheries purposes. Western Central Atlantic (Fishing Area 31)*. Vol. 5. Rome, FAO (unpaginated).
- Garrick, J.A.F. 1982. Sharks of the genus *Carcharhinus*. *NOAA, Tech. Rep., NMFS*, (445)8:194 p.
- Garrick, J.A.F. 1985. Additions to a revision of the shark genus *Carcharhinus*: synonymy of *Aprionodon* and *Hypoprion*, and description of a new species of *Carcharhinus*. *NOAA Tech. Rep., Nat. Mar. Fish. Serv.*, (34), Nov. 1985 26 p.
- Springer, V.G. 1964. A revision of the carcharhinid shark genera *Scoliodon*, *Loxodon*, and *Rhizoprionodon*. *Proc. U.S. Natl. Mus.*, 115:559-632.

Carcharhinus acronotus (Poey, 1861)

CCN

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Blacknose shark; **Fr** - Requin nez noir; **Sp** - Tiburón amarillo.

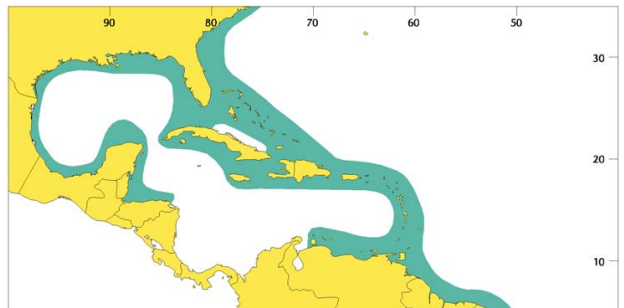


Diagnostic characters: Body moderately stout. Eyes moderately large, internal nictitating lower eyelids present. **Snout relatively long, preoral length 1.4 to 1.7 times internarial width, thin-tipped but rounded;** anterior nasal flaps in the form of low, narrowly triangular lobes; upper labial furrows very short. **Teeth in upper jaw with narrow, mostly oblique cusps, their bases coarsely serrated and outer margins deeply notched; teeth in lower jaw with broad bases and slender, very low, oblique cusps; anteroposterior tooth row counts 12 to 13/11 to 12 on each side, total tooth row counts 25 to 28/23 to 25.** Spiracles absent; gill slits short, height of third gill slits about 2.4 to 3.2% of total length; gill arches without papillae. First dorsal fin moderately high, height 7.8 to 9.8% of total length; first dorsal fin with a broadly convex anterior margin and a pointed apex in adults (rounded in young), an origin above or slightly behind inner margins of pectoral fins, and the midlength of its base closer to the pectoral-fin insertions than to the pelvic-fin origins; second dorsal fin much smaller than first, height 2.6 to 2.9% of total length; second dorsal fin with a slightly concave posterior margin, an origin opposite origin of anal fin, a slightly attenuated free rear tip, and an inner margin less than twice the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins small, narrow, and semifalcate. **No interdorsal ridge between dorsal fins;** no keels on caudal peduncle. Precaudal vertebral centra 80 to 88, total vertebral centra 161 to 181. **Colour:** grey or yellowish brown on back (some individuals are completely brown), lower sides and belly paler to whitish; **a dusky blotch on tip of snout** (darker in young individuals).

Size: Maximum total length possibly 200 cm but most less than 164 cm; matures at about 100 cm; size at birth about 50 cm; males maturing between 97 and 106 cm, females at about 103 cm.

Habitat, biology, and fisheries: An abundant inshore shark in the area, particularly off the southeastern Atlantic and Gulf coast of USA and the northeastern coast of Venezuela. Inhabits coastal waters, mainly over sandy or coralline bottoms at depths of 18 to 64 m. Number of young 3 to 6 per litter. Feeds on small fishes. Kept in large aquaria for public viewing in the area. Fished heavily in USA waters, also off Venezuela, but also caught incidentally throughout its range. Separate statistics not reported. Caught inshore with gill nets and longlines. Marketed fresh and salted. No limits to catches at present, considered vulnerable to overfishing because of low fecundity and uncontrolled fisheries.

Distribution: Western Atlantic: USA (North Carolina to Florida, Gulf of Mexico off Florida, Louisiana, and probably Mississippi and Texas), Mexico (Gulf and Caribbean coasts), Bahamas, Cuba, Virgin Islands, Puerto Rico, Antilles, Trinidad and Tobago, Belize, Honduras, Guyana, Venezuela, and the north and south coasts of Brazil.



***Carcharhinus altimus* (Springer, 1950)**

CCA

Frequent synonyms / misidentifications: None / *Carcharhinus galapagensis* (Snodgrass and Heller, 1905), *Carcharhinus obscurus* (Lesueur, 1818), *Carcharhinus plumbeus* (Nardo, 1827).

FAO names: En - Bignose shark; Fr - Requin babosse; Sp - Tiburón baboso.

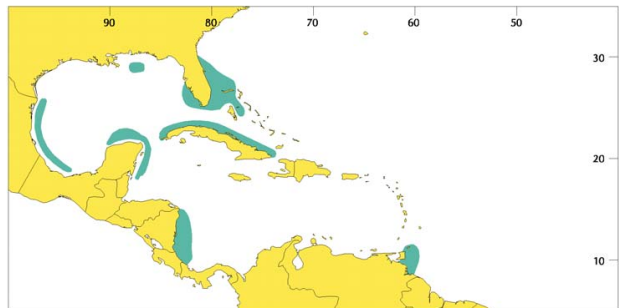
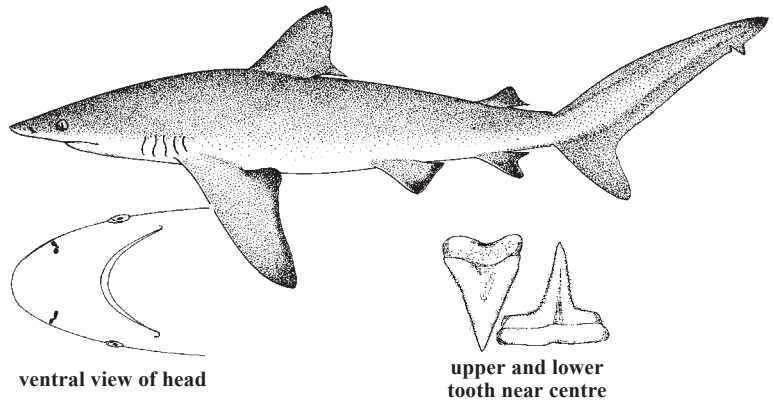
Diagnostic characters: Body slender. Eyes moderately large, internal nictitating lower eyelids present. **Snout rounded and moderately long, preoral length 1.3 to 1.4 times internarial space; anterior nasal flaps expanded as low, broadly triangular lobes;** upper labial furrows very short. Teeth with serrated edges, **upper teeth broadly triangular and erect in front of mouth, with very high cusps,** progressively oblique posteriorly; teeth in lower jaw erect and narrow-cusped; anteroposterior tooth row counts 14 to 16/14 to 16 on each side, total tooth row counts 31 to 34/29 to 31. Spiracles absent; gill slits long, height of third gill slits about 3.1 to 3.9% of total length; gill arches without papillae.

First dorsal fin moderately high, height 8.3 to 11.9% of total length; first dorsal fin with a nearly straight anterior margin, a narrowly rounded apex, an origin over inner margins of pectoral fins, and the midlength of its base closer to the pectoral-fin insertions than to the pelvic-fin origins; second dorsal fin much smaller than first but relatively high, height 2.8 to 3.4% of total length; second dorsal fin with a slightly concave posterior margin, an origin about opposite that of anal fin, a slightly attenuated free rear tip, and an inner margin less than 1.5 times the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; **pectoral fins long and not strongly falcate,** broad-tipped but with angular apices. **A high interdorsal ridge present between dorsal fins;** no keels on caudal peduncle. Precaudal vertebral centra 101 to 110, total vertebral centra 194 to 206. **Colour:** back greyish; belly whitish; inner corners of pectoral fins blackish.

Size: Maximum total length to about 3 m; common to 2.4 m; size at birth between 70 and 90 cm; adults 216 to about 300 cm.

Habitat, biology, and fisheries: Bottom dwelling, usually found in the deeper areas of the continental shelves and uppermost slopes near the bottom, ranging from the surface to 430 m depth, but commonly between 80 and 220 m; rare in shallow waters and at the surface. Number of young 3 to 15 per litter. Feeds chiefly on bony fishes, small sharks and rays, and cephalopods. Taken mainly on deep-set and pelagic longlines in the area, probably also in bottom trawls and probably on hook-and-line and with gill nets. Caught commercially off the north coast of Cuba, the USA (Florida), and Mexico. Separate statistics not reported. Flesh eaten and made into fish meal for chicken feed, the liver is processed for oil and the skin made into shagreen for sanding wood. Conservation status unknown, protected off the USA.

Distribution: Circumglobal, with patchy records in tropical and warm-temperate seas. In the area from southern Florida and the Bahamas, Cuba, the Gulf of Mexico (USA and Mexico) and the Atlantic coast of Mexico, Costa Rica, Nicaragua, Trinidad, and Venezuela; also southern Brazil. Widespread in the Atlantic, Pacific and Indian Oceans but sporadically recorded, probably because it prefers deeper water than most other *Carcharhinus* species and is rarely caught inshore in the area.

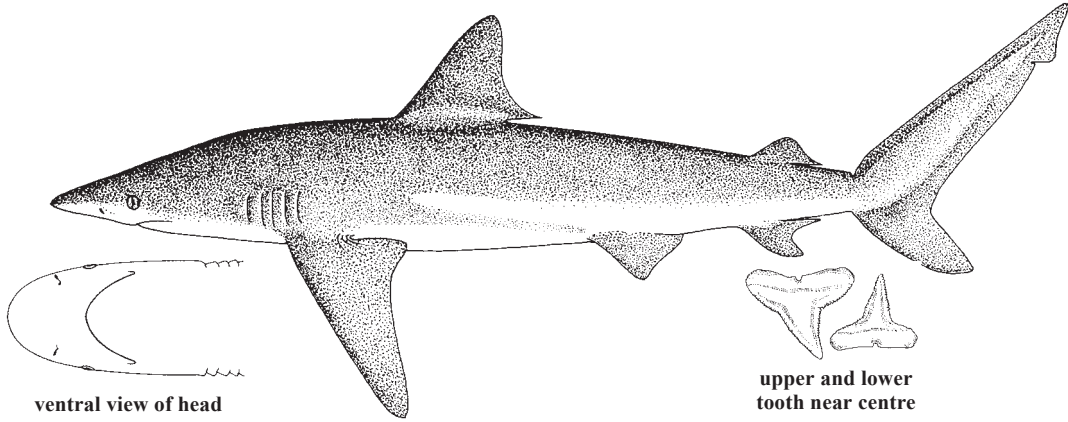


***Carcharhinus brachyurus* (Günther, 1870)**

BRO

Frequent synonyms / misidentifications: *Carcharias remotus* Duméril, 1865 / *Carcharhinus obscurus* (Lesueur, 1818).

FAO names: **En** - Copper shark (AFS: Narrowtooth shark); **Fr** - Requin cuivre; **Sp** - Tiburón cobrizo.

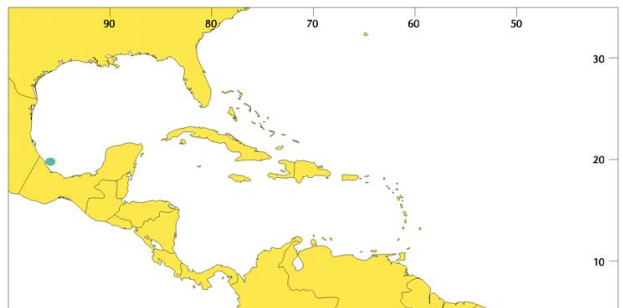


Diagnostic characters: Body slender to moderately stout. Eyes small to moderately large, internal nictitating lower eyelids present. Snout rounded or broadly angular, preoral length **1.1 to 1.4 times internarial width**; anterior nasal flaps very short to rudimentary; labial furrows short. **Upper teeth with narrow, mostly oblique and somewhat flexed cusps, well-delimited from the tooth bases and finely serrated**; lower teeth with moderately high, narrow, erect to semioblique, weakly serrated cusps; anteroposterior tooth row counts 14 to 16/14 to 15 on each side, total tooth row counts 29 to 36/29 to 35. Spiracles absent; gill slits short to moderately long, height of third gill slits about 2.5 to 4.1% of total length. First dorsal fin moderately high, height 6.8 to 9.7% of total length; first dorsal fin with a broadly convex anterior margin, a narrowly rounded or angular apex, an origin over inner margins of pectoral fins, and the midlength of its base closer to the pectoral-fin insertions than to the pelvic-fin origins; **second dorsal fin much smaller than first dorsal fin but moderately high**, height 2.0 to 2.5% of total length; second dorsal fin with a slightly concave posterior margin, an origin over that of anal fin, and an inner margin much shorter than half the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins large, narrow, and not strongly falcate, apically pointed. **Usually no interdorsal ridge** (occasionally a weak ridge present); no keels on caudal peduncle. Precaudal vertebral centra 96 to 110, total vertebral centra 179 to 203. **Colour:** dark brownish grey to bronzy grey above, white below; fins mostly plain, except for dusky tips on pelvics, as well as dusky to black tips and rear edges on pectoral fins.

Size: Maximum total lengths to about 2.9 m; matures at between 2 and 2.5 m, with females somewhat larger than males; size at birth about 59 to 70 cm; males maturing at about 200 to 229 cm, females maturing below 240 cm.

Habitat, biology, and fisheries: A coastal and offshore, littoral and semioceanic shark, preferring temperate and subtropical waters to tropical seas. Found on the continental and insular shelves, from the intertidal to at least 100 m on the bottom and at the surface over water up to 360 m deep. Number of young 13 to 20 per litter. Feeds on bottom-dwelling bony fishes, including gurnards, flatfishes, hakes, puffers, sea catfishes, jacks, and mullets; also on rays, small sharks, squids, and cuttlefishes. Rarely bites people. Taken in bottom trawls, gill nets, beach seines, and by longline.

Distribution: Nearly circumglobal in temperate, subtropical and some tropical seas, but with a patchy distribution reflecting its preference for temperate seas. In the area a questionable record from off Veracruz, Mexico (Gulf of Mexico), also southern Brazil to Argentina. Wide-ranging in the eastern Atlantic, Mediterranean Sea, and the Indo-Pacific.

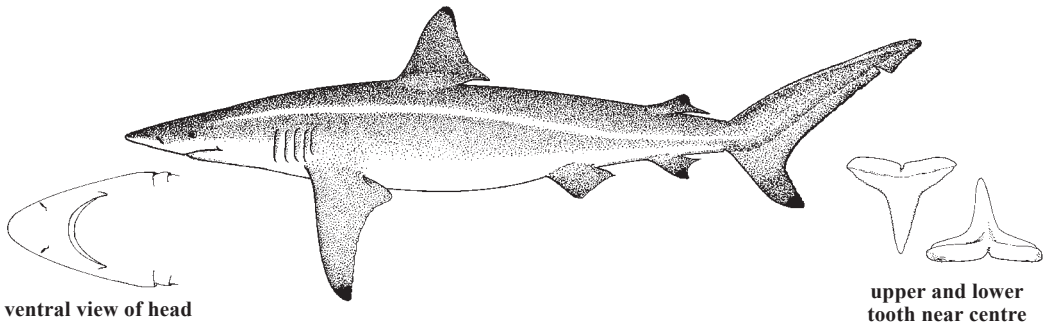


Carcharhinus brevipinna (Müller and Henle, 1839)

CCB

Frequent synonyms / misidentifications: *Isogomphodon maculipinnis* (Poey, 1865) / *Carcharhinus limbatus* (Müller and Henle, 1839).

FAO names: En - Spinner shark; Fr - Requin tisserand; Sp - Tiburón aleta negra.

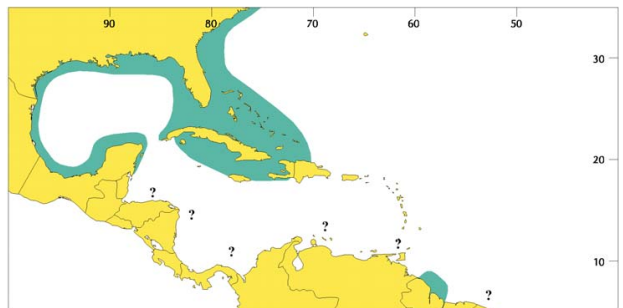


Diagnostic characters: Slender-bodied, medium to large. Eyes small, internal nictitating lower eyelids present. **Snout pointed and long, preoral length 1.5 to 1.8 times internarial space;** anterior nasal flaps rudimentary, very low; labial folds short, but usually the **upper labial furrows longer and more prominent** than in other *Carcharhinus* species. **Upper and lower teeth nearly symmetrical and very similar,** with mostly erect, very narrow cusps, upper teeth with entirely or partly serrated edges, **lower teeth smooth;** **anteroposterior tooth row counts 15 to 18/14 to 17 on each side,** total tooth row counts 32 to 37/29 to 35. Spiracles absent; **gill slits relatively long, height of third gill slit about 3.6 to 5.5% of total length;** **gill arches without papillae.** **First dorsal fin** moderately high, height 6.0 to 8.8% of total length, with a broadly convex anterior margin, a narrowly rounded apex, **an origin above or slightly behind free rear tips of pectoral fins,** and the midlength of its base closer to the pectoral-fin insertions than to the pelvic-fin origins; second dorsal fin much smaller than first dorsal fin but relatively high, height 1.8 to 2.5% of total length; second dorsal fin with a nearly straight posterior margin, an origin about over that of anal fin, a somewhat attenuated free rear tip, and its inner margin less than twice height of fin, with a deeply notched posterior margin and without long preanal ridges; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins moderate, narrow, falcate and with pointed tips. **No interdorsal ridge between dorsal fins;** no keels on caudal peduncle. Precaudal vertebral centra 84 to 96, total vertebral centra 155 to 185. **Colour:** grey on back, white below, **with a conspicuous white band on sides.** Second dorsal, anal, undersides of **pectorals, and lower caudal-fin lobe black or dark grey-tipped in subadults and adults,** but fins unmarked or nearly so in small individuals (below 1 m).

Size: Maximum total length to about 2.8 m, common to 2.5 m; size at birth about 60 to 75 cm; males maturing at 159 to 203 cm, females at 170 to 200 cm.

Habitat, biology, and fisheries: An active, fast-swimming shark, often making vertical spinning leaps out of the water, as a feeding technique. Number of young 6 to 15 per litter. Feeds mostly on small schooling fishes, also small sharks, rays, and squids. Occasionally bites people. Fished especially off Cuba, northern Gulf of Mexico (Mexico and the USA) and the east coast of Florida. Separate statistics not reported. Caught with gill nets, longlines, and hook-and-line. Utilized fresh and dried-salted for human consumption, hides used for leather, fins used in the oriental sharkfin trade, and livers for vitamin oil production. Conservation status little known, but thought to be vulnerable to overfishing.

Distribution: Widespread in the area, but records are spotty in part due to confusion with *C. limbatus*. Ranges from North Carolina to Florida, Cuba, the Bahamas, Puerto Rico, Jamaica, the Gulf of Mexico (USA and Mexico), the Atlantic coast of Mexico, and Guayana; also the north and south coasts of Brazil. A wide-ranging, nearly circumtropical species found in the western and eastern Atlantic and the Mediterranean, Indian Ocean, and western Pacific, but apparently absent from the eastern Pacific.

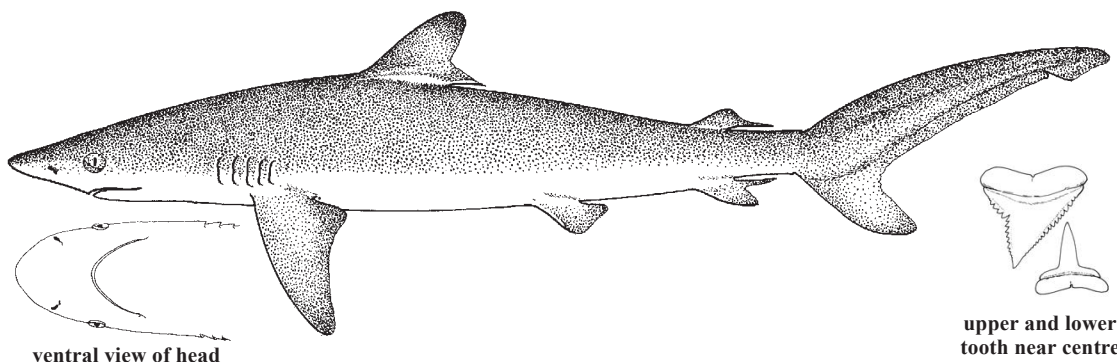


Carcharhinus falciformis (Müller and Henle, 1839)

FAL

Frequent synonyms / misidentifications: *Carcharhinus floridanus* Bigelow, Schroeder, and Springer, 1943 / *Carcharhinus obscurus* (Lesueur, 1818).

FAO names: **En** - Silky shark; **Fr** - Requin soyeux; **Sp** - Tiburón jaquetón.



Diagnostic characters: Large, with an elongate and slender body. Eyes moderately large, internal nictitating lower eyelids present. **Snout narrowly rounded, moderately long, preoral length 1.2 to 1.6 times internarial space;** anterior nasal flaps low or rudimentary; labial furrows very short. **Upper teeth with relatively narrow cusps well delimited from the heavy, serrated bases, their outer edges notched;** teeth in lower jaw erect, their edges only slightly serrated; anteroposterior tooth row counts 14 to 16/14 to 17 on each side, total tooth row counts 31 to 37/30 to 37. Spiracles absent; gill slits moderately long, height of third gill slit about 2.9 to 3.6% of total length; gill arches without papillae. First dorsal fin moderately high, height 5.2 to 8.1% of total length; **first dorsal fin with a broadly convex anterior margin, a broadly rounded apex, an origin behind the free rear tips of the pectoral fins,** and the midlength of its base somewhat closer to the pectoral-fin insertions than the pelvic-fin origins or almost equidistant between them; **second dorsal fin very low** and much smaller than the first dorsal fin, height 1.4 to 2.1% of total length; second dorsal fin with a shallowly concave posterior margin, an origin about over that of anal fin, **an elongated, slender free rear tip, and an inner margin usually twice the height of the fin or more;** anal fin with a deeply notched posterior margin and without long preanal ridges; **pectoral fins long and falcate,** more so in adults than in young. **Interdorsal ridge present between dorsal fins;** no keels on caudal peduncle. Precaudal vertebral centra 98 to 106, total vertebral centra 199 to 205. **Colour:** back dark grey, greyish brown, or bluish black (in life); belly greyish or white.

Size: Maximum about 3.3 m total length, common to 2.5 m; size at birth 70 to 87 cm; males maturing at about 187 to 217 cm and females at 213 to 230 cm.

Habitat, biology, and fisheries: Inhabits subtropical and tropical oceanic waters near and beyond the continental slopes, but also in coastal waters on continental and insular shelves in waters as little as 18 m deep. Usually live near the surface, but occur sometimes to at least 500 m. Number of young 2 to 14 per litter. Feeds chiefly on fishes, including tunas, also squids and pelagic octopods. May occasionally bite people. Caught mainly offshore near the continental slopes, with less abundant catches in coastal waters. The most important fisheries have been off southern Florida, both coasts of Cuba, Mexico (Campeche Bank), and Venezuela. Separate statistics not reported. Caught mainly with pelagic and bottom longlines, purse seines, gill nets, and hook-and-line. Its meat used fresh or dried-salted, its hide for leather, its fins for shark-fin soup, and its liver is extracted for oil, which has a high Vitamin A content. Vulnerable to overexploitation.

Distribution: Circumglobal in all warm seas. Widespread in the area, from Delaware Bay and Bermuda to southern Brazil, abundant or formerly abundant in the Gulf of Mexico, off southern Florida and around the Antilles.

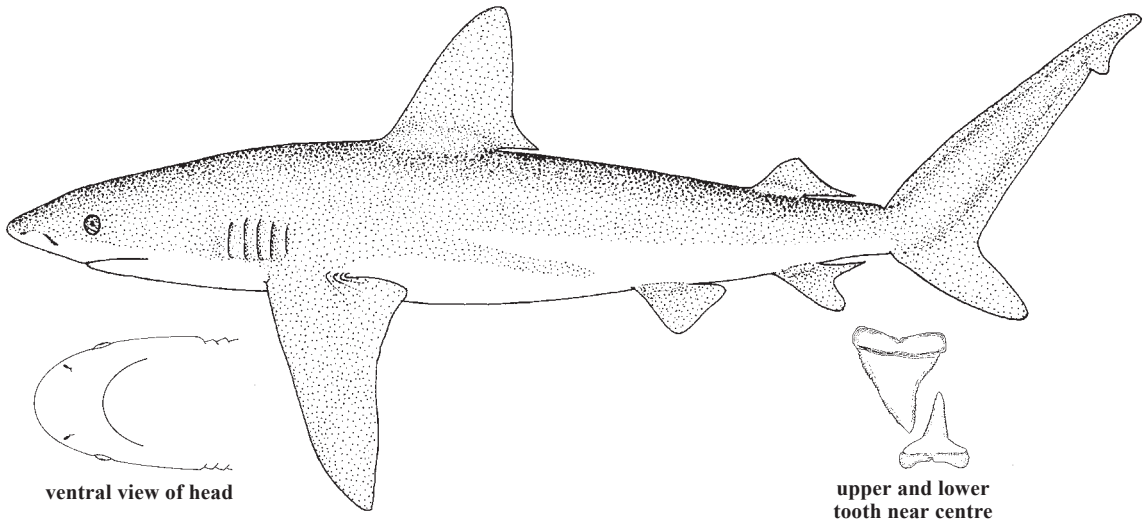


Carcharhinus galapagensis (Snodgrass and Heller, 1905)

CCG

Frequent synonyms / misidentifications: None / *Carcharhinus obscurus* (Lesueur, 1818).

FAO names: En - Galapagos shark; Fr - Requin de Galapagos; Sp - Tiburón de Galápagos.

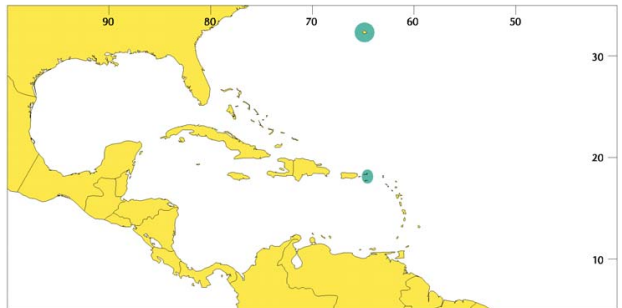


Diagnostic characters: Body slender to moderately stout. Eyes large, internal nictitating lower eyelids present. Snout rounded and short, about 1.0 to 1.3 times internarial width; **anterior nasal flaps rudimentary**; labial furrows short. **Upper teeth broadly triangular**, erect to moderately oblique, **the anterior ones strongly serrated and with higher, broad cusps not delimited from the bases**; lower teeth with high, narrow cusps and serrations; anteroposterior tooth row counts 13 to 15/13 to 15 on each side, total tooth row counts 27 to 31/27 to 31. Spiracles absent; gill slits relatively short, height of third gill slit about 2.8 to 3.5% of total length; gill arches without papillae. First dorsal fin high, height 9.5 to 11.2% of total length; **first dorsal fin with a convex or nearly straight anterior margin**, a narrowly rounded or pointed apex, **an origin over inner margins of pectoral fins** and the midlength of its base somewhat closer to the pectoral-fin insertions than the pelvic-fin origins; **second dorsal fin moderately high although much smaller than the first dorsal fin, height 2.6 to 2.8% of total length; second dorsal fin with a broadly concave posterior margin**, an origin over or slightly anterior to that of anal fin, a slightly elongated free rear tip, and an inner margin less than twice the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; **pectoral fins nearly straight** and apically pointed, not falcate. **A low interdorsal ridge present**; no keels on caudal peduncle. Precaudal vertebral centra 103 to 109, total vertebral centra 200 to 215. **Colour:** dark grey above, light below, fins plain except for slightly dusky tips in some individuals.

Size: Maximum size about 3.7 m total length, common to 3 m; size at birth about 57 to 80 cm; males maturing between 170 and 236 cm, females at about 235 cm.

Habitat, biology, and fisheries: A wide-ranging, inshore and offshore shark often preferring the coastal waters around islands to those of the continental shelf. Viviparous, number of fetuses 4 to 16. Feeds on bottom fishes, including basses, flatheads, eels, and flatfishes; also on cephalopods and bivalves. A bold and inquisitive species, sometimes pestering divers but rarely biting people. No information on utilization or fishing methods are available for the area, but likely fished because of its abundance in insular habitats.

Distribution: Widely distributed in tropical and subtropical seas, but of spotty occurrence in the Pacific and Atlantic, primarily off islands but offshore in continental waters in the eastern Pacific. In the area occurs off the Virgin Islands, but possibly more wide-ranging; common off Bermuda.

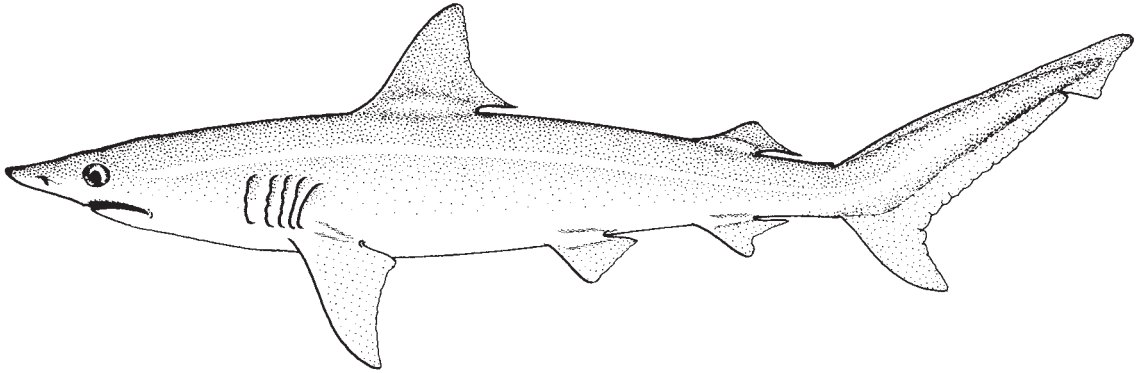


Carcharhinus isodon ((Müller and Henle, 1839))

CCO

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Finetooth shark; **Fr** - Requin à petites dents; **Sp** - Tiburón dentiliso.

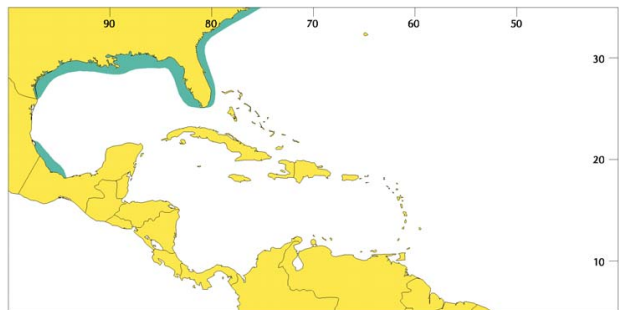


Diagnostic characters: Body relatively slender. Eyes large, internal nictitating lower eyelids present. **Snout pointed and moderately long, preoral length about 1.1 to 1.3 times internarial width;** anterior nasal flaps rudimentary; labial folds short. **Upper and lower teeth nearly symmetrical and very similar, with mostly erect, very narrow cusps; upper teeth either smooth-edged (young) or weakly and irregularly serrated (adults),** lower teeth smooth-edged; anteroposterior tooth row counts 12 to 15/3 to 14 on each side, total tooth row counts 27 to 32/29 to 31. Spiracles absent; **gill slits very long**, height of third gill slit about 4.8 to 6.5% of total length; gill arches without papillae. First dorsal fin moderately high, height 7.5 to 10.6% of total length; first dorsal fin with a broadly convex anterior margin, a narrowly rounded or pointed apex, an origin over or just behind pectoral-fin insertions and the midlength of its base closer to the pectoral-fin insertions than the pelvic-fin origins; second dorsal fin high although much smaller than first dorsal fin, height 2.5 to 2.9% of total length; second dorsal fin with a shallowly concave posterior margin, an origin about opposite origin of anal fin, a somewhat elongated free rear tip, and an inner margin much less than twice the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins small and falcate, with narrowly rounded or angular apices. **No interdorsal ridge between dorsal fins;** no keels on caudal peduncle. Precaudal vertebral centra 77 to 81, total vertebral centra 163 to 166. **Colour:** blue-grey on back, greyish on sides, white below, with a white band on sides; fins not black-tipped.

Size: Maximum total length possibly to 189 cm or even 200 cm, but otherwise to about 165 cm; size at birth 55 to 58 cm; males mature at about 133 cm and females between 125 and 135 cm, adult at 133 to 135 cm and with most below 165 cm.

Habitat, biology, and fisheries: A common, coastal, highly active and migratory schooling shark. Number of young 2 to 6 per litter. Caught incidentally throughout its range; targeted inshore along the Atlantic coast of the USA in the area, but with small catches. Separate statistics not reported. Caught with longlines, gill nets, rod-and-reel, and as bycatch in demersal bottom trawls. Highly vulnerable to gill-net fisheries off the Atlantic USA because of its inshore habitat and seasonal mass migrations on known routes along the coast.

Distribution: Western Atlantic: USA (rarely north to New York and North Carolina, normally from South Carolina to Florida, and Gulf coast from Florida, Alabama, Mississippi, and Texas), Mexico (western Gulf of Mexico); also Trinidad, Guyana, and southern Brazil. An old record from Cuba is erroneous, and eastern Atlantic records off Senegal and Guinea-Bissau may be based on some other requiem shark, possibly *Carcharhinus brevipinna* or *C. limbatus*.

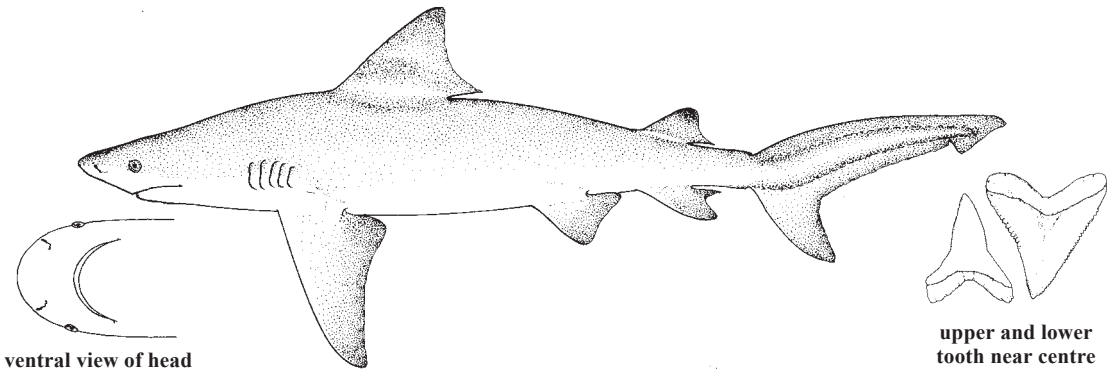


Carcharhinus leucas (Müller and Henle, 1839)

CCE

Frequent synonyms / misidentifications: None / None.

FAO names: En - Bull shark; Fr - Requin bouledogue ; Sp - Tiburón sarda.

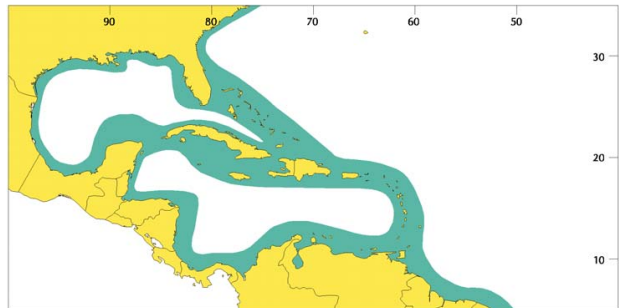


Diagnostic characters: A large, stout shark. Eyes small, internal nictitating lower eyelids present. **Snout very broadly rounded and very short**, preoral length 0.7 to 1.0 times internarial width; nostrils with a low, broadly triangular anterior nasal flap; labial furrows very short. **Teeth in upper jaw triangular, with broad, heavy, serrated cusps**, their outer edges nearly straight in anterior teeth, but becoming increasingly concave to the sides; lower teeth with erect to slightly oblique, heavy cusps with serrated edges and strongly arched bases; anteroposterior tooth row counts 12 to 14/12 to 13 on each side, total tooth row counts 25 to 29/25 to 27. Spiracles absent; gill slits moderately long, height of third gill slit about 3.1 to 4.5% of total length; gill arches without papillae. **First dorsal fin moderately high and broad, height 7.0 to 10.8% of total length, with a broadly convex anterior margin and a pointed or slightly rounded apex, its origin a little in advance of insertion of pectoral fins**, and the midlength of its base close to the pectoral-fin insertions and distant from the pelvic-fin origins; **second dorsal fin high although much smaller than the first dorsal fin, height 3.2 to 4.5% of total length; second dorsal fin with a strongly concave inner margin, an origin slightly in front of that of anal fin, a free rear tip that is hardly attenuated**, and an inner margin shorter than the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; **pectoral fins large, broad, with narrow pointed tips. No interdorsal ridge between dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 101 to 103, total vertebral centra 198 to 227. **Colour:** back greyish, belly white; tips of fins dusky to black, especially in young individuals.

Size: Maximum total length to about 340 cm; common to 260 cm; size at birth between 56 and 81 cm; males maturing at 157 to 226 cm and females maturing between 180 and 230 cm.

Habitat, biology, and fisheries: Predominantly a coastal and fresh-water species inhabiting shallow waters, especially in bays, river estuaries, rivers, and lakes. An active, bottom-dwelling shark. Number of young 1 to 13 per litter. A very wide food spectrum that includes bony fishes, sharks, rays, invertebrates (crabs, shrimps, sea urchins, etc.), marine and fresh-water turtles, birds, marine and terrestrial mammals, and carrion. Occasionally bites people. However, it is also a popular subject of ecotouristic divers in the Bahamas. Caught mainly with longlines and gill nets and used for its meat, hide, fins, liver oil (which is very rich in Vitamin A), and for fish meal. Sometimes the predominant species in shark catches in the Gulf of Mexico, off the coast of Central America and the Guyanas. Highly vulnerable to overexploitation, protected off the USA.

Distribution: Widespread along the continental coasts of all tropical and subtropical seas; the most wide-ranging cartilaginous fish in fresh water. Ranges from Massachusetts and New York (rare) and Bermuda throughout the area to Brazil, Uruguay, and Argentina. Most common from southeast Florida along the continental coast to the Guyanas; less common around the Antilles.

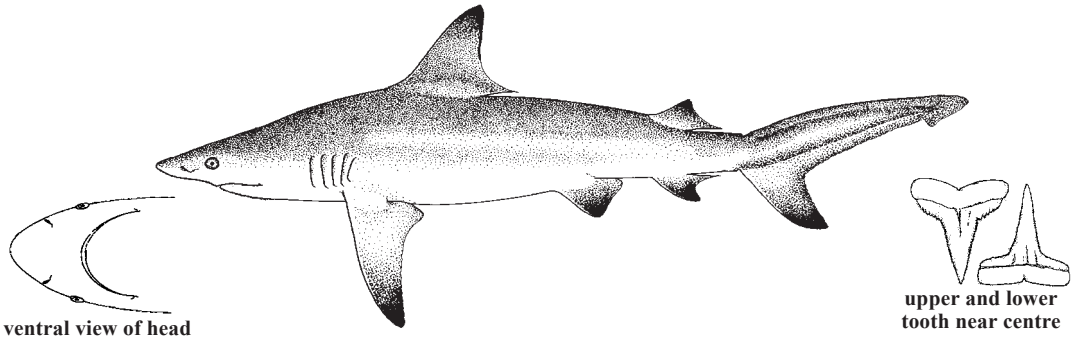


***Carcharhinus limbatus* (Müller and Henle, 1839)**

CCL

Frequent synonyms / misidentifications: None / *Carcharhinus brevipinna* (Müller and Henle, 1839).

FAO names: En - Blacktip shark; Fr - Requin bordé; Sp - Tiburón macuira.

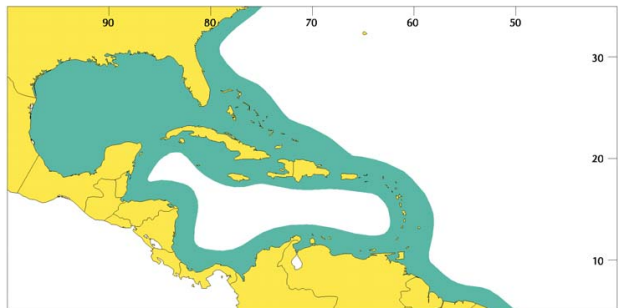


Diagnostic characters: Body fusiform, moderately slender. Eyes small, internal nictitating lower eyelids present. **Snout long**, preoral length 1.3 to 1.7 times internarial width, its tip narrowly rounded to pointed; anterior nasal flaps low and broadly triangular; labial furrows short; spiracles absent; gill slits relatively long, height of third gill slit about 3.8 to 4.9% of total length; gill arches without papillae. **Upper and lower teeth nearly symmetrical and similar, with erect, narrow cusps and serrated edges**; anteroposterior tooth row counts 14 to 16/13 to 15 on each side, total tooth row counts 29 to 35/27 to 33. **First dorsal fin high and broad, height 8.2 to 12.4% of total length; first dorsal fin with a convex or nearly straight anterior margin, a pointed or very narrowly rounded apex, an origin above, or slightly posterior to insertions of pectoral fins**, and the midlength of its base close to the pectoral-fin insertions and far from the pelvic-fin origins; **second dorsal fin high** although much smaller than the first dorsal fin, height 2.5 to 3.6% of total length; second dorsal fin with a shallowly concave posterior margin, an origin over or slightly in front of that of anal fin, a slightly attenuated free rear tip, and an inner margin less than twice the height of the fin; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins long, falcate, narrow, and with narrow pointed tips. **No interdorsal ridge between dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 88 to 102, total vertebral centra 174 to 203. **Colour:** back dark grey, ashy blue, or dusky bronze; belly white or yellowish white. **A dark band extending rearward along each side to about over origin of pelvic fin; tips of pelvic fins with a persistent black spot**; tips of dorsal, anal, and pectoral fin and the lower lobe of caudal fin usually black or dusky in young individuals, but these markings fade with growth.

Size: Maximum total length to about 2.5 m; common to 1.5 m; size at birth about 55 to 72 cm; males maturing at about 135 to 180 cm and females 120 to 190 cm.

Habitat, biology, and fisheries: Inhabits coastal as well as offshore surface waters. Occasionally enters brackish waters, but not fresh water. Number of young 1 to 10 per litter. Feeds mainly on small schooling bony fishes; also on rays and squids. Apparently of little hazard to people. Sought for ecotouristic diving in the Bahamas. Caught throughout its range, but especially off the Atlantic coast of the USA, on the shrimp grounds in the Gulf of Mexico and off the northeast coast of South America. Taken with pelagic longlines, gill nets, demersal trawls (especially shrimp trawls), and on hook-and-line. An important bycatch of the offshore swordfish fishery in USA waters. Its meat is excellent and is marketed fresh and salted for human consumption, also caught for its fins and used to produce fish meal. Skin used in manufacture of various subproducts and the liver in production of oil (high in Vitamin A). Highly vulnerable to overexploitation.

Distribution: Widespread in all tropical and subtropical continental waters. Occurring throughout the area, extending northward to New England (rare) and southward to southern Brazil. It has been the most common shark around the Bahamas Islands and off southern Florida; very common also around the Antilles and off the northwest coast of South America.

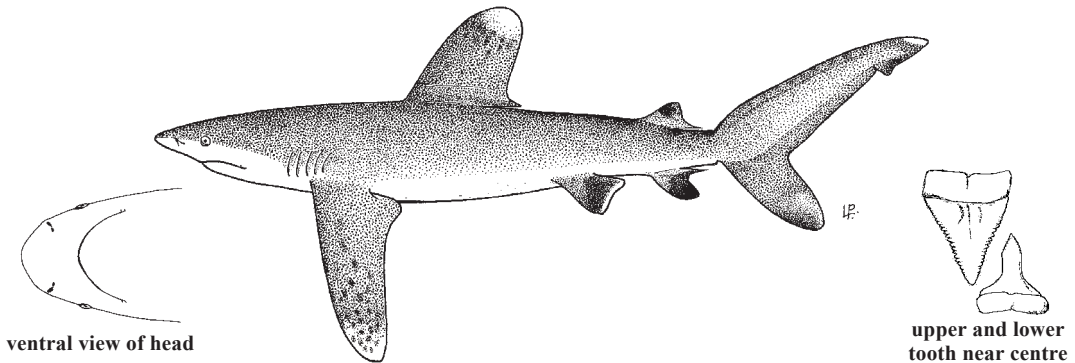


Carcharhinus longimanus (Poey, 1861)

OCS

Frequent synonyms / misidentifications: *Carcharhinus maou* (Lesson, 1831) / None.

FAO names: En - Oceanic whitetip shark; Fr - Requin océanique; Sp - Tiburón oceánico.

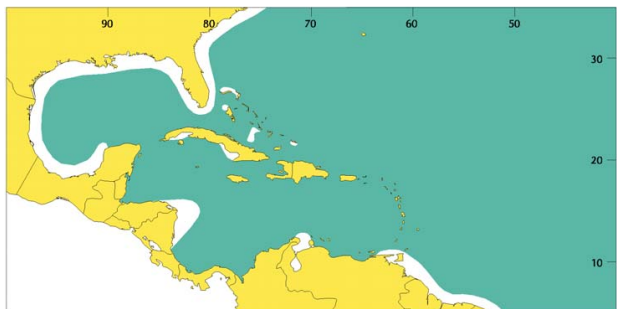


Diagnostic characters: A large, moderately stout oceanic shark. Eyes small, internal nictitating lower eyelids present. **Snout short and broadly rounded**, preoral length 1.0 to 1.1 times internarial width; anterior nasal flaps very low, rudimentary; labial furrows very short. **Teeth with serrated edges, upper anterolateral teeth triangular, with broad, heavy, mostly erect, cusps** nearly symmetrical anteriorly but becoming increasingly oblique at sides; lower teeth with erect, heavy cusps and serrated edges; anteroposterior tooth row counts 13 to 14/13 to 15 on each side, total tooth row counts 28 to 32/27 to 31. Spiracles absent; gill slits relatively long, height of third gill slit about 3.0 to 4.1% of total length; gill arches without papillae. **First dorsal fin very high, height 9.2 to 15.2% of total length; first dorsal fin with a convex anterior margin, a broadly rounded apex**, an origin slightly behind insertions of pectoral fins, and the midlength of its base close to the pectoral-fin insertions and far from the pelvic-fin origins; second dorsal fin high, although much smaller than the first dorsal fin, height 2.7 to 4.2% of total length; second dorsal fin usually with a deeply concave posterior margin, an origin over or slightly in front of that of anal fin, an attenuated free rear tip, and an inner margin less than twice the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; **pectoral fins very long** (as long as or even longer than head from snout tip to fifth gill slits), not falcate, **with broadly rounded, wide tips. An interdorsal ridge present between dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 123 to 131, total vertebral centra 228 to 244. **Colour:** back usually dark grey with a bronze tinge, but sometimes brown or bluish; underside whitish, sometimes with a yellow tinge; **tips of first dorsal fin, pectoral fins, and lower lobe of caudal fin often white or with white spots** (sometimes absent); ventral surface of pelvic fins, apices of anal and second dorsal fins, and ventral lobe of caudal fin often with black spots; also black or dusky saddle-marks in front of second dorsal fin, upper margin of caudal fin, and between dorsal fins (especially in young).

Size: Maximum total length possibly to 350 or even 395 cm, but common to 270 cm or less; size at birth 60 to 65 cm; males maturing at 175 to 198 cm and females at 180 to 200 cm.

Habitat, biology, and fisheries: Abundant in warm oceanic waters. Occasionally enters coastal waters, but more typically found from edges of continental or insular shelves to far beyond land. Number of young 6 to 9 per litter. Feeds mainly on fishes (especially scombrids and carangids) and squids; also crustaceans (especially portunid crabs), turtles, and carrion. Occasionally bites humans. Caught mostly with floating longlines and primarily as bycatch of fisheries targeting scombrids. Separate statistics are not reported for this species. Meat utilized fresh and salted for human consumption, also processed for fins and probably liver oil. Vulnerable to overexploitation.

Distribution: Circumglobal in all tropical and subtropical offshore waters. Occurs throughout the area including Bermuda, extending northward to New Jersey and southward to Uruguay and Argentina, and often caught in the Caribbean Sea.

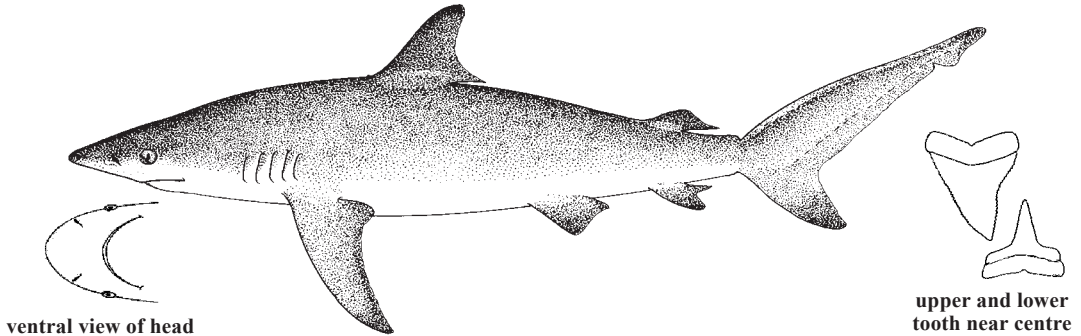


***Carcharhinus obscurus* (LeSueur, 1818)**

DUS

Frequent synonyms / misidentifications: None / *Carcharhinus falciformis* (Bibron, 1839), *C. galapagensis* (Snodgrass and Heller, 1905).

FAO names: **En** - Dusky shark; **Fr** - Requin sombre; **Sp** - Tiburón arenero.

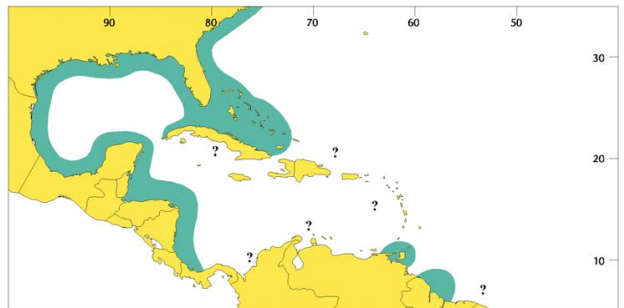


Diagnostic characters: Body slender to moderately stout. Eyes small, internal nictitating lower eyelids present. Snout moderately long to short and broad (adults), preoral length 1.0 to 1.4 times internarial width; **anterior nasal flaps rudimentary**; labial furrows short. **Upper teeth broadly triangular**, erect to moderately oblique, anterior teeth with strongly serrated broad cusps not delimited from the bases; lower teeth with low, narrow, serrated cusps; anteroposterior tooth row counts 14 to 15/13 to 15 on each side, total tooth row counts 29 to 33/29 to 33. Gill slits relatively short, height of third gill slit about 2.7 to 4.0% of total length; gill arches without papillae. **First dorsal fin relatively low, height 6.0 to 9.1% of total length; first dorsal fin with a broadly arched anterior margin**, a narrowly rounded or pointed apex, **an origin over or slightly behind free rear tips of pectoral fins**, and the midlength of its base much closer to the pectoral-fin insertions than the pelvic-fin origins; **second dorsal fin low and much smaller than first dorsal fin, height 1.8 to 2.3% of total length; second dorsal fin with a nearly straight posterior margin, an origin about over that of anal fin, an elongated free rear tip, and an inner margin about twice the fin height**; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins long, falcate, and apically pointed. **A low interdorsal ridge present between the dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 86 to 97, total vertebral centra 173 to 194. **Colour:** blue-grey or lead grey above, white below. Tips of pectoral and pelvic fins, lower lobe of caudal fin, and dorsal fins often dusky in young, plain in adults.

Size: Maximum total length possibly over 400 cm but largest adults recently measured were 340 to 365 cm; size at birth about 69 to 100 cm; males maturing at about 280 cm, females between 257 and 300 cm.

Habitat, biology, and fisheries: Active, pelagic, from close inshore to the outer continental shelf, and semioceanic in the epipelagic zone off the continental slopes. Number of young 6 to 14 per litter. Feeds chiefly on bony fishes, including scombrids, clupeids, serranids, trichiurids, bluefish, wrasses, anchovies, grunts, barracudas, and other sharks (including rays); also eats squids, octopi, gastropods, shrimps, crabs, and carrion. An important fisheries species off the north coast of Cuba, off the USA Atlantic coast, in the Gulf of Mexico, and in the Caribbean. Mainly caught with longlines and gill nets, in targeted shark fisheries and as bycatch of offshore longline fisheries targeting scombroids. Its meat is utilized fresh, dried-salted, frozen, and smoked; its hides are used for leather; fins are used for shark-fin soup; liver oil extracted for vitamins. Highly vulnerable to overfishing because of its long maturation time, low fecundity, and longevity. It is protected off the east coast of the USA.

Distribution: Wide-ranging, but with a patchy distribution in all tropical and subtropical to temperate seas. In the western Atlantic occurs from Georges Bank south to Florida, the Gulf of Mexico (Texas and Mexico), Nicaragua, the Bahamas, Cuba, Trinidad, Guyana, and northern and southern Brazil. Also known from the eastern Atlantic and Mediterranean Sea, western Indian Ocean, and western and eastern Pacific. Bermuda and some southern records may in part refer to *Carcharhinus galapagensis*.

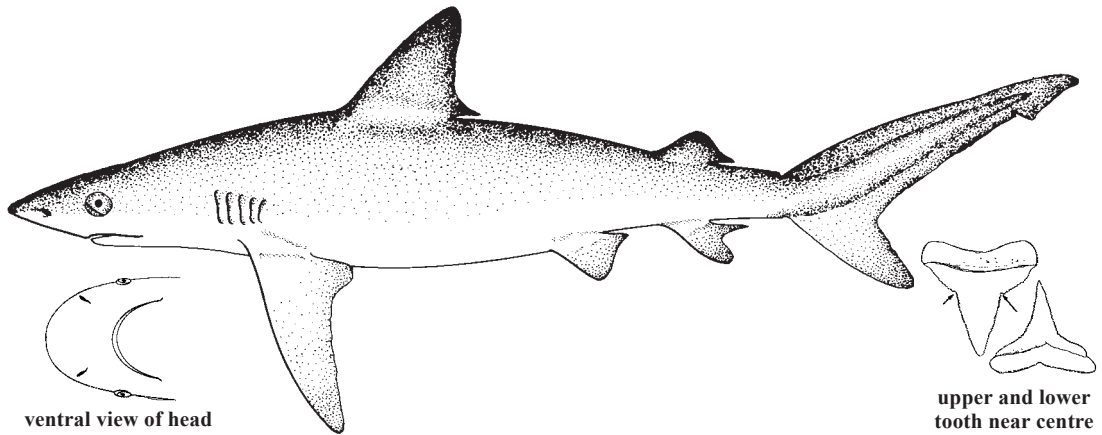


***Carcharhinus perezii* (Poey, 1876)**

CCV

Frequent synonyms / misidentifications: *Eulamia springeri* Bigelow and Schroeder, 1944 / *Carcharhinus obscurus* (Lesueur, 1818).

FAO names: **En** - Caribbean reef shark (AFS: Reef shark); **Fr** - Requin de récif; **Sp** - Tiburón coralino.

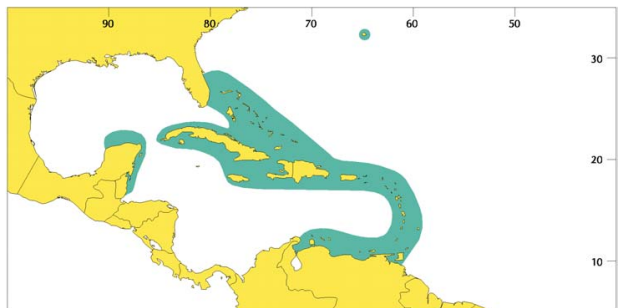


Diagnostic characters: Body fusiform, moderately stout. Eyes small, internal nictitating lower eyelids present. **Snout broadly rounded and short, preoral length 1.0 to 1.1 times internarial width;** nostrils with a low triangular anterior nasal flap; labial folds short; spiracles absent; gill slits relatively short, height of third gill slit about 2.8 to 4.0% of total length; gill arches without papillae. **Teeth with edges serrated, those in upper jaw oblique except the anterior 2 to 4 rows on each side, with moderately narrow cusps; those in lower jaw nearly erect;** anteroposterior tooth row counts 12 to 13/11 to 12 on each side, total tooth row counts 26 to 28/25 to 26. **First dorsal fin high, height 10.3 to 11.3% of total length;** first dorsal fin with a slightly convex anterior margin, a narrowly rounded apex, an origin over inner margins of pectoral fins, and the midlength of its base much closer to the pectoral-fin insertions than the pelvic-fin origins; second dorsal fin fairly high but much smaller than the first dorsal fin, height 2.9 to 3.2% of total length; second dorsal fin with a shallowly concave posterior margin, an origin about over that of anal fin, a moderately elongated free rear tip, and an inner margin nearly or quite as long as the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins long, narrow, and falcate with narrowly rounded tips. **A dermal ridge present between dorsal fins;** no keels on caudal peduncle. Precaudal vertebral centra 103 to 108, total vertebral centra 208 to 213. **Colour:** back greyish brown or greyish olive; underside white or yellowish olive.

Size: Maximum total length about 295 cm, common to 150 cm; size at birth about 70 to 73 cm; maturing at about 152 to 168 cm (both sexes).

Habitat, biology, and fisheries: Abundant around the Bahamas and the Antilles. Inhabits shallow coastal waters down to at least 30 m. Bottom-dwelling mainly in coral reef areas, but also on calcareous algae and mud bottoms off river deltas. Number of young 4 to 6 per litter. Feeds primarily on bony fishes. The most popular ecotouristic dive shark in the area. Fished in coastal waters around the Antilles, especially off Cuba, Puerto Rico, and the Virgin Islands. Separate statistics are not reported for this species, which is caught mainly with longlines. Its meat is marketed salted for human consumption and made into fish meal in some localities (Cuba); its skin is utilized for leather, livers are used for liver oil, and its fins probably enter the oriental-fin trade. Its conservation status is unknown.

Distribution: Western Atlantic: From the USA (east coast of Florida) and Bermuda through the Antilles to southern Brazil, including the Gulf of Mexico (USA and Mexico), Virgin Islands, Puerto Rico, Jamaica, Bahamas, Barbados, Colombia (rare), Venezuela, and northern and southern Brazil.

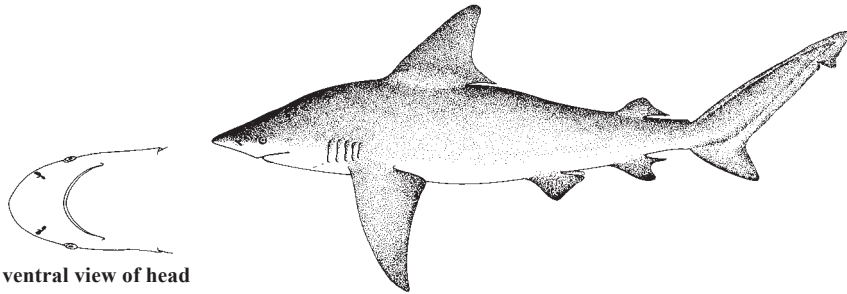


***Carcharhinus plumbeus* (Nardo, 1827)**

CCP

Frequent synonyms / misidentifications: *Carcharhinus milberti* (Müller and Henle, 1839) / *Carcharhinus altimus* (Springer, 1950), *Carcharhinus galapagensis* (Snodgrass and Heller, 1905), *Carcharhinus obscurus* (Lesueur, 1818), *Carcharhinus leucas* (Müller and Henle, 1834).

FAO names: **En** - Sandbar shark; **Fr** - Requin gris; **Sp** - Tiburón trozo.

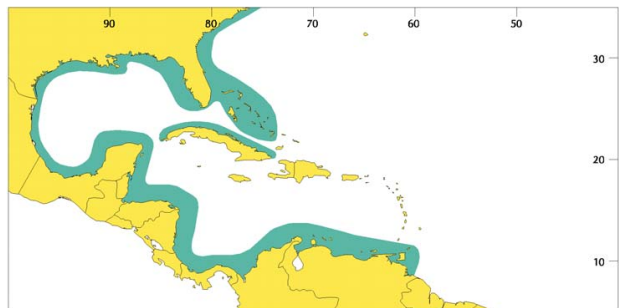


Diagnostic characters: A medium-sized, stout-bodied shark. Eyes small, internal nictitating lower eyelids present. **Snout broadly rounded and short**, preoral length 0.9 to 1.3 times internarial width; anterior nasal flaps low and broadly triangular. **Teeth finely serrate, those in upper jaw broadly triangular** and erect to slightly oblique, with broad, heavy cusps; lower teeth with narrow, erect cusps; anteroposterior tooth row counts on each side 13 to 15/12 to 15, total tooth row counts 28 to 32/27 to 32. Spiracles absent; gill slits relatively short, height of third gill slit about 2.4 to 3.7% of total length; gill arches without papillae. **First dorsal fin triangular, very high** (especially in adults), height 8.4 to 15.0% of total length; **first dorsal fin with a weakly convex or nearly straight anterior margin, a pointed or narrowly rounded apex, an origin over insertions of pectoral fins** and the midlength of its base close to the pectoral-fin insertions and far from the pelvic-fin origins; second dorsal fin moderately high although much smaller than first dorsal fin, height 2.6 to 3.3% of total length; second dorsal fin with a shallowly concave or nearly straight posterior margin, an origin about opposite origin of anal fin, a slightly elongated free rear tip, and an inner margin less than twice the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins long, broad, and falcate, with narrowly rounded or pointed apices. Precaudal vertebral centra 82 to 97, total vertebral centra 152 to 189. **Interdorsal ridge present**; no keels on caudal peduncle. **Colour:** back grey, or rarely brown; belly whitish.

Size: Maximum total length to about 239 cm, records of specimens to 300 cm uncertain; size at birth 56 to 75 cm; males maturing at 131 to 178 cm and females 144 to 183 cm.

Habitat, biology, and fisheries: Coastal, usually found over sandy or muddy bottoms; often coming near estuaries but sometimes occurring in oceanic waters to depths of 280 m. Number of young 1 to 14 per litter. Feeds mainly on bottom-dwelling animals, including flatfishes, rays, crabs, and snails; also on schooling fishes and squids. Mostly caught off the east coast of the USA, off Mexico, and off Venezuela. Separate statistics not reported. Caught with longlines, hook-and-line, and set bottom gill nets; also fished with rod-and-reel. It is utilized fresh, fresh-frozen, smoked, and dried-salted for human consumption; the hides are prized for leather and other products; the fins are of high value for shark-fin soup; the liver is extracted for oil (rich in vitamin A). Declined catastrophically off the east coast of the USA over the last 2 decades, and gill-net fisheries catching juveniles were specifically banned by state governments. Highly vulnerable to overexploitation, protected off the east coast of the USA.

Distribution: Wide-ranging in coastal waters of most tropical to warm-temperate seas, but possibly absent from the eastern Pacific. In the western Atlantic from southern New England to southern Brazil. Common off the east and Gulf of Mexico coasts of the USA and Mexico, and off Venezuela; only occasionally found off the north coast of Cuba, around the Bahamas, off Nicaragua and Costa Rica, and off Venezuela.

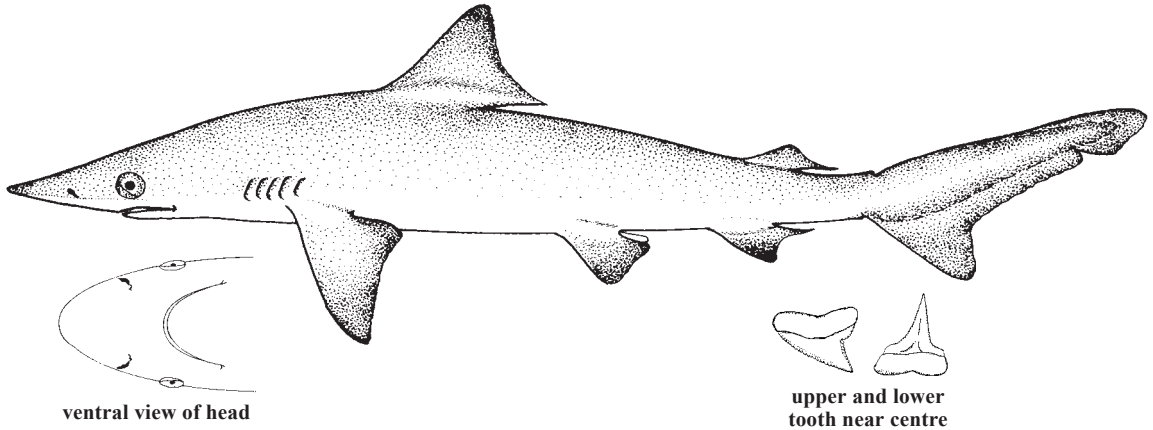


Carcharhinus porosus (Ranzani, 1840)

CCR

Frequent synonyms / misidentifications: None / *Rhizoprionodon terraenovae* (Richardson, 1836), *Rhizoprionodon porosus* (Poey, 1861), *Rhizoprionodon lalandii* (Müller and Henle, 1839).

FAO names: **En** - Smalltail shark; **Fr** - Requin tiqueue; **Sp** - Tiburón poroso.

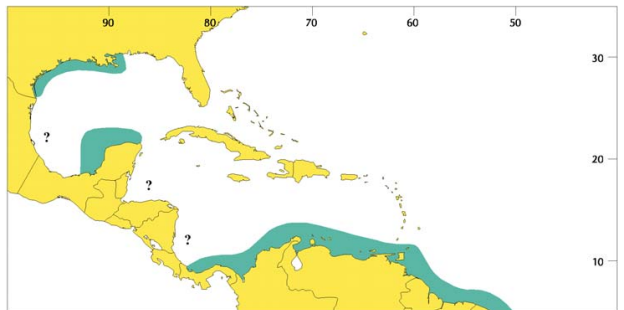


Diagnostic characters: Body slender and fusiform. Eyes large, internal nictitating lower eyelids present. Snout long, preoral length 1.2 to 1.8 times internarial width, and narrowly rounded to pointed; nostrils with a pointed, narrow-based anterior nasal flap; upper labial folds short. Teeth with serrated edges, those in upper jaw with narrow cusps, becoming progressively oblique towards the sides, those in lower jaw with high narrow cusps, erect in front, oblique posteriorly; anteroposterior tooth row counts on each side 13 to 15/12 to 15, total tooth row counts 29 to 32/26 to 32. Spiracles absent; gill slits relatively short, height of third gill slit about 2.8 to 3.4% of total length; gill arches without papillae. First dorsal fin moderately low, height 6.9 to 9.9% of total length; first dorsal fin with a broadly convex anterior margin, a narrowly rounded apex, an origin over pectoral fin inner margins, and the midlength of its base much closer to the pectoral-fin insertions than the pelvic-fin origins; second dorsal fin high although much smaller than first dorsal fin, height 2.2 to 2.8% of total length; **second dorsal fin** with a nearly straight or shallowly concave posterior margin, an **origin over or slightly behind midpoint of anal-fin base**, a somewhat elongated free rear tip, and an inner margin much less than twice the fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins short, slightly falcate, and with narrowly rounded apices. **Interdorsal ridge absent between dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 41 to 61, total vertebral centra 96 to 135. **Colour:** back greyish blue or leaden, belly paler; sides and pelvic fins tinged with reddish in some individuals.

Size: Maximum total length to 134 cm; common to 90 cm; size at birth between 31 and 40 cm; males maturing between 72 and 78 cm, females at 84 cm or below.

Habitat, biology, and fisheries: Coastal, common in shallow waters (16 to 32 m) over muddy bottoms, especially in estuaries. Number of young 2 to 7 per litter. Feeds on bony fishes, other small sharks, and small invertebrates, mainly crabs and shrimp. Caught throughout its range. Separate statistics are not reported. Caught mainly with gill nets and longlines. Important catches occur off Trinidad in the area and off northern Brazil. Marketed fresh-frozen and salted for human consumption, also for liver oil and fish meal. Conservation status uncertain.

Distribution: Western Atlantic from the Gulf of Mexico to southern Brazil; also along the Pacific coast of the Americas from Mexico (Baja, California) to Peru. Recorded from Gulf of Mexico (USA, Mexico), Trinidad and Tobago, and Panama, Suriname, and Venezuela, apparently absent from the Bahamas and the Greater and Lesser Antilles; also northern and southern Brazil.

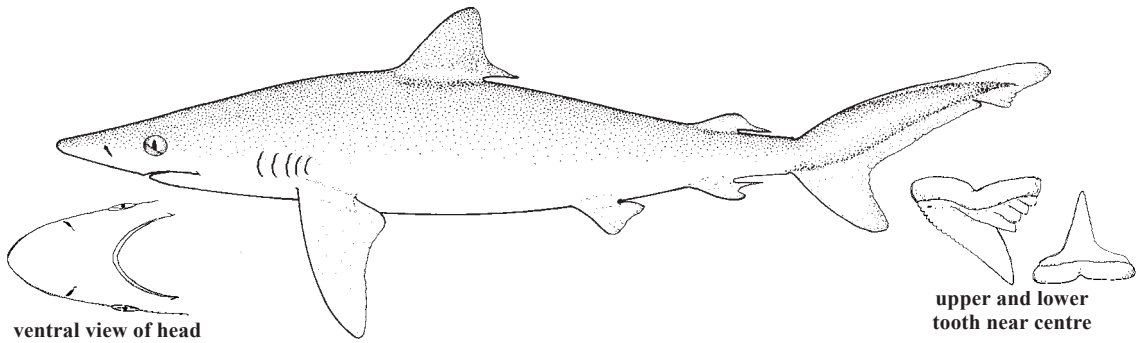


***Carcharhinus signatus* (Poey, 1868)**

CCS

Frequent synonyms / misidentifications: *Hypoprion bigelowi* Cadenat, 1956 / None.

FAO names: En - Night shark; Fr - Requin de nuit; Sp - Tiburón de noche.

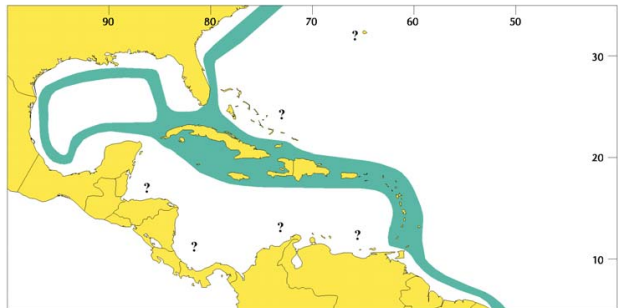


Diagnostic characters: Body fusiform and rather stout. **Eyes relatively large**, internal nictitating lower eye-lids present. **Snout noticeably elongated**, preoral length 1.7 to 1.9 times internarial width, narrow and pointed; nostrils with a short, narrow-based anterior nasal flap; labial folds very short. **Teeth with smooth-edged or weakly serrated cusps**, those in upper jaw increasingly oblique toward sides, their bases with 2 to several very prominent cusplets or strong serrations; teeth in lower jaw narrow, nearly erect and without denticulations at their bases; anteroposterior tooth row counts 15 to 16/14 to 16 on each side, total tooth row counts 31 to 34/29 to 32. Spiracles absent; gill slits relatively short, height of third gill slit about 2.7 to 3.3% of total length; gill arches without papillae. **First dorsal fin relatively low**, height 6.4 to 8.4% of total length; first dorsal fin with a shallowly convex anterior margin, a narrowly rounded apex, an origin over or slightly behind free rear tips of pectoral fins, and the midlength of its base much closer to the pectoral-fin insertions than the pelvic-fin origins; **second dorsal fin very low** and much smaller than first dorsal fin, height 1.6 to 1.9% of total length; second dorsal fin with a shallowly concave or nearly straight posterior margin, an origin about opposite origin of anal fin, an elongated free rear tip, and an inner margin about equal to twice the height of fin; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins long, narrow, slightly falcate and with pointed to narrowly rounded tips. **A low interdorsal ridge present between dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 101 to 104, total vertebral centra 184 to 192. **Colour:** back greyish blue with some scattered black spots; belly greyish white; eyes green; lining of mouth white.

Size: Maximum total length about 280 cm; size at birth about 60 to 72 cm: males maturing between about 160 to 190 cm, and females maturing between about 159 and 194 cm.

Habitat, biology, and fisheries: Deep-water semioceanic, usually found below 275 to 366 m in the day and rising to about 183 m at night, rarely occurring above 160 m. Number of young 4 to 18 per litter. Feeds on fishes, squids, and shrimps. Separate statistics are not reported. At present only caught in any numbers off north-central Brazil in the western Atlantic. Caught mainly with floating longlines, only at night, also by sports anglers with rod-and-reel. The flesh is consumed fresh or has been made into fish meal; the liver used for oil. The conservation status of this shark is problematical, declined catastrophically off the USA and Cuba over the past few decades and is now rare; probably overfished.

Distribution: Restricted to the Atlantic Ocean, from the Atlantic coast of the USA (Delaware) south to Brazil and Argentina, also Senegal to Namibia in the eastern Atlantic. Occurs off the USA (Atlantic coast south to Florida and in the Gulf of Mexico), the Gulf and Atlantic coasts of Mexico, the Bahamas, Cuba (formerly very abundant off the north coast), the lesser Antilles, Guyana, and off the north and south coasts of Brazil.

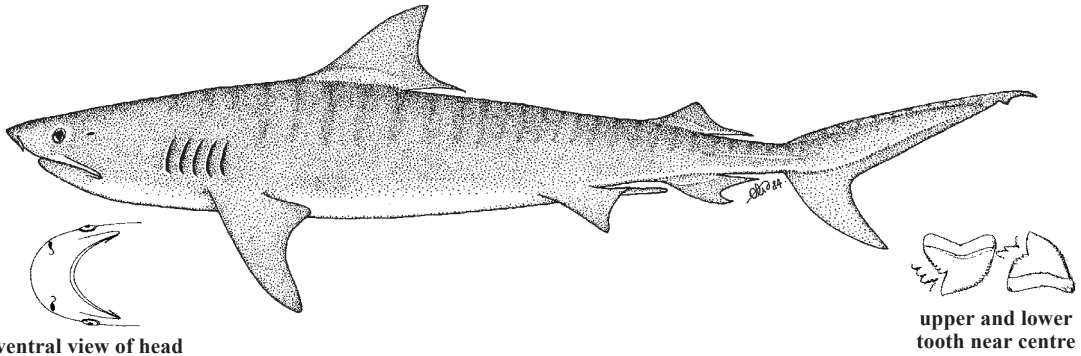


Galeocerdo cuvier (Péron and LeSueur, 1822)

TIG

Frequent synonyms / misidentifications: None / None.

FAO names: En - Tiger shark; Fr - Requin tigre commun; Sp - Tintorera tigre.

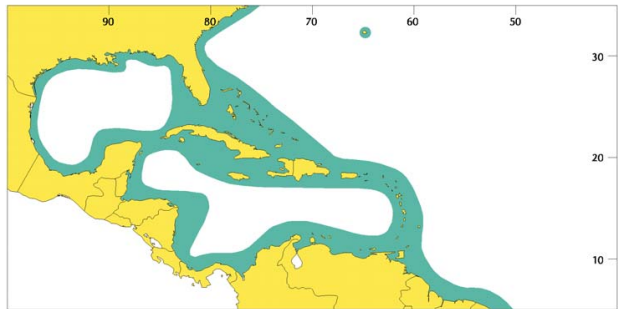


Diagnostic characters: A large, fusiform, broad-headed shark. **Eyes large, with internal nictitating lower eyelids.** Snout very short and bluntly rounded, preoral length 0.7 to 1.1 times internarial width; anterior nasal flaps short and broadly triangular; upper labial furrows about as long as snout, reaching to front of eyes. **Teeth coarsely serrated and with strong distal cusplets, their outer edges deeply notched and the tips directed obliquely outward, and their inner edges broadly convex;** anteroposterior tooth row counts 9 to 12/8 to 11 on each side, total tooth row counts 18 to 26/18 to 25. Spiracles present, these small, slit-like, and conspicuous; gill slits moderately long, height of third gill slit about 2.9 to 3.4% of total length; gill arches without papillae. First dorsal fin moderately high, height 6.4 to 9.1% of total length; first dorsal fin with a broadly convex anterior margin, an angular or narrowly rounded apex, an origin over the pectoral fin insertions or inner margins, and the midlength of its base much closer to the pectoral-fin insertions than to the pelvic-fin origins; second dorsal fin high although much smaller than first dorsal fin, height 1.9 to 3.8% of total length; second dorsal fin with a shallowly concave or sometimes nearly straight posterior margin, an origin slightly anterior to origin of anal fin, a moderately elongated free rear tip, and an inner margin somewhat less than twice its height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins moderately large, broad and falcate and with pointed or narrowly rounded tips. A strong interdorsal ridge present between dorsal fins; **a low rounded lateral keel present on each side of caudal peduncle.** Precaudal vertebral centra 100 to 112, total vertebral centra 216 to 234. **Colour:** back dark grey or greyish brown with **dark brown or black rectangular vertical bars and spots on sides and fins**, conspicuous in young but fading with growth and obscure in adults.

Size: Maximum total length at least 5.5 m and possibly to 7.4 m; common to 4 m; size at birth between 68 and 85 cm; males mature between 226 and 290 cm and females between 250 and 350 cm.

Habitat, biology, and fisheries: Coastal as well as offshore, near surface and bottom, on the continental and insular shelves and semioceanic over the continental slopes. Often found in shallow waters close inshore, including river estuaries. Possibly ovoviviparous or aplacental viviparous (unlike other carcharhinids) and very prolific with 10 to 82 young per litter, gestation period possibly a year. A voracious, indiscriminate predator feeding on all kinds of fish (including other sharks and rays), marine mammals, turtles, seabirds, sea snakes, squids, conchs, crabs, undigestible and non-nutritive items, and carrion. Considered hazardous to people. Caught off Cuba and the southern USA with line gear. Utilized for its hide, fins, liver oil (with high Vitamin A content), and meat (utilized dried-salted in some places), while offal is made into fish meal. Conservation status poorly known.

Distribution: Circumglobal in most tropical seas, with seasonal migrations into warm-temperate and temperate seas. Throughout Area 31 including Bermuda, the Atlantic and Gulf coasts of the USA and Mexico, and the Greater and Lesser Antilles south to northern Brazil.

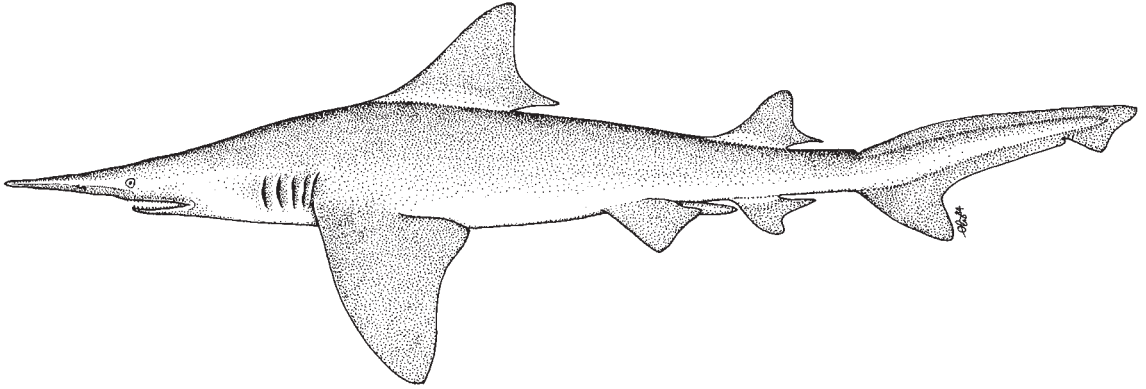


***Isogomphodon oxyrhynchus* (Müller and Henle, 1839)**

CIO

Frequent synonyms / misidentifications: *Carcharhinus oxyrhynchus* (Müller and Henle, 1839) / None.

FAO names: **En** - Daggernose shark ; **Fr** - Requin bécune; **Sp** - Cazón picudo sudamericano.

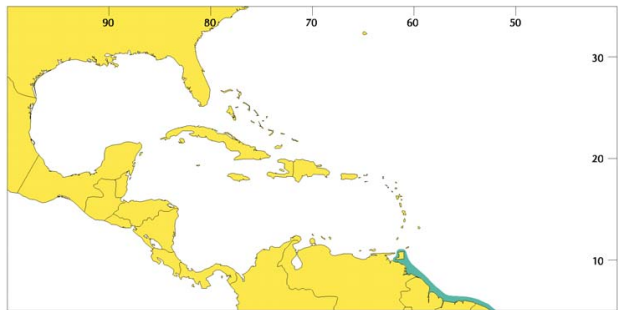


Diagnostic characters: Body moderately stout. **Eyes extremely small**, with internal nictitating lower eyelids present. **Snout very long**, preoral length 1.8 to 2.8 times internarial width, **flattened, and acutely pointed, narrowly triangular in dorsal view**; anterior nasal flaps very low, vestigial; **labial folds short but well developed, not hidden by lips when mouth is closed**. Teeth similar in both jaws, **with very narrow, slender, long, erect cusps on broad bases, serrated in upper jaw and usually smooth in lower**; **anteroposterior tooth row counts 24 to 28/24 to 28 on each side**, total tooth row counts 49 to 60/49 to 56. Spiracles absent; gill slits moderately long, height of third gill slit about 2.8 to 3.6% of total length; gill arches without papillae. First dorsal fin moderately high, height 8.9 to 10.1% of total length; first dorsal fin with a broadly convex anterior margin, a pointed or narrowly rounded apex, an origin far forward over the pectoral-fin insertions, and the midlength of its base close to the pectoral-fin insertions and far from the pelvic-fin origins; **second dorsal fin relatively large** but somewhat smaller than first dorsal fin, height 4.6 to 4.8% of total length; second dorsal fin with a concave posterior margin, an origin about over anal-fin origin, a slightly attenuated free rear tip, and an inner margin less than fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; **pectoral fins very large and broad**, not falcate. **No interdorsal ridge between dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 71 to 72, total vertebral centra 147 to 157. **Colour:** grey or yellow-grey above, white below, no conspicuous markings on fins.

Size: Maximum total length to at least 152 cm, recorded at 200 to 244 cm but not verified and possibly based on some other species; size at birth 38 to 43 cm; males mature between 90 and 110 cm and females between 105 and 112 cm.

Habitat, biology, and fisheries: Relatively common inshore, associated with hot, humid climates, turbid waters, mangrove coasts, and river mouths, often entering estuaries, and confined to coastal waters in 4 to 40 m. Number of young 3 to 8 per litter. Feeds on small schooling fishes, including herring, anchovies, catfish, and croakers. Caught incidentally in coastal waters off Trinidad and possibly the Guyanas, but an important fisheries species off northern Brazil where it comprises 10% of the catch. Separate statistics are not reported for this species. Caught with gill nets and longlines. Marketed occasionally; not highly appreciated as food. The conservation status is unknown but of concern.

Distribution: Western Atlantic: Only found off Trinidad, Venezuela, Guayana, Suriname, French Guiana, and northern Brazil, and possibly central Brazil.

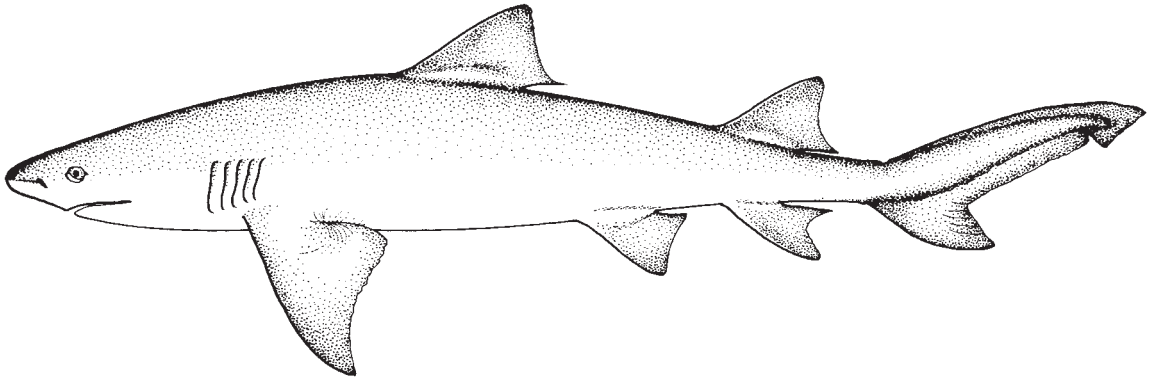


Negaprion brevirostris (Poey, 1868)

NGB

Frequent synonyms / misidentifications: None / None.

FAO names: En - Lemon shark ; Fr - Requin citron; Sp - Tiburón galano.

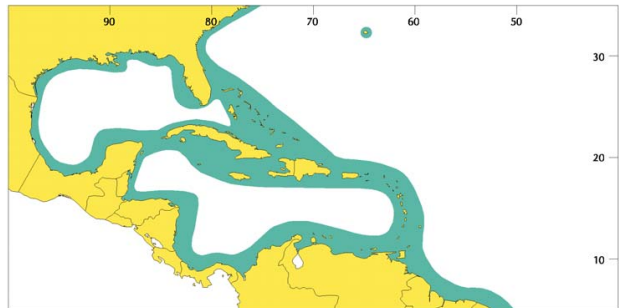


Diagnostic characters: Body stout. Eyes small, with internal nictitating lower eyelids present. **Snout short and broad, rounded or obtusely wedge-shaped**, preoral length 0.7 to 1.1 times internarial width; anterior nasal flaps short and broadly triangular; labial folds short. **Teeth narrow, their cusps smooth-edged, erect in anterior part of jaws, but becoming progressively oblique toward the sides; serrations present on bases of upper teeth**; anteroposterior tooth row counts 15/14 to 15 on each side, total tooth row counts 30 to 33/29 to 33. Spiracles usually absent; gill slits moderately long, height of third gill slit about 3.4 to 4.1% of total length; inner gill arches without gill-raker papillae. First dorsal fin moderately high, height 6.6 to 8.9% of total length; first dorsal fin with a narrowly rounded apex, an origin behind pectoral-fin free rear tips, and the midlength of its base closer to the pelvic-fin origins than the pectoral-fin insertions; **second dorsal fin nearly as large as first dorsal fin**, height 5.4 to 8.0% of total length; second dorsal fin with a shallowly to deeply concave posterior margin, an origin somewhat anterior to anal-fin origin, a slightly attenuated free rear tip, and an inner margin less than fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins moderately large, broad, and falcate. **No interdorsal ridge between dorsal fins**; no keels on caudal peduncle. Precaudal vertebral centra 117 to 121, total vertebral centra 197 to 206. **Colour: olive grey or yellowish brown**, but often darker; belly yellowish or whitish.

Size: Maximum total length to about 340 cm; common to 240 cm, most individuals under 300 cm; size at birth 60 to 65 cm; males maturing at about 224 cm and females at about 239 cm.

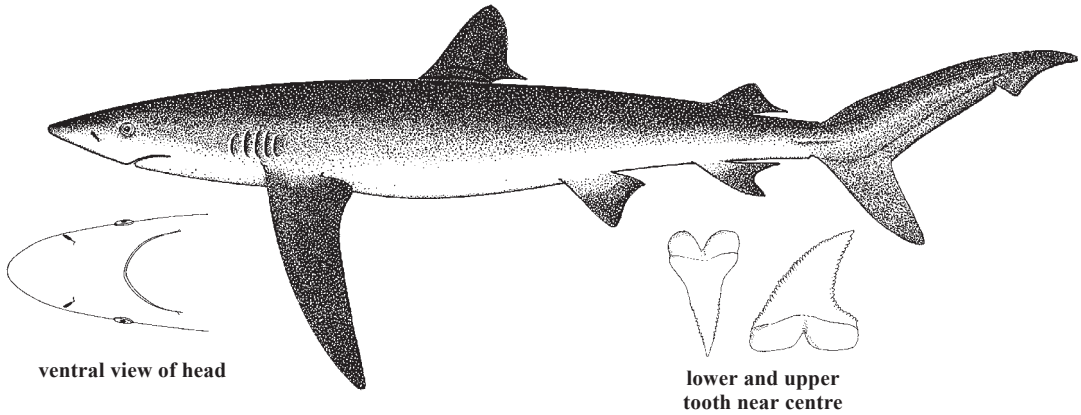
Habitat, biology, and fisheries: Sluggish, common to abundant, demersal in coastal waters from the intertidal down to at least 92 m, occasionally present in the open ocean near the surface over the continental slopes; occasionally enters river mouths. Feeds mainly on bony fishes (catfish, mullets, mojarras) and rays; also on crabs, shrimps, and carrion. Number of young 4 to 17 per litter, gestation period about 10 to 12 months. Occasionally bites people. An important ecotouristic dive shark off Florida and in the Bahamas. Caught wherever it occurs. Used for human consumption, for fish meal, liver oil, crab bait, hides for leather, and fins for soup-base. Separate statistics not reported. Conservation status uncertain but there is cause for concern.

Distribution: In the western Atlantic from New Jersey south to southern Brazil; also found in the eastern Pacific, and recorded from tropical West Africa. Found throughout the area, extending northward to New Jersey and southward to southern Brazil; most abundant in the Caribbean Sea.



***Prionace glauca* (Linnaeus, 1758)**

BSH

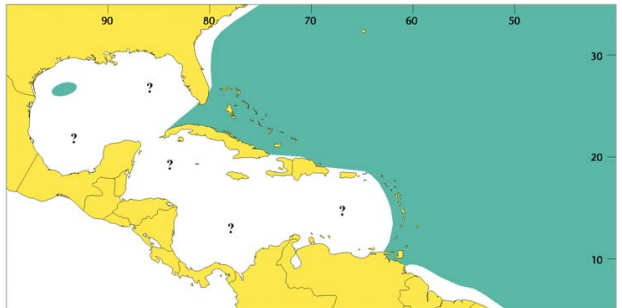
Frequent synonyms / misidentifications: None / None.**FAO names:** En - Blue shark; Fr - Peau bleue; Sp - Tiburón azul.

Diagnostic characters: Very slender, fusiform. Snout very long, preoral length 2.3 to 2.6 times internarial width, and narrowly rounded; upper labial furrows very short. Teeth serrated, broadly triangular and curved in upper jaw, narrower in lower jaw; upper medial tooth very large, nearly the size of teeth on either side of it (but sometimes absent); anteroposterior tooth row counts 12 to 15/12 to 13 on each side, total tooth row counts 27 to 30/27 to 30. Spiracles absent; gill slits moderately long, height of third gill slit about 2.9 to 3.4% of total length; inner gill arches with gill-raker papillae (visible through open mouth). First dorsal fin low, height 5.6 to 7.6% of total length; first dorsal fin with a convex anterior margin, a narrowly rounded apex, an origin well posterior to free rear tips of pectoral fins, and the midlength of its base closer to pelvic-fin origins than the pectoral-fin insertions; second dorsal fin relatively high but much smaller than first dorsal fin, height 2.1 to 3.1% of total length; second dorsal fin with a shallowly concave posterior margin, an origin slightly posterior to anal-fin origin, an attenuated free rear tip, and its inner margin between 1 and 1.5 times fin height; anal fin with a deeply notched posterior margin and without long preanal ridges; pectoral fins very long, narrow and somewhat falcate, with narrowly rounded tips. No interdorsal ridge between dorsal fins; a weak keel present on each side of caudal peduncle. Precaudal vertebral centra 142 to 151, total vertebral centra 237 to 252. **Colour:** in life, dark blue above, bright blue on sides, white below, fading to purple blackish after death, tips of pectoral and anal fins dusky.

Size: Maximum total length to about 380 cm; most specimens below 335 cm; size at birth about 34 to 48 cm; males maturing between 182 and 218 cm, females maturing between 166 and 221 cm.

Habitat, biology, and fisheries: Slow-cruising, very common, oceanic, usually well offshore and in the open sea near or at the surface, but sometimes penetrating coastal waters. Number of young per litter highly variable, 1 to 135, but usually over 20. Feeds on a wide variety of bony fishes, small sharks, squids, pelagic crustaceans and occasionally sea birds and carrion. Uncommonly bites people. Usually caught with pelagic longlines but also other gear. Its meat easily spoils unless properly bled and refrigerated, but it can be used dried-salted for human consumption. Its hides are used for leather; fins for shark-fin soup base; liver for vitamin oil; and offal for fish meal. Considered a game fish and taken in large numbers by sports anglers with rod-and-reel, particularly in the USA. Enormous numbers caught as bycatch of high-seas longline fisheries. Expanding targeted fisheries threaten it.

Distribution: Among the most wide-ranging of cartilaginous fishes, circumglobal in all tropical and temperate seas, but commoner in temperate waters. Occurs throughout the area, extending northward to Newfoundland and southward to Argentina, but uncommon or rare in Gulf of Mexico and Caribbean.

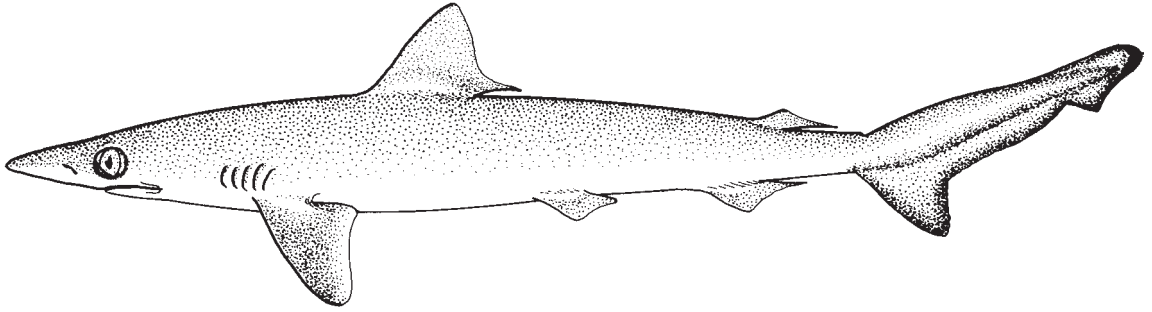


Rhizoprionodon lalandii (Müller and Henle, 1841)

RHL

Frequent synonyms / misidentifications: None / *Rhizoprionodon porosus* (Poey, 1861).

FAO names: **En** - Brazilian sharpnose shark; **Fr** - Requin aiguille brésilien; **Sp** - Cazón picudo chino.

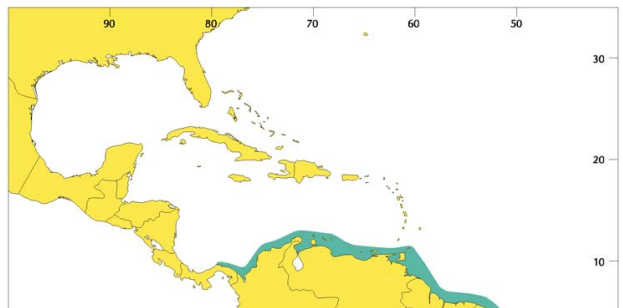


Diagnostic characters: Body fusiform and slender. Eyes large, with internal nictitating lower eyelids present. **Snout long and depressed**, preoral length 1.6 to 1.8 times internarial width, tip narrowly rounded; **labial folds well developed (slightly shorter than eye diameter), upper labial folds ending well behind eye. Teeth strongly oblique with smooth edges**; anteroposterior tooth row counts 12/11 to 12 on each side, total tooth row counts 25/23 to 24. Spiracles absent; gill slits short, height of third gill slit about 1.9 to 2.3% of total length; gill arches without papillae. First dorsal fin moderate-sized, height 6.9 to 8.1% of total length; first dorsal fin with a narrowly rounded apex, an origin opposite or slightly posterior to free rear tips of pectoral fins, and the midlength of its base about equidistant between the pelvic-fin origins and the pectoral-fin insertions; **second dorsal fin very low** and much smaller than first dorsal fin, height 1.6 to 1.9% of total length; **second dorsal fin** with a nearly straight or weakly concave posterior margin, an **origin far posterior and over or slightly in front of the anal-fin insertion**, an attenuated free rear tip, and an inner margin over twice the fin height; **anal fin with a shallowly concave posterior margin and long paired preanal ridges**; **pectoral fins relatively short**, broad and not falcate, not reaching to below midpoint of first dorsal-fin base when appressed. A low interdorsal ridge present between dorsal fins; no keels on caudal peduncle. **Precaudal vertebral centra 79 to 90 and mostly above 84, outnumbering caudal centra by 5 to 20 centra**, total vertebral centra 153 to 168. **Colour:** back greyish brown, underside white, pectoral fins dark with white rear margins, caudal fin dark with margins of both lobes blackish.

Size: Maximum total length to about 77 cm, common to 55 cm; size at birth 33 to 34 cm; males maturing between 45 and 50 cm, females adult at 54 cm or more.

Habitat, biology, and fisheries: Inhabits shallow coastal waters, usually between 40 and 70 m depth, on sandy and muddy bottoms. Feeds on small fishes and shrimps. Fished in shallow waters throughout its range. Separate statistics not reported. Caught mainly with bottom longlines and trammel nets. Marketed salted.

Distribution: Northern and eastern coasts of South America, from Colon (Panama) to Florianópolis, southern Brazil.

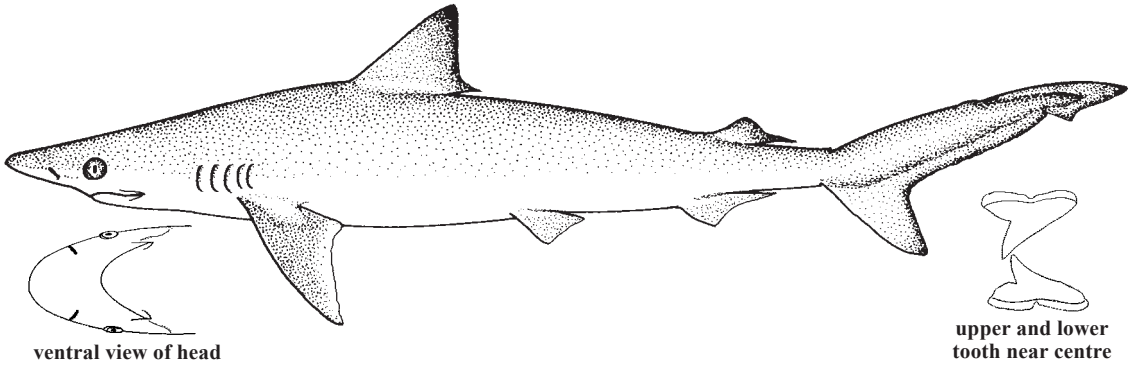


***Rhizoprionodon porosus* (Poey, 1861)**

RHR

Frequent synonyms / misidentifications: None / *Rhizoprionodon terraenovae* (Richardson, 1836), *R. lalandei* (Valenciennes, 1841).

FAO names: **En** - Caribbean sharpnose shark; **Fr** - Requin aiguille antillais; **Sp** - Cazón picudo antillano.

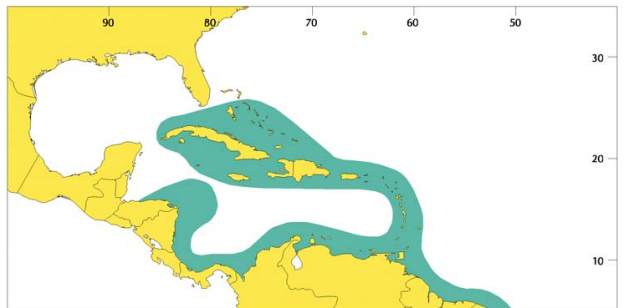


Diagnostic characters: Body slender and fusiform. Eyes large, with internal nictitating lower eyelids present. Snout long and depressed, preoral length 1.4 to 1.6 times internarial width, tip narrowly rounded; labial folds well developed, the upper pair about equal in length to eye diameter and ending well behind eyes. Teeth strongly oblique, their edges smooth to finely serrated in adults; anteroposterior tooth row counts 11 to 13/12 on each side, total tooth row counts 24 to 27/24. Spiracles absent; gill slits short, height of third gill slit about 2.0 to 2.5% of total length; gill arches without papillae. First dorsal fin moderate-sized, height 7.3 to 9.1% of total length; first dorsal fin with a narrowly rounded apex, an origin opposite the pectoral-fin inner margins, and the midlength of its base slightly closer to the pectoral-fin insertions than the pelvic-fin origins; second dorsal fin low and much smaller than first dorsal fin, height 1.9 to 2.5% of total length; second dorsal fin with a slightly concave posterior margin, an origin opposite the space between the midpoint of the anal-fin base and the anal-fin insertion, an attenuated free rear tip, and an inner margin over twice the fin height; anal fin with a shallowly concave posterior margin and long paired preanal ridges; pectoral fins relatively short, broad and not falcate, extending to below midpoint of first dorsal-fin base when adpressed. A low interdorsal ridge present or absent between dorsal fins; no keels on caudal peduncle. Precaudal vertebral centra 66 to 75, usually above 66, equal or less in number than caudal centra, total vertebral centra 136 to 159. **Colour:** back usually brown or greyish brown (occasionally violaceous), apparently without light spots, underside whitish, posterior margins of pectoral fins white, posterior margins of dorsal and caudal fins blackish.

Size: Maximum total length to about 110 cm, common to 75 cm; size at birth about 31 to 39 cm; males maturing at about 60 cm, females at about 80 cm.

Habitat, biology, and fisheries: Primarily coastal, tropical, common in bays and estuaries and often enters the mouths of rivers; may also be found in offshore waters at considerable depths (to 500 m) and occasionally in the epipelagic zone. Number of young 1 to 4 per litter. In the Bahamas an ecotouristic dive shark despite its small size. Feeds mainly on small fishes; also on gastropods and shrimps. Fished throughout its range. Off Cuba it is one of the most important species in shark catches. Separate statistics not reported. Caught mainly with floating longlines; also with bottom trawls (especially shrimp trawls) and trammelnets. Marketed salted or frozen, made into fish meal in Cuba.

Distribution: From the Bahamas throughout the Antilles and from Honduras along the Atlantic coast of America to southern Brazil and Uruguay (Maldonado). Most abundant in the Antilles off Cuba, Jamaica, Hispanola, Puerto Rico, the Virgin Islands, and Martinique, and along the northeast coast of Brazil, less abundant off Central America (Honduras, Panama) and the Caribbean coast of Colombia and Venezuela.

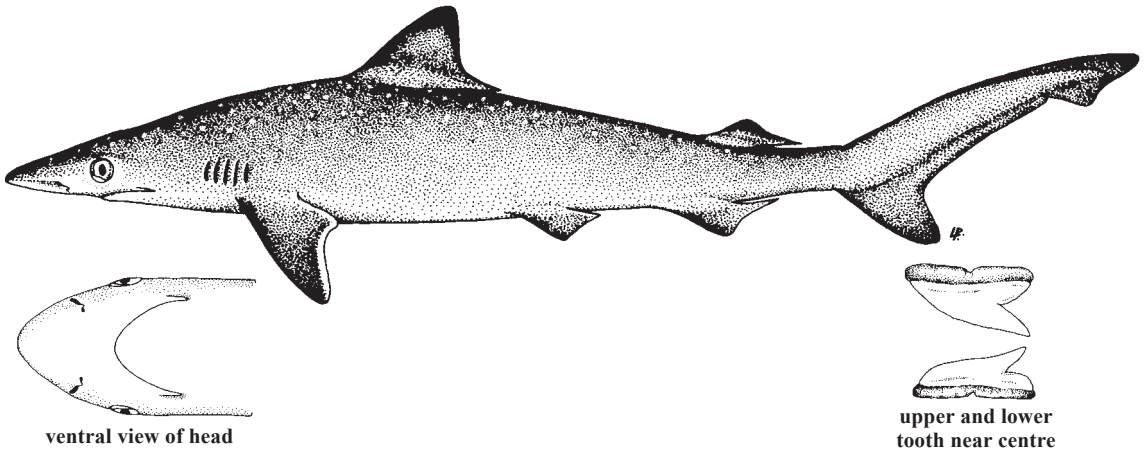


Rhizoprionodon terraenovae (Richardson, 1836)

RHT

Frequent synonyms / misidentifications: None / *Rhizoprionodon porosus* (Poey, 1861).

FAO names: En - Atlantic sharpnose shark; Fr - Requin aiguille gussi; Sp - Cazón picudo atlántico.

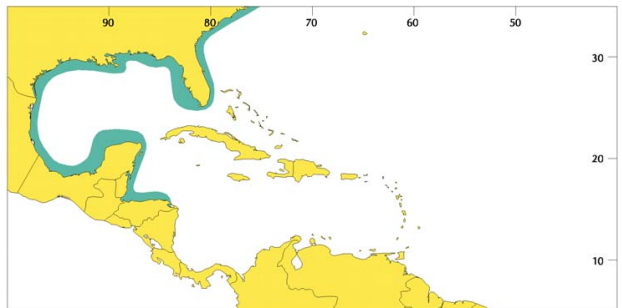


Diagnostic characters: Body slender and fusiform. Eyes large, internal nictitating lower eyelids present. Snout long and depressed, preoral length 1.5 to 1.7 times internarial width, tip narrowly rounded; labial folds well developed, the upper pair about equal in length to eye diameter and ending well behind eyes. Teeth strongly oblique, their edges smooth to finely serrated in adults; anteroposterior tooth row counts 11 to 13/12 to 13 on each side, total tooth row counts 24 to 27/24 to 27. Spiracles absent; gill slits short, height of third gill slit about 2.2 to 2.5% of total length; gill arches without papillae. First dorsal fin moderate-sized, height 7.4 to 9.2% of total length, with a narrowly rounded apex, an origin opposite the pectoral-fin inner margins, and the midlength of its base slightly closer to the pectoral-fin insertions than the pelvic-fin origins; second dorsal fin low and much smaller than first dorsal fin, height 1.9 to 2.5% of total length; second dorsal fin with a shallowly concave posterior margin, an origin opposite the space between the midpoint of the anal-fin base and the anal-fin insertion, an attenuated free rear tip, and an inner margin over twice the fin height; anal fin with a shallowly concave posterior margin and long paired preanal ridges; pectoral fins relatively short, broad and not falcate, extending to below midpoint of first dorsal-fin base when adpressed. A low interdorsal ridge present between dorsal fins; no keels on caudal peduncle. Precaudal vertebral centra 56 to 66, usually below 66, and equal or less in number than caudal centra, total vertebral centra 126 to 144. Colour: grey or grey-brown above, large specimens with small light spots on the dorsal surface, white below; pectoral fins with white margins, dorsal fins with dusky tips.

Size: Maximum total length at least 110 cm, common to 90 cm; size at birth about 29 to 37 cm; males maturing between 65 and 80 cm and females at 85 to 90 cm.

Habitat, biology, and fisheries: Inhabits waters from the intertidal to possibly 280 m deep, but usually in water less than 10 m deep. Often occurring in the surf zone off sandy beaches, and in enclosed bays, sounds, harbors, estuaries, and river mouths. Tolerates reduced salinities but does not penetrate far into fresh water. A common to abundant shark where it occurs. Migratory, moving inshore in summer and offshore in winter. Number of young 1 to 7 per litter. Feeds primarily on small bony fishes, shrimps, crabs, worms, and molluscs. Fished wherever it occurs, caught commercially in Mexico. Caught in gill nets and targeted by sports anglers using rod-and-reel; and a major bycatch of the USA shrimp trawling fishery. Despite heavy fishing pressure numbers in the Gulf of Mexico seem to be stable.

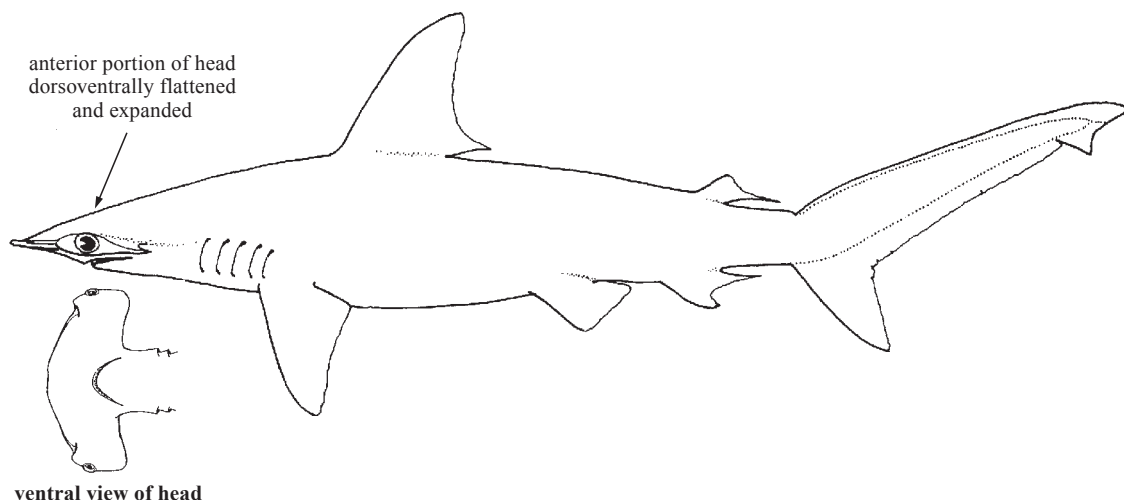
Distribution: Western North Atlantic: Canada (New Brunswick), Canada, USA (New England to Florida and the Gulf of Mexico), Mexico, and Honduras.



SPHYRNIDAE

Hammerhead and bonnethead sharks

Diagnostic characters: Small- to large-sized sharks. Body elongate and moderately slender, cylindrical or somewhat compressed. **Anterior portion of head much flattened dorsoventrally and widely expanded laterally in hammer or shovel form, with the eyes at its outer edges;** eyes with well-developed internal nictitating lower eyelids; anterolateral teeth blade-like, with a single cusp; posterior teeth similar to anterolateral teeth or modified into keeled, molariform crushing teeth without cusps. Two dorsal fins, **the first dorsal fin high and pointed, its base much shorter than caudal fin and wholly anterior to origins of pelvic fins;** second dorsal and anal fins much smaller than the first dorsal fin and either equal-sized or with the anal fin somewhat larger than the second dorsal fin; caudal fin much less than half of total length and strongly asymmetrical, with a well-marked subterminal notch and a small, but well-defined ventral lobe. Caudal peduncle slightly compressed, not strongly flattened dorsoventrally or widely expanded laterally, without lateral keels but with upper and lower precaudal pits present. **Intestine with a scroll valve.** **Colour:** back predominantly grey or brassy, sometimes yellow or very dark grey, no prominent markings except dark fin tips in young of some species; underside white or light grey.



Habitat, biology, and fisheries: Hammerhead sharks inhabit all tropical and warm-temperate seas, from the surface, surf-line, and intertidal down to at least 275 m in waters near continents, continental islands, and oceanic islands. Small species are confined to coastal continental waters; juveniles of large species are coastal off continents and islands, while adults are primarily semi-oceanic although they often approach coasts in search of food. All species are viviparous (placental viviparous, with a yolk-sac placenta), and have 4 to 42 young per litter. Hammerheads feed on a wide variety of bony fishes, other sharks (including batoids), cephalopods (squids, octopi, and cuttlefish), gastropods, bivalves, and crustaceans (shrimp, mantis shrimp, brachyurid crabs, lobsters, barnacles, and isopods), but do not feed on marine mammals or other very large marine vertebrates. Hammerhead sharks are important for fisheries in the area and are used as food and also for the preparation of various subproducts, especially Vitamin A from the liver and fins for the oriental soupfin market. A few species have been reported to occasionally bite people, but large species are generally timid when approached by divers. Hammerheads (particularly *Sphyrna lewini* and *S. mokarran*) are popular subjects for ecotouristic diving worldwide and are viewed by divers in Area 31. *Sphyrna lewini* and *S. tiburo* are popular fish for large public aquaria, including a number of aquaria along the eastern and Gulf coast of the USA. The conservation status of hammerheads is problematical because of heavy bycatch and targeted fisheries that catch them wherever they occur (including fisheries on nursery grounds which may be decimating the young), the high value of their fins (particularly from large species), their vulnerability to gill nets because of their head-shape (which helps to snare them in net-meshes), the high activity level of some species which means that they perish quickly when caught in nets or on longlines, and often poor or nonexistent species-specific or even family-specific fisheries statistics for most species. Catches of large hammerheads (*S. lewini*, *S. mokarran*) have declined markedly off the USA in Area 31, and catches are now regulated in USA waters.

Similar families occurring in the area

No other shark family has the characteristic hammer- or shovel-shaped head of the Sphyrnidae.

Key to the species of Sphyrnidae occurring in the area

- 1a. Head shovel-shaped and narrow, its width usually less than 3 times the preoral length (Fig. 1); posterior teeth formed as broad, keeled, molariform crushers *Sphyrna tiburo*
- 1b. Head hammer- or mallet-shaped and wider, its width over 3 times the preoral length (Fig. 2); posterior teeth not molariform crushers → 2

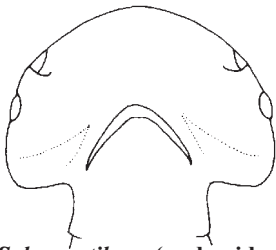


Fig. 1 *Sphyrna tiburo* (underside of head)

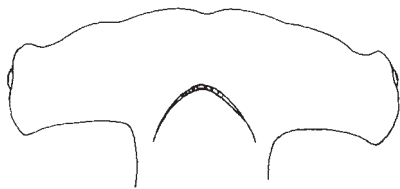


Fig. 2 *Sphyrna lewini* (underside of head)

- 2a. Free rear tip of first dorsal fin over or posterior to pelvic fin-origins (Fig. 3); posterior margin of anal fin straight or weakly concave; size smaller, adults less than 2 m → 3
- 2b. Free rear tip of first dorsal fin well ahead of pelvic-fin origins (Fig. 4); posterior margin of anal fin deeply notched; size larger, adults to 3 m or more → 4

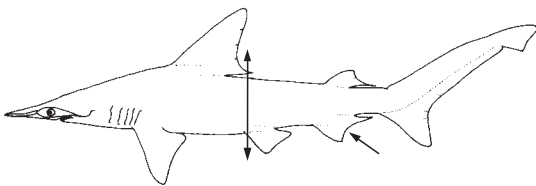


Fig. 3 *Sphyrna tudes*

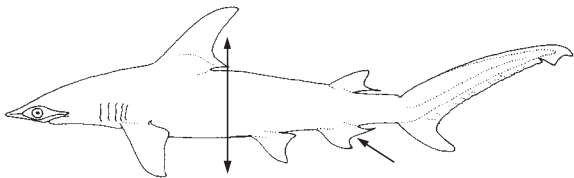


Fig. 4 *Sphyrna mokarran*

- 3a. Prenarial grooves well developed; head broader, with a well-developed medial indentation on snout (Fig. 5) *Sphyrna tudes*
- 3b. Prenarial grooves poorly developed; head narrower, without a strong medial indentation on snout (Fig. 6) *Sphyrna media*

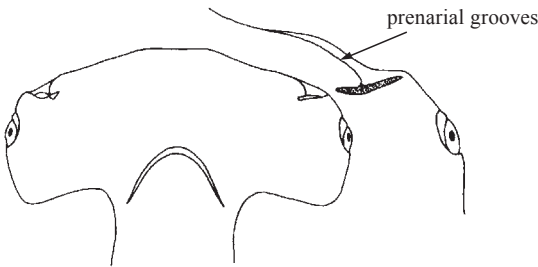


Fig. 5 underside of head (*Sphyrna tudes*)

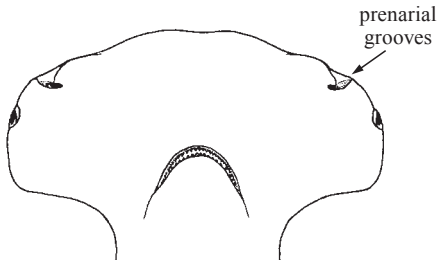


Fig. 6 underside of head (*Sphyrna media*)

- 4a.

Anterior margin of head nearly straight in adults, moderately convex in young; prenarial grooves hardly developed; teeth strongly serrated at all sizes; first dorsal fin markedly falcate; second dorsal about a third as high as first dorsal fin, with a short inner margin; posterior margins of second dorsal and pelvic fins deeply concave (Fig. 4)

Sphyrna mokarran
- 4b.

Anterior margin of head moderately convex in adults, strongly so in young; prenarial grooves well developed; teeth smooth in young, weakly serrated in large individuals; first dorsal fin erect or slightly falcate; second dorsal-fin less than a third the height of first dorsal fin, with a long inner margin; posterior margins of second dorsal and pelvic fins slightly concave to nearly straight → 5
- 5a.

Median indentation present on anterior margin of head; free rear tip of second dorsal fin nearly reaching upper caudal-fin origin; anal-fin base noticeably larger than that of second dorsal fin (Fig. 7).

Sphyrna lewini
- 5b.

Median indentation absent from anterior margin of head; free rear tip of second dorsal fin well ahead of upper caudal-fin origin; anal-fin base about as large as that of second dorsal fin (Fig. 8).

Sphyrna zygaena

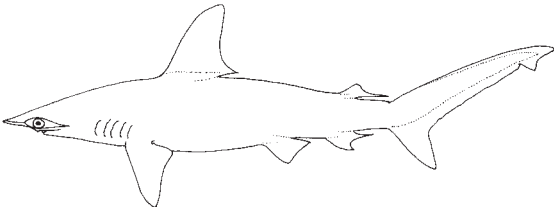


Fig. 7 *Sphyrna lewini*

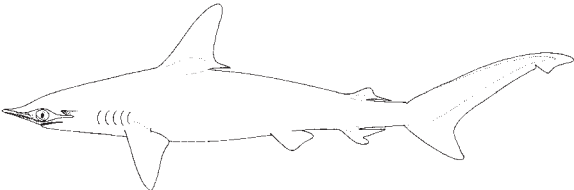









Fig. 8 *Sphyrna zygaena*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Sphyrna lewini* (Griffith and Smith, 1834).
-  *Sphyrna media* Springer, 1940.
-  *Sphyrna mokarran* (Rüppell, 1837).
-  *Sphyrna tiburo* (Linnaeus, 1758).
-  *Sphyrna tudes* (Valenciennes, 1822).
-  *Sphyrna zygaena* (Linnaeus, 1758).

References

Bigelow, H.B. and W.C. Schroeder. 1948. Sharks. In *Fishes of the Western North Atlantic. Mem. Sears Fnd. Mar. Res.*, (1):56-576.

Compagno, L.J.V. and R. Vergara R. 1978. Sphyrnidae. In *FAO species identification sheets for fisheries purposes. Western Central Atlantic, (Fishing Area 31), Volume V*, edited by W. Fischer. Rome, FAO (unpaginated).

Compagno, L.J.V. 1984. FAO Species Catalogue. Vol. 4. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. *FAO Fish. Synop.* (125)Vol.4,Pt.2: 251-655.

Compagno, L.J.V. 1988. *Sharks of the Order Carcharhiniformes*. New Jersey, Princeton University Press, 572 p.

Gilbert, C.R. 1967. A revision of the hammerhead sharks (Family Sphyrnidae). *Proc. U. S. Natn. Mus.* 119:1-88.

Gilbert, C.R. 1967. A taxonomic synopsis of the hammerhead sharks (Family Sphyrnidae). In *Sharks, Skates, and Rays*, edited by P. W. Gilbert, R.F. Mathewson, and D.P. Rall. Baltimore, Johns Hopkins Press, pp. 69-76.

McEachran, J.D. and J.D. Fechtelm. 1998. *Fishes of the Gulf of Mexico, vol. 1, Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.

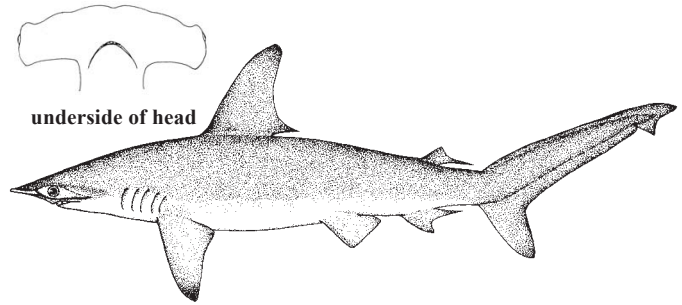
Sphyrna lewini (Griffith and Smith, 1834)

SPL

Frequent synonyms / misidentifications: *Sphyrna diplana* Springer, 1941 / *Sphyrna mokarran* (Rüppell, 1837), *Sphyrna zygaena* (Linnaeus, 1758).

FAO names: En - Scalloped hammerhead; Fr - Requin-marteau halicorne; Sp - Cornuda común.

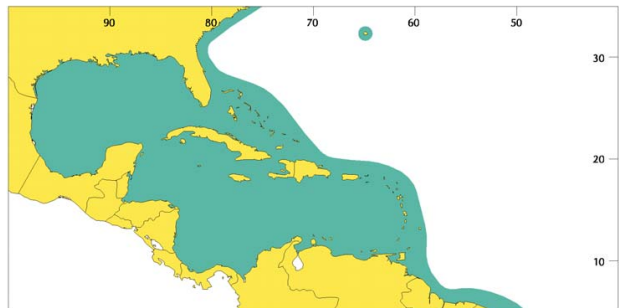
Diagnostic characters: Body elongate and laterally compressed. **Head hammer-shaped, its anterior contour broadly arched in young, but moderately arched in adults, with a shallow but distinct indentation at the midline and a deep rounded depression opposite each nostril; lateral expansions of head very prominent, broad transversely and narrow from front to back; eyes large, their horizontal diameter almost equal to length of shortest (fifth) gill slit, posterior margins of eyes slightly posterior to or nearly opposite front of mouth; nostrils with strong prenarial grooves; mouth broadly arched, with small labial furrows on lower jaw only; corners of mouth about opposite outer corners of head; teeth triangular, deeply notched posteriorly, usually with smooth-edged cusps (sometimes slightly serrate in large individuals), mostly cuspidate, not keeled and molariform. Fifth gill slit shorter than the four preceding ones, and located posterior to pectoral-fin origins. First dorsal fin high and moderately falcate, with its origin above or just behind level of pectoral-fin insertions, its free rear tip not very slender and ending well anterior to pelvic-fin origins, and its inner margin about one third the length of the fin-base; free rear tip of first dorsal fin well anterior to pelvic-fin origins; second dorsal fin small, less than 0.25 of the height of first dorsal fin, with a greatly elongated free rear tip extending backward nearly to upper precaudal pit, inner margin about twice as long as anterior margin, and a shallowly concave posterior margin; anal fin strongly falcate, its base moderately short and 1.3 to 1.6 times second dorsal-fin base and its posterior margin deeply notched; pectoral fins short, broad and slightly falcate, their posterior margins weakly concave; pelvic fins with a nearly straight posterior margin. **Colour:** uniform grey, greyish brown or olivaceous above, shading to white below; pectoral fins tipped grey or black below.**



Size: Maximum total length at about 4.2 m; commonly to 3.6 m; size at birth between 42 and 55 cm; males maturing at 140 to 165 cm and females at about 212 cm.

Habitat, biology, and fisheries: The most common hammerhead in the area, estuarine and inshore to well offshore and semi-oceanic at or near the surface, with young mostly in coastal waters including estuaries. Individuals solitary, in pairs, or in small to huge schools. A powerful swimmer performing extensive migrations. Number of young 15 to 31 per litter. Feeds on pelagic fishes, other sharks, rays, squids, lobsters, shrimps, and crabs. Probably the most abundant tropical hammerhead, readily available to inshore artisanal and small commercial fisheries as well as to offshore operations. Caught mostly with pelagic and fixed bottom longlines and drift gill nets, but also other gear; the young are easily caught on light longline gear. The meat is utilized fresh, fresh-frozen, dried-salted, and smoked for human consumption; the fins are used to prepare shark-fin soup base and are of high value, especially from large individuals; the hides are used for leather, the oil for vitamins, and carcasses for fish meal. This species forms the bulk of the commercial hammerhead catch off the USA in the area, and probably of most other countries in Area 31 and possibly worldwide. It is regarded as being highly vulnerable and overfished off the USA, with catches dropping to less than a fourth of initial catches during the past decade and a half. Adults are often unaggressive or timid when approached by divers, and are popular subjects for ecotouristic diving worldwide including the Bahamas in the area. Small and medium-sized individuals make spectacular aquarium displays, and are kept by public aquaria in the area and elsewhere.

Distribution: Essentially circumglobal in coastal warm temperate and tropical seas.

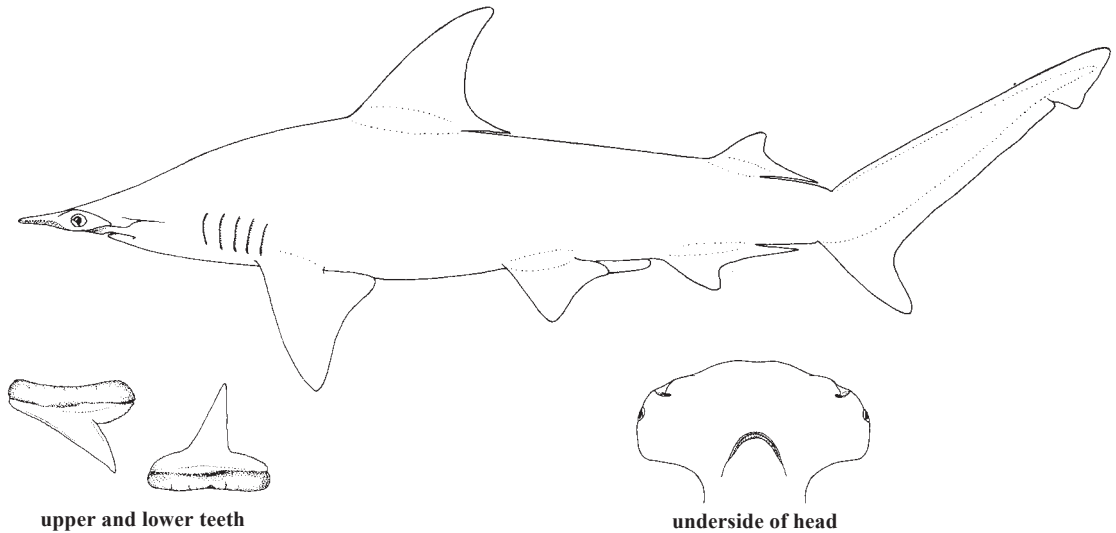


Sphyrna media Springer, 1940

SPE

Frequent synonyms / misidentifications: *Sphyrna nana* Sadowsky, 1965 / None.

FAO names: En - Scoophead; Fr - Requin-marteau écope; Sp - Cornuda cuchara.

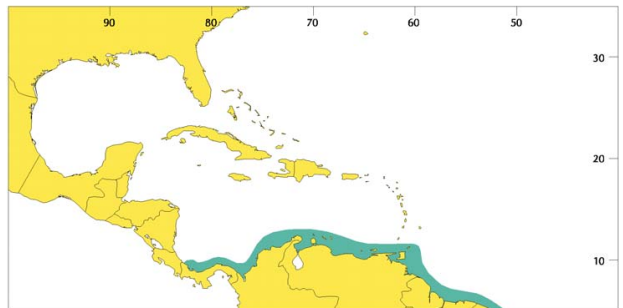


Diagnostic characters: Body elongate and laterally compressed. Head mallet-shaped, its anterior contour broadly arched, with a shallow and indistinct indentation at the midline and a weak depression opposite each nostril; lateral expansions of head very prominent, moderately broad transversely and broad from front to back; eyes small, their horizontal diameter less than length of shortest (fifth) gill slit, posterior margins of eyes slightly anterior to front of mouth; nostrils with prenarial grooves weak or absent; mouth broadly arched, with small labial furrows on lower jaw only; corners of mouth behind outer corners of head; teeth triangular, deeply notched posteriorly, with very narrow smooth-edged cusps, mostly cuspidate, not keeled and molariform. Fifth gill slit about as large as the 4 preceding ones, and located posterior to pectoral-fin origins. First dorsal fin high, moderately falcate, with its origin just behind level of pectoral-fin insertions, its free rear tip slender and ending over the pelvic-fin origins, and its inner margin slightly longer than the fin base; free rear tip of first dorsal fin over pelvic-fin origins; second dorsal fin fairly large, almost a third the height of first dorsal fin, with a greatly elongated free rear tip extending backward nearly to upper precaudal pit, inner margin of second dorsal fin about twice as long as second dorsal-fin anterior margin, and a shallowly concave posterior margin; anal fin semifalcate, its base moderately long and nearly twice length of second dorsal-fin base and its posterior margin shallowly concave; pectoral fins short, broad, and triangular, their posterior margins nearly straight; pelvic fins with nearly straight posterior margins. **Colour:** grey-brown above, light below, fins unmarked.

Size: Maximum total length to about 150 cm; size at birth 34 cm or less: adults 90 to 100 cm long or more.

Habitat, biology, and fisheries: A little-known inshore tropical hammerhead of the American continental shelves. Biology little known. Interest to fisheries limited. Taken with bottom longlines and utilized fresh for human consumption and for fish meal. Conservation status uncertain.

Distribution: Western Atlantic: Panama to southern Brazil. Eastern Pacific: Gulf of California to Ecuador and probably northern Peru.



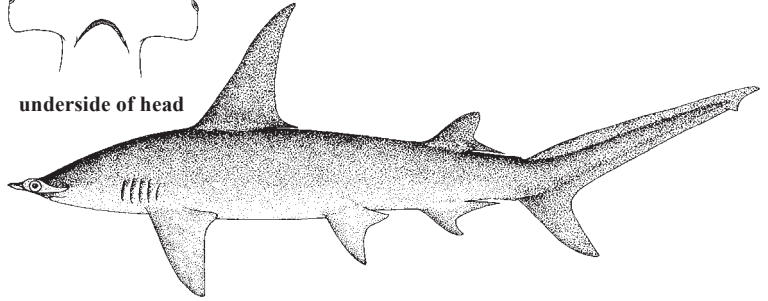
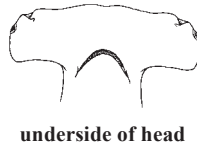
***Sphyrna mokarran* (Rüppell, 1837)**

SPK

Frequent synonyms / misidentifications: None / *Sphyrna lewini* (Griffith and Smith, 1834), *Sphyrna zygaena* (Linnaeus, 1758), *Sphyrna tudes* (Valenciennes, 1822).

FAO names: En - Great hammer-head; Fr - Grand requin-marteau; Sp - Cornuda gigante.

Diagnostic characters: Body elongate and laterally compressed. **Head hammer-shaped, its anterior contour moderately arched in young but nearly straight in adults, with a shallow but distinct indentation at the midline and a shallow rounded depression opposite each nostril; lateral expansions of head very prominent, broad transversely and narrow from front to back; nostrils with weak**

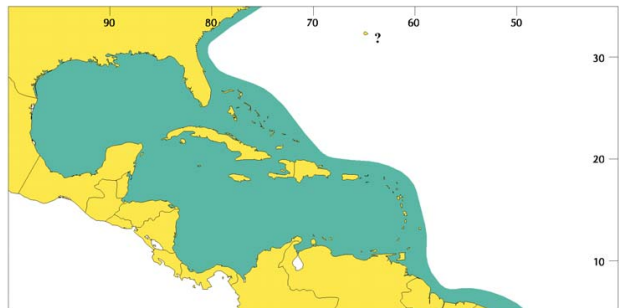


prealar grooves; eyes small, their horizontal diameter much less than length of shortest (fifth) gill slit, posterior margins of eyes well anterior to mouth; mouth broadly arched, with small labial furrows on lower jaw only; corners of mouth about opposite or behind outer corners of head; teeth triangular, deeply notched posteriorly, with strongly serrated edges, mostly cuspidate and with posterior teeth not keeled and molariform. Fifth gill slit shorter than the 4 preceding ones, and located posterior to pectoral-fin origins. First dorsal fin very high, strongly falcate, with its origin above or just behind level of pectoral-fin insertions, its free rear tip not very slender and ending well anterior to pelvic-fin origins, and its inner margin less than a third of the fin-base length; second dorsal fin very large and tall (for a sphyrnid), with a moderately short inner margin about equal to the second dorsal-fin anterior margin, a free rear tip ending well anterior to the upper precaudal pit, and a deeply concave posterior margin; anal fin strongly falcate, its base about as long as second dorsal-fin base and its posterior margin deeply notched; pectoral fins short, broad, and strongly falcate, their posterior margins strongly concave; pelvic fins with deeply concave posterior margins. **Colour: grey or grey-brown above, paler below; fins with dusky tips in young.**

Size: Maximum total length to at least 5.5 or 6.0 m, and possibly greater; commonly between 2.4 and 3.7 m; size at birth between 60 and 70 cm; males maturing at about 234 to 269 cm, females at about 250 to 300 cm.

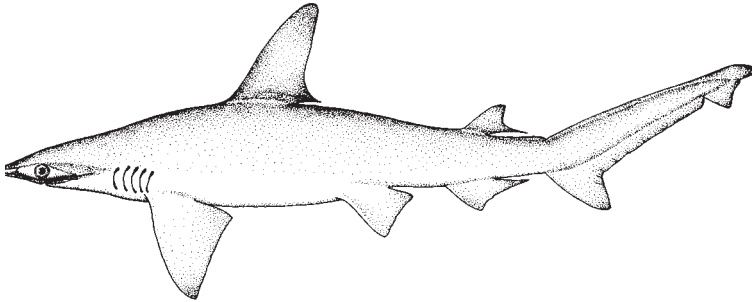
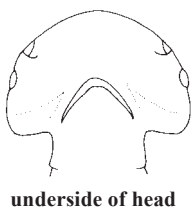
Habitat, biology, and fisheries: Powerful coastal and semi-oceanic species coming close inshore, often around and on coral reefs; also occurring near surface over deep water not far from land. Number of young 18 to 38 per litter. Feeds on a wide variety of bony fishes as well as other sharks, rays, squids, crabs, and lobsters. Although less abundant than *Sphyrna lewini*, it is regularly caught in the tropics, with longlines and other gear. Utilized for its meat, fresh, fresh-frozen, dried-salted, and smoked; for hides, processed into leather; for fins used for shark-fin soup base, which are highly valuable and are bought for higher prices than those of other hammerheads; for liver oil, processed for vitamins, and carcasses for fish meal. Regarded as potentially hazardous to people in the water, but few biting incidents reported and it is often docile and unaggressive when confronted by divers. Sought by ecotouristic divers worldwide, including those in the area. Its conservation status is of concern because of its large size, relative scarcity compared to other large hammerheads, extremely high fin value (which promotes 'finning' or removal of fins from the sharks and discarding carcasses at sea), lack of species-specific catch statistics, vulnerability to gill nets, lower fecundity compared to other large hammerheads, and presence as a complementary bycatch (for fins) in major off-shore longline fisheries in the area that target tuna and swordfish.

Distribution: Essentially circumglobal in coastal and offshore warm temperate and tropical seas. Wide-ranging in the western Atlantic from North Carolina to Brazil, including the Gulf of Mexico and Caribbean.



Sphyrna tiburo (Linnaeus, 1758)

SPJ

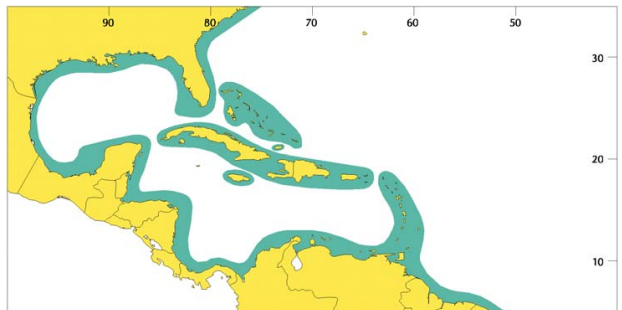
Frequent synonyms / misidentifications: None / None.**FAO names:** En - Bonnethead; Fr - Requin-marteau tiburo; Sp - Cornuda decorona.

Diagnostic characters: Body elongate and laterally compressed. Head flattened dorsoventrally and shovel- or bonnet-shaped, its anterior contour evenly rounded, not indented at midline or opposite the nostrils; lateral expansions of head relatively short (greatest width of head about 21% of total length but over 22% in other hammerheads); nostrils without prenarial grooves; eyes small, their horizontal diameter much less than length of shortest (fifth) gill slit, rear edges of eyes about opposite mouth; mouth strongly arched, corners of mouth in front of outer corners of head; teeth rather small and smooth-edged, rear teeth modified as broad, cuspless, carinate, molariform crushers. First and fifth pairs of gill slits about as long as second to fourth, the fifth gill slits located above the pectoral-fin origins. First dorsal fin high and moderately falcate, with its origin well behind the level of pectoral-fin insertions, its free rear tip slender and ending well anterior to pelvic-fin origins, and its inner margin less than one third the length of the fin base; second dorsal fin much smaller than first dorsal fin, its free rear tip very slender but ending somewhat anterior to upper precaudal pit, and a shallowly concave posterior margin; anal fin hardly falcate, its base nearly twice as long as second dorsal-fin base and with its posterior margin only slightly concave; pectoral fins broad, short, and triangular, their posterior margins nearly straight; pelvic fins with nearly straight posterior margins. **Colour:** grey or greyish brown above; paler to almost white below.

Size: Maximum total length to about 150 cm; common to 80 cm; size at birth 35 to 40 cm; males maturing between 52 and 75 cm, females at 84 cm or less.

Habitat, biology, and fisheries: Inhabits shallow coastal waters over sandy and muddy bottoms, from intertidal down to 80 m; common in river estuaries and also on coral reefs. A sluggish species, often preyed upon by larger sharks. Number of young 4 to 16 per litter. Feeds chiefly on crustaceans, especially crabs and shrimps; to a lesser extent on clams, octopi, and small fishes. No targeted fishery but often taken on shrimp grounds throughout its range or as part of inshore directed small-shark fisheries. Separate statistics not reported. Caught mainly with shrimp trawls; also with trammel nets, and occasionally on hook-and-line. Marketed fresh or salted. Conservation status may be of less concern than with big hammerheads off the USA because it is not specifically targeted, has a lower value than the larger species, and occurs close inshore beyond the range of intensive offshore fisheries. Bycatch from shrimp trawlers has not declined off the USA in the Gulf of Mexico over the past 2 decades. Although small, sought in the area by ecotouristic divers. The best known hammerhead for public aquarium displays, being hardy and easily kept, and is displayed by many aquaria in the area and elsewhere.

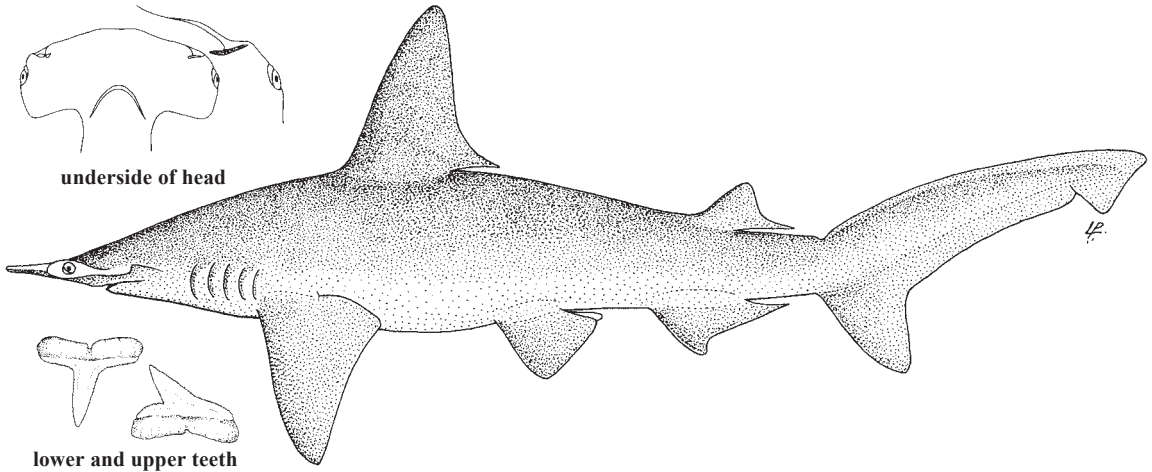
Distribution: Western Atlantic and eastern Pacific. Occurs throughout the area, including Bermuda (rare); extending northward to New England (Nantucket Sound) and southward to northern Argentina. Very abundant in the northern Gulf of Mexico, over the continental shelf of western Florida, on the Campeche Bank, along the southeast coast of Cuba and off the Guyanas. A similar bonnethead shark occurs along the eastern Pacific coast from southern California, USA, to Ecuador. It has been recognized as a separate species (*Sphyrna vespertina*), or as an allopatric subspecies of *S. tiburo*.



Sphyrna tudes* (Valenciennes, 1822)*SPQ**

Frequent synonyms / misidentifications: *Sphyrna bigelowi* Springer, 1944 / *Sphyrna mokarran* (Rüppell, 1837).

FAO names: En - Smalleye hammerhead; Fr - Requin-marteau à petits yeux; Sp - Cornuda ojichica.

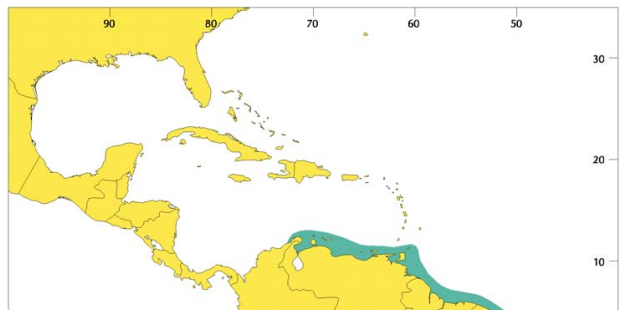


Diagnostic characters: Body elongate and laterally compressed. **Head mallet-shaped, its anterior contour broadly arched, with a shallow but distinct indentation at the midline** and a shallow rounded depression opposite each nostril; lateral expansions of head very prominent, broad transversely and broad from front to back; eyes small, their horizontal diameter much less than length of gill slits, **rear margins of eyes well in front of mouth; nostrils with strong prenarial grooves**; mouth narrowly arched, with small labial furrows on lower jaw only; corners of mouth behind outer corners of head; teeth triangular, deeply notched posteriorly, **with slender smooth-edged cusps, mostly cuspidate, posterior teeth not keeled and molariform**. Fifth gill slit about as long as the 4 preceding ones, and located posterior to pectoral-fin origin. First dorsal fin high, slightly falcate, **with its origin just behind level of pectoral-fin insertions, a slender free rear tip that extends over the pelvic-fin origins, and a short inner margin about one third the length of the fin base**; second dorsal fin moderately high, about 0.25 as high as first, with a moderately elongated free rear tip ending well in front of upper precaudal pit, an inner margin about as long as the anterior margin, and a shallowly concave posterior margin; anal fin weakly falcate, its base moderately long and about twice length of second dorsal-fin base; pectoral fins short, broad and weakly falcate, with slightly concave posterior margins; pelvic fins with straight posterior margins. **Colour:** grey-brown above, sometimes golden, light below, fins without markings.

Size: Maximum total length said to reach 150 cm, but mostly to 122 cm or less; size at birth about 30 cm; adults about 110 to 150 cm.

Habitat, biology, and fisheries: Inshore on continental shelves, found from 9 to 40 m. Viviparous, number of young 5 to 12 per litter. Feeds on small bony fishes, young sharks, crabs, squids, and shrimps. Interest to fisheries important but localized in the area. Rare to abundant, taken in coastal fisheries, but with details of gear and utilization usually not reported. Reported very common off the Guianas and off Trinidad in the western Atlantic but uncommon elsewhere. A large gill-net fishery operated off Trinidad in the 1980s for local consumption of this shark and others, but it was depleted locally after a decade. Conservation status of concern because of low fecundity, restricted range, and inshore habitat, which is subject to heavy artisanal fisheries.

Distribution: Western Atlantic: Venezuela to Uruguay. Records of this species from off Mississippi in the northern Gulf of Mexico were probably incorrect. An early Mediterranean record of this shark may also be incorrect.

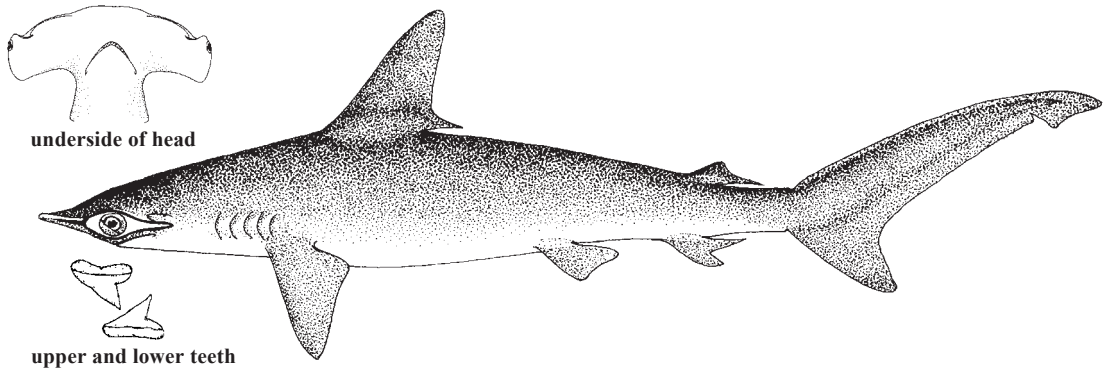


***Sphyrna zygaena* (Linnaeus, 1758)**

SPZ

Frequent synonyms / misidentifications: None / *Sphyrna lewini* (Griffith and Smith, 1834), *Sphyrna mokarran* (Rüppell, 1837).

FAO names: En - Smooth hammerhead; Fr - Requin-marteau commun; Sp - Cornuda cruz.

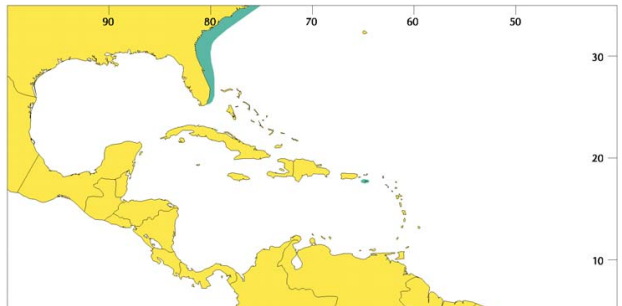


Diagnostic characters: Body elongated and laterally compressed. Head hammer-shaped, its anterior contour strongly arched in young but moderately rounded in adults, without a median indentation but with a deep rounded depression opposite each nostril; lateral expansions of head very prominent, broad transversely and narrow from front to back; eyes large (their horizontal diameter almost equal to length of shortest (fifth) gill slits, their posterior margins about opposite mouth or just anterior to it; nostrils with strong prenasal grooves; eyes large, their horizontal diameter greater than length of shortest (fifth) gill slits; mouth broadly arched, with small labial furrows on lower jaw only, corners of mouth anterior or about opposite to outer corners of head; teeth triangular, deeply notched posteriorly, with smooth or weakly serrated edges, mostly cuspidate, and with posterior teeth not keeled and molariform. Fifth gill slits shorter than the 4 preceding ones, and located posterior to pectoral-fin origins. First dorsal fin high, moderately falcate, with its origin above or just behind level of pectoral-fin insertions with its free rear tip not very slender and ending well anterior to the pelvic-fin origins and its inner margin less than 1/3 the length of its base; second dorsal fin small, with a very long inner margin almost twice the length of its anterior margin, a free rear tip ending well anterior to upper precaudal pit, and a nearly straight to shallowly concave posterior margin; anal fin falcate, with base slightly longer than second dorsal-fin base and a deeply notched posterior margin; pectoral fins short, broad, and slightly falcate, with weakly concave or nearly straight posterior margins; pelvic fins with straight to shallowly concave posterior margins. **Colour:** brownish olive or plain grey above, white or grey-white below; fins nearly plain, dusky, or blackish-tipped.

Size: Maximum total length probably between 3.7 and 4 m, commonly between 2.75 and 3.35 m; size at birth between 50 and 60 cm; adults maturing at about 210 to 240 cm.

Habitat, biology, and fisheries: Common to abundant coastal and semi-oceanic, living close inshore (especially the young) and near surface in deep water not far offshore. A strong-swimming shark, migrating northward in summer; young often found in large schools of hundreds of individuals. Number of young 29 to 37 per litter. Feeds on bony fishes, other sharks, rays, crustaceans, and squids. Caught with pelagic longlines, handlines, and even pelagic and bottom trawls. Utilized fresh, dried-salted, and possibly smoked; hides are processed for leather; liver oil is extracted for vitamins; fins are processed into shark-fin soup base; and carcasses utilized for fish meal. Conservation status uncertain because of this species being confused with other species, particularly *Sphyrna lewini*, but of concern as with that species because of heavy fisheries where it occurs. It is uncertain if this shark figures in shark viewing within the area.

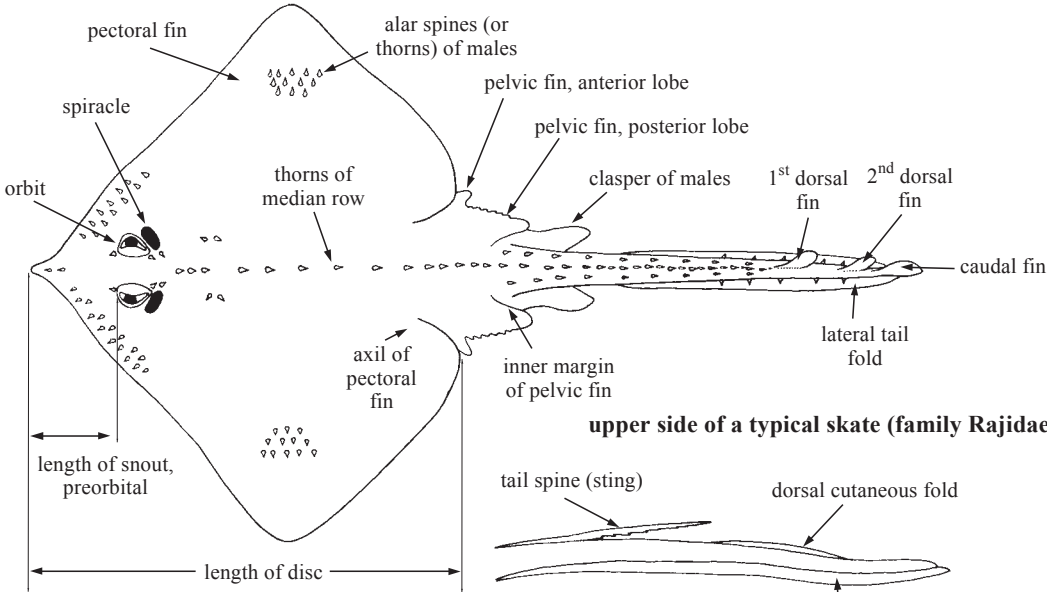
Distribution: Essentially circumglobal in temperate and tropical seas; in the area, Nova Scotia to Florida and the Virgin Islands; also northeastern Brazil to Argentina. Not recorded in the Gulf of Mexico. Possibly more wide-ranging in the area.



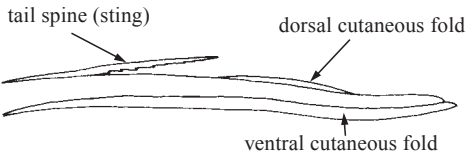
BATOID FISHES

by J.D. McEachran, Texas A & M University, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

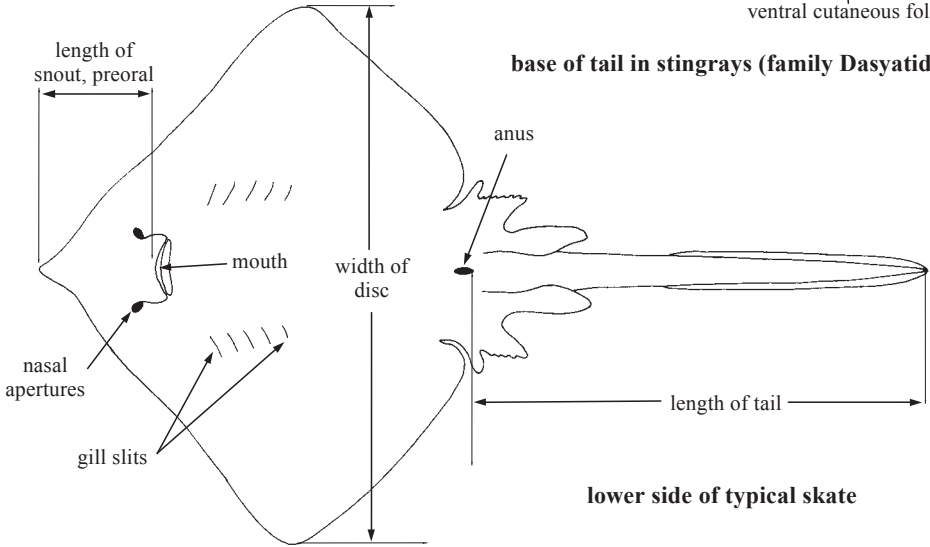
TECHNICAL TERMS AND MEASUREMENTS
(straight-line distances)



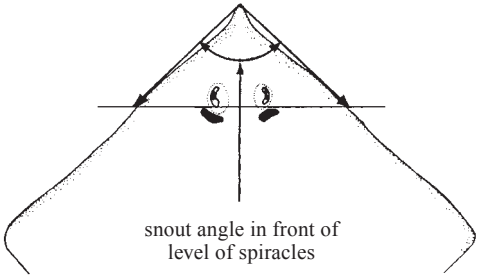
upper side of a typical skate (family Rajidae)



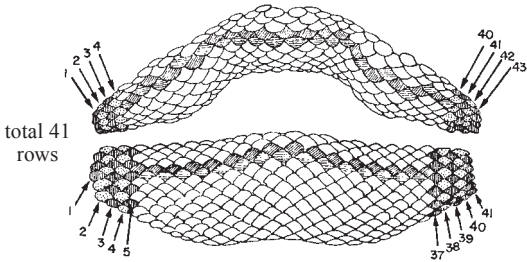
base of tail in stingrays (family Dasyatidae)



lower side of typical skate



anterior part of disc of a skate



teeth of a stingray
(arrows indicate method of counting pavement pattern in batoids)

GENERAL REMARKS

Batoid fishes are moderately to greatly flattened and are distinguished from the other elasmobranchs (sharks) by their ventral gill slits, their lack of an anal fin, and by having the pectoral fins connected to the sides of the head and trunk to form a disc. The eyes and well-developed spiracles are usually located on the dorsal surface of the head, these are secondarily located on the sides of the head in the more pelagic rays, and eyes are vestigial in a few electric rays. Sawfishes and guitarfishes are shark-like, in being only moderately flattened and laterally expanded, with pectoral fins uniting anteriorly to the sides of the head. They possess relatively stout tails that are not clearly demarcated from the disc, and well-developed caudal fins. These forms, like sharks, swim by laterally undulating their trunk musculature. Electric rays, skates, and stingrays are greatly flattened and laterally expanded, with the pectoral fins united anteriorly with the sides of the snout. They possess a slender tail that is clearly demarcated from the disc, so the head and trunk thus form a circular, ovate, or rhombic disc. These forms swim by vertically undulating or oscillating their discs. The mouth and nostrils are ventrally or subterminally located in all batoids except they are terminal in *Manta*. The majority of the batoids have 2 dorsal fins, but some electric rays, skates, and stingrays have either a single dorsal fin or no dorsal fins. Jaw teeth are arranged in transverse rows, and like sharks are constantly replaced from inside the mouth; teeth are laterally fused to form large tooth plates in some of the more pelagic rays. Batoids vary from being more or less evenly covered with tooth-like placoid scales or dermal denticles (occasionally enlarged into thorns, bucklers, or spines) to completely lacking scales and scale-like structures.

Batoids, like sharks, have cylindrical copulatory organs or claspers derived from pelvic girdle cartilages that are used for internal fertilization of eggs in females. All batoids, except skates, are viviparous without placentas. Fetuses of sawfishes and guitarfishes are nourished by contents of the yolk sacs but fetuses of stingrays are furnished with histotroph or uterine milk after they exhaust the contents of their yolk sacs. Skates, on the other hand, are oviparous, and deposit the fertilized eggs in rectangular, horn-like egg capsules that are deposited on the bottom.

Batoids vary greatly in size, ranging in total length from about 13 to 20 cm, in some electric rays (Narcinidae) and skates, to over 7 m in sawfishes; some species may reach a disc width of about 6.1 m (manta rays); and ranging in weight from 10 to 20 g to between 1 and 3 t. Most batoids are small to moderate in size, below 1 m and 60 cm wide.

Most batoids are generalized benthic predators that lack specialized food capturing and processing structures. These generalists consume a wide variety of infaunal and epifaunal benthic organisms ranging from polychaetes and other soft-bodied invertebrates to relatively small ray-finned fishes. Some electric rays (Torpedinidae) use their electric organs to stun large fishes that are swallowed whole; sawfishes use their rostral saws to disable or kill schooling fishes; and eagle rays and cownose rays use their plate-like teeth to crush hard-shelled organisms such as oysters and clams. Manta rays have specialized filter plates associated with their gill arches and feed on zooplankton and nekton. Although primarily marine animals, batoids are also found in brackish estuaries and lagoons or rivers, but only 1 family of rays, the Potamotrygonidae, is confined to fresh waters (South American rivers draining into the Atlantic Ocean). Batoids are widely distributed in all oceans, from the Arctic to the Antarctic and from shallow coastal waters to great depths. Skates have the greatest latitude and depth ranges, with representatives at most latitudes and depths to about 2 000 m, but are rare in tropical shallow waters and coral reef areas. Some electric rays (Torpedinidae) are also abundant in temperate latitudes; but all remaining batoid families are restricted to tropical and warm-temperate areas, and show a preference for relatively shallow waters; moreover, some of these families are confined to particular, well-defined geographical regions. The living batoids are grouped into 20 families, 72 genera and 513 described species, about 232 of which are in the Rajidae. Batoid fishes known from the Western Central Atlantic represent 11 families, 31 genera and 74 species. Although apparently none are the object of a special fishery, many species are a regular item in the bycatch resulting from other fisheries and some are sufficiently abundant and tasty to be exploited more or less regularly in small-scale coastal fisheries. The catch of batoids reported from Area 31 ranged from 7 591 to 9 886 t between 1995 and 1999, but the actual catch is probably considerably higher. The flesh (of the disc) is usually salted, while other parts are used in the preparation of gelatin and oil.

KEY TO FAMILIES OCCURRING IN THE AREA

- 1a. Body shark-like, only moderately depressed; pectoral fins moderately enlarged; tail not distinctly demarcated from trunk or disc → 2
- 1b. Body distinctly depressed, pectoral fins broadly enlarged; tail more or less distinctly demarcated from trunk or disc → 3
- 2a. Snout extremely prolonged as a flat, narrow, firm blade, edges of which are armed with a single series of large tooth-like structures (Fig. 1) **Pristidae**
- 2b. Snout wedge-shaped and variously prolonged (Fig. 2), but not as a blade and without lateral teeth **Rhinobatidae**

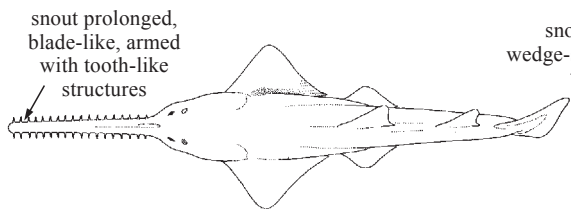


Fig. 1 Pristidae

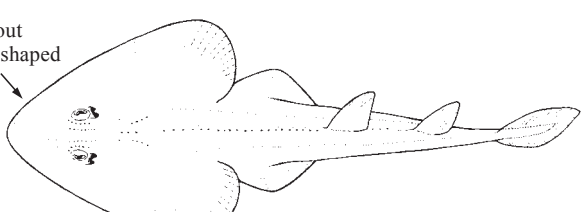


Fig. 2 Rhinobatidae

- 3a. Tail variable in shape and length, with or without armature of prickles, thorns, and spines; if armed, no single greatly enlarged and serrated spines; pseudobranchial folds present at anterior wall of spiracles (Fig. 3-5) → 4
- 3b. Tail variable in shape and length; in many cases very long and whip-like distally; upper surface of tail usually with 1 or more greatly enlarged and serrated spines; no pseudobranchial folds at anterior wall of spiracles → 6

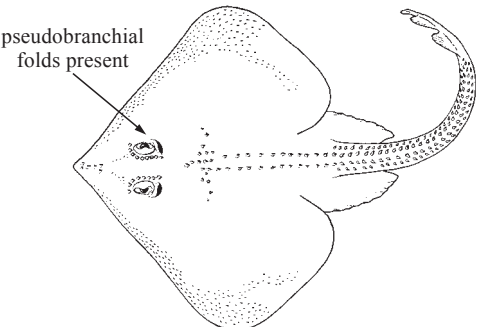


Fig. 3 Rajidae

- 4a. Margins of disc thick and fleshy; consistency of body soft and flabby; well-developed electric organs along sides of head within anterior part of disc, giving overlying skin honeycomb appearance (Fig. 4, 5) → 5
- 4b. Disc not fleshy toward margins; consistency of body mostly firm; electric organs, if present, in the tail region only; skin over anterior part of disc not honeycomb in appearance (Fig. 3) . . . **Rajidae**

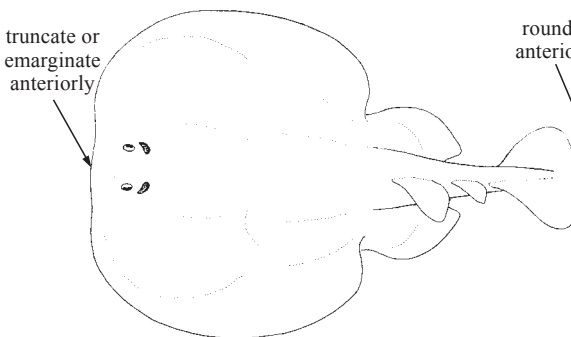


Fig. 4 Torpedinidae

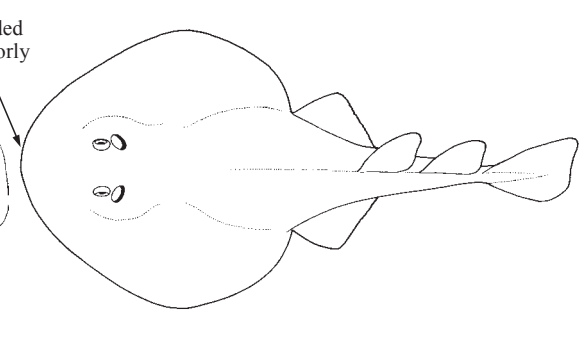
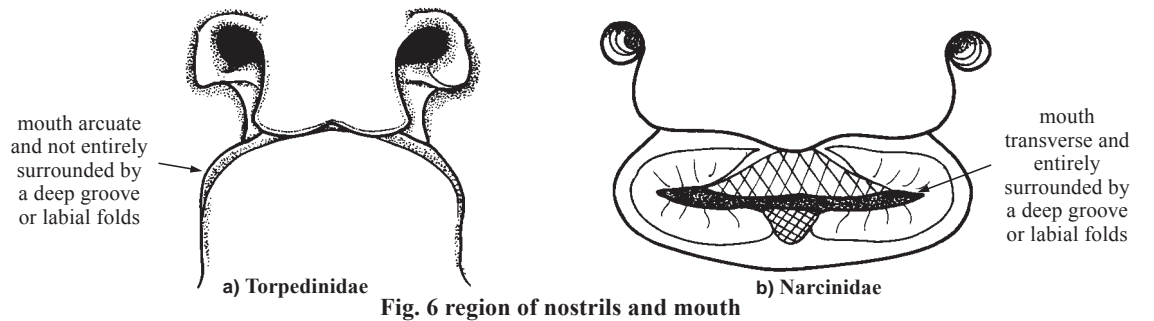
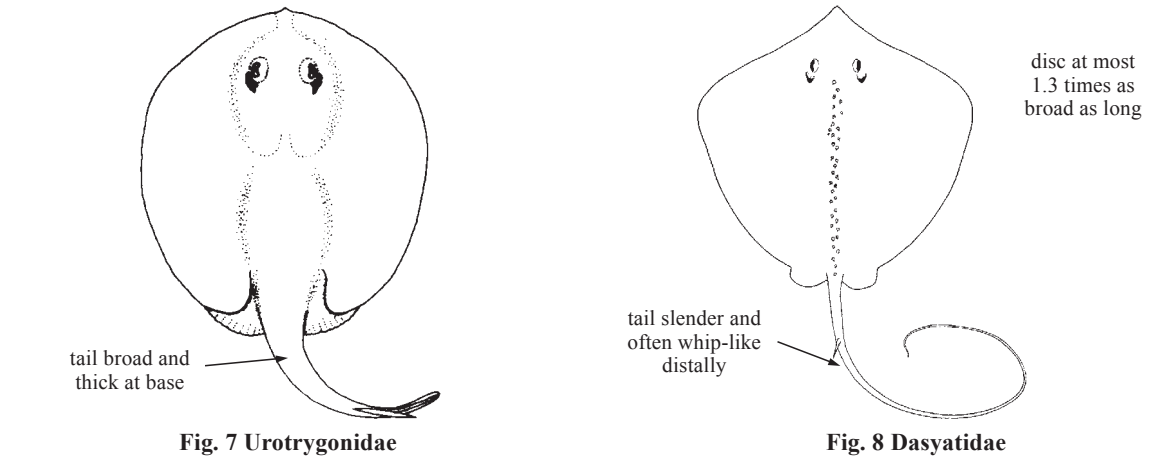


Fig. 5 Narcinidae

- 5a. Mouth arcuate and not entirely surrounded by a deep groove or labial folds (Fig. 6a); shape of disc truncate or emarginate anteriorly (Fig. 4)
- 5b. Mouth transverse and entirely surrounded by a deep groove or labial folds (Fig. 6b); shape of disc rounded anteriorly (Fig. 5).
- Torpedinidae
- Narcinidae

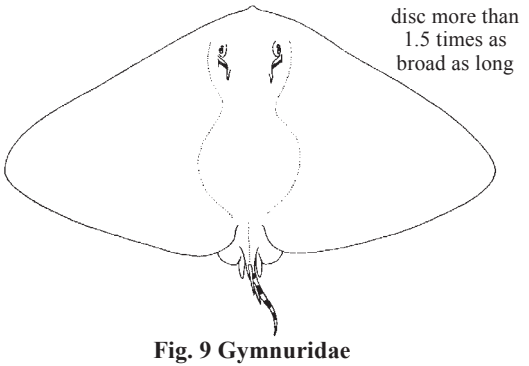


- 6a. Caudal fin well developed, supported by cartilaginous radials; tail broad and thick at base and not whip-like distally (Fig. 7)
- 6b. Caudal fin absent, or represented by dorsal and ventral longitudinal folds; tail very slender and often whip-like distally (Fig. 8-12) → 7
- Urotrygonidae



- 7a. Eyes and spiracles on top of head; head part of disc, anterior margins of pectoral fins continuous along sides of head; no separate cephalic fins or rostral lobes → 8
- 7b. Eyes and spiracles on sides of head; head distinctly demarcated from body, or anterior margins of pectoral fins forming separate lobes or fins → 9

- 8a. Disc at most 1.3 times as broad as long (Fig. 8); tail (if complete) much longer than disc width; transverse parts of nasal curtains with fringed margins; floor of mouth with several fleshy papillae
- 8b. Disc more than 1.5 times as broad as long (Fig. 9); tail distinctly shorter than disc width; transverse parts of nasal curtains smooth-edged; no papillae on floor of mouth
- Dasyatidae
- Gymnuridae



- 9a. Anterior subdivisions of pectoral fins forming 2 thin and widely separated cephalic fins (Fig. 10); teeth minute and in bands of many series in 1 or both jaws **Mobulidae**
- 9b. Anterior parts of pectoral fins forming 1 fleshy lobe extending below front of head, or this lobe with a more or less deep median notch, thus forming 2 basally connected lobes (Fig. 11,12); teeth large, flat, and in a few series only (Fig. 13) → 10

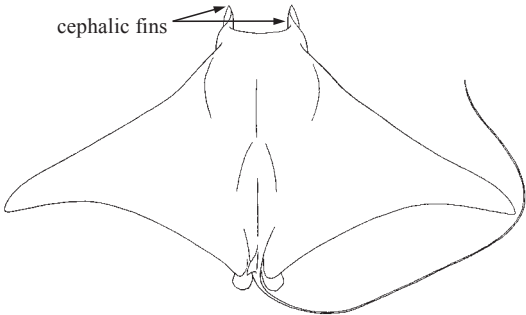


Fig. 10 Mobulidae

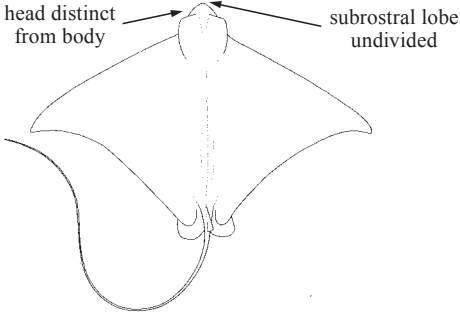


Fig. 11 Myliobatidae

- 10a. Subrostral lobe undivided (Fig. 11); floor of mouth with several fleshy papillae **Myliobatidae**
- 10b. Subrostral lobe deeply incised at midline, thus forming 2 basally continuous lobes (Fig. 12); floor of mouth without papillae **Rhinopteridae**

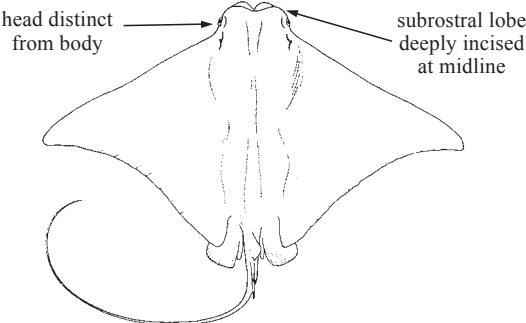


Fig. 12 Rhinopteridae

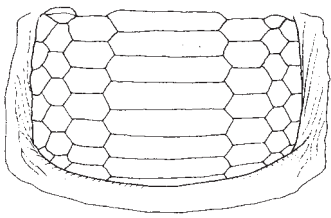


Fig. 13 Rhinopteridae upper jaw teeth

LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

The symbol ♠ is given when species accounts are included.

TORPEDINIDAE: Electric rays, torpedoes

- ♠ *Torpedo andersoni* Bullis, 1962.
- ♠ *Torpedo nobiliana* Bonaparte, 1835.

NARCINIDAE

- ♠ *Benthobatis marcida* Bean and Weed, 1909.
- ♠ *Diplobatis colombiensis* Fechhelm and McEachran, 1984.
- ♠ *Diplobatis guamachensis* Martín, 1957.
- ♠ *Diplobatis pictus* Palmer, 1950.
- ♠ *Narcine bancroftii* (Griffith and Smith, 1834).
- ♠ *Narcine* sp.

PRISTIDAE: Sawfishes

- ♣ *Pristis pectinata* Latham, 1794.
- ♣ *Pristis pristis* (Linnaeus, 1758).

RHINOBATIDAE: Guitarfishes

- ♣ *Rhinobatos horkelii* Müller and Henle, 1841.
- ♣ *Rhinobatos lentiginosus* Garman, 1880.
- ♣ *Rhinobatos percellens* (Walbaum, 1792).

RAJIDAE: Skates

- ♣ *Anacanthobatis americanus* Bigelow and Schroeder, 1962.
- ♣ *Anacanthobatis folirostris* (Bigelow and Schroeder, 1951).
- ♣ *Anacanthobatis longirostris* Bigelow and Schroeder, 1962.
- ♣ *Amblyraja radiata* (Donovan, 1808).
- ♣ *Breviraja claramaculata* McEachran and Matheson, 1985.
- ♣ *Breviraja colesi* Bigelow and Schroeder, 1948.
- ♣ *Breviraja mouldi* McEachran and Matheson, 1995.
- ♣ *Breviraja nigriventralis* McEachran and Matheson, 1985.
- ♣ *Breviraja spinosa* Bigelow and Schroeder, 1950.
- ♣ *Cruriraja atlantis* Bigelow and Schroeder, 1948.
- ♣ *Cruriraja cadenati* Bigelow and Schroeder, 1962.
- ♣ *Cruriraja poeyi* Bigelow and Schroeder, 1948.
- ♣ *Cruriraja rugosa* Bigelow and Schroeder, 1958.
- ♣ *Dactylobatus armatus* Bean and Weed, 1909.
- ♣ *Dactylobatus clarkii* (Bigelow and Schroeder, 1958).
- ♣ *Dipturus bullisi* (Bigelow and Schroeder, 1962).
- ♣ *Dipturus garricki* (Bigelow and Schroeder, 1958).
- ♣ *Dipturus olseni* (Bigelow and Schroeder, 1951).
- ♣ *Dipturus oregoni* (Bigelow and Schroeder, 1958).
- ♣ *Dipturus teevani* (Bigelow and Schroeder, 1951).
- ♣ *Fenestraja atripinna* (Bigelow and Schroeder, 1950).
- ♣ *Fenestraja cubensis* (Bigelow and Schroeder, 1950).
- ♣ *Fenestraja ishiyamai* (Bigelow and Schroeder, 1962).
- ♣ *Fenestraja plutonia* (Garman, 1881).
- ♣ *Fenestraja sinusmexicanus* (Bigelow and Schroeder, 1950).
- ♣ *Gurgesiella atlantica* (Bigelow and Schroeder, 1962).
- ♣ *Gurgesiella dorsalifera* McEachran and Compagno, 1980.
- ♣ *Leucoraja garmani* (Whitley, 1939).
- ♣ *Leucoraja lentiginosa* (Bigelow and Schroeder, 1951).
- ♣ *Leucoraja yucatanensis* (Bigelow and Schroeder, 1950).
- ♣ *Malacoraja senta* (Garman, 1885).
- ♣ *Neoraja carolinensis* McEachran and Stehmann, 1984.
- ♣ *Pseudoraja fischeri* Bigelow and Schroeder, 1954.
- ♣ *Raja ackleyi* Garman, 1881.
- ♣ *Raja bahamensis* Bigelow and Schroeder, 1965.
- ♣ *Raja cervigoni* Bigelow and Schroeder, 1964.
- ♣ *Raja eglanteria* Bosc, 1800.
- ♣ *Raja texana* Chandler, 1921.
- ♣ *Rajella fuliginea* (Bigelow and Schroeder, 1954).
- ♣ *Rajella purpuriventralis* (Bigelow and Schroeder, 1962).

DASYATIDAE: Stingrays, whiprays

- ♣ *Dasyatis americana* Hildebrand and Schroeder, 1928.
- ♣ *Dasyatis centroura* (Mitchill, 1815).
- ♣ *Dasyatis geijskesi* Boeseman, 1948.
- ♣ *Dasyatis guttata* (Bloch and Schneider, 1801).
- ♣ *Dasyatis sabina* (Lesueur, 1824).
- ♣ *Dasyatis say* (Lesueur, 1817).
- ♣ *Himantura schmardae* (Werner, 1904).
- ♣ *Pteroplatytrygon violacea* (Bonaparte, 1832).

UROTRYGONIDAE:

- ♣ *Urobatis jamaicensis* (Cuvier, 1816).
- ♣ *Urotrygon microphthalmum* Delsman, 1941.
- ♣ *Urotrygon venezuelae* Schultz, 1949.

GYMNURIDAE: Butterfly rays

- ♣ *Gymnura altavela* (Linnaeus, 1758).
- ♣ *Gymnura micrura* (Bloch and Schneider, 1801).

MYLIOBATIDAE: Eagle rays

- ♣ *Aetobatus narinari* (Euphrasen, 1790).
- ♣ *Myliobatis freminvillii* Lesueur, 1824.
- ♣ *Myliobatis goodei* Garman, 1885.

RHINOPTERIDAE: Cownose rays

- ♣ *Rhinoptera bonasus* (Mitchill, 1815).
- ♣ *Rhinoptera brasiliensis* Müller, 1836.

MOBULIDAE: Devil rays and mantas

- ♣ *Manta birostris* (Walbaum, 1792).
- ♣ *Mobula hypostoma* (Bancroft, 1831).
- ♣ *Mobula tarapacana* (Philippi, 1893).

References

- Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In *Fishes of the Western North Atlantic*, Part 2 edited by J. Tee-Van, C.M. Breder, A.E. Parr, W.C. Schroeder, and L.P. Schultz. New Haven: *Sears Found. Mar. Res. Mem.*, 1.
- Compagno, L.J.V. 1973. Interrelationships of living elasmobranchs. In *Interrelationships of fishes*, edited by Greenwood, P.H., R.S. Miles, and C. Patterson. New York, Academic Press, pp. 15-61.
- Compagno, L.J.V. 1977. Phyletic relationships of living sharks and rays. *Amer. Zool.*, 17:303-322.
- McEachran, J.D., K.A. Dunn, and T. Miyake. 1996. Interrelationships of batoid fishes (Chondrichthyes: Batoidae). In *Interrelationships of fishes*, edited by M.L.J. Stiassny, L.R. Parenti, and G.D. Johnson. New York, Academic Press, pp. 63-84.
- McEachran, J.D. and K.A. Dunn. 1998. Phylogentic analysis of skates, a morphologically conservative clade of elasmobranchs (Chondrichthyes: Rajidae). *Copeia* (1998):271-290.

Order TORPEDINIFORMES

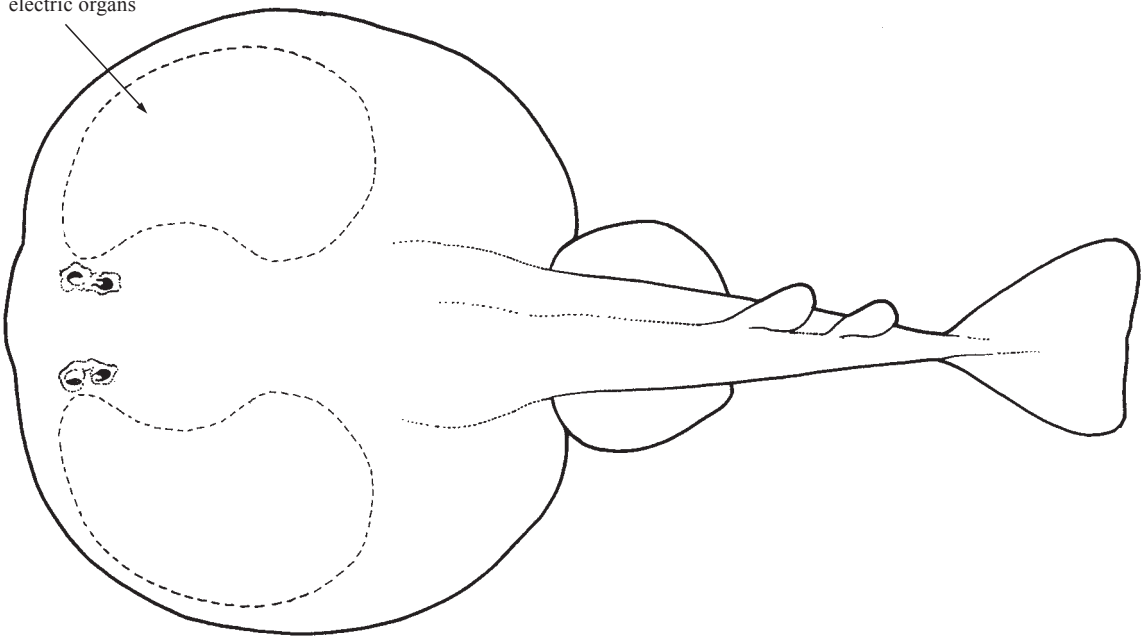
TORPEDINIDAE

Electric rays (torpedos, AFS: torpedo electric rays)

by J.D. McEachran, Texas A & M University, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoid fishes of small to moderately large size (total length to about 180 cm, but most species less than 100 cm in total length). Body very depressed, head, trunk and enlarged pectoral fins forming more or less circular disc. **Anterior contour of disc truncate or slightly arched**, snout extremely short. Eyes and spiracles small and close together on top of head. Posterior margin of spiracles smooth or with papillae; pseudobranchial folds present inside anterior spiracular border. Nostrils transverse and relatively large, closer to mouth than to snout; **anterior lobe expanded posteriorly and medially to form nasal curtain continuous in front of mouth, except for narrow isthmus, and with smooth posterior margin.** **Mouth of moderate size and usually arched, flanked by longitudinal furrows but without well-developed labial cartilages;** numerous monocuspid, small teeth in quincunx arrangement along each jaw. **Pectoral fins very thick near margin**, completely attached from sides of head to at least origin of pelvic fins. Tail very stout, not demarcated from disc, **distinctly shorter than disc length**, with cutaneous fold along lower lateral margin; **2 dorsal fins with first distinctly larger than second, and located partially or totally above pelvic-fin base; caudal fin large, subtriangular** and with upper and lower lobes continuous around vertebral column. **Skin very soft and naked. Two well-developed, kidney-shaped electric organs, visible externally on either side of head.** **Colour:** dorsal surface uniformly dark, or with various light and dark ornamentations (ocellae, spots, mottlings) on variable shades of brown; ventral surface whitish, disc and pelvic fins often with dark margin.

2 well-developed
electric organs



Habitat, biology, and fisheries: Electric rays inhabit continental shelves from tropical to temperate latitudes, to depths of 100 m, but most commonly occur in shallow water along coasts. Some, however, occur at depths to 360 m. Generally they are active on the bottom, frequently partially covering themselves with sand or mud to ambush prey. They may also be observed swimming slowly in the water column, where they may actively hunt by over swimming prey items. Some of the larger species may also make long migrations. Food consists of ray-finned fishes and invertebrates living on the bottom. The electric organs can discharge up to 45 volts, depending on the size of the ray, and are used to stun prey and to defend themselves against predators. All spe-

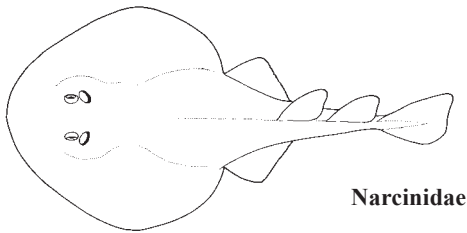
cies are viviparous without placentae. Two species occur in the area. They are caught as by-catch in trawls but have a low market acceptance and are not consumed regularly.

Similar families occurring in the area

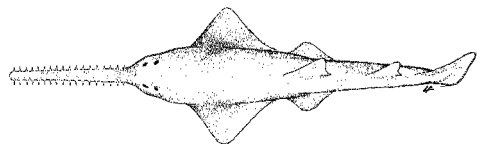
Narcinidae: mouth relatively narrow, not strongly arched, and protractile; upper and lower jaw bound together by labial cartilages; 2 equal-sized dorsal fins.

Pristidae, Rhinobatidae: body shark-like; margin of disc not thick, soft, or flaccid; pectoral fins generally only moderately expanded; partially or totally covered with scales (denticles).

Other rays: disc margin very thin; no electric organs in pectoral fins; tail slender to whip-like.



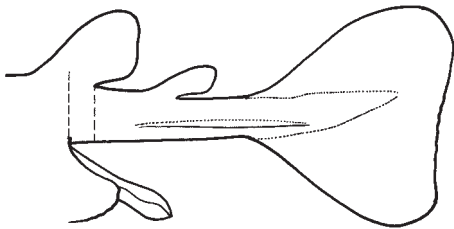
Narcinidae



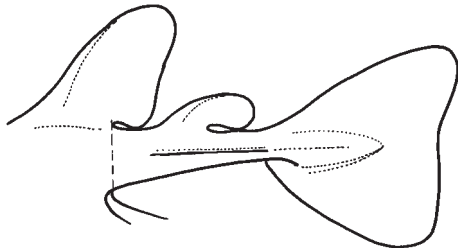
Pristidae

Key to the species of Torpedinidae occurring in the area

- 1a. First dorsal-fin base extends posterior to base on pelvic fin; upper body dark brown to purplish, either plain or with few darker, poorly defined blotches (Fig. 1a). *Torpedo nobiliana*
- 1b. First dorsal-fin base not extending posterior to pelvic-fin base; upper body light tan with small, irregular dark brown to reddish spots over disc and tail regions (Fig. 1b) . . . *Torpedo andersoni*



a) *Torpedo nobiliana*



b) *Torpedo andersoni*

Fig. 1 posterior fin positions

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Torpedo andersoni* Bullis, 1962.

 *Torpedo nobiliana* Bonaparte, 1835.

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the western North Atlantic. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Mem. Sears Found. Mar. Res.*, (1)Pt.2:588 p.

Bullis, H.R., Jr. 1962. A new species of *Torpedo* from the Florida Straits. *Bull Mar. Sci. Gulf Caribb.*, 12:61-65.

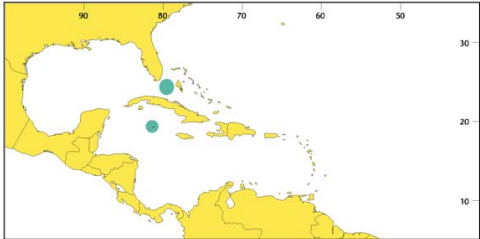
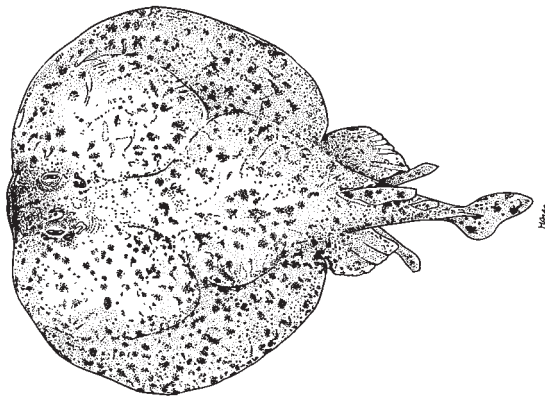
Castro-Aguirre, J.L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideiomorpha)*. Universidad Nacional Autónoma de México, 75 p.

McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1. Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.

Torpedo andersoni Bullis, 1962

En - Florida torpedo.

Maximum size 31 cm total length. Benthic on coral formations (Grand Cayman) in 11 m, and along the upper slope, at 229 m (Grand Bahama Bank). Known from the two type specimens (22 cm and 16 cm total length) from the western edge of the Grand Bahama Bank and photographic record from Grand Cayman Island. Dorsal surface light tan, with small, reddish tan blotches; ventral surface light cream coloured.

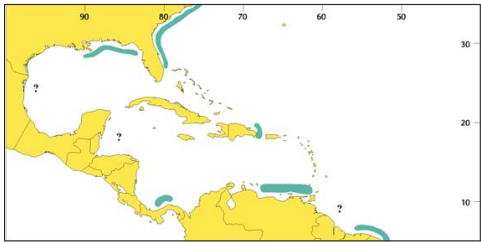
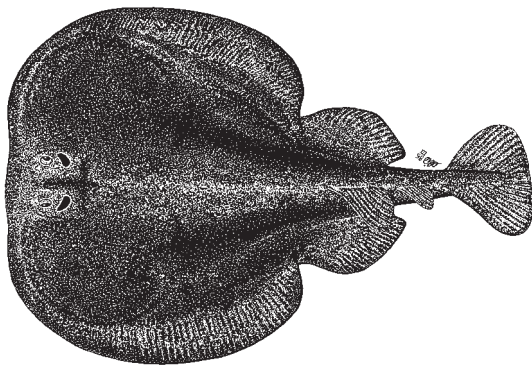


Torpedo nobiliana Bonaparte, 1835

TTO

En - Electric ray (AFS: Atlantic torpedo); **Fr** - Torpille noire; **Sp** - Tremolina negra.

Maximum size 180 cm total length; neonates 20 to 25 cm total length at birth. Up to 60 embryos in large females and gestation period about 1 year. Large female about 150 cm total length (98 cm in disc width) weighed 64 kg. Benthic, primarily on soft or muddy bottoms, along the continental shelf and upper slope, between shoreline and 530 m. Adults are frequently pelagic or semi-pelagic. Recorded from Nova Scotia to eastern Florida, northeastern Gulf of Mexico, Greater Antilles, Panama, and northern coast of South America. More abundant in temperate waters of the western North Atlantic than in area. Also recorded in eastern Atlantic and Mediterranean. Records from the Indian Ocean and South China Sea may refer to other species. Dorsal surface dark brown to purplish brown, with or without darker spots; ventral surface white. Food consists of a variety of fishes including small sharks, as well as invertebrates.

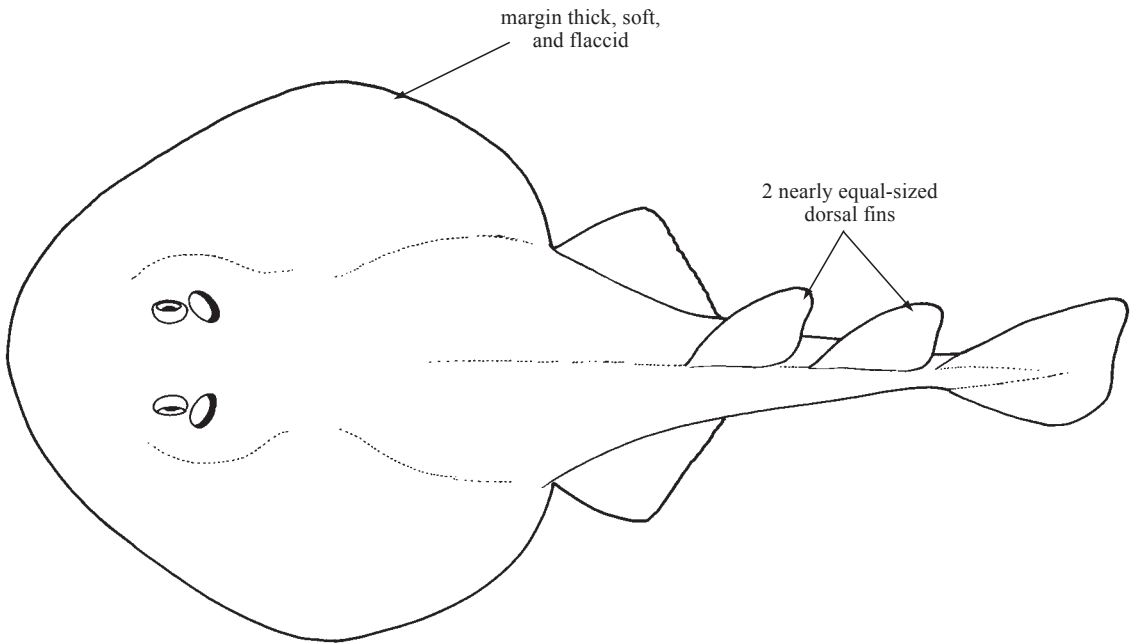


NARCINIDAE

Numbfishes (AFS: electric rays)

by J.D. McEachran, Texas A & M University, USA and
M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoids of small to moderate size (total length about 75 cm). Body very depressed, head, trunk, and enlarged pectoral fin forming elongate disc, **margin of disc moderately thick, soft, and flaccid. Anterior contour of disc rounded to obtuse**, snout moderately long, broad, and more or less evenly convex; eyes small and functional to minute and non-functional; spiracles small, close behind eyes and on top of head. Posterior spiracular margins smooth, irregular, or papillated; pseudobranchial folds inside anterior spiracular margins. Nostrils transverse and closer to mouth than to margin of snout; **anterior lobe of nostrils expanded posteriorly and medially to form nasal curtain that is continuous over narrow isthmus in front of mouth**. Mouth relatively small, **surrounded by groove, with well-developed labial cartilages and protractile into short tube**; numerous monocuspid small teeth arranged in band along each side of jaw. Pectoral fins relatively thick near margin and completely attached to sides of head to at least origin of pelvic fins. Tail moderately short, about equal to disc length. **Two large and more or less equal-sized dorsal fins, with first over or slightly posterior to base of pelvic fins**. Outer corners of pelvic fins subtriangular to broadly rounded; **caudal fin with upper and lower lobes continuous around vertebral column**. **Skin soft and naked. Electric organs well developed, kidney-shaped and visible on either side of head. Colour:** dorsal surface brown, olivaceous, grey, or reddish, and either plain or patterned with light or dark reticulations, vermiculations, bands, spots, or ocellae. Ventral surface whitish.



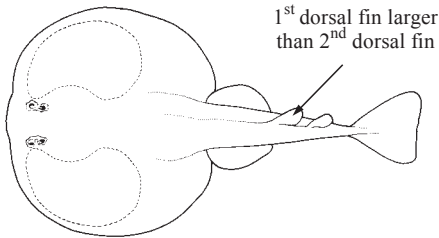
Habitat, biology, and fisheries: Numbfishes inhabit continental and insular shelves, and occasionally slopes in tropical to warm temperate latitudes, to depths of about 1 000 m (most occur below 250 m). Food consists of benthic invertebrates including polychaetes, crustaceans, and small ray-finned fishes. All species are viviparous without placentae. Six species occur in the area. None are of great commercial interest, although some are occasionally captured as bycatch in trawl fisheries for shrimp (more commonly *Narcine bancroftii*). The flesh of the tail region may be marketed after removal of the electric organs in the larger species, but is generally considered to be mediocre in quality.

Similar families occurring in the area

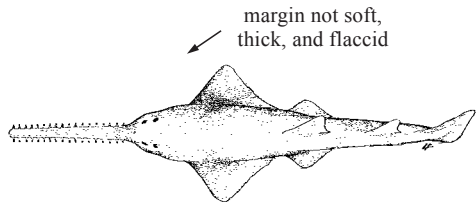
Torpedinidae: mouth is relatively wide, strongly arched, and not protractile; upper and lower jaws not bound by labial cartilage; first dorsal fin distinctly larger than second.

Pristidae, Rhinobatidae: margin of disc not thick, soft, and flaccid; pectoral fins moderately expanded, partially or totally covered with small scales.

Other batoids: disc margin very thin; no electric organs on sides of disc.



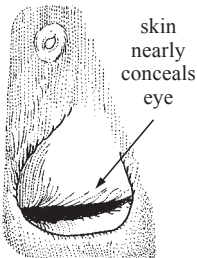
Torpedinidae



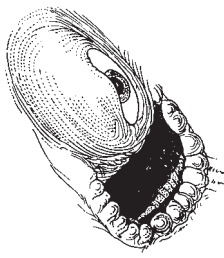
Pristidae

Key to the species of Narcinidae occurring in the area

- 1a. Eyes minute, almost entirely concealed by skin (Fig. 1a); entire inner margin of pelvic fins connected with side of tail *Benthobatis marcida*
- 1b. Eyes normally developed, not concealed almost entirely by skin (Fig. 1b); distal section of inner margin of pelvic fins free of side of tail → 2

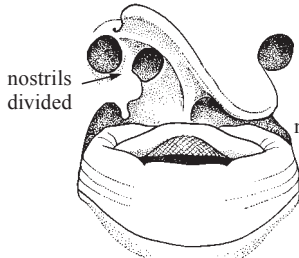


a) *Benthobatis marcida*

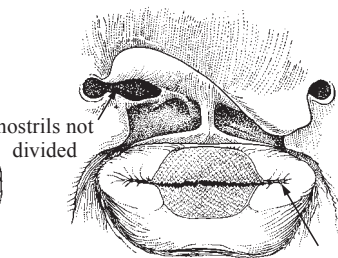


b)

Fig. 1 eye and spiracle



a)



b)

Fig. 2 nasal apertures and mouth

- 2a. Nostrils divided into 2 separate and equal sized apertures by cross-bridge; teeth entirely enclosed in mouth when mouth is closed (Fig. 2a) → 3
- 2b. Nostrils not divided into 2 separate apertures by cross-bridge; teeth extending onto upper and lower lips and visible when mouth is closed (Fig. 2b) → 5
- 3a. Dorsal coloration composed of relatively thin brownish bands running perpendicular to body-axis on disc and pelvic fins, and transversely on base of tail region . . *Diplobatis guamachensis*
- 3b. Dorsal coloration devoid of bands over disc, pelvic fins, and base of tail region, and composed of spots, mottlings, freckles or ocelli of varying diameter and number → 4
- 4a. Spots over dorsal disc, pelvic fins and tail region circular, not very numerous, and roughly of same size (larger or about equal to eye diameter). *Diplobatis colombiensis*
- 4b. Spots over dorsal region irregular in shape, numerous, and varying greatly in size, from small freckles to mottlings and incomplete ocelli larger than eye diameter (smaller spots and freckles are more central on disc and base of tail, larger spots are more peripheral) *Diplobatis pictus*

- 5a. Dorsal coloration with numerous small (smaller than eye diameter) dark brown spots over most of disc, base of tail, and dorsal and caudal fins *Narcine* sp.
- 5b. Dorsal disc coloration with few, scattered incomplete ocelli, without numerous small dark brown spots over entire disc, base of tail, and dorsal and caudal fins *Narcine bancroftii*

List of species occurring in the area

The symbol ♠ is given when species accounts are included.

Note: New species presently being described elsewhere.

- ♠ *Benthobatis marcida* Bean and Weed, 1909.
- ♠ *Diplobatis colombiensis* Fechhelm and McEachran, 1984.
- ♠ *Diplobatis guamachensis* Martín, 1957.
- ♠ *Diplobatis pictus* Palmer, 1950.
- ♠ *Narcine bancroftii* (Griffith and Smith, 1834).
- ♠ *Narcine* sp.

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the western North Atlantic. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Mem. Sears Found. Mar. Res.*, (1)Pt.2:588 p.

Carvalho, M.R. de. 1999a. *A systematic revision of the electric ray genus Narcine Henle, 1834 (Chondrichthyes: Torpediniformes: Narcinidae), and the higher-level phylogenetic relationships of the orders of elasmobranch fishes (Chondrichthyes)*. Unpubl. PhD thesis, City University of New York, 726 p.

Carvalho, M.R. de. 1999b. A synopsis of the deep-sea genus *Benthobatis* Alcock, with a redescription of the type-species *Benthobatis moresbyi* Alcock, 1898 (Chondrichthyes, Torpediniformes, Narcinidae). In *Proceedings of the fifth Indo-Pacific Fish Conference (Nouméa, 3-8 November, 1997)*, edited by B. Séret and J.-Y. Sire. *Soc. Fran. Ichtyol. and Inst. Rech. Develop.*, pp. 231-255.

Fechhelm, J.D. and J.D. McEachran. 1984. A revision of the electric ray genus *Diplobatis* with notes in the interrelationships of Narcinidae (Chondrichthyes, Torpediniformes). *Bull. Florida State Mus., Biol. Sci.*, 29:171-209.

McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1. Myxiniformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.

Narcine bancroftii (Griffith and Smith, 1834)

Frequent synonyms / misidentifications: None / *Narcine brasiliensis* (von Olfers, 1831).

FAO names: En - Bancroft's numbfish.

Diagnostic characters: Disc oval to rounded in outline, about as wide as long (both disc width and length somewhat variable, ranging from 43 to 60% of total length and 45 to 57% of total length, respectively); greatest disc width at about 2/3 of disc length. Snout rounded to broadly angular; preorbital snout length from 10 to 16% of total length, occupying about 1/4 of disc length. Eyes relatively large, larger than spiracles and bulging in fresh specimens; **spiracles circular to ovoid, with thick, elevated borders and warty papillae on entire spiracular margin (papillae more slender in juveniles).** Electric organs bean-shaped, extending from level of eyes to posterior 1/5 of disc length; **weighing up to 1/6 of total weight.** Nasal curtain wider than long, reaching to level of upper tooth band; nostrils with elevated borders. **Mouth protrusible, with strong labial cartilages;** mouth slightly wider than nasal curtain, **with exposed portions of tooth plates (7 to 9 horizontal rows) of about equal dimensions on both jaws; teeth ranging from 17/17 to 21/22 exposed vertical rows in**

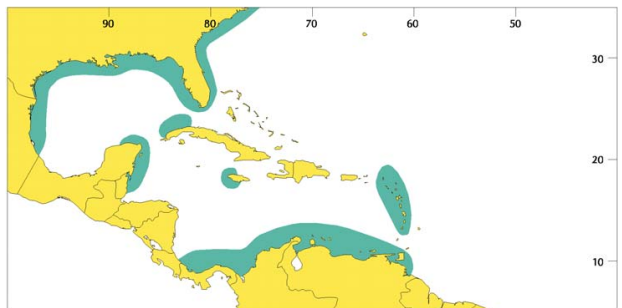
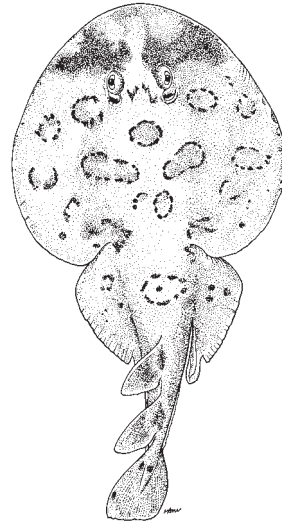
pre-adult and adult specimens (23 to 40 cm total length) but generally more rows on larger specimens. Pelvic fins wide and long, originating from underneath posterior disc margins; claspers elongate and relatively straight, not tapering very much. Tail strong and stout at base, tapering; **tail length less than disc width or length; lateral tail folds prominent, originating at posterior 2/3 of first dorsal-fin base and extending to caudal peduncle.** Second dorsal fin slightly larger than first; dorsal fins similar in shape; first dorsal fin originates over posterior lobes of pelvic fins; caudal fin tall, fan-shaped, with broadly rounded ventral margin, and subacute dorsal apex. Pores of lateral-line system present on anterior head region, bordering electric organs and sides of tail; ampullary pores numerous dorsally and ventrally on snout region. **Colour:** dorsal surface varying from yellowish brown to greyish brown and darker brown, with darker blotches anteriorly on snout over antorbital cartilages, and **small (less than eye diameter) dark spots forming incomplete ocelli over disc and base of tail regions;** dark cross-bands usually present on tail at bases of dorsal and caudal fins. Ventral surface white to creamy white, sometimes with grey or brown blotches on electric organs, pectoral axils, tail region or outlining disc and pelvic fins.

Size: Maximum size 58 cm total length; males mature at 23 to 25 cm; females mature at 27 to 32 cm; neonates 9 to 10 cm at birth.

Habitat, biology, and fisheries: Oviducts of female are synchronous, and may contain up to 18 embryos of various sizes. This species is relatively immobile within an area during a season, congregating on sand bars and surf zones of barrier beaches during summer, but moving to deeper offshore waters during winter months. Food consists of polychaetes and other invertebrates, as well as ray-finned fishes. Benthic on the continental shelf, between the shoreline and 37 m. Relatively common in some areas. Tail region may be consumed as food and considered of good quality, but not targeted regularly by fisheries in our area.

Distribution: Widely distributed from North Carolina to the Gulf of Mexico, Caribbean Sea and the Greater and Lesser Antilles (absent from the Bahamas).

Note: This species has been almost universally referred to as *Narcine brasiliensis* (von Olfers, 1831) in our area, but recent revisions have subdivided that previously wide-ranging species, which is now restricted to the southwestern Atlantic. *Narcine bancroftii* (Griffith, 1834) is the oldest available name for specimens of *Narcine* from our area (Carvalho, 1999a).

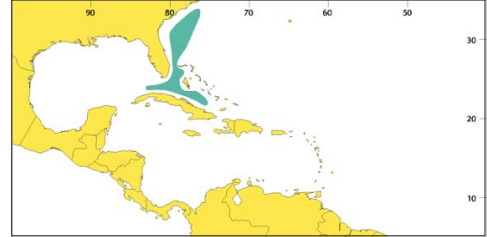
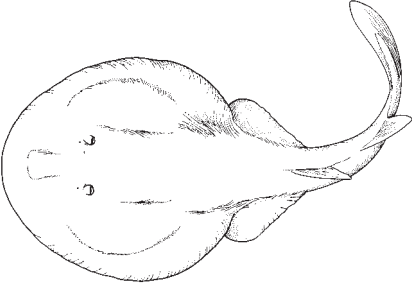


Benthobatis marcida Bean and Weed, 1909

TNB

En - Blind torpedo; **Sp** - Raya eléctrica de profundidad.

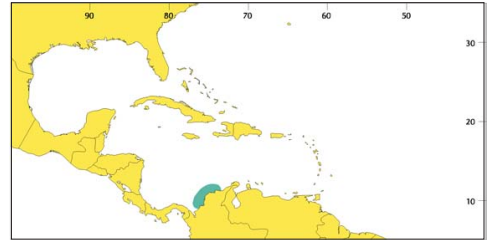
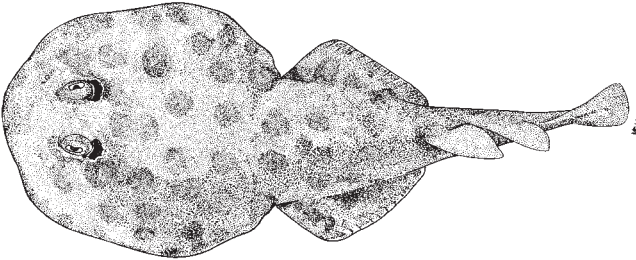
Maximum size 49 cm total length; young are about 8 to 9 cm at birth. Uniform in colour, ranging from light tan to darker brown. Benthic along the slope, between 274 and 923 m. Recorded from North Carolina to Florida Keys and Cuba. Food consists of crustaceans and other invertebrates, and small ray-fined fishes. Dorsal surface light tan; ventral surface white to pale yellow.



Diplobatis colombiensis Fechhelm and McEachran, 1984

En - Colombian electric ray.

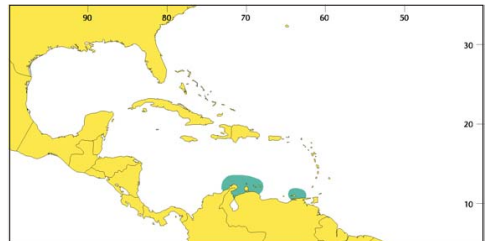
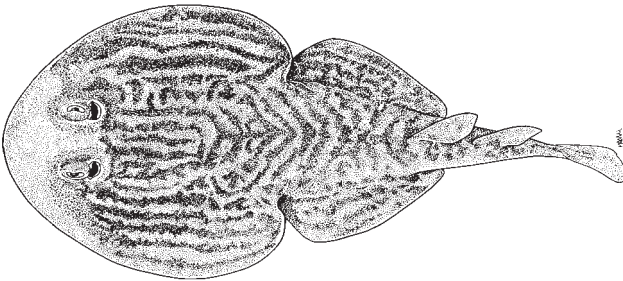
Maximum size 17 cm total length. Benthic on the continental shelf from 30 to 100 m. Recorded from the northern coast of Colombia, this species apparently is replaced in the east by *Diplobatis guamachensis*. Dorsal surface golden tan, with brown spots up to size of orbit symmetrically arranged on disc and tail; ventral surface white to cream coloured.



Diplobatis guamachensis Martín, 1957

En - Brownband numbfish.

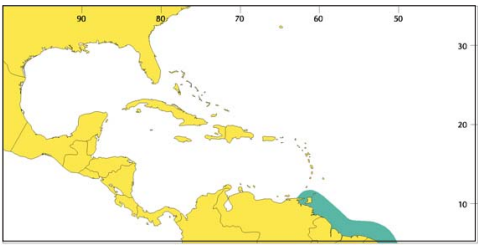
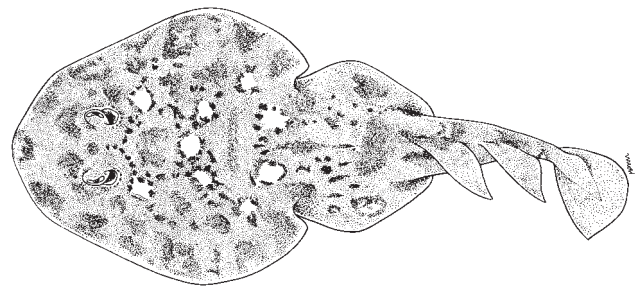
Maximum size slightly less than 20 cm total length. Continental shelf between 30 and 183 m. Recorded from Gulf of Venezuela to western Trinidad. Most common in the Gulf of Venezuela region. Replaced by *Diplobatis pictus* farther eastward. Dorsal surface tan to golden tan, with darker brown wavy bands and stripes; ventral surface white to cream coloured.



***Diplobatis pictus* Palmer, 1950**

En - Variegated electric ray; **Sp** - Raya eléctrica variegada.

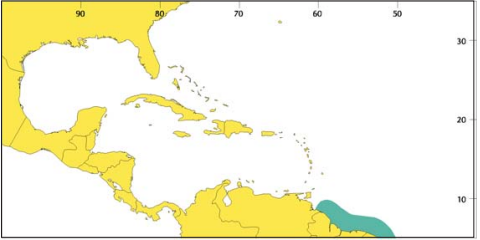
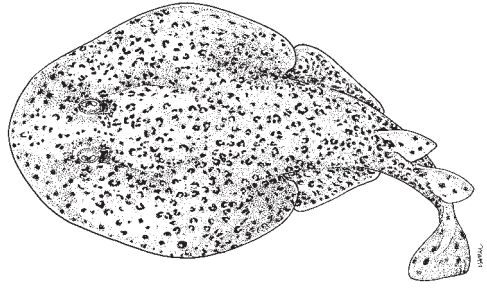
Maximum size 18 cm total length. Common over muddy and sandy bottoms, on the continental shelf, between 2 and 130 m. Recorded from southeastern Venezuela to northern Brazil. Dorsal surface highly variable in colour pattern but always with spots, mottlings, and ocelli of various sizes; ventral surface white.



***Narcine* sp.**

En - Smallspotted numbfish.

Maximum size 62 cm total length, but common to about 56 cm. Sizes at maturity and birth similar to *Narcine bancroftii*. Benthic on the continental shelf, in depths from 15 to 43 m. Recorded from Suriname to Brazil (Maranhão state). Both oviducts are functional and synchronous, and 13 embryos were observed in one 46 cm total length female. Food consists of invertebrates, especially polychaetes and crustaceans, and ray-finned fishes.



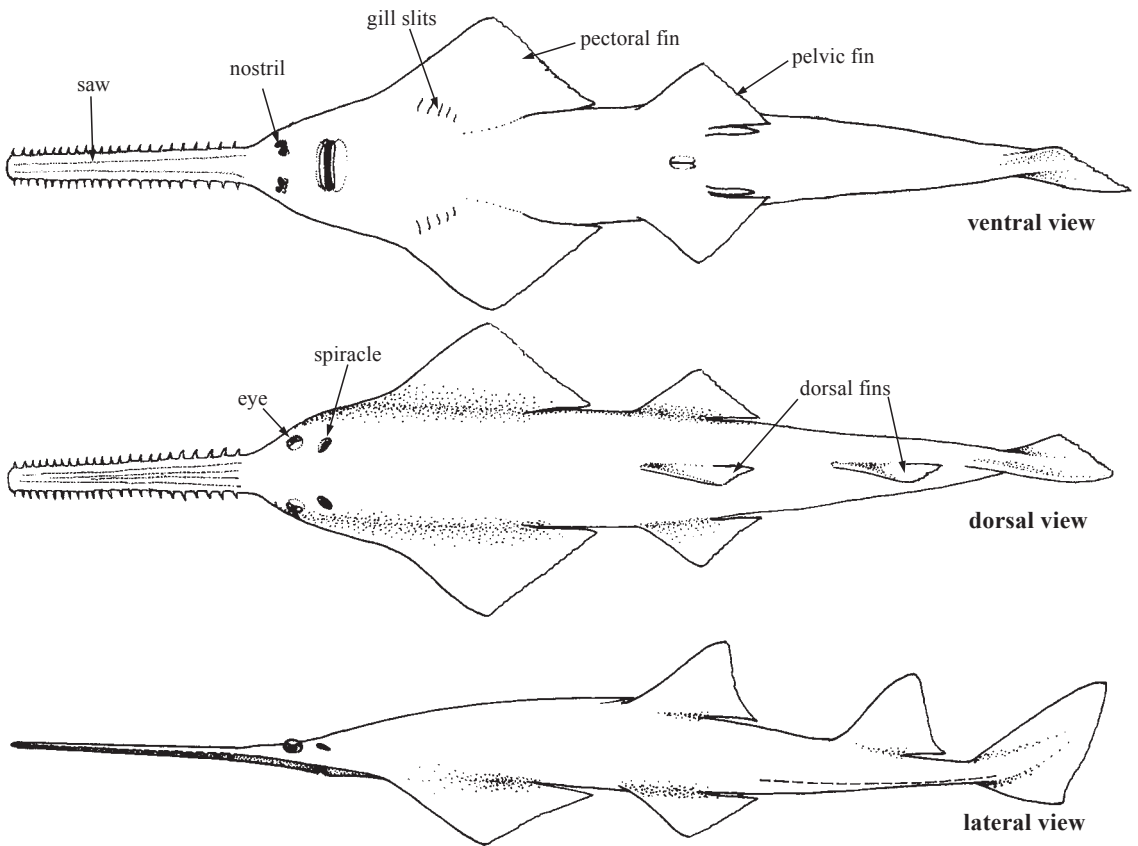
Order RAJIFORMES

PRISTIDAE

Sawfishes

by J.D. McEachran, Texas A & M University, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoids of large size, regularly attaining 500 cm in total length. Body depressed anteriorly; posterior part of head, trunk, and slightly enlarged pectoral fins forming narrow, triangular disc. **Snout prolonged as a stout, thin, narrow blade, armed on each side with a series of pointed teeth in sockets.** Eyes and spiracles on top of head, spiracles well behind eyes; mouth transverse and straight, without barbels and grooves; teeth small, numerous, and arranged in band along jaws; nostrils distinctly anterior to and completely separate from mouth, partially covered by anterior lobe. **Two large dorsal fins widely separated, first over pelvic-fin base; caudal fin well developed,** with or without distinct ventral lobe. **Tail stout and shark-like, not demarcated from body or trunk,** with a longitudinal ridge along lower sides. **Pectoral fins little enlarged, attached to posterior part of head, not reaching mouth** and terminating anterior to origin of pelvic fins. Pelvic fins with single moderately expanded lobe. Entire body except for saw and fins densely covered with small, ovoid, flat dermal denticles; no thorns. **Colour:** dorsal surface and lateral surfaces uniform brown, olive, grey, or yellowish; ventral surface white; fins of some species darker; border of fins and lateral corner of trunk occasionally whitish.



Habitat, biology, and fisheries: Sawfishes are sluggish bottom-dwelling fishes living in coastal waters, estuaries, mouths of rivers, and in fresh waters of tropical and subtropical regions (specimens have been captured as far as 1 340 km from the mouth of the Amazon river). They occur on sandy and muddy bottoms, normally in less than 10 m. All of the species are viviparous without placenta. They feed on benthic organisms and small schooling ray-finned fishes. The saw is used to probe the bottom for benthic prey and to slash and disable schooling fishes. They are frequently captured in tropical regions by trammel nets, set nets, and trawls. Two species occur in the area, of a total of 4 to 7 in the family (identity of many nominal species needs verification).

The flesh is sold frozen and salted for human consumption. Sawfishes are quite vulnerable to overfishing and habitat alteration, and as a result are in decline in many areas.

Similar families occurring in the area

No other family of rays has an enlarged snout resembling a saw, and no other family, except for Rhinobatidae, is shark-like.

Key to the species of Pristidae occurring in the area

- 1a.** Caudal fin with a distinct ventral lobe (Fig. 1a); rostrum with 20 or fewer pairs of teeth . . . *Pristis pristis*
1b. Caudal fin without a distinct ventral lobe (Fig. 1b); rostrum with more than 23 pairs of teeth
..... *Pristis pectinata*

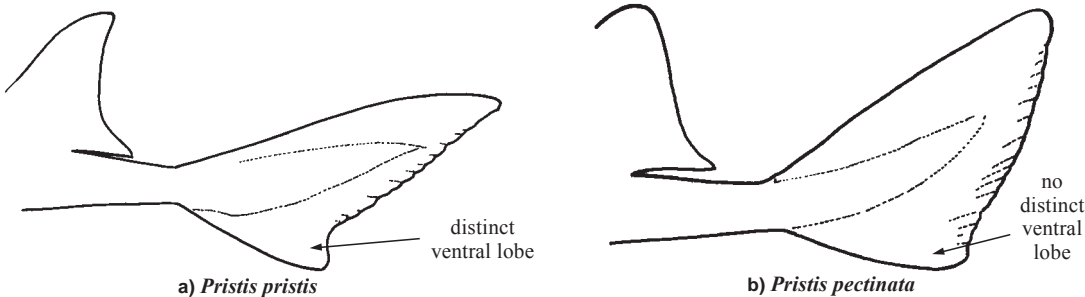


Fig. 1 caudal fin

List of species occurring in the area

The symbol ♠ is given when species accounts are included.

- ♠ *Pristis pectinata* Latham, 1794.
♠ *Pristis pristis* (Linnaeus, 1758).

References

Bigelow, H. B. and W. C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In: Fishes of the Western North Atlantic, Part 2, *Sears Found. Mar. Res. Mem.* (2)1:1-514.

Castro-Aguirre, J. L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideiomorpha)*. Universidad Nacional Autónoma de México.

McEachran, J. D. and J. D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, Vol. 1. Myxiniformes to Gasterosteiformes. Austin, University of Texas Press.

Thorson, T. B. 1976. Observations on the reproduction of the sawfish, *Pristis perotteti*, in Lake Nicaragua, with recommendations for its conservation. In: *Investigations of the ichthyofauna of Nicaraguan lakes*, edited by T. B. Thorson. Lincoln, University of Nebraska.

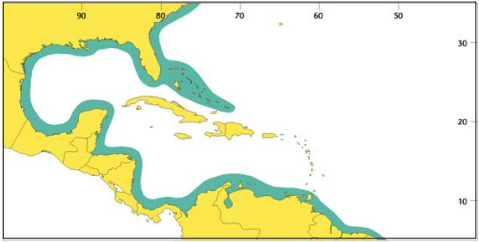
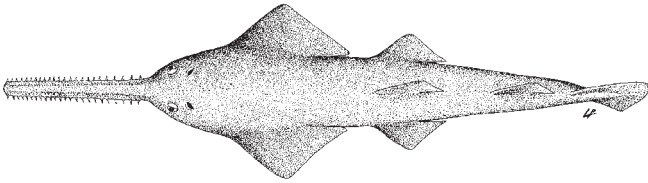
Zorzi, G. D. 1995. The biology of freshwater elasmobranchs: an historical perspective. In: *The Biology of Freshwater Elasmobranchs, A Symposium to Honor Thomas B. Thorson*, edited by M. I. Oetinger and G. D. Zorzi. *J. Aquar. Aqua. Sci.*, 7:10-31.

Pristis pectinata Latham, 1794

RPP

En - Smalltooth sawfish; **Fr** - Poisson-scie tident; **Sp** - Pejepeine.

Maximum size 550 cm total length; females mature at 460 cm total length; neonates 60 cm total length at birth. Specimen measuring 4.8 m weighed around 315 kg. The rostral saw may measure up to 1/4 of total length. Benthic along coast, estuaries, lagoons, and fresh-water habitats. Recorded from North Carolina and Bermuda to southern Florida, throughout the Gulf of Mexico, Bahamas, Caribbean coast of Central America, and northern coast of South America to northern Argentina. Records from the eastern Pacific, eastern Atlantic, Mediterranean, Indian Ocean and Indo-west Pacific need verification, and are possibly not of this species. Dorsal surface greyish brown to blackish brown; ventral surface white to greyish white. Food consists of benthic invertebrates and ray-finned fishes. Litters range from 15 to 20. This species is becoming increasingly rare due to over-fishing, and there are no recent records from many localities where it was once more common, including the Gulf of Mexico. Currently protected in state waters of Florida and Louisiana.

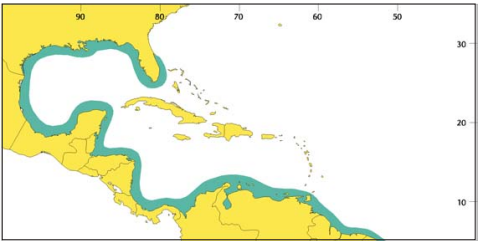
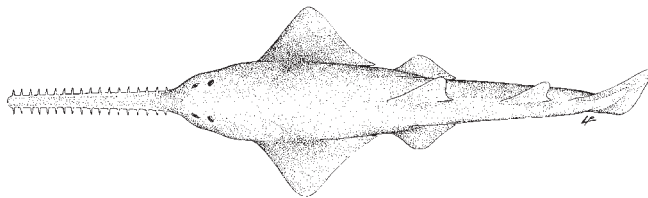


Pristis pristis (Linnaeus, 1758)

RPR

En - Common sawfish (AFS: Largetooth sawfish); **Fr** - Poisson-scie commun; **Sp** - Pez sierra común.

Maximum size 610 cm total length; young are from 60 cm to 76 cm at birth (1 to 13 pups per litter, but commonly 7 to 9). Rostral saw may measure up to 1/5 of total length. A specimen may weigh 500 kg at around 500 cm in total length. Benthic in coastal areas, estuaries, lagoons, and fresh-water habitats. Recorded from southern Florida, throughout Gulf of Mexico, Caribbean coast of Central America, and northern coast of South America to Brazilian state of São Paulo. Also from tropical eastern Pacific and eastern Atlantic (frequently as *Pristis perotetti*). Food consists of benthic invertebrates and ray-finned fishes. Severely threatened by over-fishing and habitat degradation. Virtually extirpated from Lake Nicaragua, where once abundant (and has been protected for more than 10 years).

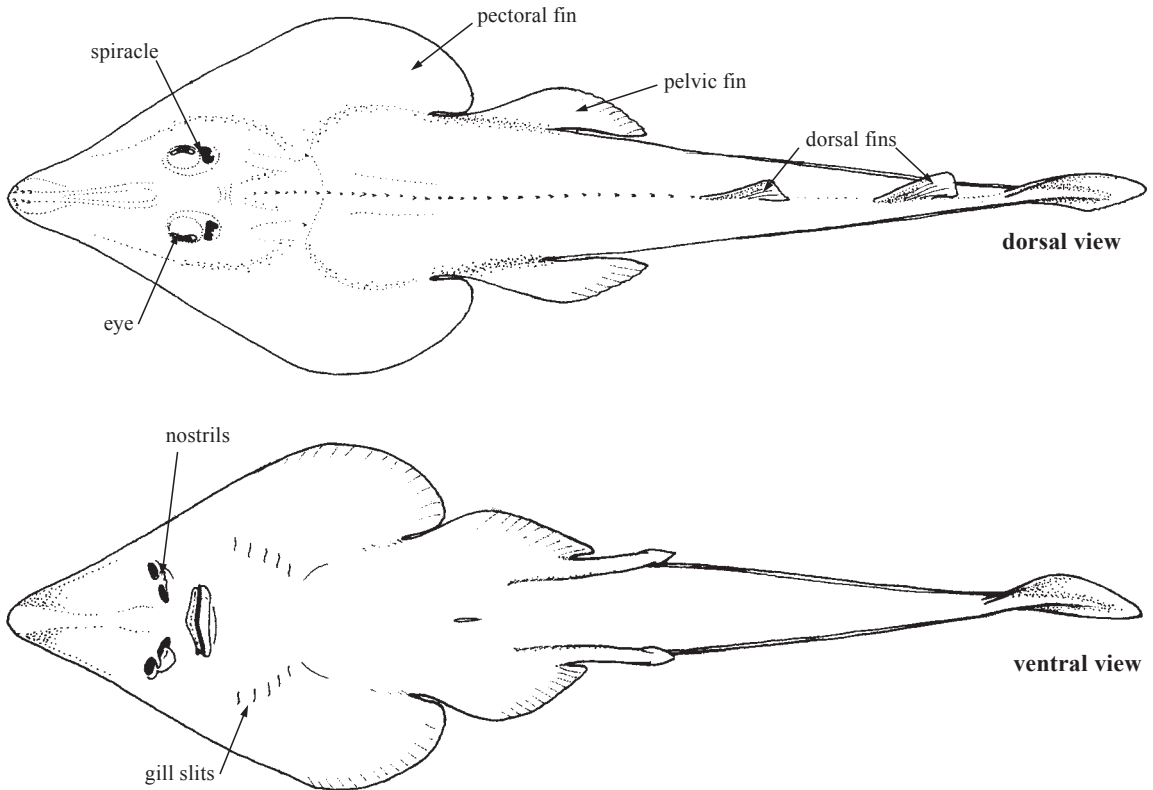


RHINOBATIDAE

Guitarfishes

by J.D. McEachran, Texas A & M University, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoid fishes of moderately large size (total length up to 270 cm). Body moderately depressed anteriorly; head, trunk, and moderately enlarged pectoral fins forming wedge-shaped disc. Pectoral fins fused to sides of head and trunk from level of nostrils to mid-snout length to origin of pelvic fins. **Tail stout and shark-like, not demarcated from trunk or disc**, with a narrow longitudinal fold along each side. Snout moderately short and obtuse to long and acute. Eyes and spiracles on top of head; spiracles immediately behind eyes and **possessing pseudobranchial folds on anterior margin**. Nostrils are very large and separate from mouth in most species but partially connected to mouth in several species; anterior lobe of nostril narrow and extending to posterior margin of nostril in most species but is greatly expanded and extending to mouth, forming nasal curtain in species in which nostrils are partially connected to mouth. Mouth transverse and nearly straight to moderately arched; teeth numerous and small, in pavement-like bands along both jaws. **Pelvic fins with single moderately expanded lobe. Two dorsal fins, first located posterior to tips of pelvic fins, and a well-developed caudal fin**, lacking a well-defined lower lobe. Body and fins densely covered with denticles of various shapes except for interbranchial area in some species; snout, orbital region, nuchal-scapular area, and midline of back sometimes with tubercles. **Colour:** plain coloured with grey or brown, or with more or less distinct dark or light spots or bands; ventral side plain-coloured as above or pale; sometimes dark areas present on snout, head, or along fin margins.



Habitat, biology, and fisheries: Guitarfishes are sluggish bottom-living animals occurring over sandy or muddy bottoms in shallow coastal areas, including brackish water and sometimes even fresh water, in all tropical, subtropical, and warm-temperate latitudes. Their food consists of small ray-fined fishes and bottom-dwelling invertebrates. Species are viviparous without a placenta. There is no special fishery for guitarfishes in the area at the present time. They are, however, moderately abundant in some localities and caught very easily. They are often seen in local fish markets. The flesh, and especially the fins, are sold dried and salted, but are considered of mediocre quality.

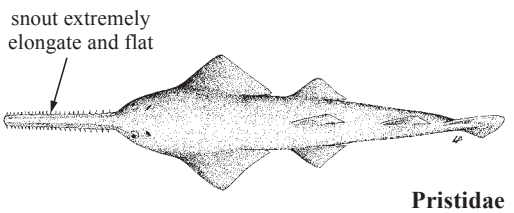
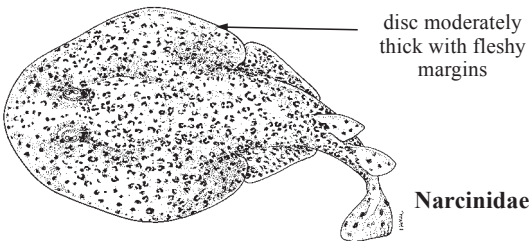
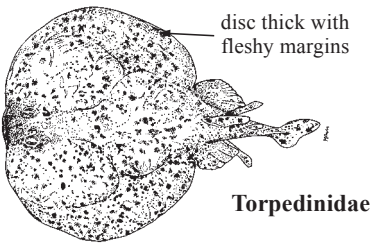
Similar families occurring in the area

Torpedinidae: disc thick with fleshy margins; consistency of body soft and flabby; well-developed electric organs along sides of head within anterior part of disc; no scales on body.

Narcinidae: disc moderately thick with fleshy margins; well-developed electric organs along sides of head within anterior part of disc; mouth surrounded by deep groove; no scales on body.

Pristidae: snout extremely prolonged as a flat, narrow, and firm blade bearing large, tooth-like structures along each edge of blade.

Other batoid fish families: tail sector not stout and shark-like but distinctly demarcated from trunk or disc; pectoral fins much more enlarged.



Key to the species of Rhinobatidae occurring in the area

- 1a. Rostral cartilage expanded near tip, spatulate-shaped; tip of snout with few enlarged, conical tubercles, except in small juveniles (Fig. 1a) *Rhinobatos lentiginosus*
- 1b. Rostral cartilage not expanded near tip, not spatulate-shaped; tip of snout with flat or roundish tubercles, or without tubercles (Fig. 1b) → 2
- 2a. Nostril length equal to or slightly greater than distance between nostrils (100 to 120%), and slightly greater than 50% of mouth width; dorsal coloration usually with whitish spots about equal to eye diameter (Fig. 2a). *Rhinobatos percellens*
- 2b. Nostril length nearly 1 1/2 times distance between nostrils (140%), and about 75% of mouth width; uniform olive grey to brown dorsal coloration, without spots (Fig. 2b) *Rhinobatos horkelii*

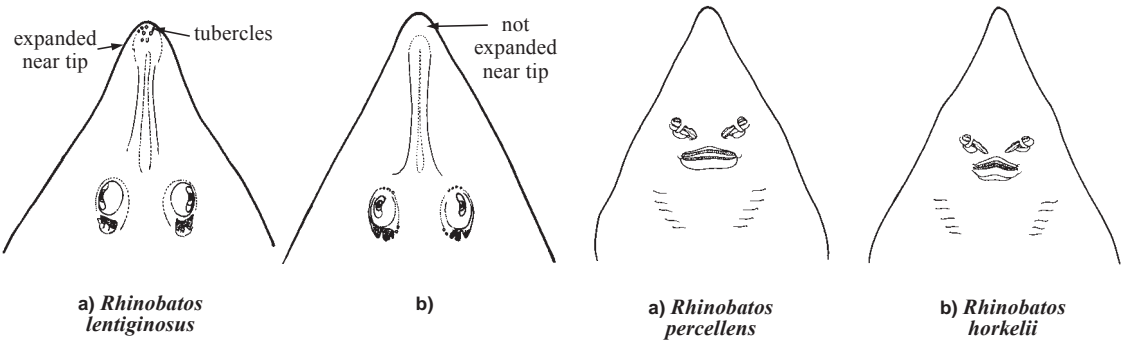


Fig. 1 dorsal view of head

Fig. 2 ventral view of head

List of species occurring in the area

The symbol ♠ is given when species accounts are included.

♠ *Rhinobatos horkelii* Müller and Henle, 1841.

♠ *Rhinobatos lentiginosus* Garman, 1880.

♠ *Rhinobatos percellens* (Walbaum, 1792).

References

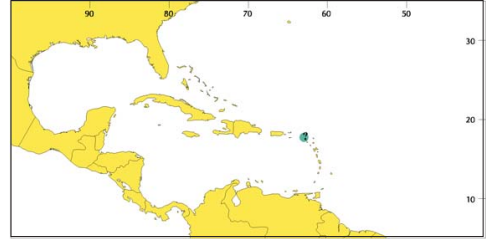
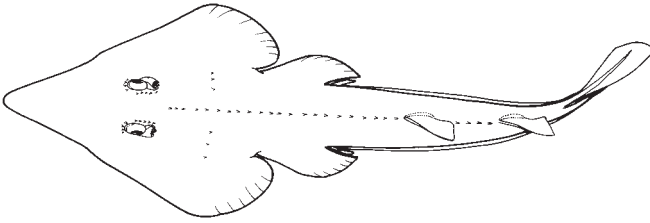
- Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In *Fishes of the western North Atlantic, Part 2*, edited by J. Tee-Van, C.M. Breder, A.E. Parr, W.C. Schroeder, and L.P. Schultz. *Sears Found. Mar. Res. Mem.*, (1)Pt.2:588 p.
- Castro-Aguirre, J.L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideomorpha)*. Universidad Nacional Autónoma de México, 75 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1. Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.
- Norman, J.R. 1926. A synopsis of the rays of the family Rhinobatidae, with a revision of the genus *Rhinobatus*. *Proc. Zool. Soc. London*, 1926(62):941-982.

Rhinobatos horkelii Müller and Henle, 1841

RBK

En - Brazilian guitarfish.

Maximum size 120 cm total length. Benthic in coastal waters. One questionable record from West Indies (possibly St. Eustatius). More abundant farther south, off the coast of Brazil south to northern Argentina. Dorsal surface uniform olive grey or chocolate brown; ventral surface similar to dorsal surface or lighter shades of same colours. Recent studies, however, indicate drastic declines in landings off Brazil (by over 95% in a 10 year period). This species may be critically endangered.

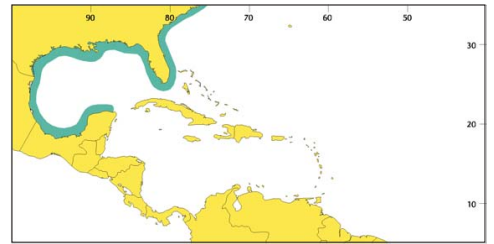
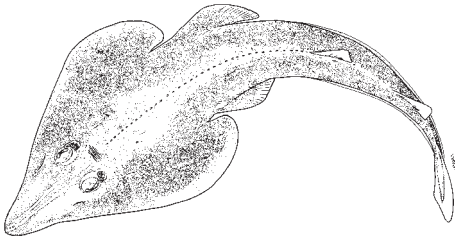


Rhinobatos lentiginosus Garman, 1880

RBT

En - Atlantic guitarfish.

Maximum size 76 cm total length. Benthic in coastal waters between the coastline and 18 m. Recorded from North Carolina to Yucatán, throughout Gulf of Mexico. Dorsal surface ash grey to chocolate brown, with numerous, small white spots over most of dorsal surface (some specimens from the northern Gulf of Mexico without spots); ventral surface pale yellowish. Enlarged tubercles dorsally on snout.

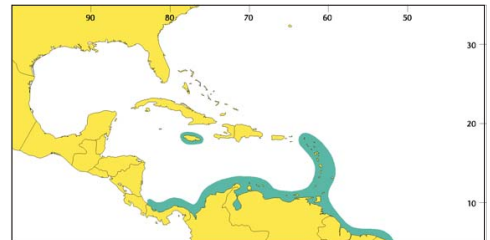


Rhinobatos percellens (Walbaum, 1792)

GUD

En - Chola guitarfish; **Fr** - Poisson-guitare chola; **Sp** - Guitarra chola.

Maximum size about 100 cm total length. Benthic in coastal water to depths of 110 m. Recorded from Panama, Jamaica, Lesser Antilles, and northern coast of South America to northern Argentina. Dorsal surface olive grey to brown or reddish, with darker brown blotches occasionally present, and cream coloured spots about equal to eye diameter (spots larger and less numerous than in *Rhinobatos lentiginosus*); ventral surface pale yellowish. Generally lacking enlarged tubercles on the snout.

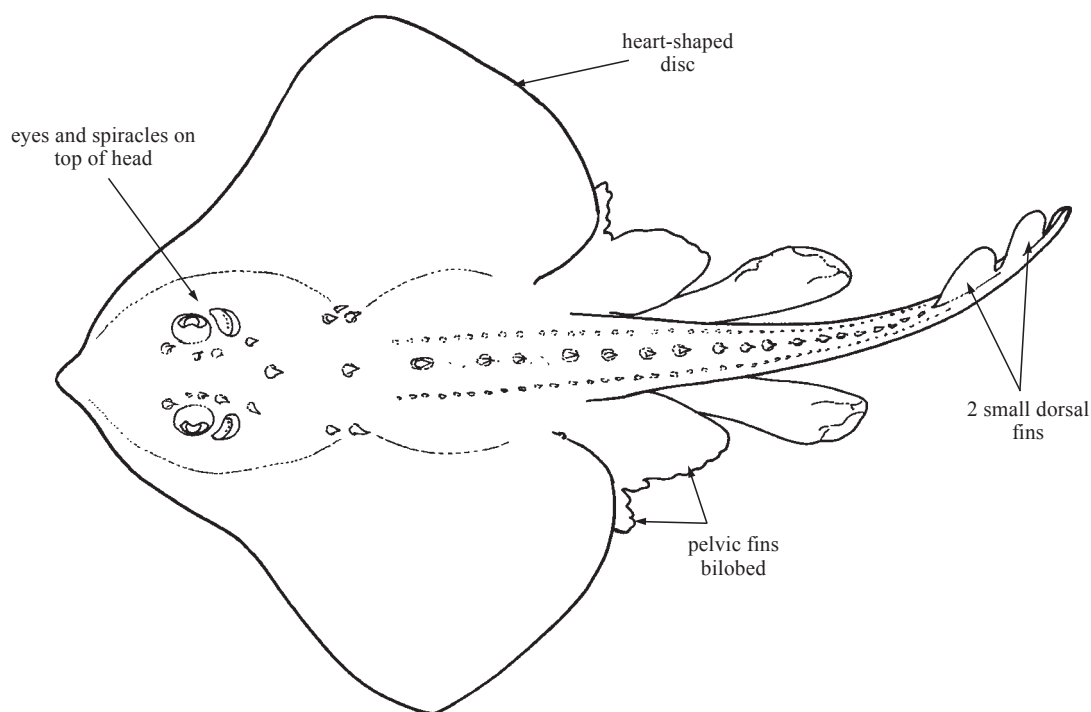


RAJIDAE

Skates

by J.D. McEachran, Texas A & M University, Texas, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoid fishes of very small size (20 to 30 cm total length for *Fenestraja*) to moderately large size (more than 200 cm total length for *Bathyraja* and *Dipturus*). Body strongly depressed; **head, trunk, and broadly expanded pectoral fins forming a rhombic or heart-shaped disc**. Pectoral fins fused to sides of head and trunk from tip to about midlength of snout to insertion of pelvic fins. **Tail moderately slender, distinctly demarcated from disc**, with a narrow longitudinal fold along each side; **tail length less than 2 times disc width**. Snout ranging from acutely angled to obtusely rounded. Front of cranium extending as a rostral bar, which is stout to very delicate; anterior pectoral-fin rays either extending to tip of snout (species with delicate rostral bar) or to about 2/3 length of snout (species with stout rostral bar). Eyes and spiracles on top of head, spiracles immediately behind eyes and **with pseudobranchial folds on anterior walls**. Nostrils small and located near front of mouth; **anterior lobes expanded posteriorly as large nasal curtains that are joined to broad transverse isthmus in front of mouth**. Mouth transverse to strongly bowed. Numerous small teeth in bands along jaws, obtuse to pointed and showing sexual dimorphism in many species; placed either in pavement pattern or in parallel rows or in combination of both. Two small dorsal fins far posterior on tail, or rarely one or both dorsal fins absent; caudal fin near tip of tail and consists of narrow fold on dorsal surface of tail, and occasionally present on ventral surface as low fold or ridge. **Pelvic fins bilobed or rarely with single lateral lobe, 2 lobes separated by more or less deep notch along outer margin or anterior lateral lobe completely separate from posterior lobe**. Dorsal surface densely to sparsely covered with denticles and variously covered with small to moderately large thorns; latter usually arranged in patches, or rows, but often in 1 to several distinct regions; at least a median row of thorns along tail (except some *Malacoraja* species); **mature males generally possess alar and alar thorns along the anterior margin of the disc**. Ventral surface smooth or with denticles on snout and along margin of disc, or more or less covered with denticles, and rarely with some thorns. Squamation varies with growth, age, and sexual maturity. **Colour:** dorsal surface ranging from nearly white to brownish black, and often patterned with small to large spots, bars, reticulations, or ocelli or in combinations of these. Ventral surface uniformly dark or light, or mottled with both, or a light centre of the disc is bordered with dark; some species with darkly pigmented sensory pores. Generally deep-water skates plain dark coloured on both sides; shallow-water species are mainly white ventrally and often extremely variegated on dorsal surface. Colour and pattern may vary depending on nature of substrate.

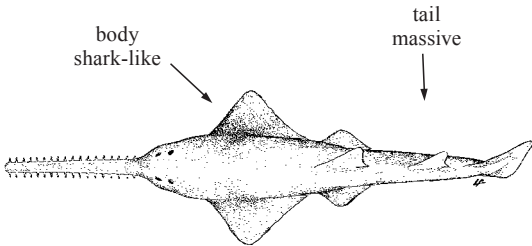


Habitat, biology, and fisheries: Skates are widely distributed in all oceans from the Arctic to the Antarctic and from shallow coastal waters to abyssal depths (3 000 m); they are rare over inner continental and insular shelves in tropical latitudes, and are absent in the vicinity of coral reefs. Species are predominantly marine; some species enter brackish waters, but only a single species enters fresh waters. They are bottom dwellers typically with small ranges but some of the larger species occur over several ocean basins. Skates predominantly feed on a wide variety of bottom- and near bottom-dwelling invertebrates and fishes. All species are oviparous and deposit large fertilized eggs in leathery egg capsules. They are the most diverse of the batoid taxa in number of species, geographical distribution, and depths inhabited. However, not much data concerning the general biology of many species are available. There is a commercial fishery on skates in several parts of the world, but not in the area. Only the wings of skates are used for human consumption in fresh, salted, or smoked form.

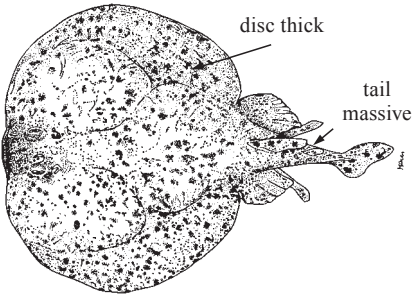
Similar families occurring in the area

Pristidae, Rhinobatidae: body shark-like, tail massive and not distinctly demarcated from body or disc; pectoral fins moderately enlarged.

Torpedinidae: disc thick and with fleshy margins, well-developed electric organs along sides of head; tail massive and not demarcated from disc; no scales on body.



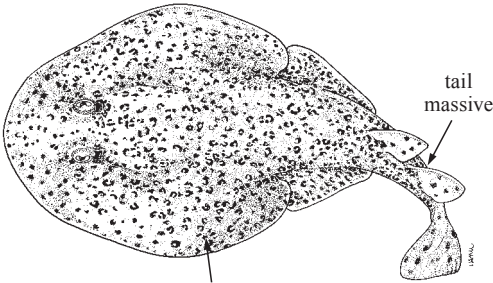
Pristidae



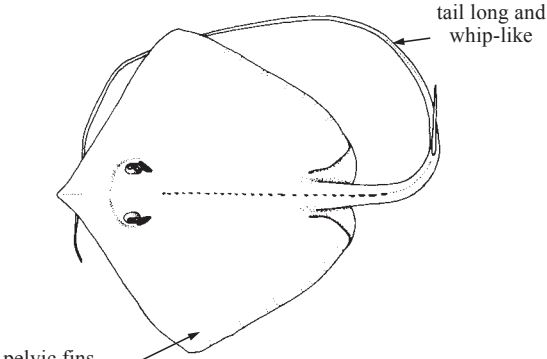
Torpedinidae

Narcinidae: disc moderately thick and with fleshy margins, well-developed electric organs along sides of head; tail massive and not demarcated from disc; no scales on body.

Dasyatidae, Urotrygonidae, Gymnuridae, Myliobatidae, Rhinopteridae, Mobulidae: pelvic fins with single lobe; tail in most species very long and whip-like distally, usually 1 or more greatly enlarged and serrated spine(s) on tail; no pseudobranchial folds in spiracles.



Narcinidae



Dasyatidae

Key to the species of Rajidae occurring in the area

- 1a. Pelvic fins with single laterally directed lobe (Fig. 1a)→ 2
- 1b. Pelvic fins with anterior and posterior lobes (Fig. 1b)→ 4

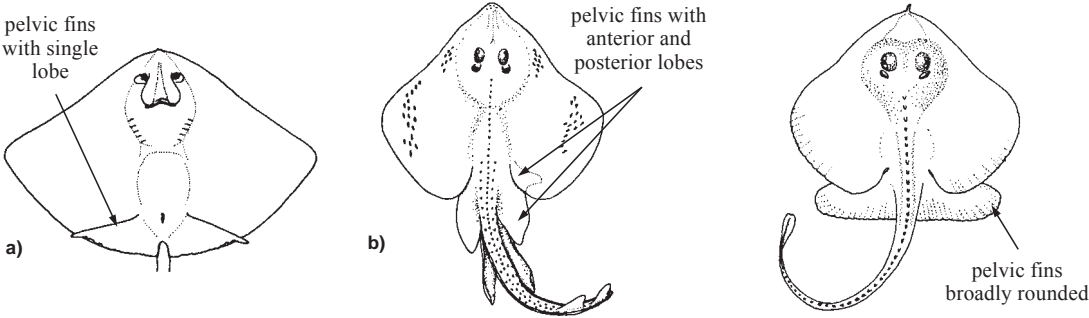


Fig. 1 dorsal view

Fig. 2 *Pseudoraja fischeri*

- 2a. Lateral extreme of pelvic fin broadly rounded and posterior margin transverse (Fig. 2) *Pseudoraja fischeri*
- 2b. Lateral extreme of pelvic fin acutely pointed and posterior margin diagonal (Fig. 1a).→ 3
- 3a. Dorsal fin rarely present; dorsal surface uniform brown; ventral surface of disc with denticles *Gurgesiella atlantica*
- 3b. Dorsal fin always present; dorsal surface with light or dark blotches; ventral surface of disc without denticles *Gurgesiella dorsalis*

- 4a. Anterior and posterior lobes of pelvic fin separate, anterior lobe finger-like (Fig. 3a)→ 5
- 4b. Anterior and posterior lobes of pelvic fin continuous, connected by series of radials and fin membranes (Fig. 3b)→ 11

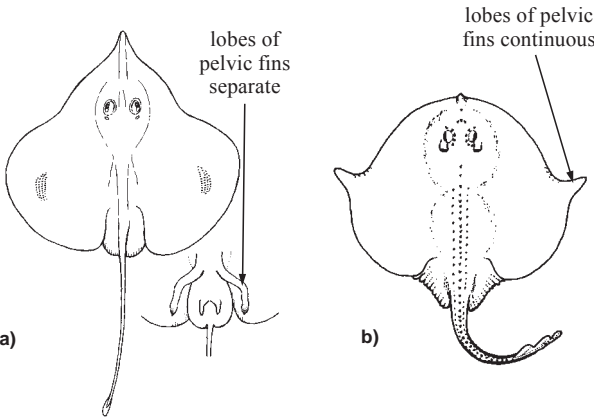


Fig. 3 dorsal view

- 5a. Dorsal fins lacking; preorbital length greater than 15% of total length→ 6
- 5b. Two dorsal fins present; preorbital length usually less than 15% of total length→ 8
- 6a. Orbit diameter 20 to 25% snout length *Anacanthobatis americanus*
- 6b. Orbit diameter 11 to 14% snout length→ 7
- 7a. Distal section of snout laterally expanded into leaf-like structure (Fig. 3a). . *Anacanthobatis foliostris*
- 7b. Distal section of snout evenly attenuating to filament and not laterally expanded *Anacanthobatis longirostris*

- 8a.** Interspace between dorsal fins at least 50% of first dorsal-fin base *Cruriraja atlantis*
- 8b.** Interspace between dorsal fins less than 50% of first dorsal-fin base → **9**
- 9a.** Nuchal region generally without thorns; anterior margins of dorsal fins black; dorsal surface of disc largely free of fine denticles *Cruriraja poeyi*
- 9b.** Nuchal region generally with thorns; anterior margins of dorsal fins and tip of caudal fin brown like remainder of fins; dorsal surface of disc more or less uniformly covered with fine denticles → **10**
- 10a.** No thorns on disc posterior to nuchal thorns; dorsal surface of tail with single irregular row of thorns; ventral surface of tail covered with denticles in specimens larger than 25 cm total length *Cruriraja rugosa*
- 10b.** Scapular thorns present, posterior half of disc with midrow of thorns; ventral surface of tail without denticles; dorsal surface of tail with 2 or more irregular rows of thorns . . . *Cruriraja cadenati*
- 11a.** Anterior margin of snout very obtuse (Fig. 4); anterolateral margin of ventral side of disc with band of claw-like denticles → **12**
- 11b.** Anterior margin of snout acute to moderately obtuse; anterolateral margin of ventral side of disc without band of claw-like denticles → **13**
- 12a.** Lateral aspect of disc with narrow spatulate-like lobe; anterolateral margin of disc convex; dorsal surface of disc grey with blackish blotches (Fig. 4) *Dactylobatus armatus*
- 12b.** Lateral aspect of disc without narrow spatulate-like lobe; anterolateral margin of disc concave; dorsal surface of disc tan, generally with several pairs of prominent white markings outlined with dark pigment *Dactylobatus clarkii*
- 13a.** Tip of snout flexible; rostral cartilage distally very slender; anterior pectoral-fin rays extending nearly to tip of snout (Fig. 5a). → **14**
- 13b.** Tip of snout firm; rostral cartilage moderately stout to stout; anterior pectoral-fin rays distinctly separated from tip of snout (Fig. 5b) → **24**

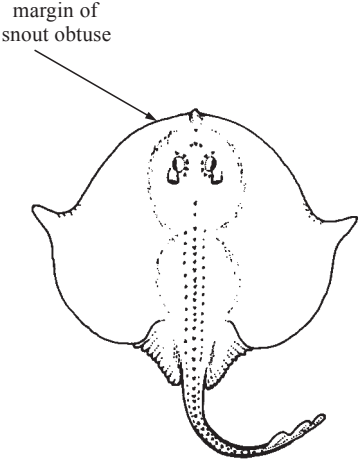


Fig. 4 dorsal view

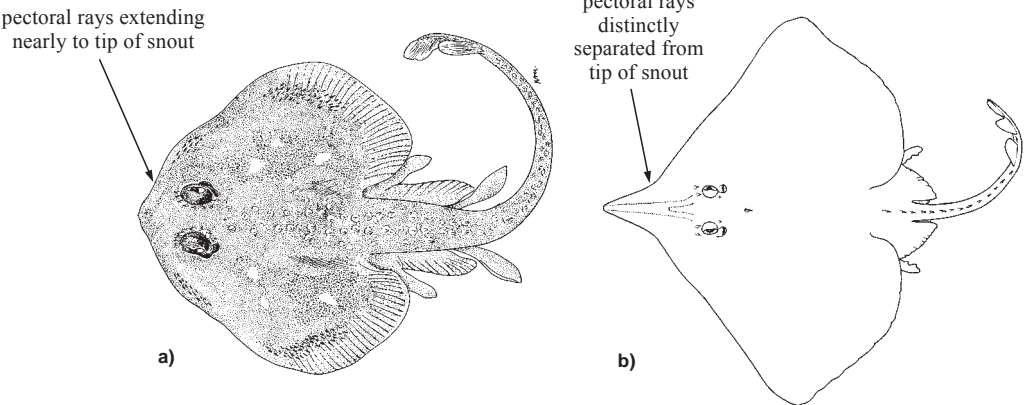


Fig. 5 dorsal view

- 14a. Anterior lobe of pelvic fin 65 to 80% of posterior lobe; tail width at base slightly greater than orbit diameter (Fig. 6a) → 15
- 14b. Anterior lobe of pelvic fin 80 to 100% of posterior lobe; tail width at base less than orbit diameter (Fig. 6b) → 19
- 15a. Ventral surface sooty grey to black over central part of disc or over entire disc except for pale areas around mouth, gill slits, and cloaca → 16
- 15b. Ventral surface light tan to yellowish white over central part of disc → 17

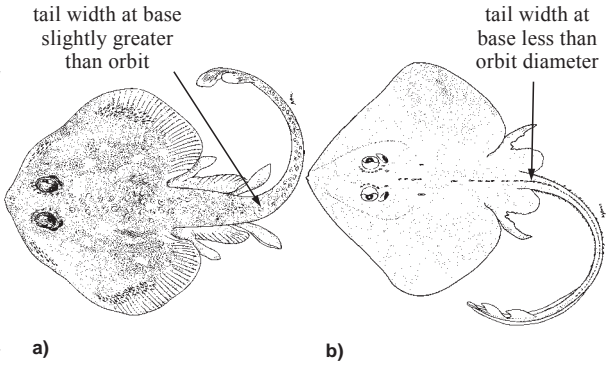


Fig. 6 dorsal view

- 16a. Jaws strongly arched on either side of isthmus; lower jaw with spatulate process, partially to totally overlapping symphysis of upper jaw; upper caudal-fin lobe greater than half height of second dorsal fin; lower caudal-fin lobe present (Fig. 7) *Breviraja nigriventralis*
- 16b. Jaws moderately arched on each side of symphysis; lower jaw without spatulate process; upper caudal-fin lobe less than half height of second dorsal fin; lower caudal-fin lobe absent *Breviraja spinosa*

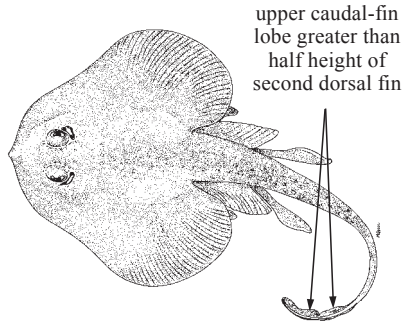


Fig. 7 *Breviraja nigriventralis*

- 17a. Dorsal surface of disc tan with 4 to 8 symmetrically arranged circular white spots; 32 to 40 tooth rows in upper jaw *Breviraja claramaculata*
- 17b. Dorsal surface of disc uniform tan to brown, or brown to tan and mottled with irregularly shaped light and dark spots and blotches; 38 to 48 tooth rows in upper jaw → 18
- 18a. Dorsal surface of disc uniform tan to brown or occasionally mottled with ill-defined light coloured blotches; ventral tip of snout with a dark brown to black blotch; band of 3 rows of small thorns from level of maximum disc width to axil of pelvic fins *Breviraja mouldi*
- 18b. Dorsal surface of disc tan to brown and mottled with irregular darker and lighter spots and blotches; ventral tip of snout without dark blotch; a single row of thorns, at most from level of maximum disc width to axil of pelvic fins *Breviraja colesi*

- 19a. Oronasal pits, located anterior to upper jaw and above nasal curtain, absent → 20
- 19b. Oronasal pits, located anterior to upper jaw and above nasal curtain, present (Fig. 8) *Neoraja carolinensis*
- 20a. Distance between dorsal fins greater than 100% length of first dorsal-fin base; ventral surface of tail covered with dermal denticles *Fenestraja atripinna*
- 20b. Distance between dorsal fins less than 100% of first dorsal-fin base; ventral surface of tail not covered with denticles → 21

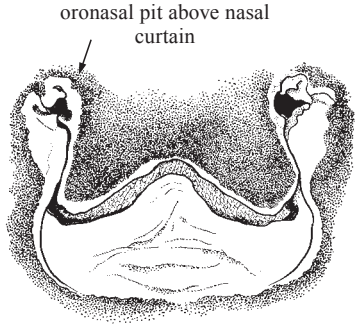


Fig. 8 oronasal pits

- 21a.** Band of 3 rows of thorns along midline from maximum disc width to axil of pelvic fins; 3 or 4 distinct rows of thorns along midbelt of tail *Fenestraja sinusmexicanus*
- 21b.** Single row of thorns along midline of disc from maximum width to axil of pelvic fins; usually single row of thorns on midbelt of tail → 22

- 22a.** Dorsal surface of disc and tail uniform greyish brown *Fenestraja ishiyamai*
- 22b.** Dorsal surface of disc with dark markings; tail with dark crossbars → 23

- 23a.** Two to 4 thorns on shoulder region of disc; thorns along midline of disc and anterior half of tail relatively large and conspicuous; anterior lobe of pelvic fin as long as posterior lobe *Fenestraja plutonia*
- 23b.** Zero to 2 thorns on shoulder region of disc; thorns along midline of disc and anterior half of tail small and inconspicuous; anterior lobe of pectoral fin shorter than posterior lobe *Fenestraja cubensis*

- 24a.** Snout moderately elongated to distinctly elongated (Fig. 9a), anterolateral margin of disc concave (line connecting tip of snout to anterior aspect of lateral corner of disc free of disc); ampullar pores on ventral surface of disc generally darkly pigmented → 25
- 24b.** Snout generally not elongated (Fig. 9b), anterolateral margin of disc straight to slightly convex (line connecting tip of snout to anterior aspect of lateral corner of disc intersecting disc); ampullar pores on ventral surface of disc not darkly pigmented → 29

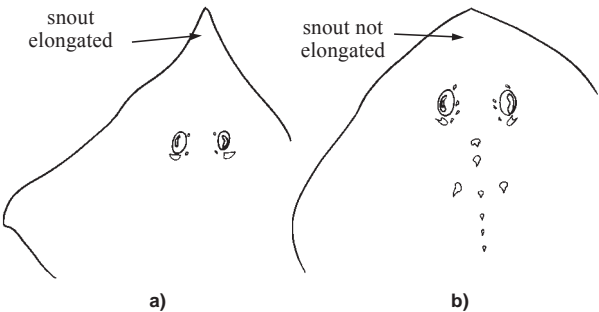


Fig. 9 dorsal view of snout

- 25a.** Midbelt of disc without thorns → 26
- 25b.** Midbelt of disc with at least single nuchal thorn → 28

- 26a.** Tail with 1 row of thorns *Dipturus teevani*
- 26b.** Tail with 3 rows of thorns → 27

- 27a.** Midline of tail with 31 to 48 thorns; thorns on tail with compressed hook-shaped crowns; distance between dorsal fins shorter than base of first dorsal fin; only 1 thorn between dorsal fins (Fig. 10) *Dipturus oregoni*
- 27b.** Midline of tail with 13 to 26 thorns; thorns on tail without compressed and hook-shaped crowns; distance between dorsal fins about equal to length of first dorsal-fin base; 3 to 6 thorns between dorsal fins *Dipturus olseni*

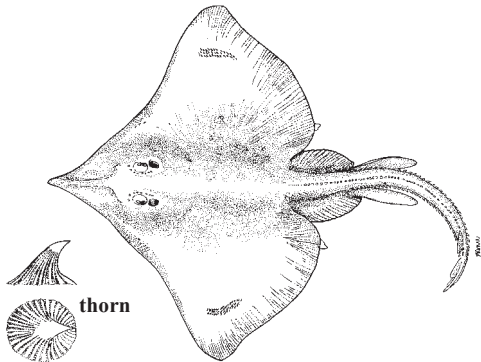


Fig. 10 *Dipturus oregoni*

- 28a.** Midbelt of disc with continuous row of thorns extending from nuchal region to tail . . . *Dipturus garricki*
28b. Nuchal thorn only thorn along midbelt of disc *Dipturus bullisi*
- 29a.** Distal fourth to third of tail without distinct thorns but uniformly covered with denticles
. *Malacoraja senta*
29b. Distal fourth to third of tail with distinct thorns → 30
- 30a.** Midrow thorns on disc very large and with stellate bases; about 10 midrow thorns on tail
between axil of pelvic fins and first dorsal fin *Amblyraja radiata*
30b. Midrow thorns on disc (if present) small to moderate in size and without stellate bases;
more than 15 midrow thorns on tail between axil of pelvic fins and first dorsal fin → 31
- 31a.** Dorsal surface of disc with various colour patterns (ocelli, spots, bars, rosettes); ventral
surface of disc light coloured → 32
31b. Dorsal surface of disc plain coloured; ventral surface of disc as dark or darker than dorsal
side → 39
- 32a.** Dorsal surface of disc with ocellus near base of each pectoral fin → 33
32b. Dorsal surface of disc without ocellus near base of each pectoral fin → 36
- 33a.** Thorns absent along midline of disc between nuchal region and axil of pectoral fins . *Raja bahamensis*
33b. Thorns present along midline of disc between nuchal region and axil of pectoral fins → 34
- 34a.** Disc width greater than 70% total length *Raja cervigoni*
34b. Disc less than 65% total length → 35
- 35a.** Lateral margin of snout distinctly concave; orbit length about 20% preorbital snout length;
no thorns over scapular region of disc *Raja texana*
35b. Lateral margin of snout only slightly concave; orbit length about 33% preorbital snout
length; 1 or more thorns over scapular region of disc *Raja ackleyi*
- 36a.** Dorsal surface of disc with many irregular dark spots and transverse, oblique narrow bars;
several thorns on scapular and nuchal region of disc, but thorns never forming a triangular
patch *Raja eglanteria*
36b. Dorsal surface of disc peppered with small dark and light spots or with spots concentrated
into dark rosettes; thorns on scapular and nuchal region of disc forming triangular patch → 37
- 37a.** Dorsal surface with diffuse to concentrated rosette pattern of dark spots *Leucoraja garmani*
37b. Dorsal surface with dark and pale spots → 38
- 38a.** Dorsal surface sparsely covered with small dark spots; maturity reached between 260 and
302 mm total length *Leucoraja yucatanensis*
38b. Dorsal surface densely covered with dark and pale spots; specimens mature between 350
and 418 mm total length *Leucoraja lentiginosa*
- 39a.** Preorbital snout length about 10% total length; snout obtuse and bluntly rounded . . *Rajella fuliginea*
39b. Preorbital snout length about 15% total length; snout acutely angled *Rajella purpuriventralis*

List of species occurring in the area

The symbol ♠ is given when species accounts are included.

- ♠ *Anacanthobatis americanus* Bigelow and Schroeder, 1962.
- ♠ *Anacanthobatis foliostris* (Bigelow and Schroeder, 1951).
- ♠ *Anacanthobatis longirostris* Bigelow and Schroeder, 1962.
- ♠ *Amblyraja radiata* (Donovan, 1808).
- ♠ *Breviraja claramaculata* McEachran and Matheson, 1985.
- ♠ *Breviraja colesi* Bigelow and Schroeder, 1948.
- ♠ *Breviraja mouldi* McEachran and Matheson, 1995.
- ♠ *Breviraja nigriventralis* McEachran and Matheson, 1985.
- ♠ *Breviraja spinosa* Bigelow and Schroeder, 1950.
- ♠ *Cruriraja atlantis* Bigelow and Schroeder, 1948.
- ♠ *Cruriraja cadenati* Bigelow and Schroeder, 1962.
- ♠ *Cruriraja poeyi* Bigelow and Schroeder, 1948.
- ♠ *Cruriraja rugosa* Bigelow and Schroeder, 1958.
- ♠ *Dactylobatus armatus* Bean and Weed, 1909.
- ♠ *Dactylobatus clarkii* (Bigelow and Schroeder, 1958).
- ♠ *Dipturus bullisi* (Bigelow and Schroeder, 1962).
- ♠ *Dipturus garricki* (Bigelow and Schroeder, 1958).
- ♠ *Dipturus olseni* (Bigelow and Schroeder, 1951).
- ♠ *Dipturus oregoni* (Bigelow and Schroeder, 1958).
- ♠ *Dipturus teevani* (Bigelow and Schroeder, 1951).
- ♠ *Fenestraja atripinna* (Bigelow and Schroeder, 1950).
- ♠ *Fenestraja cubensis* (Bigelow and Schroeder, 1950).
- ♠ *Fenestraja ishiyamai* (Bigelow and Schroeder, 1962).
- ♠ *Fenestraja plutonia* (Garman, 1881).
- ♠ *Fenestraja sinuomexicanus* (Bigelow and Schroeder, 1950).
- ♠ *Gurgesiella atlantica* (Bigelow and Schroeder, 1962).
- ♠ *Gurgesiella dorsalifera* McEachran and Compagno, 1980.
- ♠ *Leucoraja garmani* (Whitley, 1939).
- ♠ *Leucoraja lentiginosa* (Bigelow and Schroeder, 1951).
- ♠ *Leucoraja yucatanensis* (Bigelow and Schroeder, 1950).
- ♠ *Malacoraja senta* (Garman, 1885).
- ♠ *Neoraja carolinensis* McEachran and Stehmann, 1984.
- ♠ *Pseudoraja fischeri* Bigelow and Schroeder, 1954.
- ♠ *Raja ackleyi* Garman, 1881.
- ♠ *Raja bahamensis* Bigelow and Schroeder, 1965.
- ♠ *Raja cervigoni* Bigelow and Schroeder, 1964.
- ♠ *Raja eglanteria* Bosc, 1800.
- ♠ *Raja texana* Chandler, 1921.
- ♠ *Rajella fuliginea* (Bigelow and Schroeder, 1954).
- ♠ *Rajella purpuriventralis* (Bigelow and Schroeder, 1962).

References

- Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In *Fishes of the western North Atlantic*, edited by J. Tee-Van, C.M. Breder, A.E. Parr, W.C. Schroeder, and L.P. Schultz. *Mem. Sears Found. Mar. Res.*, (1)Pt. 2:588 p.
- Castro-Aguirre, J.L. and H. Espinosa Pérez. 1996. Listados faunísticos de México. VII *Catalogo sistemático de las rayas y especies afines de México* (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideomorpha). Universidad Nacional Autónoma de México, 75 p.
- McEachran, J.D. and K.A. Dunn. 1998. Phylogenetic analysis of skates, a morphologically conservative clade of elasmobranchs (Chondrichthyes: Rajidae). *Copeia*, 1998:271-290.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, Vol. 1, Myxiniformes to Gasterosteiformes. Austin, University of Texas Press, 1112 p.
- McEachran, J.D. and R.E. Matheson, Jr. 1985. Polychormatism and polymorphism in *Breviraja spinosa* (Elasmobranchii: Rajiformes), with descriptions of three new species. *Copeia*, 1985:1035-1052.

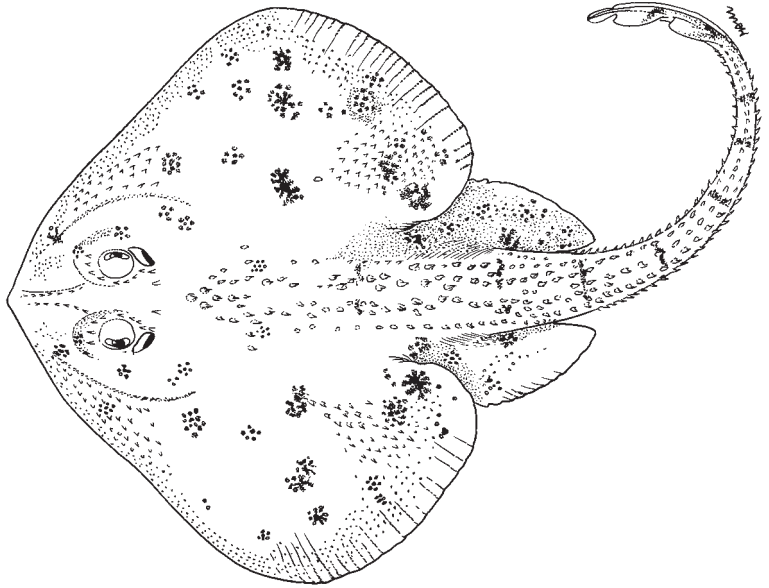
Leucoraja garmani (Whitley, 1939)

JFG

Frequent synonyms / misidentifications: *Raja garmani* Whitley, 1939 / *Leucoraja lentiginosa* (Bigelow and Schroeder, 1951).

FAO names: En - Rosette skate; Fr - Raie rosette; Sp - Raya germán.

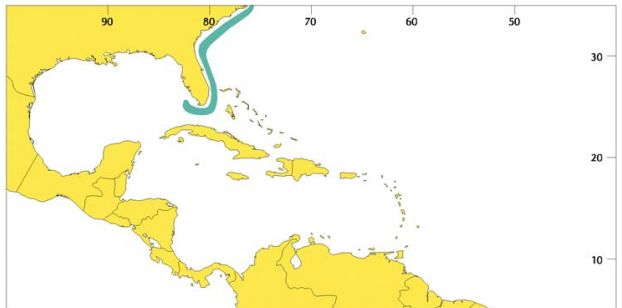
Diagnostic characters: Disc heart-shaped, about 1.2 to 1.3 times as broad as long; snout little projecting, anterior angle of snout 110 to 120°; anterolateral margin of disc straight in young to moderately concave opposite spiracles in adults; outer and posterior corners of disc broadly rounded. Snout moderately short, preorbital length 9 to 10% of total length. Mouth arched, teeth arranged in 44 to 52 rows in upper jaw. **Pectoral radials extending to about 3/4 length of snout. Anterior pelvic-fin lobe connected to posterior lobe by membrane and 48 to 56% of length of posterior lobe.** Tail 59 to 61% of total length; lateral tail folds narrow and extending from tip of posterior lobe of pelvic fin to near tip of tail; dorsal fins of similar shape and size, and separated by a space less than length of base of first dorsal fin. Denticles in broad band along anterior margin of disc; thorns along lateral margins of rostrum, in crescent-shaped arc along inner margin of orbits and spiracles, and **arranged in a triangular patch over the nuchal and scapular areas; 1 to 3 rows of thorns lateral to midline of disc and to midrow thorns on tail; midrow thorns present on disc only in juveniles.** Precaudal vertebrae 22 to 25, predorsal caudal vertebrae 58 to 64, and pectoral radials 61 to 67. **Colour: dorsal surface pale buff to brown with dark spots concentrated to form rosette patterns. Dark spots on upper surface of tail concentrated to form bars.** Ventral surface white to yellow, occasionally with greyish brown blotches on disc and tail.



Size: Maximum to 44 cm total length and 26 cm disc width; **common to 40 cm total length in the area;** north of Cape Hatteras maturity occurs between 33 and 44 cm total length, and south of Cape Hatteras maturity occurs between 25 and 34 cm total length.

Habitat, biology, and fisheries: This species is benthic on soft bottoms along the outer continental shelf and upper slope, between 37 and 366 m at temperatures between 6 and 21°C, but is common between 60 and 366 m at 9 to 20°C. Food consists of decapod crustaceans and to a lesser extent epibenthic copepods, amphipods, polychaetes, squids, and ray-finned fishes. Species consists of 2 subspecies located north of Cape Hatteras, North Carolina (*Leucoraja garmani virginica*) and between Cape Hatteras and Dry Tortugas, Florida (*Leucoraja garmani garmani*). It is exploited incidentally along the southeastern coast of the USA. Separate statistics are not reported for this species. Caught mainly with bottom trawls and bottom longlines. Marketed fresh and salted; also used for bait.

Distribution: From Cape Cod, Massachusetts, to the Florida Keys, Florida.

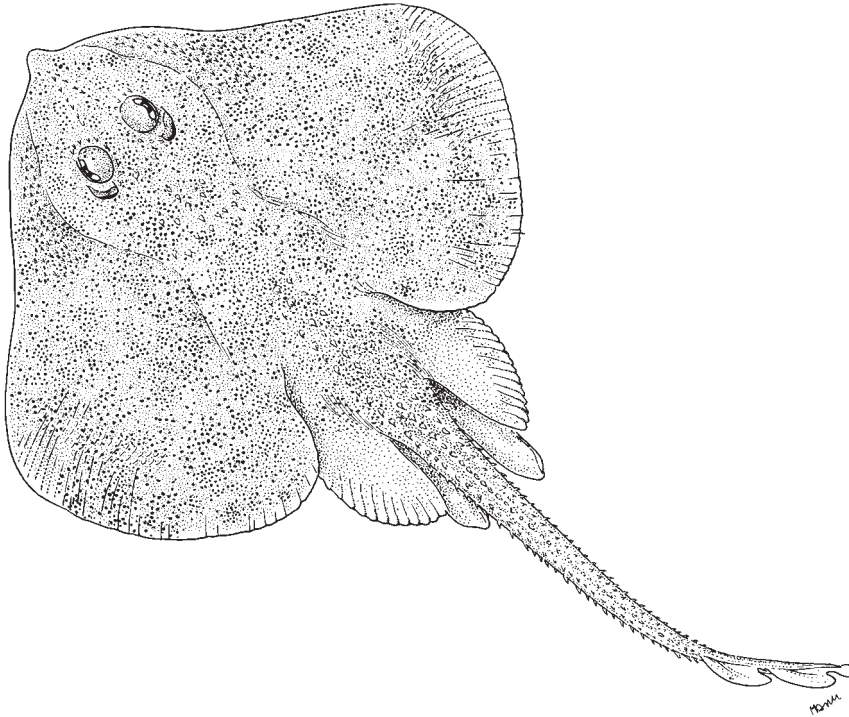


***Leucoraja lentiginosa* (Bigelow and Schroeder, 1951)**

JFS

Frequent synonyms / misidentifications: *Raja lentiginosa* Bigelow and Schroeder, 1951 / *Leucoraja garmani* (Whitley, 1939).

FAO names: En - Freckled skate.

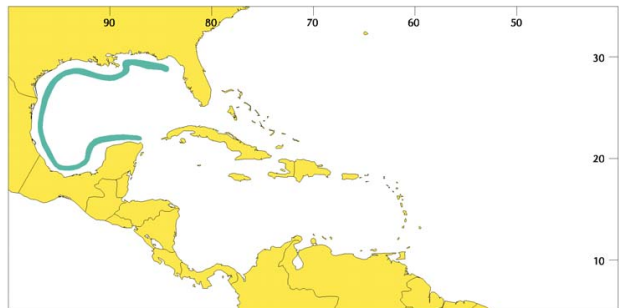


Diagnostic characters: Disc heart-shaped, about 1.2 to 1.3 times as broad as long; snout little projecting, anterior angle of snout 110 to 120°; anterolateral margin of disc straight in young to moderately concave opposite spiracles in adults; outer and posterior corners of disc broadly rounded. Snout moderately short, preorbital length is 8.5 to 9.7% total length. Mouth arched, teeth arranged in 47 to 54 rows in upper jaw. **Pectoral radials extend to about 3/4 snout length. Anterior pelvic-fin lobe connected to posterior lobe by membrane and distinctly shorter than posterior lobe.** Tail is 59 to 61% total length; lateral tail fold narrow and extending from tip of posterior lobe of pelvic fin to near tip of tail; dorsal fins of similar shape and size and separated by space less than length of base of first dorsal fin. Denticles in broad band along anterior margin of disc; thorns along lateral margins of rostrum, in crescent-shaped arc along inner margin of orbits and spiracles and **arranged in triangular patch over nuchal and scapular areas**; 1 to 3 rows of thorns lateral to midline of disc and to midrow thorns on tail; midrow thorns present on disc only in juveniles. Precaudal vertebrae 21 to 27, and predorsal caudal vertebrae 59 to 65, and pectoral radials 63 to 68. **Colour: dorsal surface pale buff to brown and freckled with scattered pale and dark spots.** Ventral surface white to yellow, occasionally with greyish brown blotches on disc and tail.

Size: Maximum to 44 cm total length and 25 cm disc width; common to 40 cm total length.

Habitat, biology, and fisheries: This species is benthic on soft bottoms along the outer continental shelf and upper slope, between 53 and 588 m at 11 to 21° C but is common between 60 and 366 m at 9 to 20° C.

Distribution: Throughout the Gulf of Mexico from northwestern Florida to Yucatán.



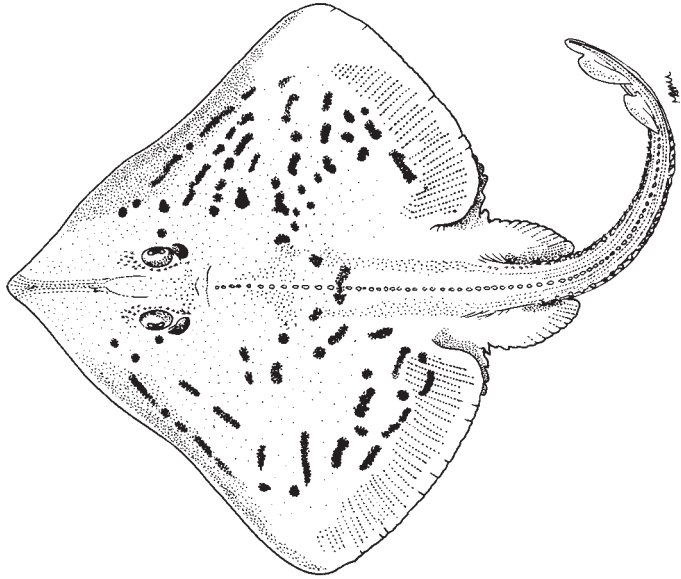
Raja eglanteria Bosc, 1800

JFE

Frequent synonyms / misidentifications: None / None.

FAO names: En - Clearnose skate; Fr - Raie blanc nez; Sp - Raya hialina.

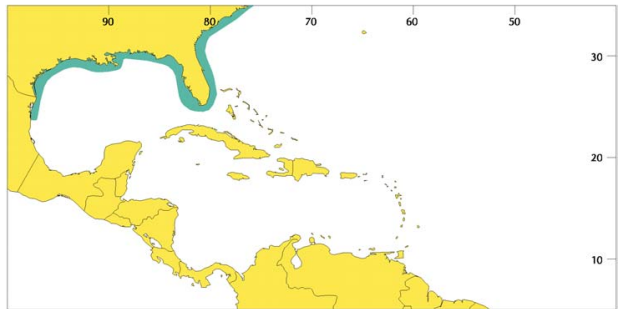
Diagnostic characters: Disc rhombic, about 1.2 to 1.3 times as broad as long; snout moderately projecting; anterior angle of snout 90 to 110°; anterolateral margin of disc straight to slightly concave opposite spiracles; outer corners of disc abruptly rounded; posterior corners of disc broadly rounded. Snout moderately long, preorbital length 14 to 15% total length. Mouth straight to slightly arched; teeth arranged in 46 to 54 rows in upper jaw. Pectoral-fin radials extend slightly anterior to midlength of snout. Anterior pelvic-fin lobe connected to posterior lobe by membrane, and **anterior lobe about 50% length of posterior lobe. Tail about 50% total length**, lateral tail fold well developed and extending from tip of posterior lobe of pelvic fins to near tip of tail; dorsal fins of similar shape and size and separated by space equal to about 1/4 length of base of first dorsal fin. Denticles in band along anterior margin of disc and over much of remainder of disc; thorns in crescent-shaped arc along inner margin of orbits and spiracles; **continuous row of thorns from nuchal region to first dorsal fin; 1 to 5 scapular thorns, not arranged with nuchal thorns in triangular patch; lateral and often parallel row of thorns on each side of tail**; 1 or 2 thorns between dorsal fins. Precaudal vertebrae number 33 to 35, predorsal caudal vertebrae number 56 to 59, pectoral-fin radials number 81 to 82. **Colour: upper dorsal surface light brown with dark brown to black spots and bars**; area on either side of snout semitransparent; ventral surface white. Individuals from the southern part of the range blunter snouts, a less distinct colour pattern, and mature at a smaller size than those from the northern part of the range and may represent a separate species.



Size: Maximum to 79 cm total length and 52 cm width; common to about 70 cm total length in area.

Habitat, biology, and fisheries: This species occurs from the shore zone to 119 m at temperatures from 5 to 27° C but it is most common between the shore and 111 m at 15 to 25° C in area. Occasionally found in estuaries but not in fresh water. Food consists mainly of decapod crustaceans, bivalves, polychaetes, squids, and ray-finned fishes. Exploited in the southeastern USA, but separate statistics are not reported for this species. Caught mainly with bottom trawls. Marketed fresh and salted; also used for bait.

Distribution: Western Atlantic coast of USA from Massachusetts and occasionally from Gulf of Maine, bordering Florida and throughout northern Gulf of Mexico to northern Tamaulipas state, Mexico.



***Raja texana* Chandler, 1921**

JAF

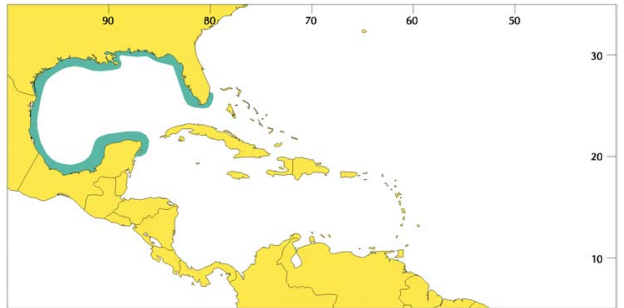
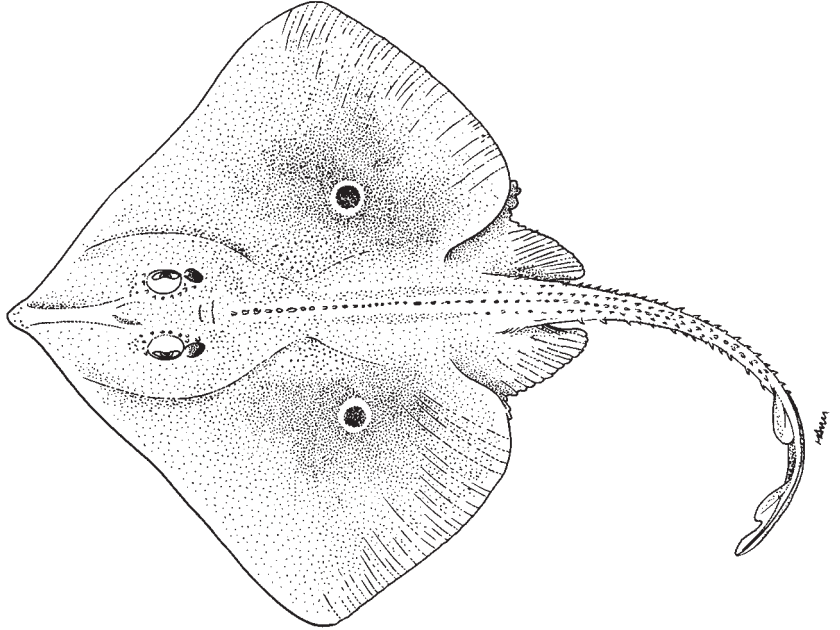
Frequent synonyms / misidentifications: None / None**FAO names** En - Roundel skate; Fr - Raie tourteau; Sp - Raya tejana.**Diagnostic characters:**

Disc rhombic, about 1.2 to 1.3 times as broad as long; snout moderately projecting; anterior angle of snout 85 to 106°; anterolateral margin of disc moderately to strongly concave opposite spiracles; outer corners of disc abruptly rounded; posterior corners of disc broadly rounded. Snout moderately long, preorbital length is 14 to 18% total length. Mouth gently to strongly arched; teeth arranged in 44 to 48 rows. Pectoral radials extending to midlength of snout. Anterior pelvic-fin lobe connected to posterior lobe and **anterior lobe 67 to 72% length of posterior lobe. Tail about 55% total length;** lateral tail fold narrow and extending from tip of posterior lobe of pelvic fins to near tip of tail; dorsal fins of similar shape and size, and separated by space equal to 1/3 to 1/2 the length of base of first dorsal fin. Upper surface of disc smooth except for thorns in arc along inner margin of orbits and spiracles, **in linear series from nuchal region to first dorsal fin** and alar thorns in males; **those on midlength of disc very small; 1 lateral and 1 parallel row of thorns on tail.** Precaudal vertebrae number 30 to 33, predorsal caudal vertebrae number 48 to 51, and pectoral radials number 76 to 80. **Colour: dorsal surface brown with a round ocellar spot on basal section of pectoral fin; ocellus is dark brown to black surrounded by a yellow ring;** area on either side of snout semitransparent. Lower surface white. Young specimens often with light spots and blotches scattered over dorsal aspect of disc.

Size: Maximum size 53.7 cm total length, 33.3 cm width; common up to 47.5 cm total length.

Habitat, biology, and fisheries: This species occurs on the continental shelf on soft bottoms from 15 to 110 m at temperatures from 14 to 28°C but it is most common inshore of 91 m at 16 to 25°C. Food consists largely of decapod crustaceans and to a lesser extent other benthic invertebrates and ray-fined fishes. Exploited in the northern Gulf of Mexico, west of the Mississippi River. Separate statistics are not reported for this species. Caught mainly with bottom trawls. Marketed fresh and salted; also used for bait.

Distribution: Predominantly throughout Gulf of Mexico (also in southeastern Florida) from Florida to just east of Cape Catoche, Quintana Roo (Mexico).

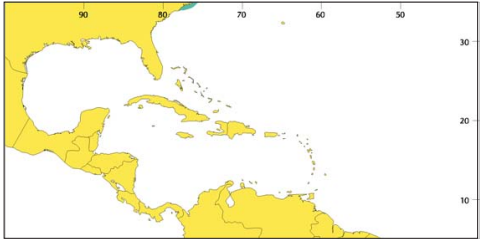
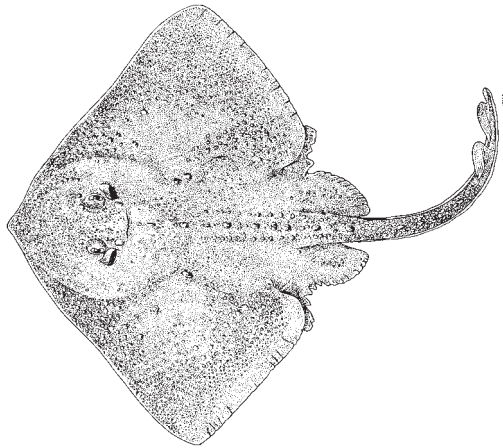


Amblyraja radiata (Donovan, 1808)

RJR

En - Starry skate (AFS: Thorny skate); **Fr** - Raie radiée (AFS: Raie épineuse); **Sp** - Raya radiante.

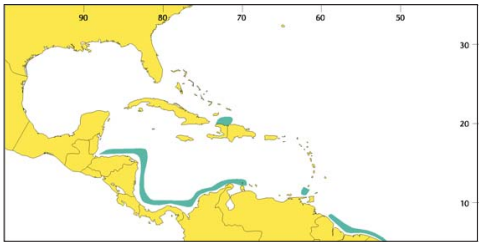
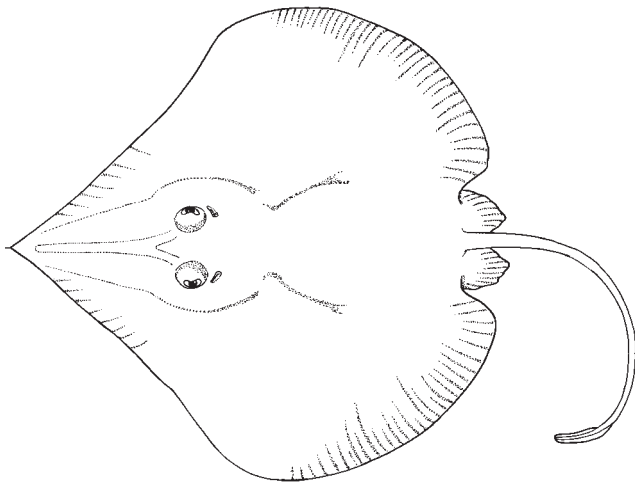
Maximum size 102 cm total length; males mature between 54 and 85 cm total length. Benthic along continental shelf and slope between 18 and 896 m but limited to narrow band along midslope in southern part of range. Recorded from Hudson Bay and Greenland to off South Carolina. Rare south of Cape Hatteras. Dorsal surface uniform brown or brown with darker mottling; ventral surface white, often with sooty blotches.



Anacanthobatis americanus Bigelow and Schroeder, 1962

En - American spineless skate.

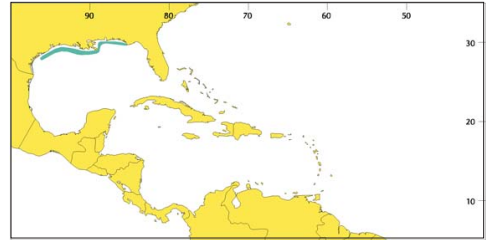
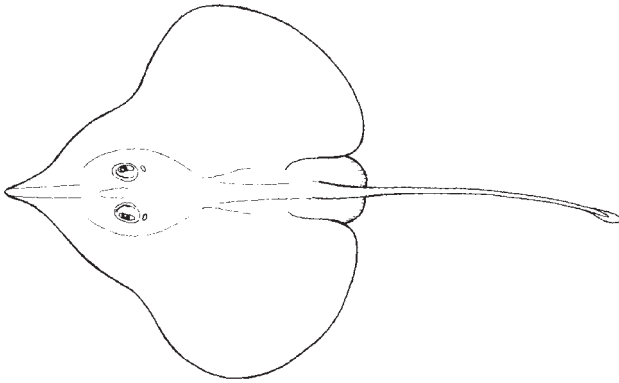
Maximum size 38 cm total length; males mature by at least 32 cm total length. Benthic along slope between 183 and 915 m. Recorded from Hispaniola, Caribbean coast of Central America, and northern coast of South America. Dorsal surface greyish brown, ventral surface generally greyish white with a dark brown mottled region between mouth and scapular area. Snout relatively short and attenuating as fine filament.



***Anacanthobatis folirostris* (Bigelow and Schroeder, 1951)**

En - Leafsnout spineless skate.

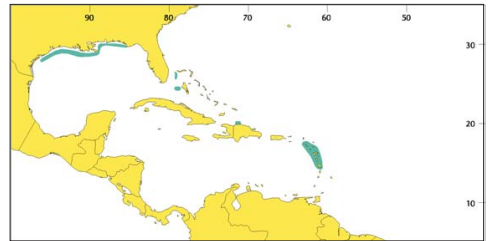
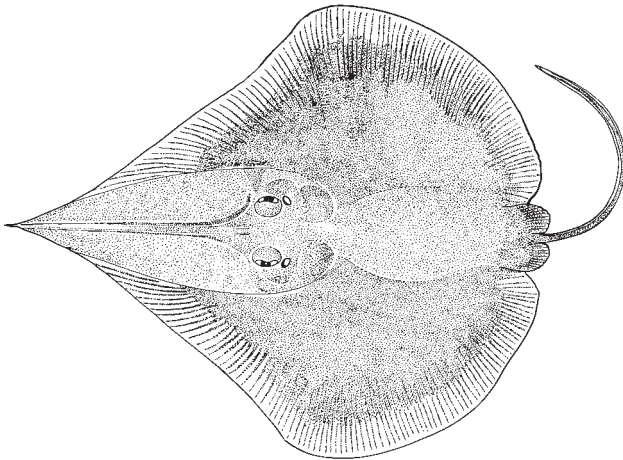
Maximum size 58 cm total length for males and 62 mm total length for females. Benthic along upper slope, between 300 and 512 m. Recorded (as *Springeria folirostris*) from northern Gulf of Mexico. Dorsal surface ash grey; ventral surface pale grey. Snout very long and laterally expanded into leaf-like structure.



***Anacanthobatis longirostris* Bigelow and Schroeder, 1962**

En - Longsnout spineless skate.

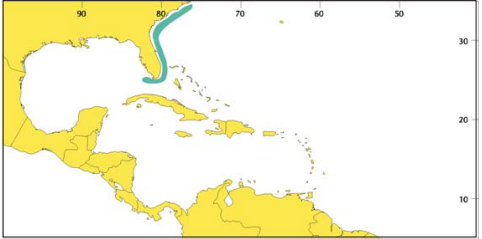
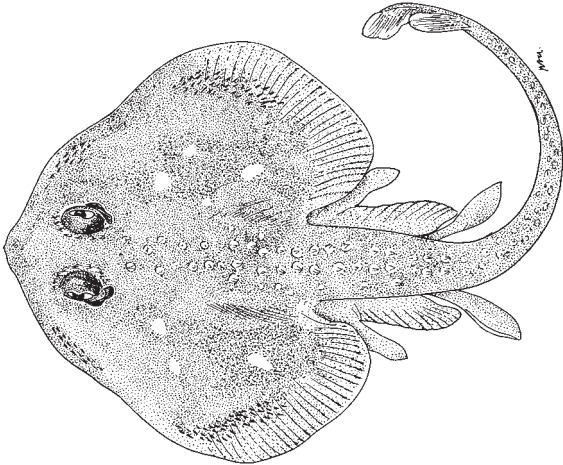
Maximum size 75 cm total length. Benthic along slope, between 520 and 1 052 m. Recorded from northern Gulf of Mexico, Bahamas, Hispaniola, and Lesser Antilles. Dorsal surface purplish grey dorsally; ventral surface light grey, anterior snout region blackish. Snout very long and attenuating as fine filament.



***Breviraja claramaculata* McEachran and Matheson, 1985**

En - Lightspotted shortskate.

Maximum size 29 cm total length. Benthic along slope, between 293 and 896 m. Recorded from South Carolina to Florida Keys. Dorsal surface tan with symmetrically arranged white spots surrounded by darker brown blotches; ventral surface white with tan disc margin. Three rows of small thorns along midline of posterior half of disc.

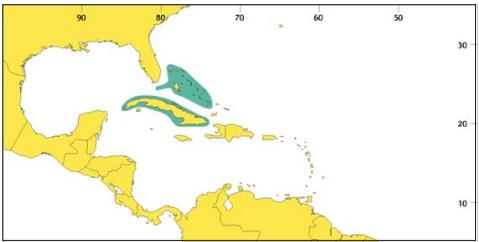
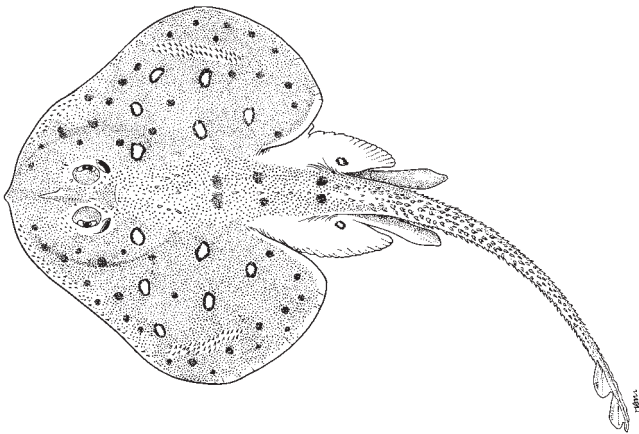


***Breviraja colesi* Bigelow and Schroeder, 1948**

BVO

En - Sheathsnout shortskate.

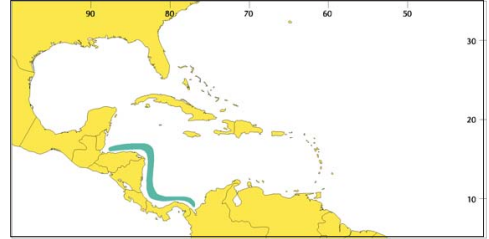
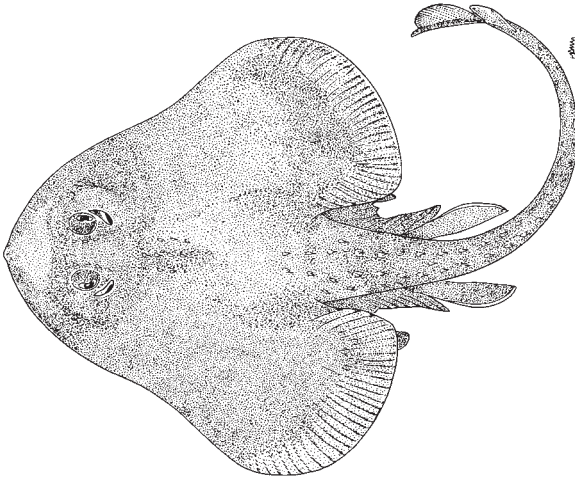
Maximum size 40 cm total length; males mature at 32 cm total length. Benthic along upper slope, between 220 and 415 m. Recorded from east coast of Florida, Bahamas, and Cuba. Dorsal surface pale brown, with scattered dark brown blotches and spots, and with eye-sized whitish spots surrounded by dark brown; ventral surface white to yellowish. Single, often incomplete, row of thorns along posterior half of disc.



***Breviraja mouldi* McEachran and Matheson, 1995**

En - Mould's shortskate.

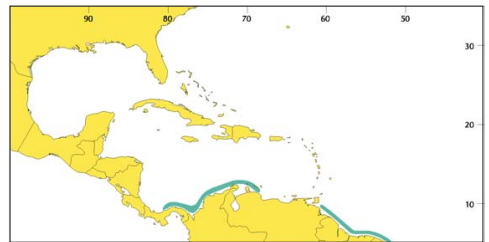
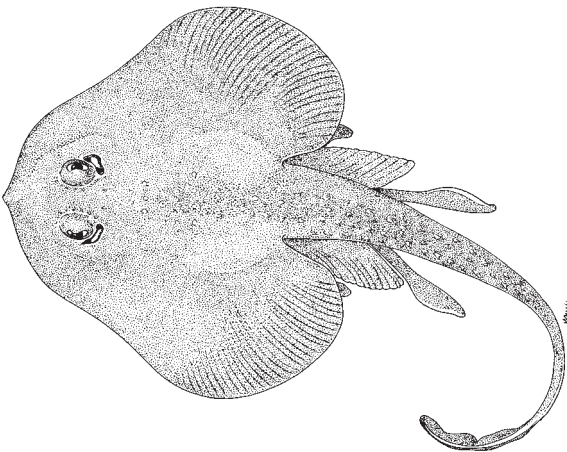
Maximum size 41 cm total length. Benthic along continental slope, between 353 to 776 m. Recorded from Honduras to Panama. Dorsal surface uniformly tan with indistinct brown blotches on dorsal and caudal fins; ventral surface pale tan with lateral aspect of disc slightly darker. Three rows of small thorns along midline of posterior half of disc.



***Breviraja nigriventralis* McEachran and Matheson, 1985**

En - Blackbelly shortskate.

Maximum size 44 cm total length. Benthic along the lower slope, between 549 and 776 m. Recorded from northern South America, from Panama to French Guiana. Dorsal surface tanish grey to blackish grey, with black dorsal and caudal fins; ventral surface black except for lighter grey rostral area, centre of abdomen, anterior to pectoral-fin axils and posterior disc margin. Three rows of small thorns along midline of posterior half of disc and lower jaw with spatula-like process partially overlapping symphysis of upper jaw.

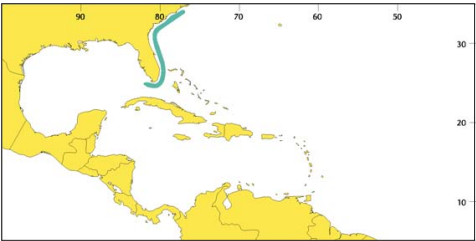
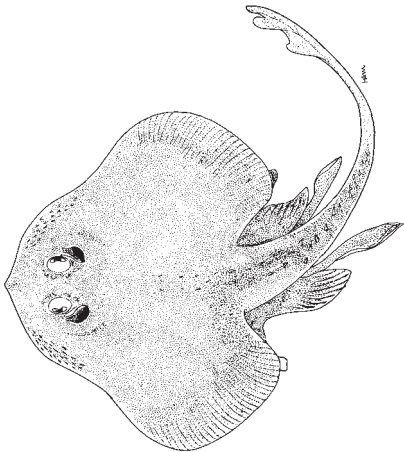


Breviraja spinosa Bigelow and Schroeder, 1950

BVS

En - Spiny shortskate.

Maximum size at least 33 cm total length; mature males from 33 cm total length. Benthic along slope, between 366 and 671 m. Recorded from North Carolina to the Florida Keys, with questionable record from northeastern Gulf of Mexico. Dorsal surface tan; ventral surface tan, with sooty grey blotches on ventral central disc area. Three rows of small thorns along midline of posterior half of disc.

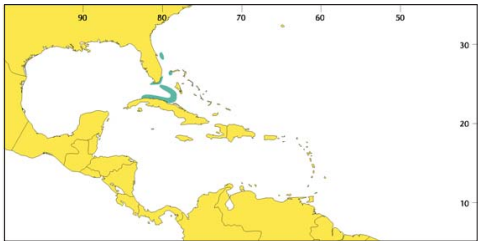
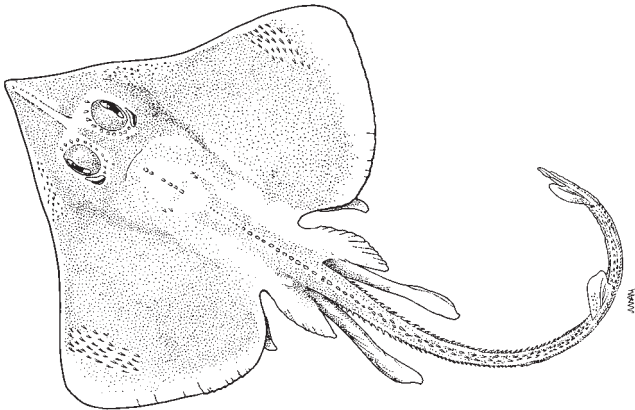


Cruriraja atlantis Bigelow and Schroeder, 1948

CJA

En - Cuban limbedskate.

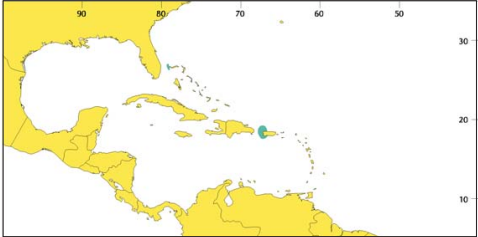
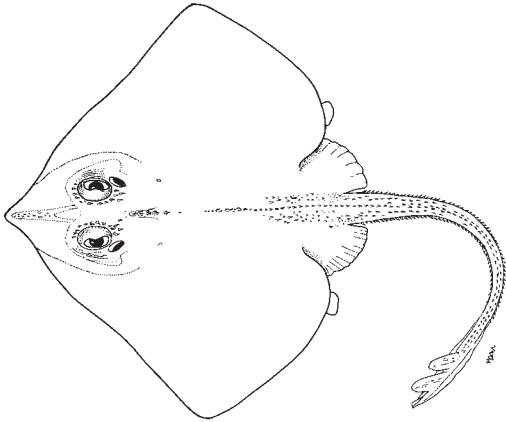
Maximum size 34 cm total length; males appear mature at 30 cm. Benthic along slope, between 512 and 777 m. Recorded from east coast of Florida, Florida Keys, Bahamas, and Cuba. Dorsal surface pale brown, with faded crossbands at levels of dorsal fins, dorsal fins black; ventral surface yellowish, with faded blotches on abdomen, posterior disc, and pelvic fins. Interspace between dorsal fins exceeds length of first dorsal-fin base. Several thorns located on nuchal and scapular regions.



Cruriraja cadenati Bigelow and Schroeder, 1962

En - Cadenat's limbedskate.

Maximum size 38 cm total length. Benthic along slope, between 457 and 896 m. Recorded from east coast of Florida and Puerto Rico. Dorsal surface light brown with numerous darker brown irregular spots of various sizes but not greater than eye diameter; ventral surface white with outer disc margin grey. Several thorns located on nuchal region and dorsal fins closely spaced.

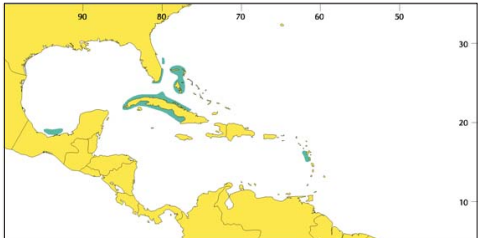
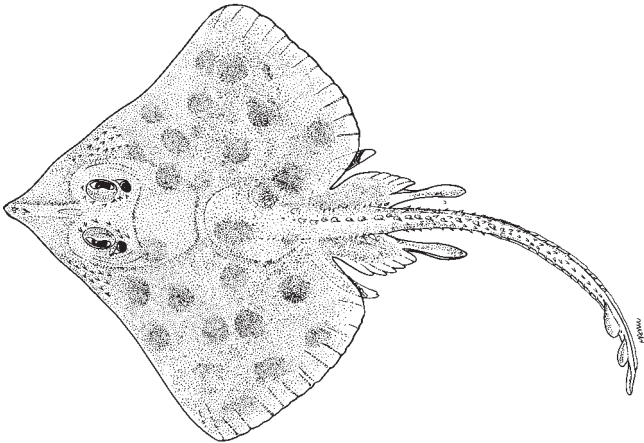


Cruriraja poeyi Bigelow and Schroeder, 1948

CJY

En - Poey's limbedskate.

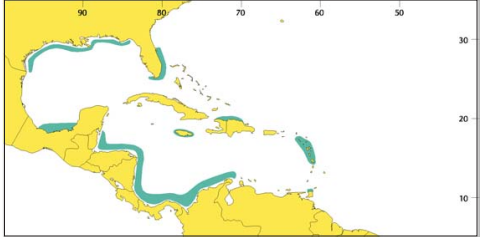
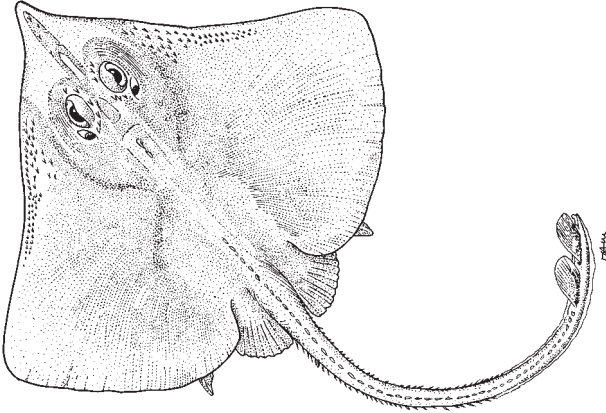
Maximum size 34 cm total length; males mature at close to 32 cm total length. Benthic along slope, between 366 and 870 m. Recorded from southern Florida, Florida Keys, Bahamas, Cuba, and southern Gulf of Mexico. Dorsal surface pale brown, usually with dark brown round spots scattered on disc; ventral surface dark brown. Nuchal region generally lacks thorns.



Cruriraja rugosa Bigelow and Schroeder, 1958

En - Wrinkled limbedskate.

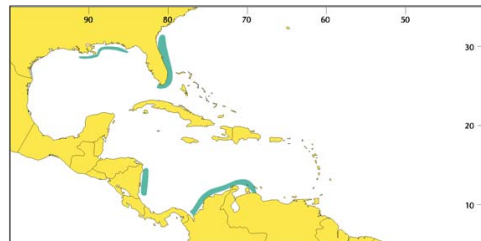
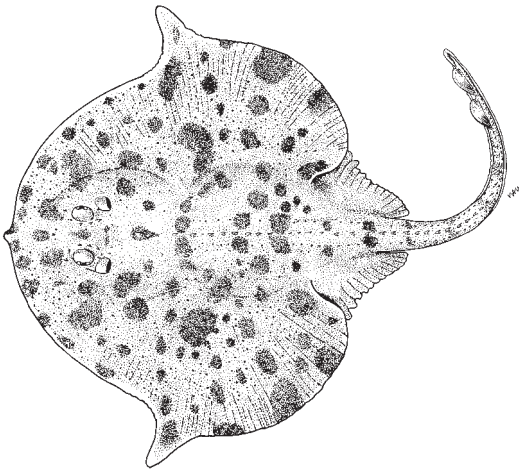
Maximum size 49 cm total length; males mature at close to 40 cm total length. Benthic along continental slope, between 366 and 1 007 m. Recorded from east coast of Florida, Florida Keys, throughout Gulf of Mexico, Bahamas, Greater and Lesser Antilles, and Caribbean coasts of Central America and South America. Dorsal surface brown without markings; ventral surface pale brown to bluish. Several thorns generally located on scapular region.



Dactylobatus armatus Bean and Weed, 1909

En - Armed fingerskate.

Maximum size at least 32 cm total length; mature males with fully-developed claspers unknown. Benthic along upper slope, between 338 and 685 m. Recorded from South Carolina to southern Florida, northern Gulf of Mexico, and Caribbean coasts of Nicaragua and South America. Dorsal surface brownish grey, with variously-sized darker blotches; ventral surface yellowish white. Lateral contour of disc extended as spatulate process. Double row of curved denticles run along anterior ventral margin of disc.

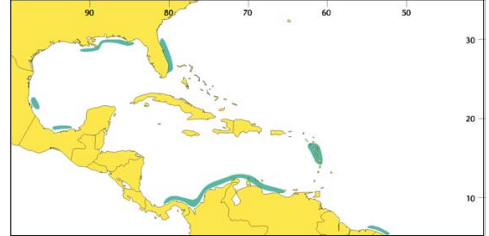
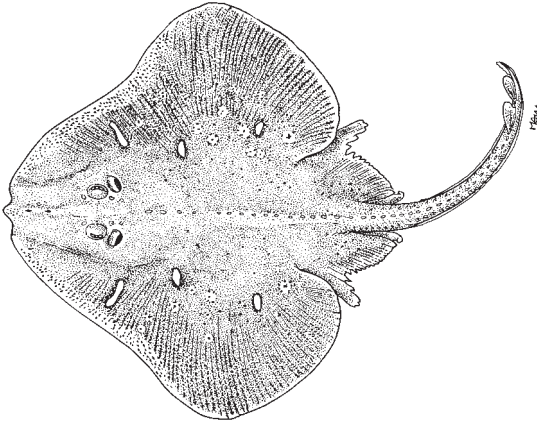


Dactylobatus clarkii (Bigelow and Schroeder, 1958)

JRR

En - Clark's fingerskate.

Maximum size at least 75 cm total length; males are suspected to mature at great size. Benthic along slope, between 366 and 915 m. Recorded from east coast of Florida, throughout Gulf of Mexico, Caribbean coasts of Central and South America, Suriname, and the Lesser Antilles. Dorsal surface pale brown, with white laterally-elongated blotches with darker margins over disc (more prominent in larger specimens); ventral surface whitish. Anterior margin of snout very obtuse and double row of curved denticles along anterior ventral margin of disc.

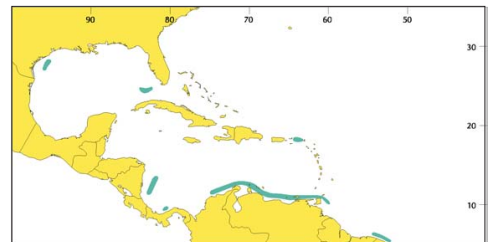
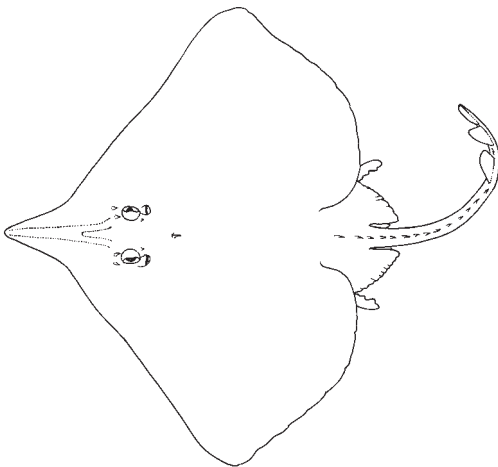


Dipturus bullisi (Bigelow and Schroeder, 1962)

JRL

En - Bullis' skate (AFS: Lozenge skate); **Fr** - Raie de Bullis; **Sp** - Raya de Bullis.

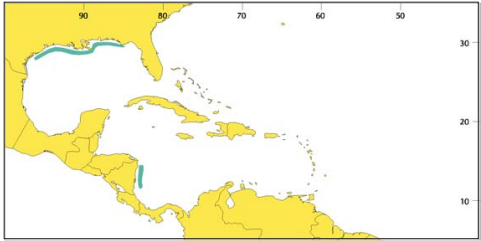
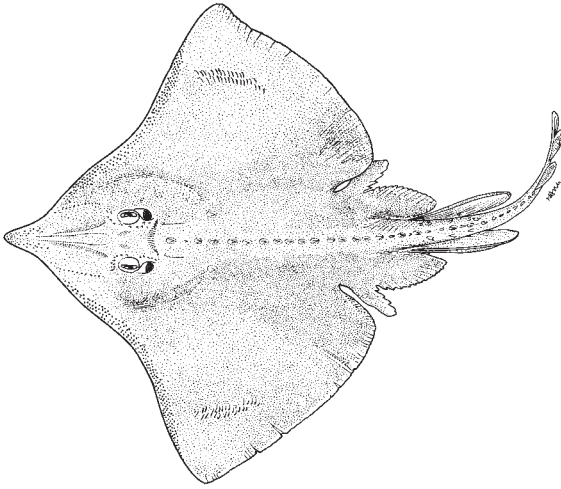
Maximum size at least 77 cm total length; males mature at around 76 cm total length; neonates 17 cm total length at birth. Benthic along upper slope, between 183 and 549 m. Recorded from the eastern and western Gulf of Mexico, Lesser Antilles, and Caribbean coasts of Central and South America. Dorsal surface uniform light brown; ventral surface dark brown, with darker pigment on ampullary pores of snout and posterior to lower jaw. Orbital and nuchal thorns on disc.



***Dipturus garricki* (Bigelow and Schroeder, 1958)**

En - Garrick's wingedskate.

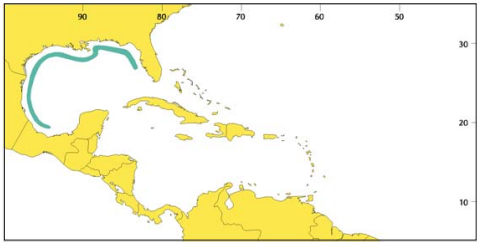
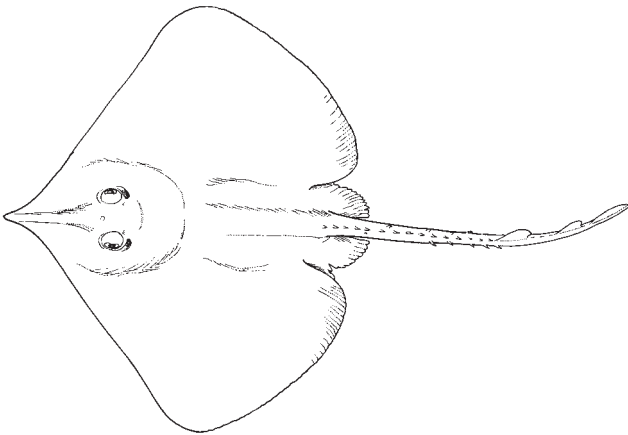
Maximum size 107 cm total length; males mature at 96 cm total length. Benthic along upper slope, between 275 and 476 m. Recorded from northern Gulf of Mexico and Nicaragua. Dorsal surface uniform brown; ventral surface pale dusky bluish, with dark-pigmented ampullary pores anterior to abdominal region. Thorns on scapular region and along midline to origin of first dorsal fin.



***Dipturus olseni* (Bigelow and Schroeder, 1951)**

En - Olsen's wingedskate (AFS: Spreadfin skate).

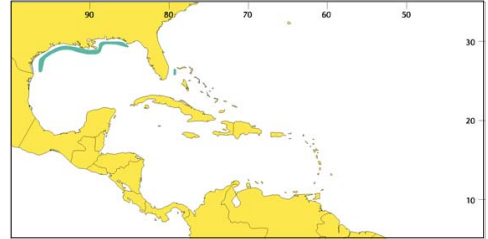
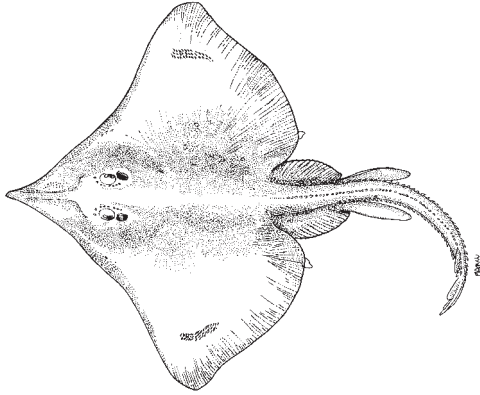
Maximum size 57 cm total length; males mature at 51 cm total length. Benthic along outer continental shelf and upper slope, between 55 and 384 m. Recorded from northern Gulf of Mexico. Dorsal surface dark brown, with undefined darker blotches on disc and light-pigmented ampullary pores; ventral surface grey to black with dark-pigmented ampullary pores. No thorns along midbelt of disc but 3 rows of thorns on tail. Interspace between dorsal fins equal to length of first dorsal-fin base or greater.



Dipturus oregoni (Bigelow and Schroeder, 1958)

En - RV Oregon's wingedskate.

Maximum size 144 cm total length; males mature between 107 cm and 144 cm total length. Benthic along lower slope, between 475 and 1 079 m. Recorded from the east coast of Florida and northern Gulf of Mexico. Dorsal surface brown; ventral surface pale bluish grey, with dark-pigmented ampullary pores anterior to abdomen. No thorns along midbelt of disc but 3 rows of thorns on tail, with lateral rows of tail compressed and hook-shaped.

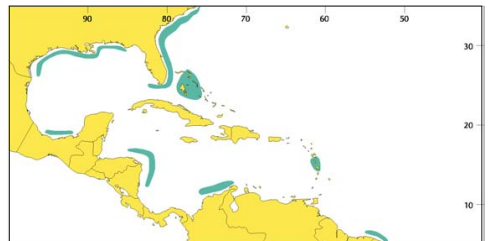
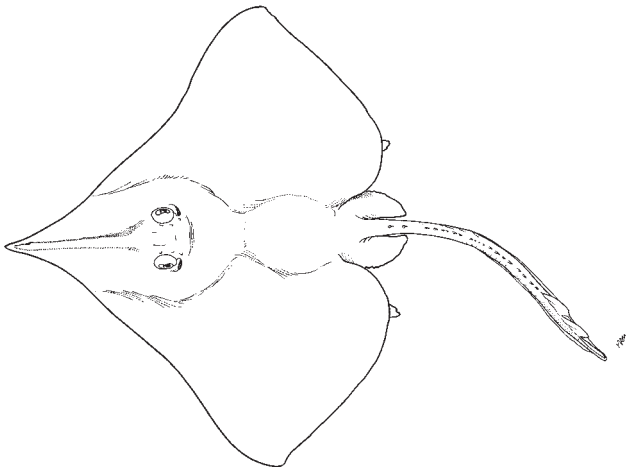


Dipturus teevani (Bigelow and Schroeder, 1951)

JAB

En - Prickly brown ray; **Fr** - Raie rugueuse; **Sp** - Raya piel de lija.

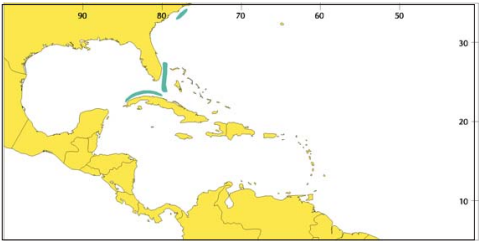
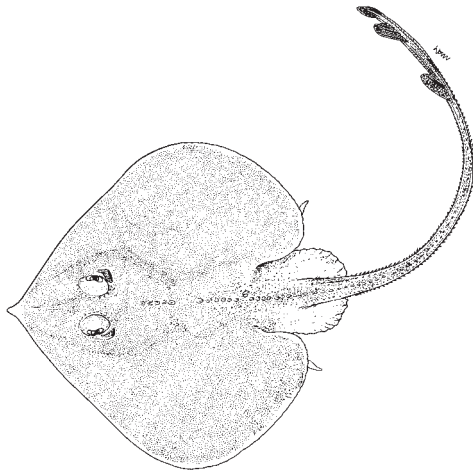
Maximum size 84 cm total length; males mature at 63 cm total length. Benthic along slope, between 311 and 732 m. Recorded from North Carolina to Florida Keys, throughout Gulf of Mexico, Caribbean coast of Central America, northern coast of South America, and Lesser Antilles. Dorsal surface pale brown, with blackish dorsal and caudal fins; ventral surface cream coloured, with ampullary pores of snout region dark-pigmented. No thorns along midbelt of disc but single row of thorns on tail.



***Fenestraja atripinna* (Bigelow and Schroeder, 1950)**

En - Blackfined window skate.

Maximum size 29 cm total length. Benthic along slope, 366 and 951 m. Recorded from North Carolina, southern Florida, Bahamas, and Cuba. Dorsal surface tan to brown, with black dorsal fins and caudal fold; ventral surface creamy, with darker brown, indistinct blotches. Anterior lobe of pelvic fin as long or only slightly shorter than posterior lobe. Distance between dorsal fins about equal to length of first dorsal-fin base.

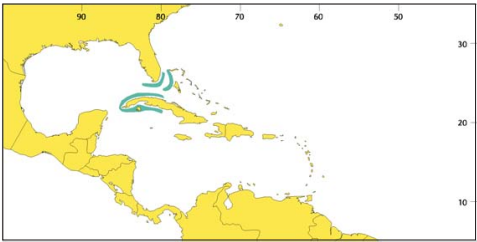
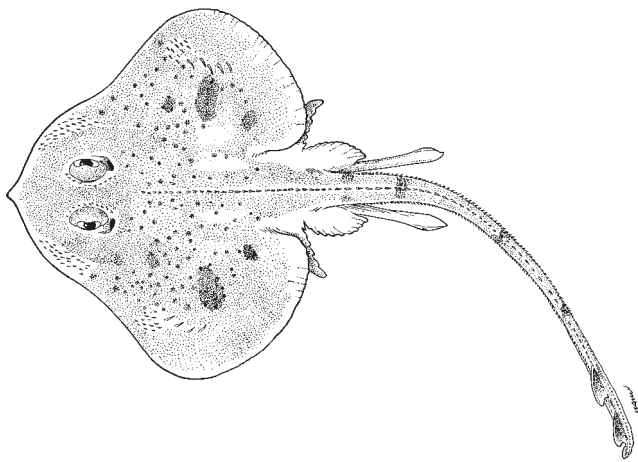


***Fenestraja cubensis* (Bigelow and Schroeder, 1950)**

BVU

En - Cuban window skate.

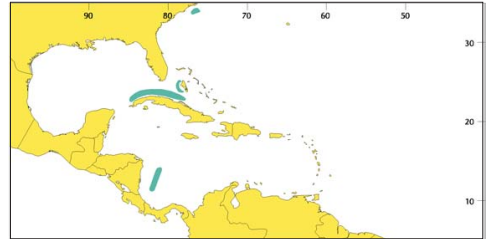
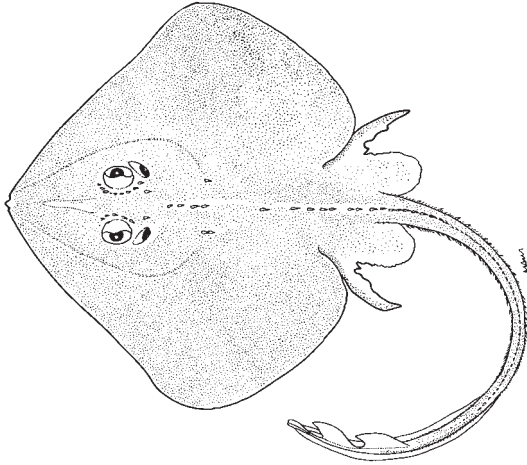
Maximum size 23 cm total length; mature males at 18 cm to 21 cm total length; neonates about 7 cm total length at birth. Benthic along slope, between 440 and 869 m. Recorded from southeastern Florida, Florida Keys, Bahamas, and Cuba. Dorsal surface pale brown, with darker brown spots and blotches of varying diameter, and cross-bands on tail; ventral surface pale yellowish. Anterior lobe of pelvic fin only slightly shorter than posterior lobe. Thorns along midline of disc inconspicuous.



***Fenestraja ishiyamai* (Bigelow and Schroeder, 1962)**

En - Ishiyama's window skate.

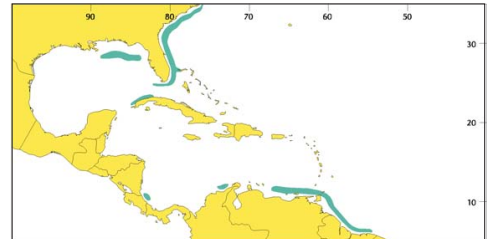
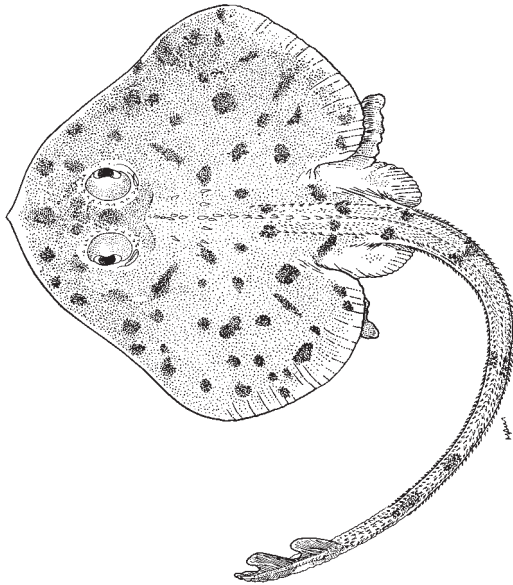
Maximum size 36 cm total length. Benthic along the slope, between 503 and 950 m. Recorded from southeastern Florida, Florida Keys, Bahamas, Cuba, and Caribbean coast of Nicaragua. Dorsal surface uniform greyish brown; ventral surface pinkish white ventrally. Anterior lobe of pelvic fin as long or only slightly shorter than posterior lobe.



***Fenestraja plutonia* (Garman, 1881)**

En - Underworld window skate.

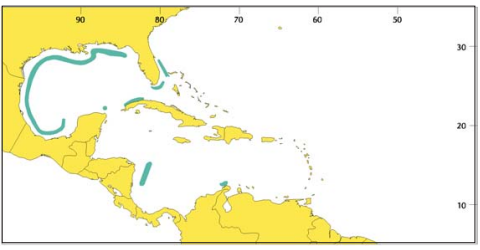
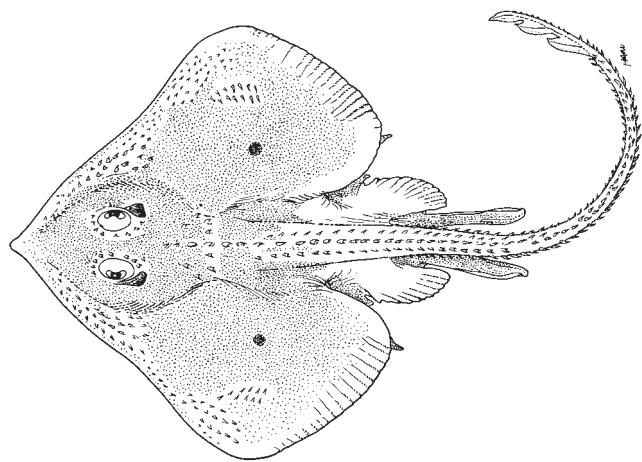
Maximum size 27 cm total length; males mature at about 23 cm total length. Benthic along slope, between 293 and 1 024 m. Recorded from North Carolina to Florida Keys, Bahamas, northeastern Gulf of Mexico, Costa Rica, and northern coast of South America. Dorsal surface varying from pale yellowish brown to greyish or purplish brown, with dark, irregular blotches over disc and cross-bands on tail; ventral surface yellowish white. Anterior lobe of pelvic fin as long or slightly shorter than posterior lobe.



***Fenestraja sinuomexicanus* (Bigelow and Schroeder, 1950)**

En - Gulf-of-Mexico windowskate (AFS: Gulf skate).

Maximum size 36 cm total length; males mature at 31 cm to 34 cm total length. Benthic along outer continental shelf and slope, between 56 and 1 096 m. Recorded from southeastern Florida, Bahamas, throughout Gulf of Mexico, Cuba, and Caribbean coast of Nicaragua and Venezuela. Dorsal surface brownish purple, sometimes with irregular dark blotches on disc; ventral surface yellowish white. Anterior lobe of pelvic fin as long or only slightly shorter than posterior lobe. Midline of posterior half of disc and tail to origin of first dorsal fin with 3 rows of thorns.

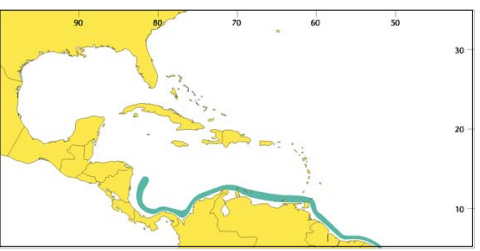
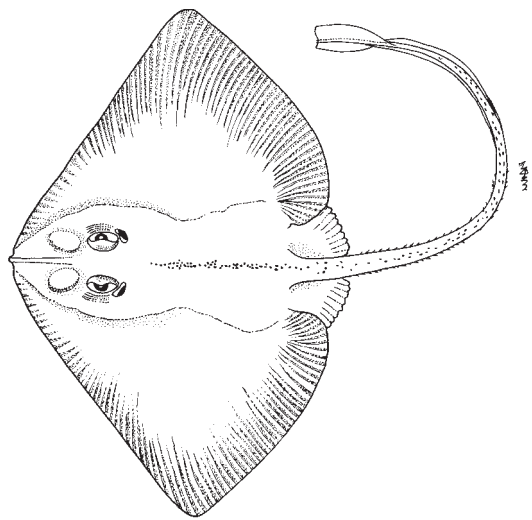


***Gurgesiella atlantica* (Bigelow and Schroeder, 1962)**

RGA

En - Atlantic abyssalskate.

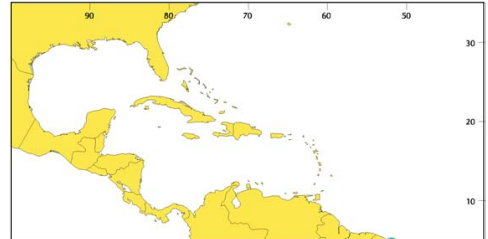
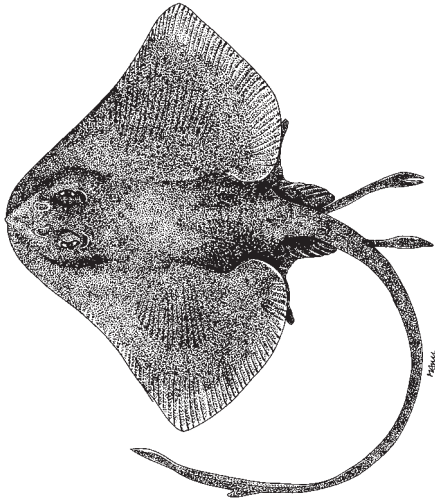
Maximum size 49 cm total length; males mature at 42 cm at least. Benthic along slope, between 247 and 960 m. Recorded from Nicaragua, Panama, and northern coast of South America. Dorsal surface uniform pale brown, with black caudal fin; ventral surface pale brown to pinkish, with dusky brown blotches on ventral tail surface. Pelvic fins with single, laterally directed, pointed lobe. Dorsal fin usually absent.



***Gurgesiella dorsalifera* McEachran and Compagno, 1980**

En - Dorsal-fined abyssalskate.

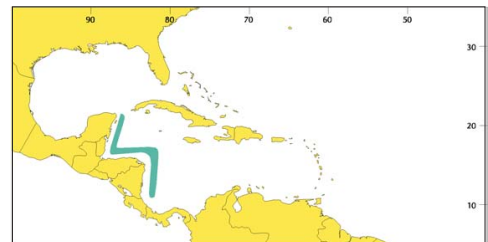
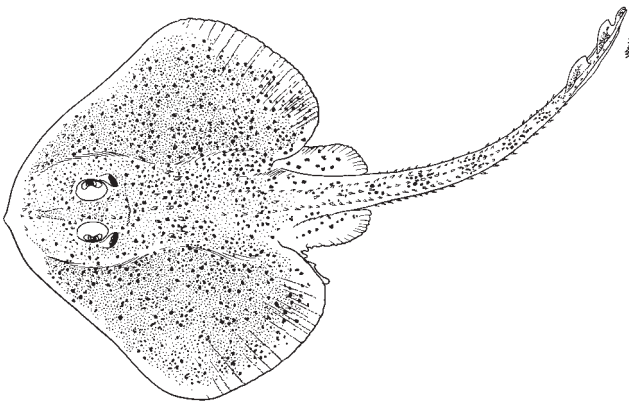
Maximum size 53 cm total length; males mature at 42 cm total length. Benthic along slope, between 500 and 800 m. Recorded from northern coast of Brazil and southern Brazil. Dorsal surface tanish brown to chocolate brown, with light tan blotches scattered over disc, tan cross-bands on tail, and dark-pigmented ampullary pores; ventral surface light tan, with slightly darker outer disc and pelvic-fin margins. Dorsal fin present.



***Leucoraja yucatanensis* (Bigelow and Schroeder, 1950)**

En - Yucatan whiteskate.

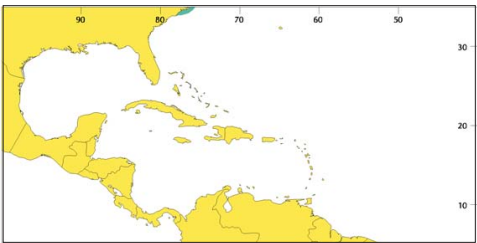
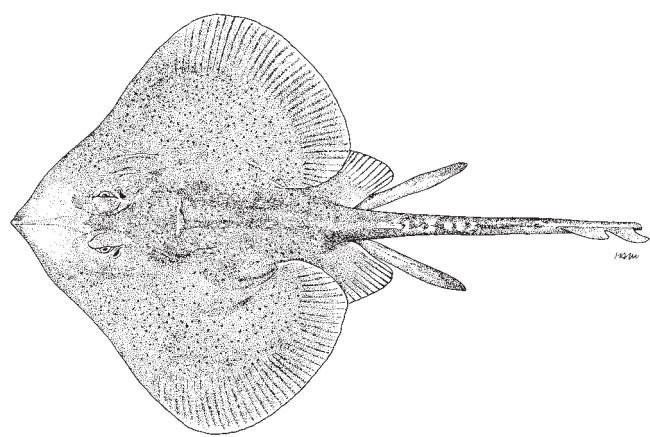
Maximum size 30 cm total length; males mature by 26 cm total length. Benthic along upper slope, between 192 and 457 m. Recorded from east coast of Yucatán, Belize, Honduras, and Nicaragua. Dorsal surface pale brownish grey, with small dark spots anteriorly on snout and posteriorly on tail, and with cross-bands on tail; ventral surface uniform pale yellowish. Thorns on nuchal and scapular region in triangular patch.



Malacoraja senta (Garman, 1885)

En - Smooth skate; **Fr** - Raie lissée américain.

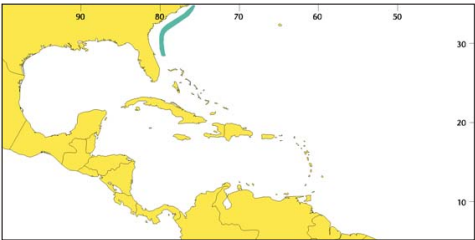
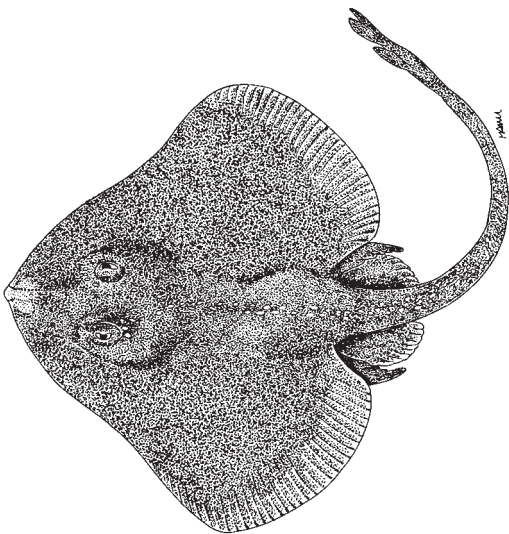
Maximum size 61 cm total length; males mature at 52 cm total length. Benthic along outer continental shelf and slope between 46 and 874 m. Recorded from Gulf of St. Lawrence to South Carolina. Rare south of Cape Hatteras. Dorsal surface pale brown, with numerous obscure dark spots and dusky blotches; ventral surface white, occasionally with dusky spots or blotches.



Neoraja carolinensis McEachran and Stehmann, 1984

En - Carolina's novelskate.

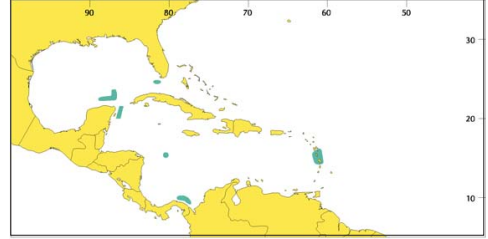
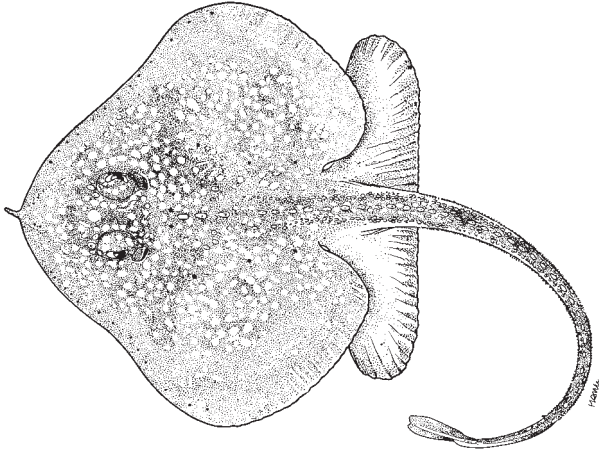
Maximum known size 29 cm total length; males mature at least at 29 cm total length. Benthic along lower slope, between 695 and 1 010 m. Recorded from North Carolina and northeastern Florida. Dorsal surface uniform greyish brown; ventral surface yellowish white with some darker blotches scattered on abdominal region. Anterior lobe of pelvic fin nearly as long as posterior lobe.



***Pseudoraja fischeri* Bigelow and Schroeder, 1954**

En - Fischer's falseskate.

Maximum known size 58 cm total length. Mature males unknown. Benthic along midslope, between 412 and 576 m. Recorded from southern Gulf of Mexico, Florida Keys, Lesser Antilles, Honduras, and Panama. Dorsal surface ash grey to sooty grey, with pale spots scattered over disc and base of tail; ventral surface ash grey, with indistinct sooty markings over abdominal region. Pelvic fin with single, laterally directed, broadly rounded lobe.

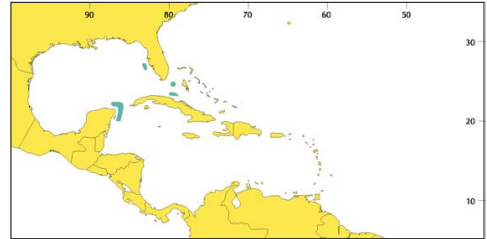
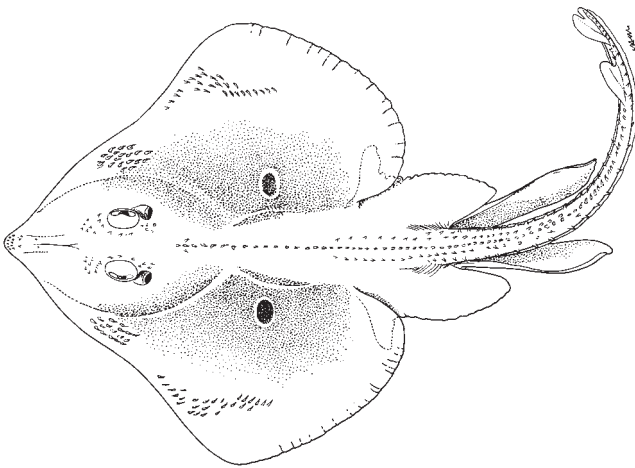


***Raja ackleyi* Garman, 1881**

JRK

En - Ocellate skate.

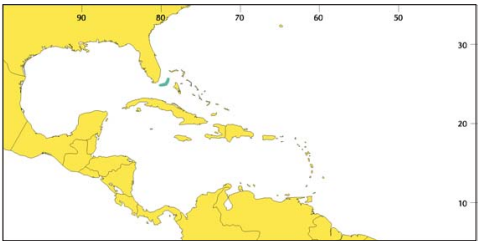
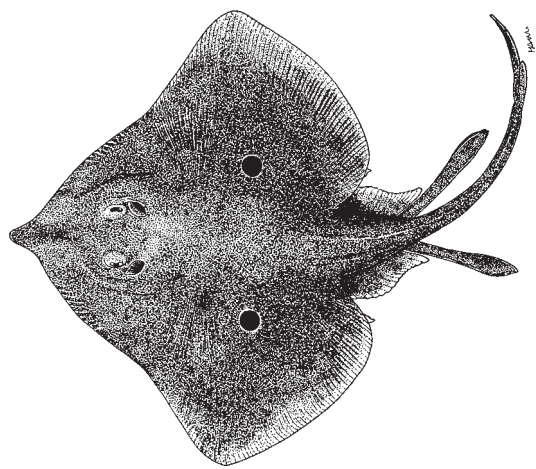
Maximum size 41 cm total length; males mature at 41 cm total length. Benthic along continental shelf and upper slope, between 32 and 384 m. Recorded from southern Florida, Cuba, southern Gulf of Mexico, and eastern Yucatán. Dorsal surface yellowish brown, with scattered pale and darker spots, and 2 large ocelli (of dark centre and pale margins) over midlateral disc region; ventral surface white. Snout only slightly concave and moderately short. One to several thorns over scapular region.



Raja bahamensis Bigelow and Schroeder, 1965

En - Bahaman skate.

Maximum size 54 cm total length. Benthic along upper slope, between 366 and 411 m. Recorded from Bahamas and southern Florida. Dorsal surface pale greyish brown, with 1 (occasionally 2) pair of ocelli (brown centre and pale outer rim) at midlateral disc region; ventral surface whitish. Thorns absent along midline of disc from nuchal region to axil of pectoral fins.

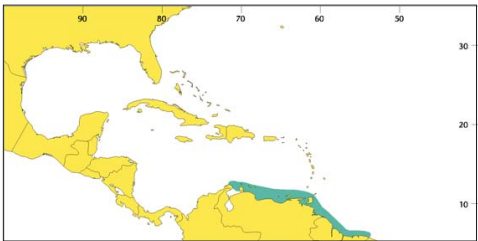
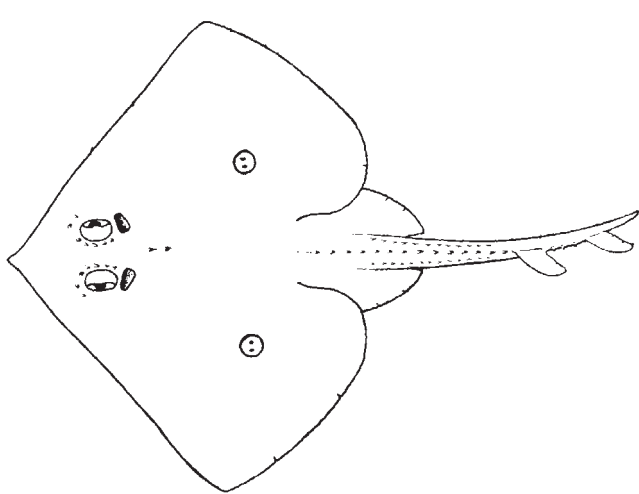


Raja cervigoni Bigelow and Schroeder, 1964

JRG

En - Finspot ray; **Fr** - Raie yeux noirs; **Sp** - Raya espinosa.

Maximum known size 51 cm total length; males mature by at least 50 cm total length. Benthic along the outer continental shelf, 37 to 174 m. Recorded from northern South America from Venezuela to Suriname. Dorsally uniform pale brown, with pair of ocelli on midlateral disc region (ocelli darkly rimmed with small dark central spot or spots); ventrally greyish brown, sometimes with darker blotches on tail region. Thorns present along midline of disc between nuchal region and axil of pectoral fins. Disc width about 70% of total length.

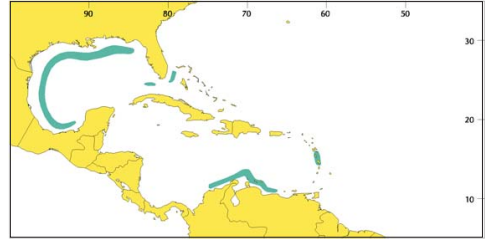
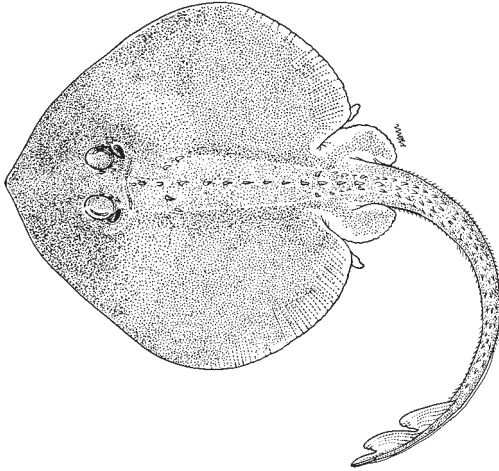


***Rajella fuliginea* (Bigelow and Schroeder, 1954)**

JFF

En - Sooty smallskate.

Maximum size 45 cm total length; males mature 42 cm total length. Benthic along outer slope, between 731 and 1 280 m. Recorded from southern Florida, throughout Gulf of Mexico, Florida Keys, Lesser Antilles, and Caribbean coast of South America. Dorsal surface uniform dark ashy grey; ventral surface sooty dark brown to black, and darker than dorsal surface on ventral head and outer disc regions. Snout obtuse and bluntly rounded. Preorbital snout length about 10% of total length.

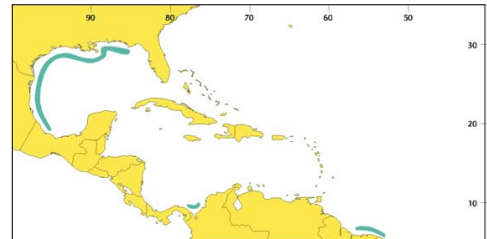
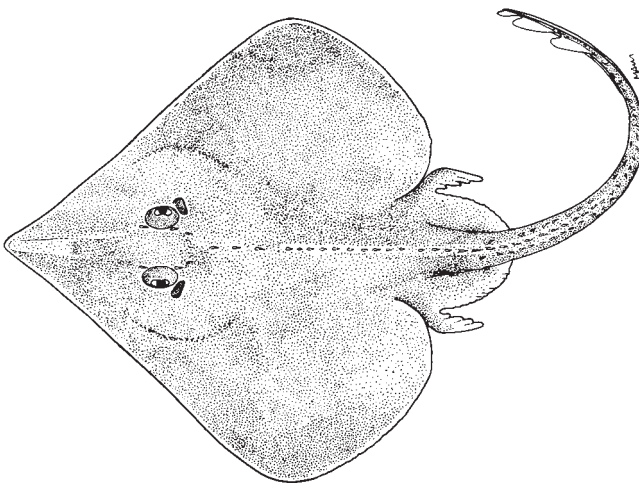


***Rajella purpuriventralis* (Bigelow and Schroeder, 1962)**

JAV

En - Purplebottomed smallskate.

Maximum size 51 cm total length. Benthic along lower slope and continental rise, between 732 and 2 010 m. Recorded from northern Gulf of Mexico, Panama, Suriname, and French Guiana. Dorsal surface dark grey to purplish; ventral surface black to purplish, with pale mouth and rear edge of nasal curtain. Snout acute and preorbital snout length about 15% of total length.

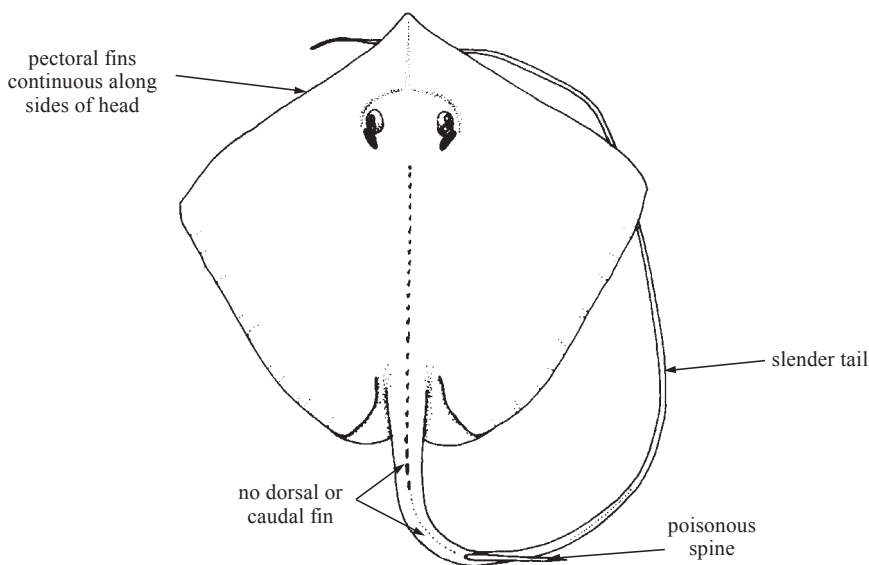


DASYATIDAE

Stingrays

by J.D. McEachran, Texas A & M University, Texas, USA and
M.R. de Carvalho, American Museum of Natural History, New York, USA

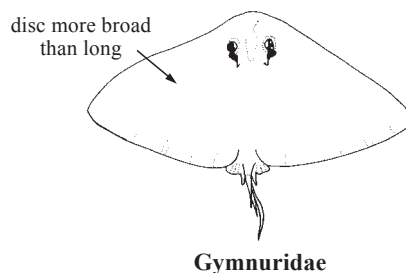
Diagnostic characters: Batoids of moderate to very large size, disc width from 30 cm to more than 2 m. Body strongly depressed, with head, trunk, and broadly expanded pectoral fins forming rhomboid or oval-shaped disc. **Disc not more than 1.3 times as broad as long.** Tail distinctly demarcated from disc. **Pectoral fins continuous along sides of head, not forming subrostral lobes or cephalic fins.** Snout obtuse, rounded, or more or less pointed. Eyes and spiracles on top of head. **Floor of mouth with fleshy papillae.** Small teeth in many series forming bands along jaws. Nasal curtains well developed and continuous across narrow isthmus in front of mouth and deeply fringed. **No dorsal fins or caudal fin. Tail very slender, tapering, much longer than disc, and with 1 or more saw-edged, long, poisonous spines on medial half of length.** Some species with longitudinal tail folds (fin-folds) on upper and/or lower surface. Skin on dorsal side naked or armed with tubercles or prickles. **Colour:** dorsal surface usually grey to dark brown, sometimes with darker or paler markings; ventral surface generally whitish.



Habitat, biology, and fisheries: Whiptail stingrays occur primarily in tropical to warm-temperate waters worldwide; they are usually found in shallow coastal waters, lagoons, estuaries, and occasionally fresh waters, but a few species may occur in deeper waters (beyond 100 m). In tropical regions some species are restricted to fresh waters. All but 1 species are benthic and often remain, for extended periods of time, partially buried in soft bottom substrates. The exception (*Pteroplatytrygon violacea*) is epipelagic in open oceans and along continental and insular shelf margins. All species are viviparous without placentas, young remain in oviducts of female until they are fully formed. Eight species in 3 genera occur in the area. Some stingrays are reportedly very abundant in certain localities and are regularly seen in local markets (e.g. in Venezuela). The flesh (thicker part of disc) is well esteemed as food; other parts are used in preparation of gelatin and liver oil. Some species are important for ecotourism (*Dasyatis say* and *Dasyatis americana* of Grand Cayman Island).

Similar families occurring in the area

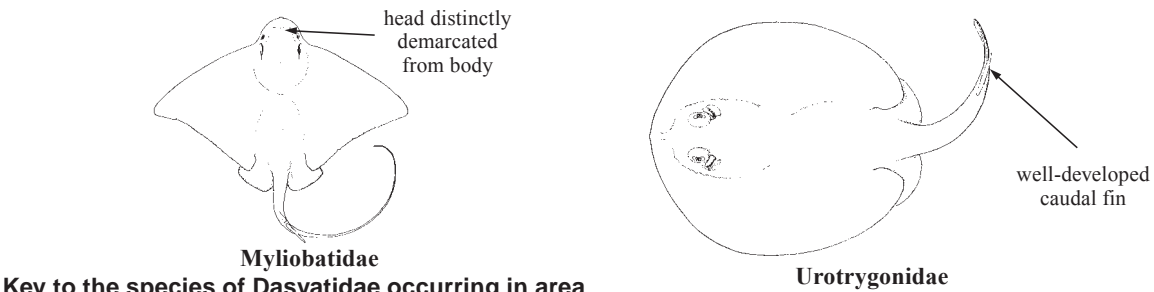
Gymnuridae: disc more than 1.5 times as broad as long; no papillae on floor of mouth; nasal curtains smooth-edged.



Myliobatidae, Rhinopteridae, Mobulidae: head distinctly demarcated from body, anterior portions of pectorals forming separate lobes or fins; eyes and spiracles on sides of head.

Urotrygonidae: well-developed caudal fin, supported by cartilaginous radials.

Other families of batoids: lack characteristic tail spine(s); tail stout to moderately slender; 1 or 2 dorsal fins and rudimentary caudal fin.



Key to the species of Dasyatidae occurring in area

- 1a. Anterior margin of disc evenly convex to nearly straight (Fig. 1a) → 2
- 1b. Anterior margin of disc subangular, with tip of snout forming apex of angle (Fig. 1b) → 3

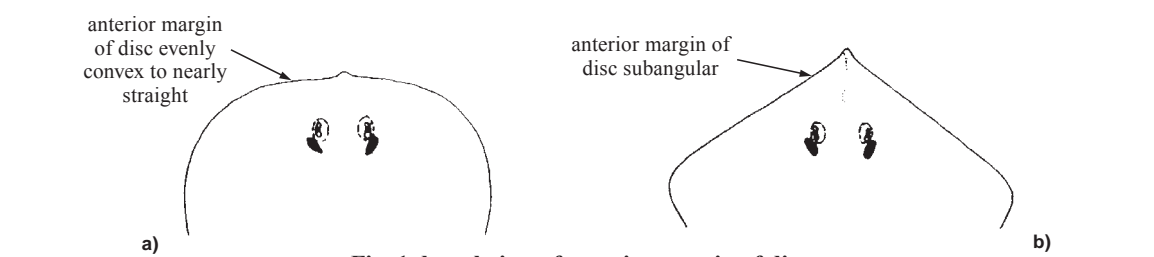


Fig. 1 dorsal view of anterior margin of disc

- 2a. Dorsal surface uniformly covered with numerous small tubercles, and with enlarged tubercles over scapular region; ventral surface of disc creamy white to yellowish, often with variously coloured blotches and dusky margin; ventral surface of tail with very low and indistinct keel *Himantura schmardae*
- 2b. Dorsal surface of disc mostly naked, no enlarged tubercles over scapular region; ventral surface of disc uniformly brown to black; ventral surface of tail with well-developed fin-fold or flap, usually taller than tail *Pteroplatytrygon violacea*
- 3a. Pelvic fins greatly expanded laterally, more than twice as wide as long, and with narrowly pointed outer corners; preorbital length more than 4 times distance between eyes (Fig. 2a) *Dasyatis geijskesi*
- 3b. Pelvic fins not greatly expanded laterally, only about as wide as long, and with broadly rounded outer corners; preorbital length between 1 and 2 times distance between eyes (Fig. 2b) → 4

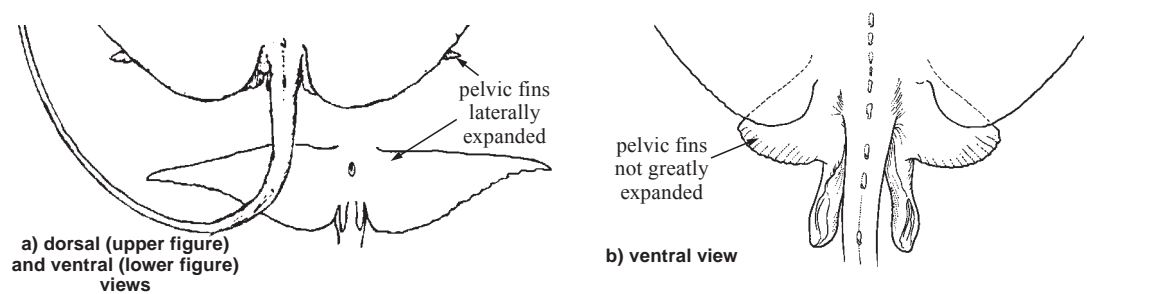


Fig. 2 pelvic fins

- 4a. Outer corners of disc broadly and evenly rounded (Fig. 3a) → 5
4b. Outer corners of disc narrowly rounded or subangular (Fig. 3b). → 6

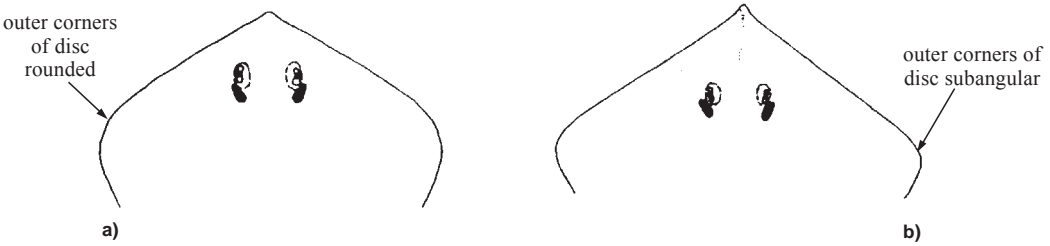


Fig. 3 dorsal view of anterior portion of disc

- 5a. Preorbital length greater than distance between spiracles; pelvic fins projecting beyond posterior margin of disc by about 1/3 of their length (Fig. 4a). *Dasyatis sabina*
5b. Preorbital length shorter than distance between spiracles; pelvic fins usually not projecting beyond posterior margin of disc, or, if projecting, never by as much as 1/3 their length (Fig. 4b) *Dasyatis say*

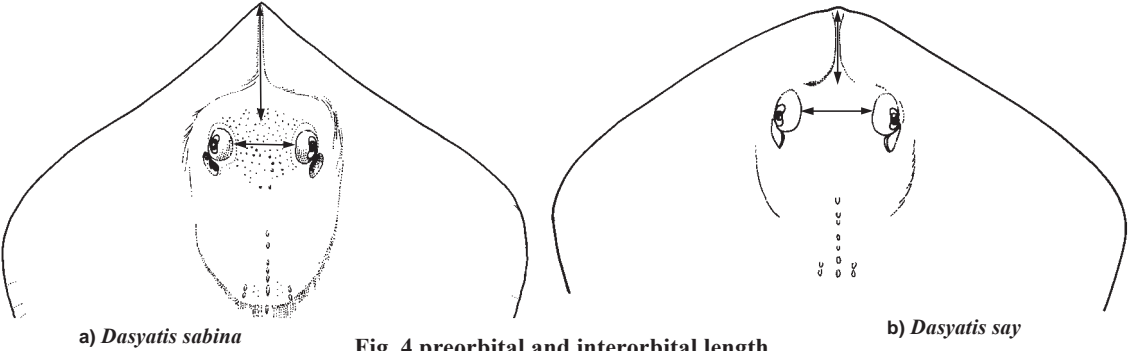


Fig. 4 preorbital and interorbital length

- 6a. Snout projecting beyond remainder of anterior margin of disc, forming a small triangular protuberance; dorsal disc region with dense and broad array of blunt tubercles from interorbital area to base of tail region on larger juveniles and adults (Fig. 5) *Dasyatis guttata*
6b. Snout not projecting beyond remainder of anterior margin of disc, not forming a small triangular protuberance; dorsal disc region without dense and broad array of blunt tubercles from interorbital area to base of tail region on larger juveniles and adults (Fig. 6) → 7

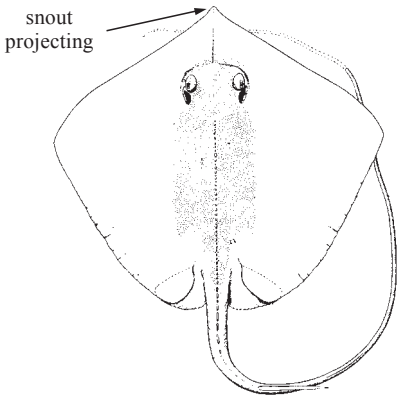


Fig. 5 *Dasyatis guttata* (dorsal view)

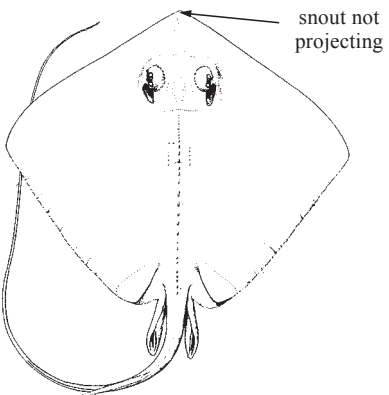


Fig. 6 dorsal view

- 7a. Lateral sides of tail without conspicuous tubercles or thorns; longitudinal fin-fold along ventral side of tail about as deep as height of tail *Dasyatis americana*
- 7b. Lateral sides of tail with conspicuous tubercles and thorns in large juveniles and adults; longitudinal fin-fold along ventral side of tail about 1/2 as deep as height of tail . . . *Dasyatis centroura*

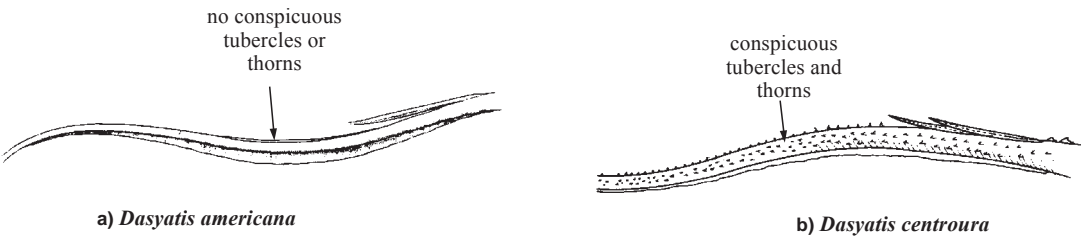


Fig. 7 lateral view of tail

List of species occurring in the area

The symbol ♠ is given when species accounts are include.

- ♠ *Dasyatis americana* Hildebrand and Schroeder, 1928.
- ♠ *Dasyatis centroura* (Mitchill, 1815).
- ♠ *Dasyatis geijskesi* Boeseman, 1948.
- ♠ *Dasyatis guttata* (Bloch and Schneider, 1801).
- ♠ *Dasyatis sabina* (Lesueur, 1824).
- ♠ *Dasyatis say* (Lesueur, 1817).
- ♠ *Himantura schmardae* (Werner, 1904).
- ♠ *Pteroplatytrygon violacea* (Bonaparte, 1832).

References

- Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In: Fishes of the western North Atlantic, Part 2, edited by J. Tee-Van, C.M. Breder, A.E. Parr, W.C. Schroeder, and L.P. Schultz. *Sears Found. Mar. Res. Mem.*, (1):588 p.
- Castro-Aguirre, J.L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideiomorpha)*. Universidad Nacional Autónoma de México, 75 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1. Myxiniformes to Gasterosteiformes*. Austin, University of Texas Press, 1112 p.

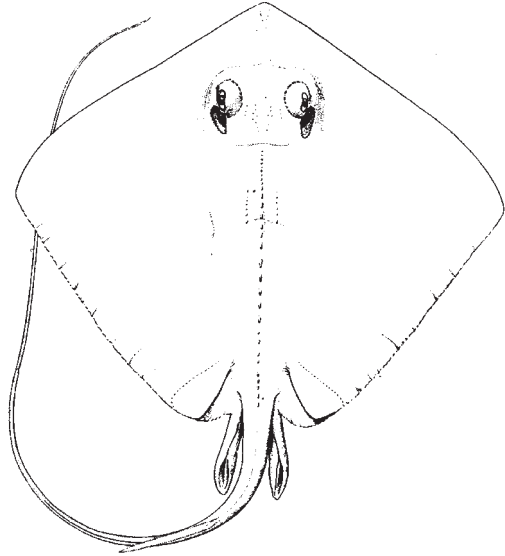
Dasyatis americana Hildebrand and Schroeder, 1928

RDA

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Southern stingray; **Fr** - Pastenague américaine; **Sp** - Raya-látigo americana.

Diagnostic characters: Disc rhombic, about 1.2 times as broad as long; **snout barely projecting**; anterior angle of snout about 135°; **outer and posterior corners of disc abruptly rounded or nearly acute-angled**. Mouth arched; teeth arranged in 39 to 56 rows in the upper jaw. Teeth of females and juveniles with rounded cusps, those of mature males with sharp pointed cusps. Centre of floor of mouth with 3 stout papillae arranged in transverse series, sometimes single additional papilla on one or both sides. Tail slender and much longer than disc width; usually 1 (sometimes several or none) long, serrated, and poisonous spine(s) on base of tail; no dorsal fins or caudal fin; **upper surface of tail with a low longitudinal ridge posterior to spine, lower surface with a longitudinal fin-fold originating at level of spine, depth of fold equal to height of tail above fold**. Pelvic fins with a straight anterior margin and a rounded outer corner. **A median row of irregularly (juveniles and**



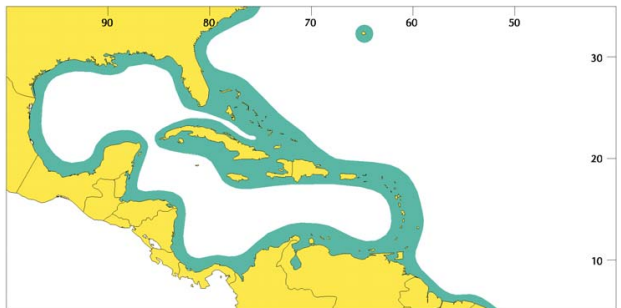
half-grown individuals) or regularly (adults) spaced tubercles along midline from nuchal region to base of tail; a short longitudinal row of scapular tubercles on each side of midline; **denticles in band along midline from between orbits to base of tail**. **Colour:** dorsal surface light brown, grey, or olive, varying with substrate, with pale spot on midline of snout in front of eyes. Ventral surface white with grey or brown margins. Longitudinal ridge and fin-fold of tail dark brown.

Size: Maximum: 150 cm disc width; males mature at 51 cm disc width, females mature at 75 to 80 cm disc width, and young are 17 to 18 cm at birth.

Habitat, biology, and fisheries: Inhabits shallow waters, burying in sandy bottoms (more rarely, muddy bottoms). This species is an active swimmer, migrating in the summer months along the surface to the higher latitudes. It is found in water ranging from 15.4 to 30.3°C, generally at high salinities (28.5 to 36.2‰) but occasionally occurs in estuaries and fresh water. Feeds on bottom-dwelling invertebrates, mainly bivalves and worms; also on shrimps, crabs, and small ray-finned fishes. Litters range from 3 to 5. Caught mainly with trammel nets and bottom longlines; also with spears. Mainly east coast of the USA and Venezuela; to a lesser extent north coast of Colombia. Marketed salted; the flesh of the disc is well esteemed; remainder of body used in the preparation of gelatin and good quality oil. Very destructive to cockle and oyster farms; also dangerous to bathers and fishers because of the wounds it can inflict with its poisonous spine.

Distribution: Widely distributed from New Jersey to Florida, throughout the Gulf of Mexico, Bahamas, and the Greater and Lesser Antilles, and bordering the northern coast of South America to southeastern Brazil.

Note: Records of *Dasyatis pastinaca* from Uruguay are probably of this species or *Dasyatis say*.



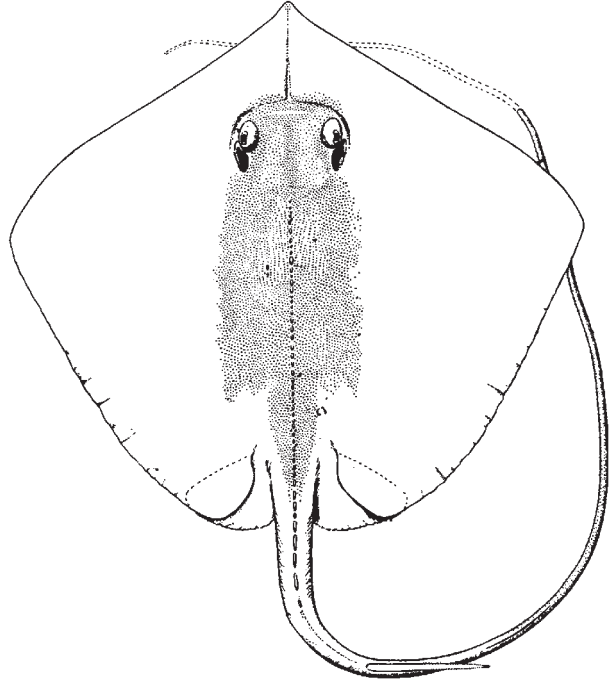
Dasyatis guttata (Bloch and Schneider, 1801)

RDU

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Longnose stingray; **Fr** - Pastenague longnez; **Sp** - Rayá-latigo hocicona.

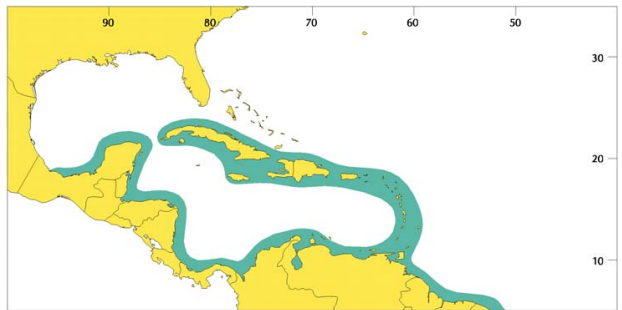
Diagnostic characters: Disc rhombic, about 1.1 times as broad as long; **snout** is relatively long, 23 to 26% of disc width, and **moderately projecting**, anterior angle of snout 105 to 115°; outer corners of disc abruptly rounded, forming a 90° angle; posterior corner of disc more broadly rounded. Mouth arched; teeth arranged in 34 to 46 rows in upper jaw. Teeth of females and juveniles have rounded cusps, and those of mature males have sharp pointed cusps. Centre of floor of mouth with 3 stout papillae in a transverse series. Tail slender and much longer than disc width; usually 1 (sometimes several or none) long, serrated, and poisonous spine(s) at base of tail; no dorsal fins or caudal fin; **upper surface of tail with a low longitudinal ridge posterior to tip of serrated spine, lower surface with a well-developed longitudinal fin-fold originating at level of spine, depth of fin-fold equal to 1/3 to 4/5 height of tail above fold.** Pelvic fins ovoid, anterior margin convex, outer corner rounded. **Small flattened thorns (tubercles) in a band along midline from level of orbits to base of tail in larger juveniles and adults; a continuous, broad series of blunt tubercles and thorns along midline from nuchal region to insertion of serrated spine.** **Colour:** dorsal surface grey, brown, or olive, either uniform or with dark spots; ventral surface white to yellowish white; keel and ridge of tail black.



Size: Maximum size is 180 to 200 cm disc width.

Habitat, biology, and fisheries: Inhabits shallow waters. Little is known of the biology of this species. Caught mainly with bottom longlines off Venezuela and the Guianas. Marketed mostly salted; the flesh of the disc is well esteemed; also used in preparation of gelatin and good quality oil. May be dangerous to bathers and fishers because of the wounds it can inflict with its poisonous spine.

Distribution: Widespread primarily in the southern Gulf of Mexico, Antilles, off northern South America, and in the southwestern Atlantic to southeastern Brazil.



Himantura schmardae (Werner, 1904)

DHH

Frequent synonyms / misidentifications: None / None.

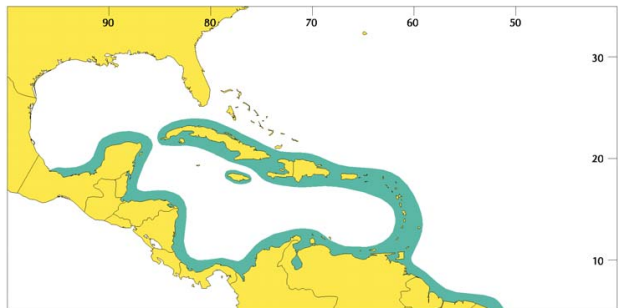
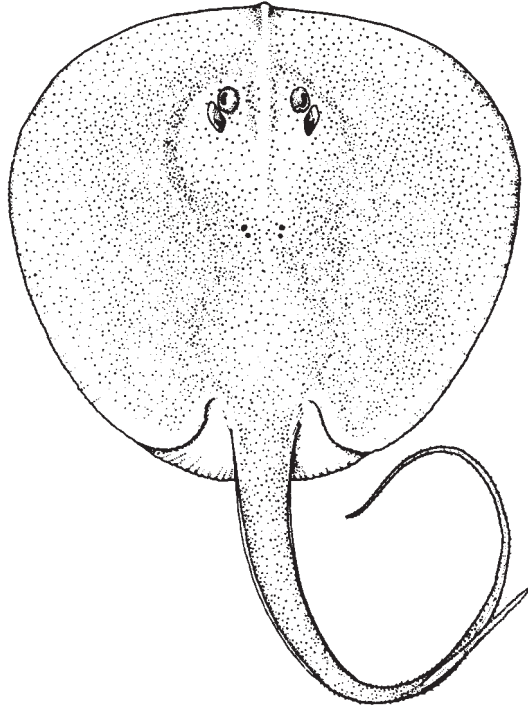
FAO names: En - Chupare stingray (AFS: Caribbean whiptail stingray); Fr - Pastenague chupare; Sp - Chupare.

Diagnostic characters: Disc ovate, about 1.0 to 1.1 times as broad as long; tip of snout barely projecting as a broad-based papilla; **anterolateral margin of disc broadly arched to almost straight across; outer and posterior corners of disc broadly rounded.** Mouth moderately arched; teeth arranged in 28 to 36 rows in upper jaw. Cusps of teeth flat or rounded, with transverse depression and scalloped margin. Centre of floor of mouth with 5 papillae in transverse series. Tail slender and much longer than disc width; usually 1 very long, serrated, and poisonous spine located at about midlength of tail; no dorsal fins or caudal fin; **no longitudinal ridge on dorsal surface of tail; sides of tail with a low longitudinal ridge running along anterior 1/4 of tail; lower surface of tail with a low ridge originating at level of origin of spine.** Pelvic fins with straight anterior margins and convex posterior margins that do not extend beyond outline of disc. **Upper surface of disc and tail anterior to serrated spine densely covered with small tubercles, with enlarged tubercles over scapular region on each side of disc.** **Colour:** dorsal surface dark brown, sooty olive, or sepia; ventral surface yellowish to creamy white.

Size: Maximum size is about 120 cm disc width.

Habitat, biology, and fisheries: Inhabits shallow waters; rather abundant in mangrove-lined lagoons in Venezuela. Caught mainly with trammel nets and with bottom longlines. Off Venezuela. Marketed salted; also used in the preparation of gelatins and oil. Dangerous to bathers and fishers because of the wounds it can inflict with its poisonous spine.

Distribution: Recorded from the southern Gulf of Mexico, Caribbean coasts of Mexico and Central America, Greater and Lesser Antilles, and northern South America to French Guiana.

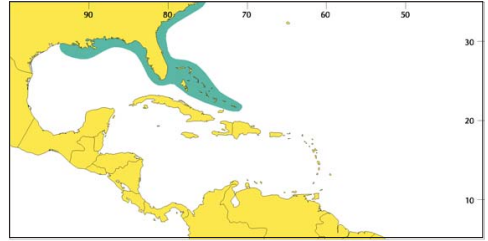
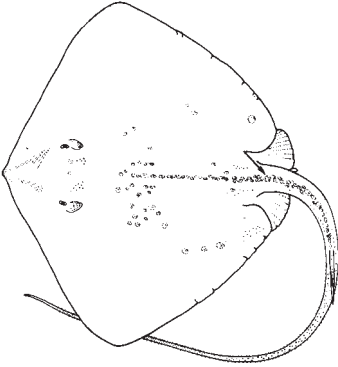


***Dasyatis centroura* (Mitchill, 1815)**

RDC

En - Roughtail stingray; **Fr** - Pastenague des îles; **Sp** - Raya-látigo isleña.

Maximum size 210 cm disc width (making it one of the largest known stingrays); males mature at 130 to 150 cm disc width (claspers of an 84 cm disc width male barely extending beyond tip of pelvic fins); females mature at 140 to 160 cm disc width, and neonates at 34 to 37 cm disc width at birth. Benthic along the inner continental shelf to 91 m, rarely to 274 m. Recorded from Georges Bank and Cape Cod to southern Florida, northern and northeastern Gulf of Mexico, Bahamas, and coast of South America from southeastern Brazil to Argentina (also eastern Atlantic and Mediterranean Sea). Dorsal surface uniform dark brown to deep olive; ventral surface creamy white to yellowish. Dorsal surface with scattered enlarged tubercles and bucklers at about 30 cm disc width. Food consists of polychaetes, cephalopods, crustaceans, and ray-finned fishes. Litters range from 2 to 6 young.

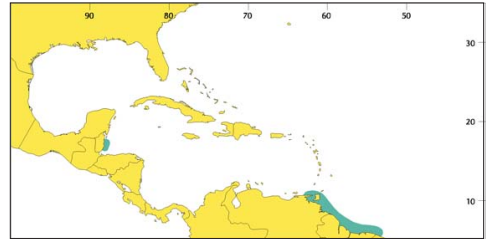
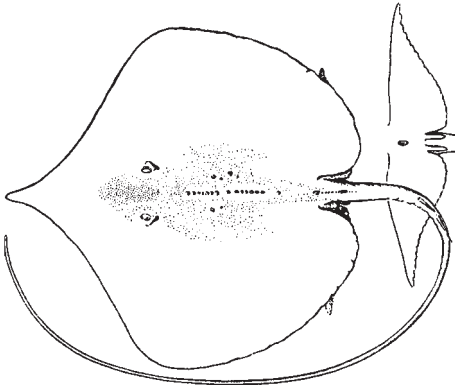


***Dasyatis geijskesi* Boseman, 1948**

RDJ

En - Sharpsnout stingray; **Fr** - Pastenague bécune; **Sp** - Raya-látigo picúa.

Maximum size 150 cm disc width; male 36 cm disc width is still immature. Benthic in coastal waters in up to 80 m. Recorded from Venezuela to northern Brazil (Ilha de Maracá, Amapá state). Possibly more widely distributed in the western Caribbean Sea (unconfirmed record from Belize). Pelvic fins greatly laterally expanded and short, with acute tips. Dorsal surface plain brown; ventral surface whitish, with grey disc margins.

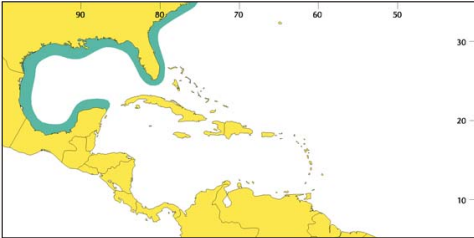
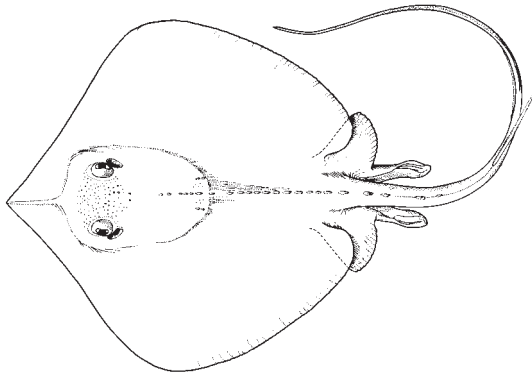


Dasyatis sabina (Lesueur, 1824)

JDS

En - Atlantic stingray.

Maximum size 61 cm disc length (about equal to disc width); females mature at 16 to 18 cm disc width, and neonates 10 cm disc width at birth. Benthic in coastal waters from shoreline to about 20 m, also in estuaries and fresh water. Recorded from Chesapeake Bay to Florida Keys, throughout Gulf of Mexico. Records from northern South America and Brazil questionable. Food consists of polychaetes, crustaceans, and ray-finned fishes. Litters range from 1 to 3 young. Upper surface brown to yellowish brown, sometimes with darker stripe along midline; ventrally whitish occasionally with darker disc outline.

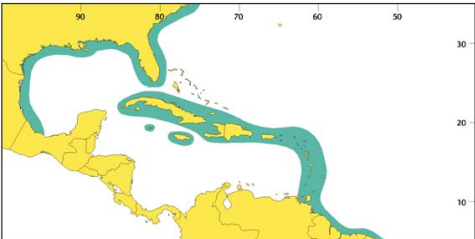
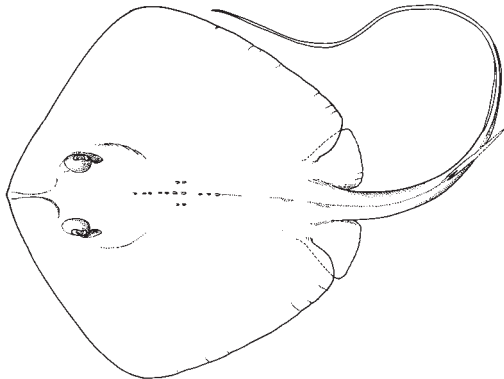


Dasyatis say (Lesueur, 1817)

JDY

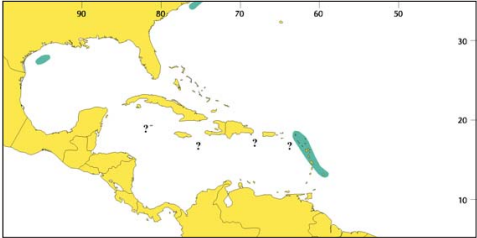
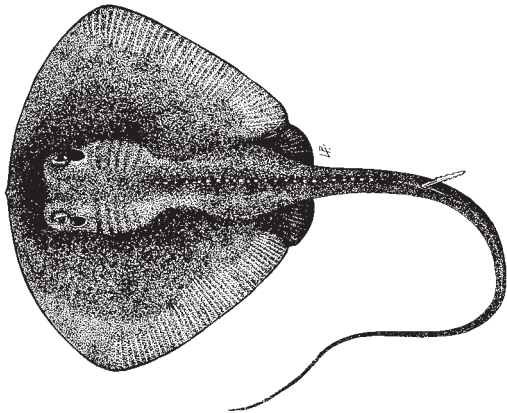
En - Bluntnose stingray.

Maximum size 100 cm disc width; neonates 15 to 16 cm at birth. Benthic along the shoreline to 9 m; also occurs in estuaries. Recorded from New Jersey to Florida Keys, northern and western Gulf of Mexico, Greater and Lesser Antilles, and eastern Venezuela to northern Argentina. It has not been recorded from the southern Gulf of Mexico or the Caribbean coasts of Mexico and Central America. Records of *Dasyatis pastinaca* from Uruguay and Argentina probably refer to this species or *Dasyatis americana*. Food consists of polychaetes, bivalves, gastropods, and ray-finned fishes. Litters range from 2 to 4 young. Dorsal surface greyish brown, olivaceous brown to reddish, occasionally with bluish spots; ventral surface whitish. Both upper and lower fin-folds well developed, even in late term embryos.



Pteroplatytrygon violacea (Bonaparte, 1832)

FAO names: **En** - Blue stingray (AFS: Pelagic stingray); **Fr** - Pastenague violette, **Sp** - Raya-látigo violeta. Maximum size 80 cm disc width (about 165 cm total length); males mature at 48 cm disc width, females mature at 40 to 50 cm disc width; neonates about 7 cm disc width at birth. Epipelagic along continental and insular shelves, and oceanic waters. Recorded in western Atlantic at the Grand Banks, Cape Hatteras, northern Gulf of Mexico off Texas, Lesser Antilles, and southwestern Atlantic (Santos, Brazil). Circumtropical in pelagic waters. Food consists of squids, coelenterates, medusae, crustaceans, and ray-finned fishes. Frequently caught in longlines. Dorsal surface purple, deep grey bluish to blackish purple; ventral surface lighter greyish purple to bluish. Easily identified by tall, flap-like fin-fold and blunt, rounded anterior disc margin.

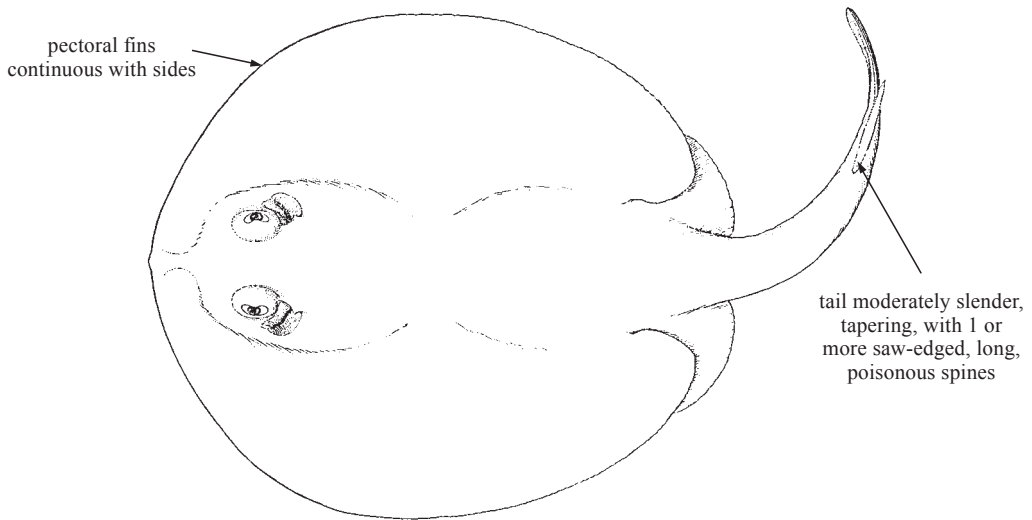


UROTRYGONIDAE

American round stingrays

by J.D. McEachran, Texas A & M University, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoids of small to moderate size, total length 16 cm to 80 cm at maturity. Body strongly depressed, with head, trunk, and broadly expanded pectoral fins forming oval-shaped to nearly round disc. **Disc not more than 1.3 times as broad as long.** Tail distinctly demarcated from disc. **Pectoral fins continuous along sides of head, not forming subrostral lobes or cephalic fins.** Snout obtuse, rounded, or more or less pointed. Eyes and spiracles on top of head. **Spiracles with small spiracular knob or tentacle resorbed shortly after birth.** Floor of mouth with fleshy papillae. Small teeth in many series forming bands along jaws. Nasal curtains well developed and continuous across narrow isthmus in front of mouth and generally fringed. **Tail moderately slender, tapering, about as long as disc length, with 1 or more saw-edged, long, poisonous spines on medial half of length,** without dorsal fin, and with **well-developed caudal fin** either continuous or discontinuous around tip of vertebral column. Skin on dorsal side naked or armed with thorns and denticles. **Colour:** dorsal surface usually grey to dark brown, sometimes with lighter or darker spots or reticulations; ventral surface generally whitish.

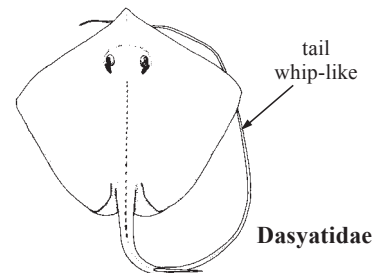


Habitat, biology, and fisheries: Round rays occur primarily in tropical to warm temperate waters in the western Atlantic and eastern Pacific; they are usually found in shallow coastal waters, lagoons, estuaries, and occasionally fresh waters. All species are benthic and often remain, for extended periods of time, partially buried in soft bottom substrates. All species are viviparous without placentas, young remain in oviducts of female until fully formed. Three species in 2 genera occur in the area; the greatest diversity of the family is in the eastern Pacific. Because of their small size they are of little commercial importance.

Remarks: Other authors include Urolophidae or Dasyatidae.

Similar families occurring in the area

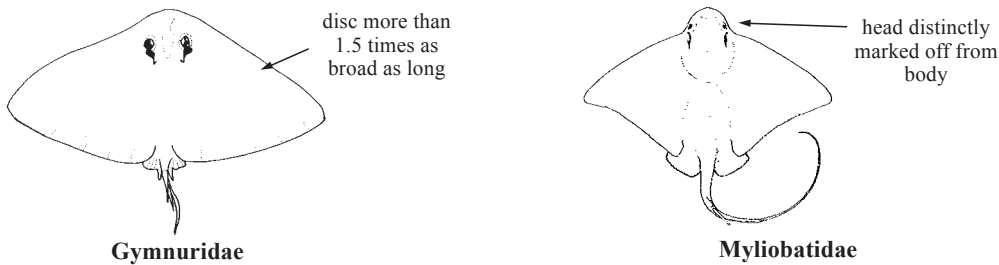
Dasyatidae: dorsal fin and caudal fin absent; tail whip-like and longer than disc length.



Gymnuridae: disc more than 1.5 times as broad as long; no papillae on floor of mouth; nasal curtains smooth-edged

Myliobatidae, Rhinopteridae, Mobulidae: head distinctly marked off from body, anterior portions of pectorals forming separate lobes or fins; eyes and spiracles on sides of head.

Other families of batoids: lack characteristic tail spine(s); tail stout to moderately slender; 1 or 2 dorsal fins and rudimentary caudal fin.



Key to the species of Urotrygonidae occurring in the area

- 1a. Tail length less than 1/2 total length; dorsal lobe of caudal fin about 1/4 as high as long; dorsal and ventral lobes of caudal fin confluent (Fig. 1a). *Urobatis jamaicensis*
- 1b. Tail length greater than 1/2 total length; dorsal lobe of caudal fin less than 1/6 as high as long; dorsal and ventral lobes of caudal fin not confluent (Fig. 1b). → 2

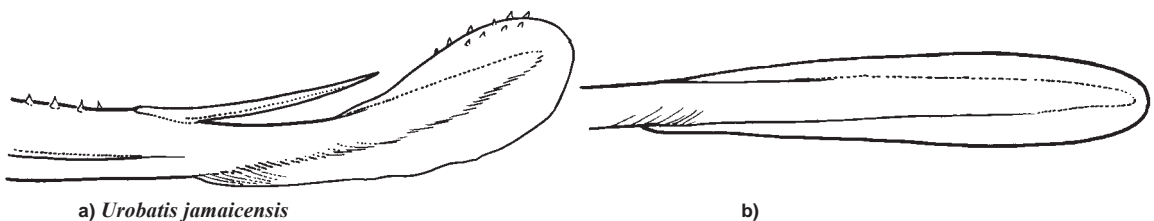


Fig. 1 caudal fin

- 2a. Preorbital snout length about 33% of disc width; dorsal surface of disc mostly naked *Urotrygon microphthalmum*
- 2b. Preorbital snout length about 25% of disc width; dorsal surface of disc covered with denticles; midline of disc and anterior section of tail with row of thorns *Urotrygon venezuelae*

List of species occurring in the area

The symbol ♠ is given when species accounts are included.

- ♠ *Urobatis jamaicensis* (Cuvier, 1816).
- ♠ *Urotrygon microphthalmum* Delsman, 1941.
- ♠ *Urotrygon venezuelae* Schultz, 1949.

References

Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In *Fishes of the western North Atlantic*, Part 2, edited by J. Tee-Van, C. M. Breder, A.E. Parr, W.C. Schroeder, and L.P. Schultz. *Sears Found. Mar. Res. Mem.*, 1(2):588 p.

McEachran, J.D. and J.D. Fechtel. 1998. *Fishes of the Gulf of Mexico, Vol. 1. Myxiniiformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 75 p.

Miyake, T. and J.D. McEachran. 1986. Taxonomy of the stingray genus *Urotrygon* (Myliobatiformes, Urolophidae): preliminary results based on external morphology. 291-302. In *Indo-Pacific fish biology: Proceedings of the Second International Conference on Indo-Pacific Fishes*, edited by T. Uyeno, R. Arai, T. Taniuchi, and K. Matsuura, Ichthyological Society of Japan, 1112 p.

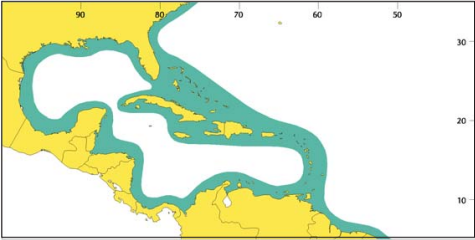
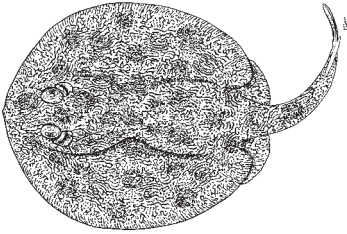
Miyake, T. and J.D. McEachran. 1988. Three new species of the stingray genus *Urotrygon* (Myliobatiformes: Urolophidae) from the eastern Pacific. *Bull. Mar. Sci.*, 42:366-375.

Urobatis jamaicensis (Cuvier, 1816)

RUJ

En - Yellow stingray.

Maximum size 70 cm total length and 36 cm disc width; males mature at 15 to 16 cm disc width. Benthic near shore, over sandy, muddy, grassy, or coral bottoms, and in bays, and estuaries. Recorded from North Carolina to Florida Keys, throughout the Gulf of Mexico, Caribbean coast of Central America, northern coast of South America, and Greater and Lesser Antilles. Both oviducts of females functional and synchronous, and up to 4 neonates born tail first at about 6 cm in disc width. Neonates basically same coloration as adults, and with small spiracular knob or tentacle resorbed shortly after birth. Dorsal surface tan to brown, with numerous golden, greenish to whitish spots and mottlings (of varying diameter) forming a reticulate or vermiculate pattern; ventral surface brownish white to yellowish. Food consists of crustaceans and ray-fined fishes. Females may congregate on turtle grass, or other similar substrates, for parturition.

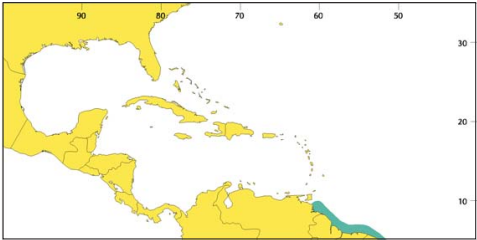
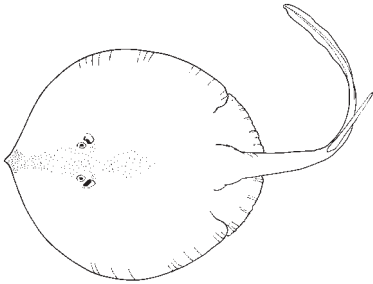


Urotrygon microphthalmum Delsman, 1941

JUM

En - Smalleye roundray.

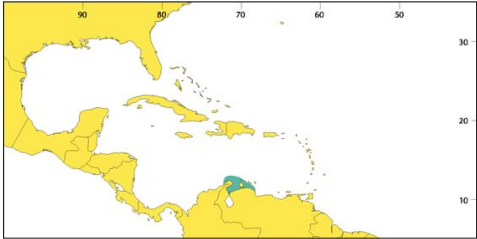
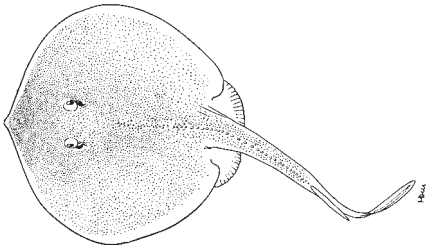
Maximum known size about 28 cm total length and about 13.5 cm disc width; males sexually mature between 22 and 24 cm total length, and females at 19 cm total length with young. Young born tail first at about 8 cm total length. Benthic in coastal waters from 16 to 54 m, but possibly occurring in shallower waters. Recorded from northern South America, eastern Venezuela to northern Brazil. Dorsal surface grey to brownish, with distinctly darker caudal fin; ventral surface whitish. Dorsal surface of disc and tail relatively smooth.



Urotrygon venezuelae Schultz, 1949

En - Venezuelan roundray.

Maximum length 29 cm total length and 15.7 cm disc width. Benthic in coastal waters. Recorded from western Venezuela but not common. Dorsal surface uniform greyish brown; ventral surface creamy. Dorsal surface of disc and tail covered with minute denticles.

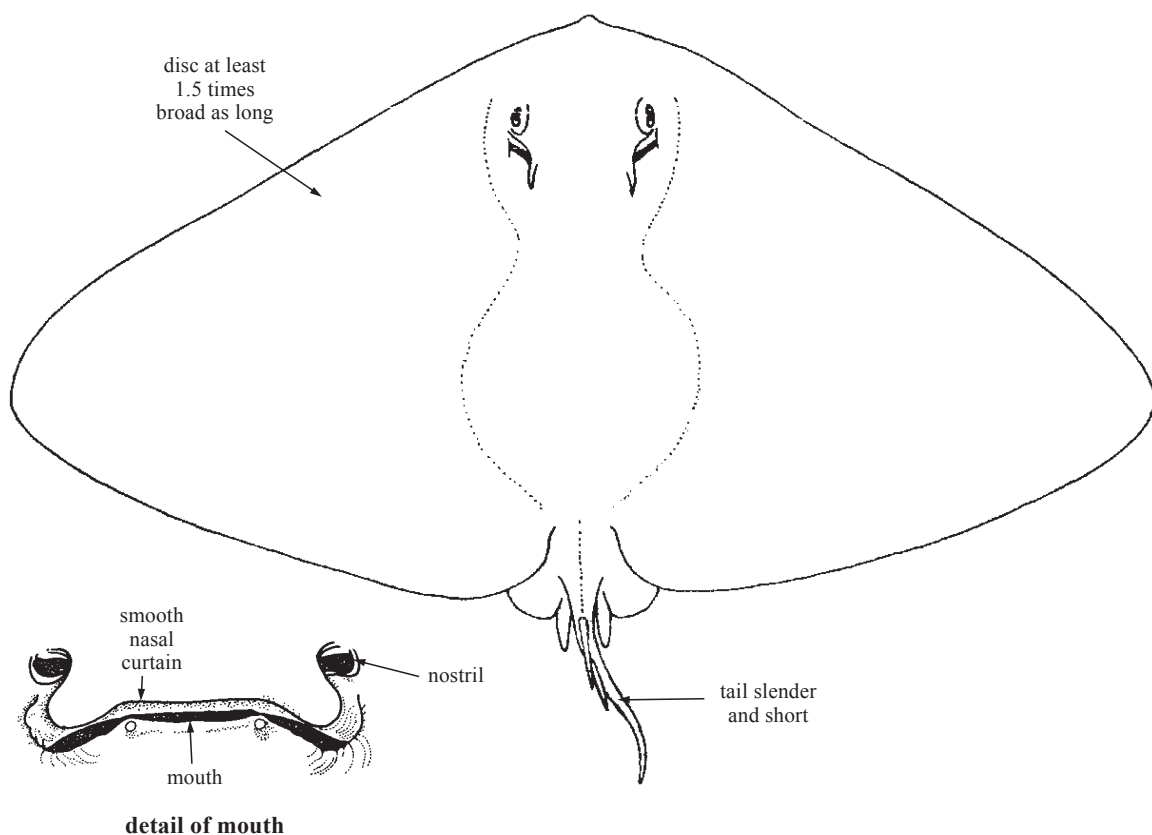


GYMNURIDAE

Butterfly rays

by J.D. McEachran, Texas A & M University, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Medium to large-sized stingrays (maximum disc width over 2 m). Body strongly depressed, with head, trunk, and broadly expanded pectoral fins forming rhomboid disc. **Disc at least 1.5 times broad as long.** **Tail very slender and short (shorter than disc)**, distinctly demarcated from disc. **Pectoral fins continuous along sides of head, not forming subrostral lobes or cephalic fins.** Eyes and spiracles on top of head. Some species have spiracular tentacles. Snout obtuse and angular. **Nasal curtains** are broadly expanded and continuous across narrow isthmus in front of mouth and are **smooth-edged** (with rare exceptions). Mouth is slightly arched and **lacks papillae on floor.** Jaws bear many small teeth in bands. Caudal fin always absent, dorsal fin absent in all Western Central Atlantic representatives. **Pectoral fins extend distinctly posterior to origin of pelvic fins.** Pelvic fins are moderately laterally expanded and not divided into anterior and posterior lobes. Some species have 1 or more long, serrated spines. **Tail with longitudinal folds on upper and/or lower surfaces.** **Skin of upper side naked in most species**, but with a variable number of tubercles in large individuals of others. **Colour:** dorsal surface grey, light green, olive, purple, or dark brown, sometimes with a reddish cast, often marked with spots or lines; ventral surface white, sometimes with a bronze or rusty cast.

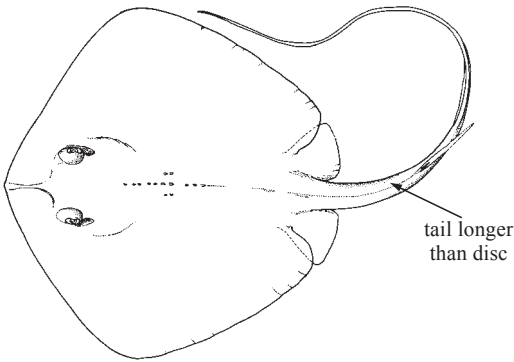


Habitat, biology, and fisheries: Butterfly rays are cosmopolitan in tropical and warm-temperate waters, usually inhabiting sandy and muddy bottoms in shallow coastal waters, including estuaries and river mouths. Because they have very short tails compared to whiptailed stingrays (Dasyatidae), they pose little threat to people (some species even lack a caudal serrated spine). They are viviparous without placenta and feed primarily on crustaceans and clams. Species are often caught in bottom gill nets. Large specimens are marketed fresh and salted.

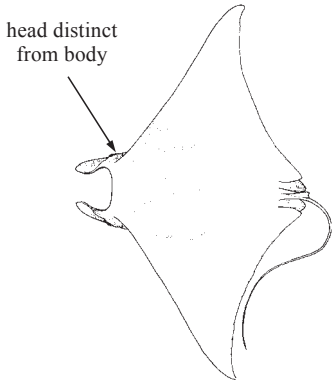
Similar families occurring in the area

Dasyatidae: disc not more than 1.3 times as broad as long; tail much longer than disc; nasal curtains deeply fringed; fleshy papillae present on floor of mouth.

Myliobatidae, Rhinopteridae, Mobulidae: head distinctly demarcated from body; anterior portions of pectorals forming separate lobes or cephalic fins; eyes and spiracles on sides of head.



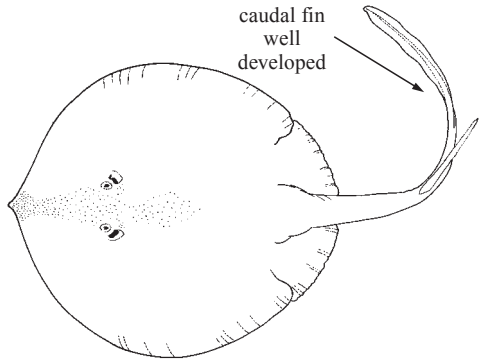
Dasyatidae



Mobulidae

Urotrygonidae: caudal fin well developed, supported by cartilaginous radials.

Other batoid families: lack serrated tail spine and have stout to moderately slender tails that are equal to or greater than 1/2 disc length.




Urotrygonidae

Key to species of Gymnuridae occurring in the area

- 1a. Tail with 1 or more serrated spines; posterior margin of spiracle with distinct tentacle *Gymnura altavela*
- 1b. Tail without serrated spines; no tentacle on posterior margin of spiracle. *Gymnura micrura*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Gymnura altavela* (Linnaeus, 1758).
-  *Gymnura micrura* (Bloch and Schneider, 1801).

References

Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In *Fishes of the western North Atlantic*, Part 2, edited by J. Tee-Van, C.M. Breder, A.E. Parr, W.C. Schroeder, and L.P. Schultz. *Sears Found. Mar. Res. Mem.*, 1(2).

Castro-Aguirre, J.L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideiomorpha)*. Universidad Nacional Autónoma de México.

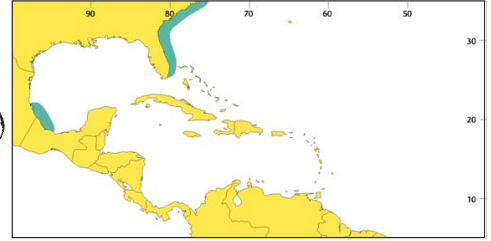
McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico*, Vol. 1. Myxiniiformes to Gasterosteiformes. Austin, University of Texas Press.

***Gymnura altavela* (Linnaeus, 1758)**

RGL

En - Spiny butterfly ray; **Fr** - Raie-papillon épineuse; **Sp** - Rayamariposa espinuda.

Maximum size 208 cm disc width; males mature at about 101 cm disc width; neonates 38 cm to 44 cm disc width at birth. Benthic in shallow water to 55 m. Sporadically recorded from Massachusetts to northern Argentina, but not throughout entire area; its presence in Gulf of Mexico is rarely recorded. Also recorded in eastern Atlantic. Dorsal surface dark brown to lighter brown, with small darker or lighter spots and blotches scattered on disc; ventrally creamy white.

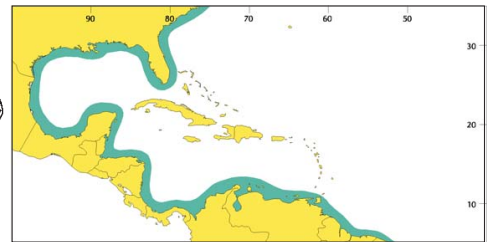
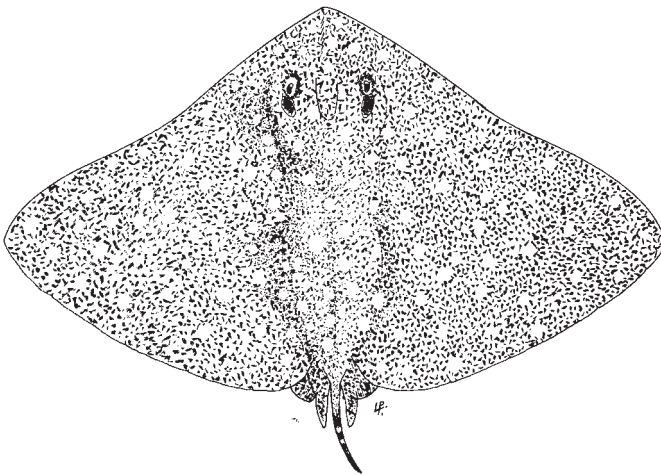


***Gymnura micrura* (Bloch and Schneider, 1801)**

RGI

En - Smooth butterfly ray; **Fr** - Raie-papillon glabre; **Sp** - Rayamariposa menor.

Maximum size 90 to 120 cm disc width; males mature at 42 cm disc width, females mature at 50 cm disc width, and neonates 16 to 22 cm at birth. Benthic along the coast over sandy bottoms, but also occurs in estuaries. Recorded from Chesapeake Bay to Brazil, and common in Gulf of Mexico, but unrecorded from the greater and Lesser Antilles. Records of *Gymnura micrura* from the eastern Atlantic, and Indian and Pacific Oceans probably refer to other species. Dorsal surface grey, brown, light green, or purplish, with vermiculate patterns of lighter and darker shades, and cross-bands on tail; ventral surface whitish, with grey disc outline. Food consists of bivalve molluscs, crustaceans including mysids, shrimps, crabs, and ray-finned fishes.

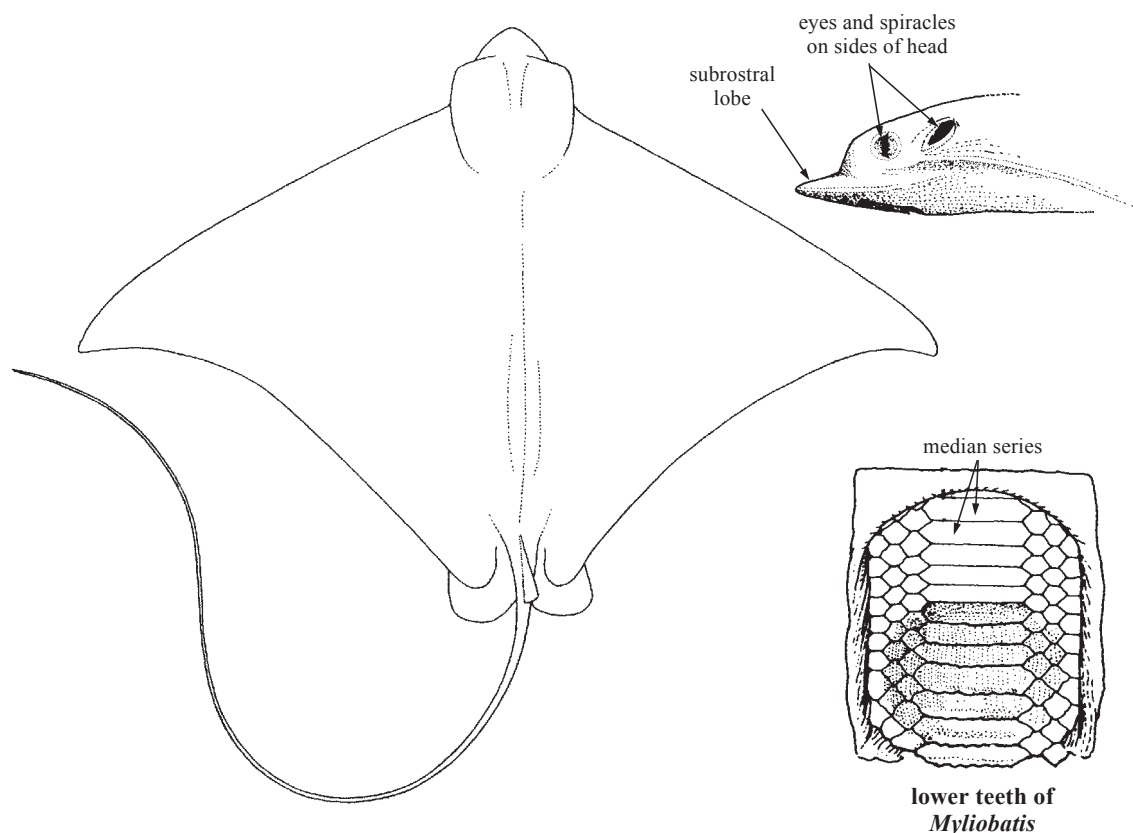


MYLIOBATIDAE

Eagle rays

by J.D. McEachran, Texas A & M University, USA and
M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoids of moderate to large size, disc width up to or greater than 2.5 m. Body strongly depressed. With head, trunk, and broadly expanded pectoral fins forming rhomboid to diamond-shaped disc. **Disc much broader than long.** Tail distinctly demarcated from disc. **Head distinctly elevated from disc, anterior portions of pectoral fins forming a projecting subrostral lobe**, with lobe either continuous or discontinuous with remainder of pectoral fin. **Eyes and spiracles on sides of head.** Mouth straight to slightly arched; several fleshy papillae on floor of mouth; **teeth flattened plates, arranged like pavement stones and in 1 to 7 series, with median series largest.** Nasal curtain well developed, with posterior free margin finely fringed and overlapping mouth. Tail whip-like and much longer than disc. **Small dorsal fin at base of tail;** poisonous serrated spine(s) present or absent at base of tail; immediately behind dorsal fin; no caudal fin. Dorsal surface naked, or with tubercles around orbits, along back, and sometimes also on tail. Ventral surface naked. **Colour:** dorsal surface usually grey to dark brown, sometimes with pale markings; ventral surface whitish, with margin of disc darker in some species.



Habitat, biology, and fisheries: Eagle rays occur in tropical to temperate latitudes worldwide, over continental and insular shelves. They swim actively by flapping their pectoral fins, similar to birds in flight, and are capable of travelling long distances. They are often observed swimming near the surface, and occasionally leaping completely out of the water. However, they generally swim in groups near the bottom. Food consists of benthic crustaceans and hard shelled molluscs that are dislodged from the bottom by tips of the pectoral fins and by the subrostral lobe. All species are viviparous without a placenta. Neonates closely resemble their parents. Three species in 2 genera occur in the area. None of the eagle rays are the object of a regular fishery but some species are frequently captured in tropical waters and used for human consumption.

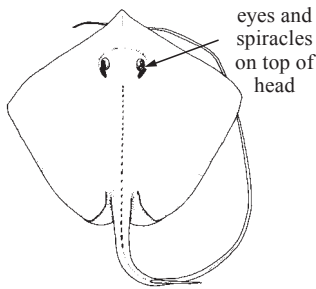
Similar families occurring in the area

Dasyatidae, Gymnuridae, Urotrygonidae: eyes and spiracles on top of head; anterior portions of pectorals continuous along sides of head, no separate subrostral lobes or cephalic fins.

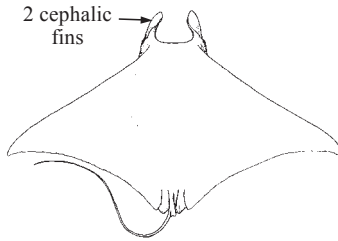
Mobulidae: anterior portions of pectorals forming 2 separate cephalic fins; teeth minute, in bands of many series.

Rhinopteridae: subrostral lobe deeply incised through midline, thus divided into 2 basally connected lobes; floor of mouth without papillae.

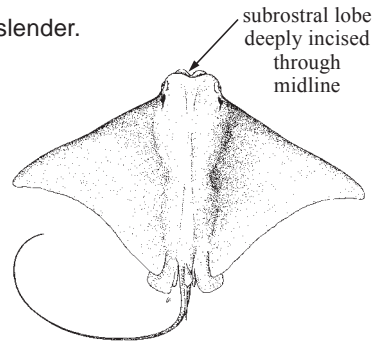
Other batoid families: lack serrated tail spine; tail is stout to moderately slender.



Dasyatidae



Mobulidae



Rhinopteridae

Key to the species of Myliobatidae occurring in the area

- 1a. Single series of large teeth in each jaw (Fig. 1). *Aetobatus narinari*
- 1b. More than 1, normally 7 series of teeth in each jaw, teeth of the median series much larger than those in peripheral rows (Fig. 2) → 2
- 2a. Base of dorsal fin about equal to distance between exposed nostrils; origin of dorsal fin near posterior margin of pelvic fin *Myliobatis freminvillii*
- 2b. Base of dorsal fin about 62 to 77% of distance between exposed nostrils; origin of dorsal fin well posterior to posterior margin of pelvic fin *Myliobatis goodei*

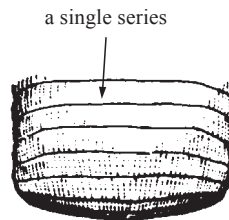


Fig. 1 *Aetobatus*

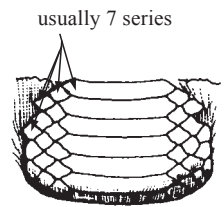





Fig. 2 *Myliobatis*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Aetobatus narinari* (Euphrasen, 1790).
-  *Myliobatis freminvillii* Lesueur, 1824.
-  *Myliobatis goodei* Garman, 1885.

References

- Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, and chimaeroids. In *Fishes of the western North Atlantic*, edited by J. TeeVan, C.M. Breder, A.E. Parr, W.C. Schroeder, and L.P. Schultz. *Mem. Sears Found. Mar. Res.*, (1)Pt.2:588 p.
- Castro-Aguirre, J. L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideiomorpha)*. Universidad Nacional Autónoma de México, 75 p.
- McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico. 1. Myxiniformes to Gasterosteiformes*. Austin, University of Texas Press, 1112 p.

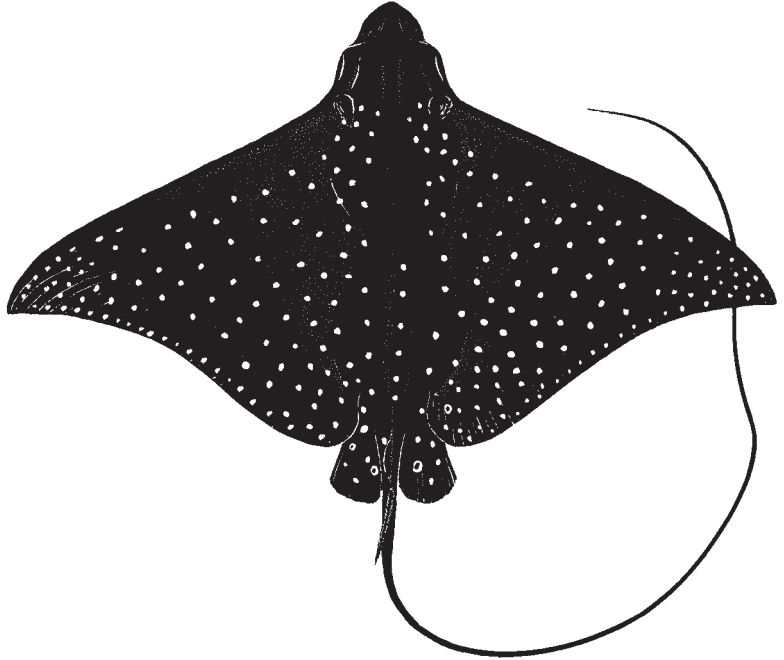
Aetobatus narinari (Euphrasen, 1790)

MAE

Frequent synonyms / misidentifications: None / None.

En - Spotted eagle ray; **Fr** - Aigle de mer léopard; **Sp** - Chucho pintado.

Diagnostic characters: Disc rhombic, about 2.1 times as broad as long. Head conspicuously elevated from disc; snout rounded and relatively short, 6 to 7% of disc width; subrostral lobe, below anterior part of head, rounded and separated from remainder of pectoral fins, eyes and spiracles on sides of head; **teeth in a single series, broad and flat, combined into 1 dental plate on each jaw**; nasal curtain fringed and indented at symphysis; floor and roof of mouth with a row of papillae. Outer corners of pectoral fins pointed; **small dorsal fin located between pelvic fins on base of tail**; no caudal fin. Pelvic fins are relatively narrow and extend considerably posterior to posterior margin of pectoral fins. Tail distinctly marked off from disc, whip-like, and much longer than disc. One to several long, serrated tail spines, located close behind dorsal fin; upper and lower surfaces of tail each with a low longitudinal ridge posterior to origin of spine. Skin naked. **Colour:** dorsal surface grey, olive grey, or chestnut brown, with whitish, yellowish, or bluish spots variable in size and shape (rounded, elliptical, or annular); ventral surface white; outer margin of pectoral fins brownish.

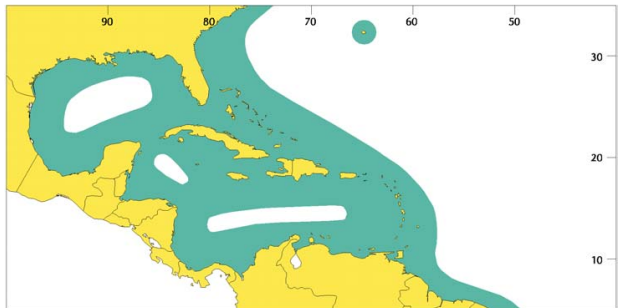


Size: Maximum size is 230 cm disc width; common to 140 cm width; young range from 18 to 36 cm at birth.

Habitat, biology, and fisheries: Usually found in coastal surface waters, either solitary or in large schools of several hundred individuals during the summer spawning migration. An active swimmer, capable of travelling long distances; often performs spectacular leaps above the water surface during spawning time or when pursued by sharks. Viviparous without a placenta, females produce about 4 young per season. Food consists of polychaetes, bivalves, molluscs, gastropods, cephalopods, shrimps, and small ray-finned fishes. Caught frequently with longlines, trammel nets, beam trawls, and shrimp seines. Marketed salted in some localities (Antilles, Yucatán, Venezuela). Very harmful to oyster and cockle farms.

Distribution: Tropical to warm-temperate coastal areas of all major oceans. In area, recorded from North Carolina to southern Brazil, as well as the Bahamas, Greater and Lesser Antilles, Bermuda, and Gulf of Mexico.

Note: Although worldwide in distribution, there are variations in colour pattern that may permit subdivision of this species into more than 1 geographically constrained species.

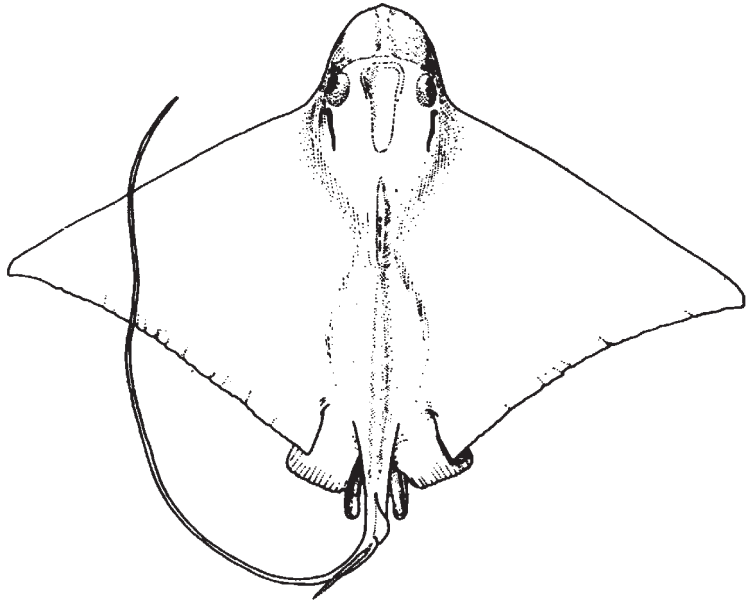


***Myliobatis freminvillii* Lesueur, 1824**

MYM

Frequent synonyms / misidentifications: None / None.**En** - Bullnose eagle ray (AFS: Bullnose ray); **Fr** - Aigle de mer taureau; **Sp** - Chucho blanco.

Diagnostic characters: Disc rhombic, about 1.6 to 1.8 times as broad as long. Head distinctly elevated from disc; snout moderately short, preorbital length 7 to 10% of disc width, subrostral lobe located below anterior part of head, rounded, and continuous with remainder of pectoral fins; eyes and spiracles on sides of head; **teeth flat hexagonal plates, usually in series of 7, occasionally more or fewer** (but never a single series), those of the median row much larger than the others; nasal curtains fringed and not indented at symphysis of jaws; floor of mouth with 5 or 6 papillae. **Distance between fifth gill openings about equal to distance between inner edges of nasal apertures.** Corners of pectoral fins markedly acute-angled; **small dorsal fin close behind rear tips of pelvic fins**; no caudal fin. Whip-like tail distinctly

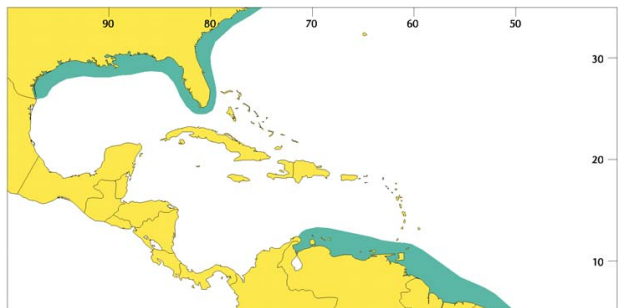


marked off from body, much longer than disc and without longitudinal folds or ridges. One or 2 long, serrated tail spines close behind dorsal fin. Skin smooth on small individuals; larger individuals with low tubercles in a medial row on shoulder, and adult males additionally with a single thorn above each eye. **Colour:** dorsal surface greyish, reddish brown, or dark brown, with diffuse whitish spots (these usually smaller than eye diameter); ventral surface white. Dorsal fin occasionally paler; posterior part of tail dark brown or black; teeth green.

Size: Maximum size 86 cm; common to 70 cm disc width; males mature at 60 to 70 cm disc width; neonates 25 cm at birth.

Habitat, biology, and fisheries: Found most frequently in coastal waters, to 10 m depth, mainly in shallow estuaries. In the northern part of its range, this species migrates northward during early summer and southward during early winter. Capable of travelling long distances; occasionally leaping out of the water. Food consists of bivalves, gastropods, and crustaceans (lobsters and crabs). Caught mainly on longlines and with trammel nets. Marketed salted in limited quantities.

Distribution: Occurs from Cape Cod (rarely) to southern Brazil, Uruguay, and northern Argentina. Also present in the northern Gulf of Mexico, but absent from the Greater and Lesser Antilles and Bahamas. Presence in the Caribbean appears to be limited to northern South America.

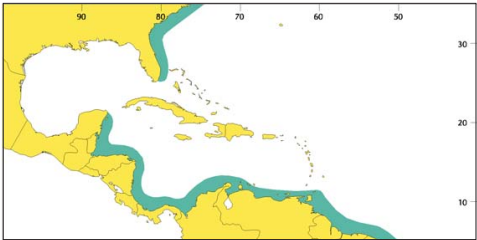
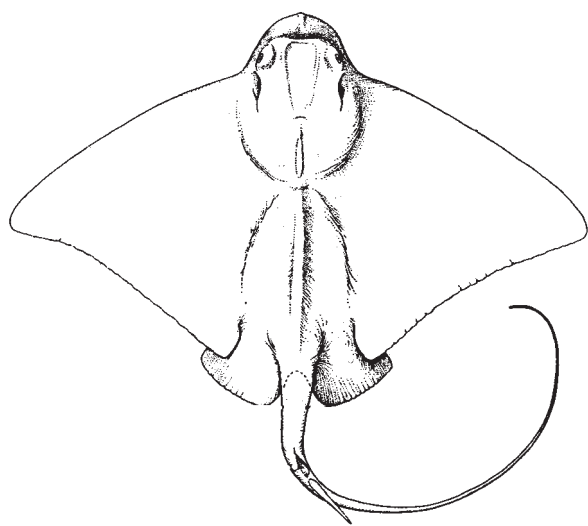


Myliobatis goodei Garman, 1885

MYO

En - Southern eagle ray; **Fr** - Aigle de mer du sud; **Sp** - Chucho amarillo.

Maximum size 99 cm disc width; males mature at 45 cm disc width. Benthic to epipelagic in coastal waters. Recorded from South Carolina to southern Florida, Caribbean coast of Central America, and northern South America to northern Argentina. Records of eastern Atlantic *Myliobatis aquila* from southern Brazil probably refer to this species, if both species are indeed distinct (if not, *M. aquila* has priority). Capable of travelling long distances. Food consists of crustaceans and bivalves. Dorsal surface chocolate brown to greyish brown; ventral surface brownish white with dusky outer disc margins. Further distinguished from *Myliobatis freminvillei* in having more blunt, less elongate, snout; greater distance between the last pair of gill openings; and more broadly rounded outer disc margins.

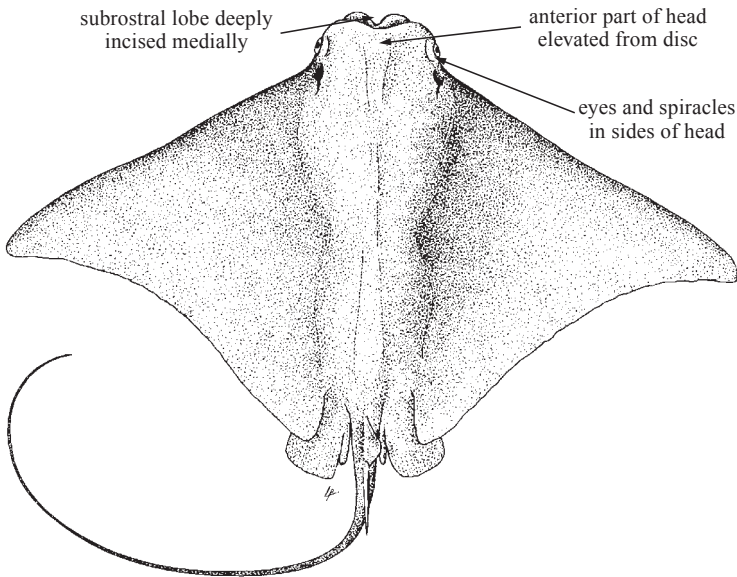


RHINOPTERIDAE

Cownose rays

by J.D. McEachran, Texas A & M University, Texas, USA
and M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoids of moderate to large size, disc width up to 2 m; disc rhomboid or lozenge-shaped, distinctly broader than long. **Anterior part of head distinctly elevated from disc; anterior section of pectoral fin separated from remainder of fin and forming fleshy subrostral lobe, lobe extends slightly in front of head and is deeply incised medially.** Eyes and spiracles on sides of head. Mouth nearly transverse; fleshy papillae absent on floor of mouth; **teeth consist of flattened plates arranged like pavement stones in 6 to 9 series, forming dental plate in each jaw; those of medial column largest.** Anterior lobe of nostrils posteriorly expanded into broad nasal curtain, with posterior margin fringed. Pectoral fins falciform, originating on dorsal side of head posterior to orbits. One small dorsal fin located between medial margins of pelvic fins; caudal fin absent; tail distinct from trunk, very slender, and circular in cross-section; longer than disc width; armed with 1 (rarely more) long, serrated, poisonous spine(s), located immediately posterior to dorsal fin. Skin entirely smooth on dorsal and ventral sides, or roughened with denticles on dorsal surface and on midline of body. **Colour:** dorsal surface greenish brown, brown, bronze, or grey; ventral surface whitish, border of disc often dark like dorsal surface; tail dark.



Habitat, biology, and fisheries: Cownose rays inhabit tropical to temperate continental and insular shelves worldwide. They actively swim by rapidly flapping their pectoral fins like birds in flight, and are capable of migrating long distances. Occasionally they are observed at the surface and leaping out of the water but generally swim near the bottom in small groups. Food consists of benthic crustaceans and hard-shelled molluscs that are dislodged from the bottom with their pectoral fins and subrostral lobes. All species are viviparous without placenta and neonates resemble their parents. Two species occur in the area. Cownose rays are not directly targeted by fisheries but they are frequently caught in tropical waters and are processed fresh or salted for human consumption.

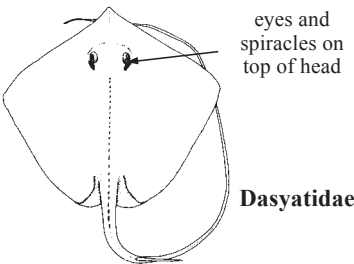
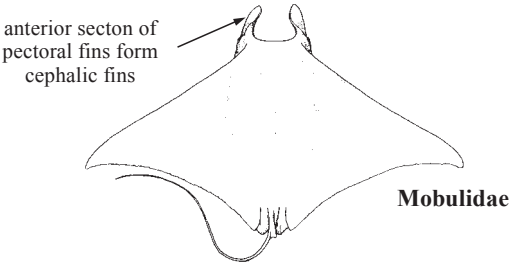
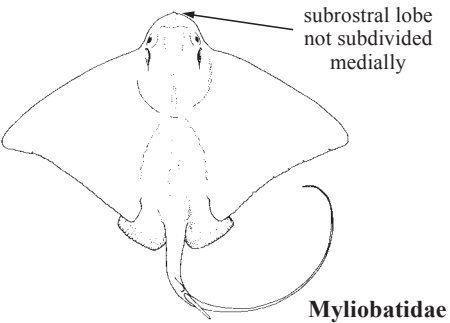
Similar families occurring in the area

Myliobatidae: subrostral lobe not prominent and not subdivided medially along anterior margin; fleshy papillae on floor of mouth.

Mobulidae: anterior section of pectoral fins form cephalic fins; teeth very small, numerous and arranged in bands along one or both jaws.

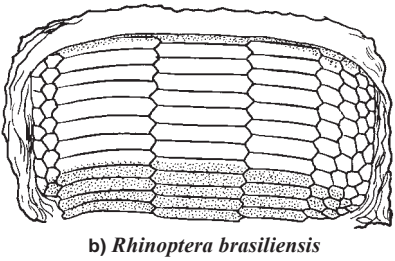
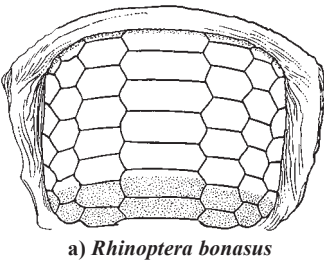
Dasyatidae, Gymnuridae, Urotrygonidae: eyes and spiracles on top of head; anterior part of head not elevated and not distinct from remainder of disc; no subdivisions of pectoral fins forming subrostral lobes.

Other rays: tail stout to moderately slender and not whip-like; no serrated spine(s) on tail; eyes and spiracles on top of head and anterior part of head not elevated above remainder of disc.



Key to the species of Rhinopteridae occurring in the area

- 1a. Teeth usually in 7 series in each jaw (occasionally 6 or 8) *Rhinoptera bonasus*
1b. Teeth usually in 9 series in each jaw (occasionally 8 or 10) *Rhinoptera brasiliensis*



upper teeth

List of species occurring in the area

The symbol ♠ is given when species accounts are included.

- ♠ *Rhinoptera bonasus* (Mitchill, 1815).
♠ *Rhinoptera brasiliensis* Müller, 1836.

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the western North Atlantic. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Mem. Sears Found. Mar. Res.*, (1)Pt.2: 588 p.

Castro-Aguirre, J.L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideiomorpha)*. Universidad Nacional Autónoma de México, 75 p.

McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1. Myxiniformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.

Smith, J.W. and J.V. Marriner. 1986. Observations on the reproductive biology of the cownose ray, *Rhinoptera bonasus*, in Chesapeake Bay. *U.S. Nat. Mar. Fish. Serv. Fish. Bull.*, 84:871-877.

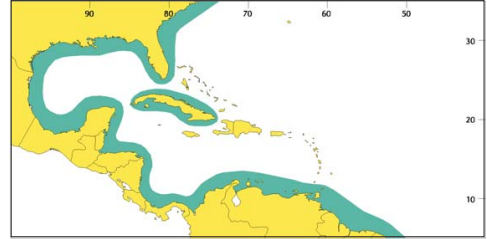
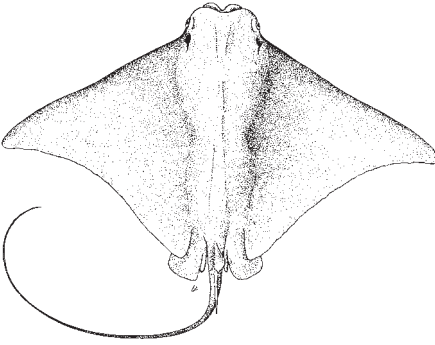
Smith, J.W. and J.V. Marriner. 1985. Food habits and feeding behavior of the cownose ray, *Rhinoptera bonasus*, in lower Chesapeake Bay. *Estuaries*, 8:305-310.

***Rhinoptera bonasus* (Mitchill, 1815)**

MRB

En - Cownose ray; **Fr** - Mourine américaine; **Sp** - Mancha.

Maximum size 91 cm disc width; females mature at 78 cm disc width; neonates about 37 cm disc width at birth. Benthic to epipelagic along the continental and insular shelves. Recorded from southern New England to northern Argentina, including the Gulf of Mexico, and Cuba. Litters from 2 to 6 young. Feeds primarily on hard-shelled molluscs and crustaceans. Dorsal surface uniform brown; ventral surface white to yellowish. Tooth plates with relatively long teeth compared to *Rhinoptera brasiliensis*.

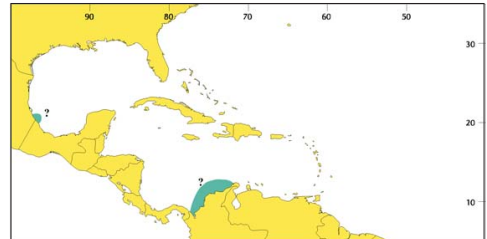
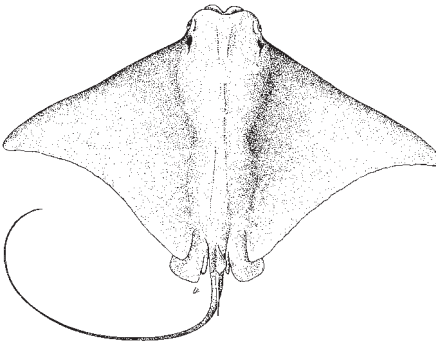


***Rhinoptera brasiliensis* Müller, 1836**

MRR

En - Ticon cownose ray; **Fr** - Mourine ticon; **Sp** - Gavilán ticón.

Maximum size 91 cm disc width; neonates 44 to 49 cm disc width at birth. Feeds on hard-shelled molluscs and crustaceans. Benthic to epipelagic along continental and insular shelves. Recorded from North Carolina, southwestern Gulf of Mexico, Caribbean coast of Colombia, and southwestern Atlantic off Brazil. Dorsal surface uniform brown and ventral surface white below, with darker margins of disc ventrally. Distinguished from *Rhinoptera bonasus* by having relatively short teeth.

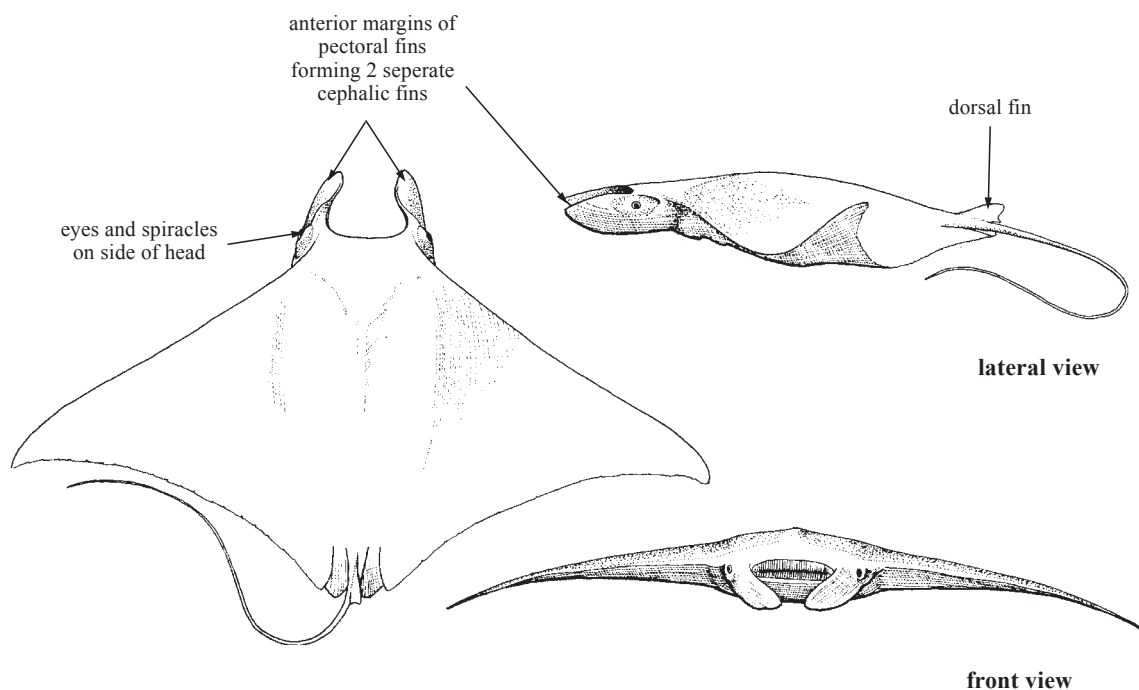


MOBULIDAE

Devil rays or mantas

by J.D. McEachran, Texas A & M University, USA and
M.R. de Carvalho, American Museum of Natural History, New York, USA

Diagnostic characters: Batoids of very large size, disc width of over 7 m in some species (*Manta* spp.). Body strongly depressed, with head, trunk, and broadly expanded pectoral fins forming a broad rhomboid disc. Disc much broader than long. Tail distinctly demarcated from disc. **Anterior margins of pectoral fins forming 2 separate cephalic fins that are separated from remainder of fins, project over front of head, and are orientated vertically.** Head broad and slightly elevated but distinct from trunk. **Eyes and spiracles on sides of head.** Mouth subterminal to terminal and straight. **Teeth are minute** and arranged in many series in 1 or both jaws. Anterior lobe of nostril greatly expanded to form well-developed nasal curtain that is complete across broad symphysis, and either entire or finely fringed along posterior margin; no papillae in mouth. No caudal fin, but **small dorsal fin on base of tail;** long serrated spine (or spines) present on tail in some species, lacking in others. Pelvic fins moderately narrow and extend little beyond posterior margin of pectoral fins. Skin naked or more or less rough with prickles or small tubercles. **Colour:** upper surface of body and outer surfaces of cephalic fins varying from grey to reddish or olivaceous brown to black; lower surface of body and inner surfaces of cephalic fins yellowish or greyish white, often with dusky patches.



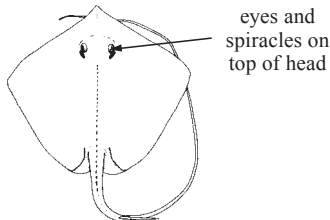
Habitat, biology, and fisheries: Devil rays occur in tropical and warm-temperate waters of all oceans, over continental and insular shelves. They are pelagic and highly migratory, swimming in surface waters by flapping their wing-like pectoral fins. All species are viviparous without placentae and feed on larger zooplanktonic organisms and small schooling fish. They have specialized branchial plates or lamellae that trap planktonic organisms when water leaves pharynx over the gill surfaces. None of the 3 species of devil rays occurring in Area 31 is sufficiently abundant to be considered of significant commercial interest. However, some are caught frequently (especially with harpoons) and are highly esteemed because of their large size and the good quality of their flesh, marketed mainly salted; other parts are used for the production of oil. Worldwide, some species are important for ecotourism.

Similar families occurring in the area

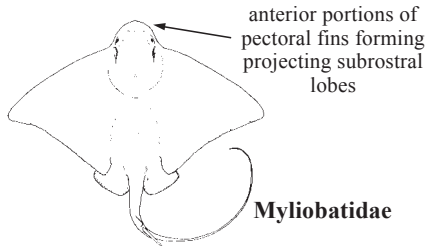
Dasyatidae, Gymnuridae, and Urotrygonidae: eyes and spiracles on top of head; anterior margin of pectoral fins continuous along sides of head, which is not marked off from body.

Myliobatidae and Rhinopteridae: anterior portions of pectoral fins forming projecting subrostral lobes, either single (Myliobatidae) or medially incised (Rhinopteridae); teeth plate-like and in 1 to 9 series.

Other batoid families: lack serrated tail spine; tail is stout to moderately slender. No other family has the typical cephalic fins of the devil rays.



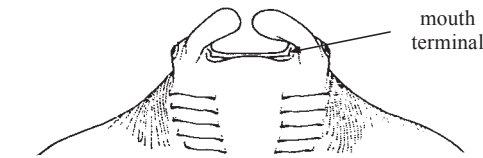
Dasyatidae



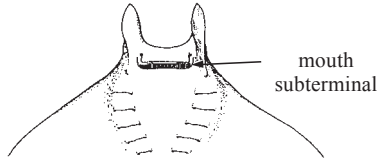
Dasyatidae

Key to the species of Mobulidae occurring in the area

- 1a. Mouth terminal, extending across front of head; teeth on lower jaw only; head width greater than 17% of disc width (Fig. 1a) ***Manta birostris***
- 1b. Mouth subterminal; teeth present in both jaws; head width less than 17% of disc width (Fig. 1b) → 2



a) *Manta birostris*



b) *Mobula*

Fig. 1 ventral view of cephalic region

- 2a. Branchial filter plates fused at tips; tooth bands about 70% of mouth width; cephalic fins about 60% as wide as long ***Mobula tarapacana***
- 2b. Branchial filter plates separate at tips; tooth bands less than or equal to 50% of mouth width; cephalic fins about 50% as wide as long ***Mobula hypostoma***

List of species occurring in the area

The symbol ♦ is given when species accounts are included.

- ♦ *Manta birostris* (Walbaum, 1792).
- ♦ *Mobula hypostoma* (Bancroft, 1831).
- ♦ *Mobula tarapacana* (Philippi, 1893).

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the western North Atlantic. Sawfishes, guitarfishes, skates and rays, and chimaeroids, *Mem. Sears Found. Mar. Res.*, (1)Pt.2:588 p.

Castro-Aguirre, J.L. and H. Espinosa Pérez. 1996. *Listados faunísticos de México. VII Catalogo sistemático de las rayas y especies afines de México (Chondrichthyes: Elasmobranchii: Rajiformes: Batoideiomorpha)*. Universidad Nacional Autónoma de México, 75 p.

McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1. Myxiniformes to Gasterosteiformes*. Austin, Texas, University of Texas Press, 1112 p.

Notabartolo-di-Sciara, G. 1987. Natural history of the rays of the genus *Mobula* in the Gulf of California. *Fish. Bull.*, 86:45-66.

Notabartolo-di-Sciara, G. 1987. A revisionary study of the genus *Mobula* (Chondrichthyes, Mobulidae), with the description of a new species. *Zool. J. Linnean Soc. Lond.*, 91:1-91.

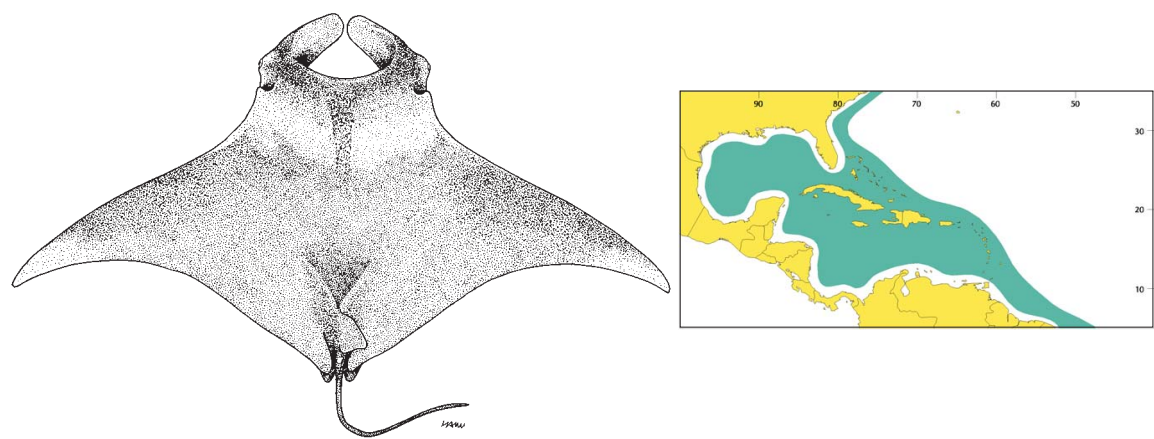
Notabartolo-di-Sciara, G. and E.V. Hillyer. 1989. Mobulid rays off Venezuela (Chondrichthyes, Mobulidae). *Copeia*, 1989:607-614.

Manta birostris (Walbaum, 1792)

RMB

En - Giant manta (AFS: Manta); **Fr** - Mante géante; **Sp** - Manta voladora (AFS: Mantaraya).

Maximum size 700 cm disc width; neonates 120 cm at birth. Pelagic in coastal and oceanic waters. Recorded from southern New England and Georges Bank, North Carolina, and Bermuda to central Brazil, including Gulf of Mexico, Bahamas, and the Greater and Lesser Antilles. Thought to be worldwide but records from other oceans may represent separate species. Dorsal coloration varies from reddish brown to black, with small spots and blotches occasionally present; ventrally white, with grey blotches sometimes present. Serrated spines may be present. Food consists of zooplankton, small pelagic crustaceans, and ray-finned fishes. Rarely caught; meat from pectoral fins is salted and dried (Mexico).

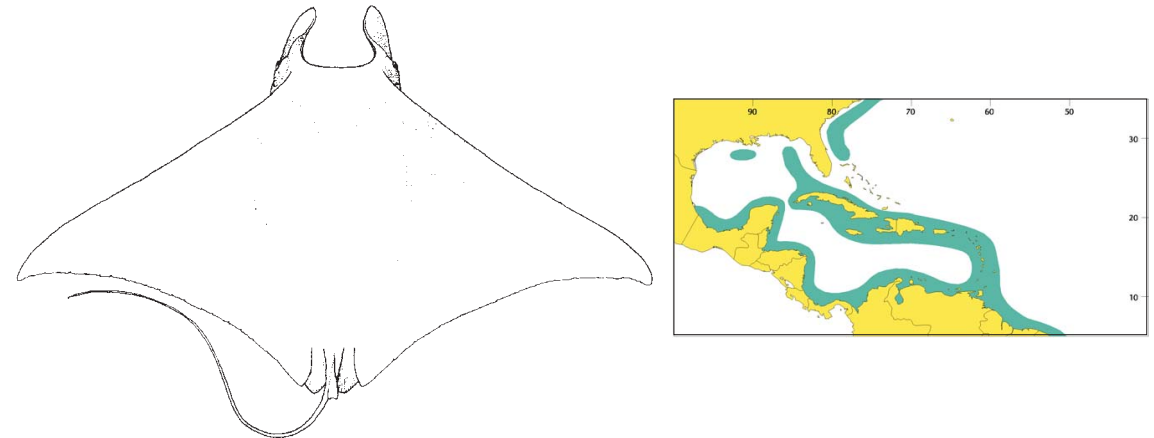


Mobula hypostoma (Bancroft, 1831)

RMH

En - Devil ray; **Fr** - Diable géant; **Sp** - Manta negra.

Maximum size 120 cm disc width, males mature at 114 cm disc width, females mature at 111 cm disc width, neonates 55 cm at birth. Pelagic in coastal and occasionally oceanic waters. Recorded from North Carolina (Cape Lookout) to northern Argentina, including Gulf of Mexico, and Greater and Lesser Antilles. Records from eastern Atlantic refer to *Mobula rochebrunei*. Dorsal coloration blackish brown to bluish black; upper margins and inner terminal portion of cephalic fins also blackish brown; ventral surface yellowish or greyish white; outer margins of cephalic fins yellowish or grey. Caudal serrated spine absent. Small denticles present on disc and base of tail. Food consists of zooplankton, small pelagic crustaceans, and ray-finned fishes.

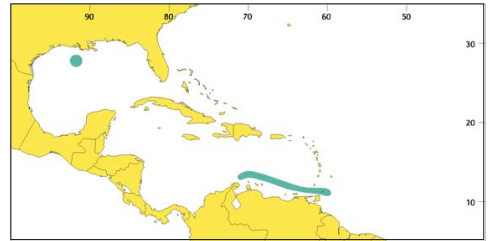
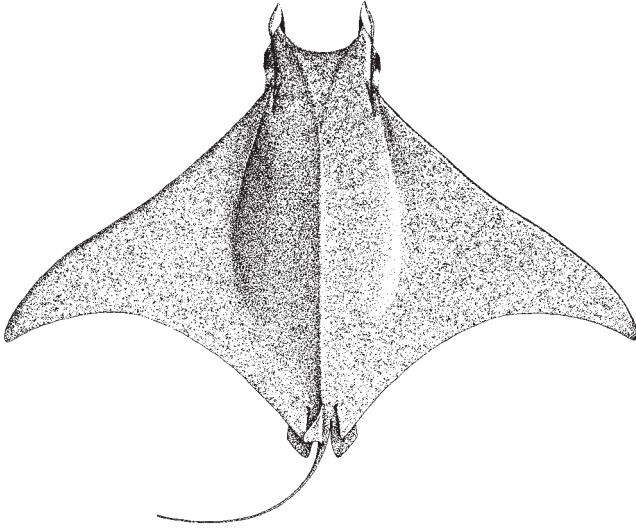


Mobula tarapacana (Philippi, 1893)

RMT

En - Chilean devil ray (AFS: Sicklefin devil ray); **Fr** - Mante chilienne; **Sp** - Manta cornuda.

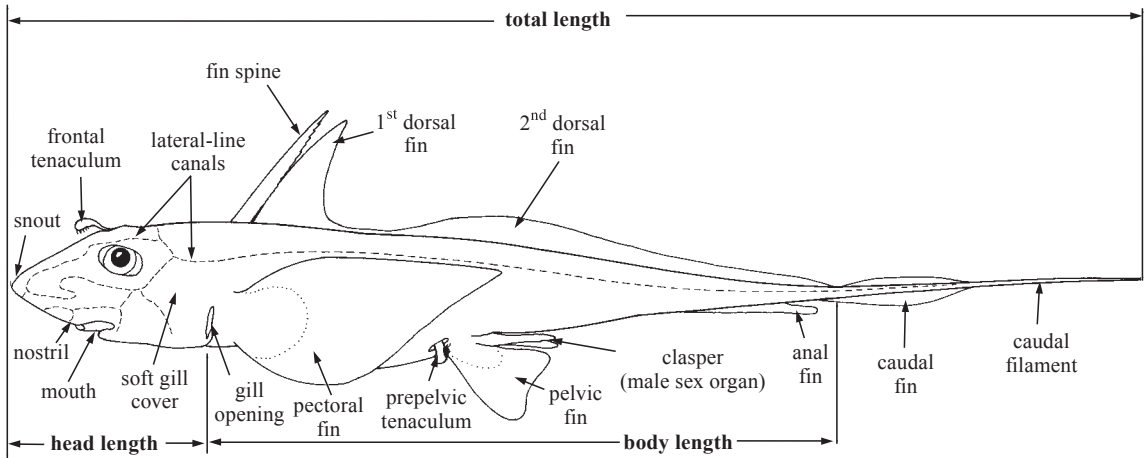
Maximum size is 305 cm disc width. Pelagic in coastal and occasionally oceanic waters. Recorded from north-western Gulf of Mexico and Venezuela. Widespread in tropical waters (described originally from off Chile). Dorsal coloration brown to olivaceous green; ventrally white on anterior half and grey posteriorly (both portions clearly distinct). No serrated spine on tail. Densely covered with minute denticles. Also distinguished from *Mobula hypostoma* by having a relatively longer "neck" region. Food consists of zooplankton, small pelagic crustaceans, and ray-finned fishes.



CHIMAERAS

by D.A. Didier, Academy of Natural Sciences, Philadelphia, Pennsylvania, USA

TECHNICAL TERMS AND MEASUREMENTS



GENERAL REMARKS

The chimaeroids are shark-like fishes characterized by large heads and elongate bodies that taper to a whip-like tail. In overall body shape they resemble grenadiers (*Macrouridae*), but they are true cartilaginous fishes (*Chondrichthyes*) with no bony skeleton, fin rays, or scales. There are currently 30 known species, but many new species have recently been discovered and the actual number is probably greater than 40. Although closely related to sharks, skates, and rays, the chimaeroid fishes exhibit some striking morphological differences. In particular, all chimaeroids have large eyes, a smooth, rubbery skin devoid of denticles (although tiny denticles are present on the dorsal surface of the head and body in hatchlings), and a fleshy operculum covers the four gill openings on each side of the head. A single gill opening is present anterior to the base of each pectoral fin; no spiracle is present. The mouth is small, ventral, and connected to the nostrils by a pair of deep grooves that channel water from the nostrils to the mouth. The teeth are formed into 3 pairs of non-replaceable hypermineralized tooth plates, 2 pairs in the upper jaw and 1 pair in the lower jaw, which protrude from the mouth like rodent's incisors, suggesting the common names ratfish or rabbitfish for some of the species. Other species are also commonly called spookfish or ghostshark because of their remarkable spectral appearance. The pectoral fins of chimaeras are broad and wing-like and serve to propel the fish through the water by a flapping motion. All chimaeroids have 2 dorsal fins, the first erectile, preceded by a stout and often toxic spine, the second long and spineless. The tail is elongate and tapering, typically ending in a long terminal filament and bearing a caudal fin with dorsal and ventral lobes that are unequal in size (externally heterocercal) or nearly equal in size (diphycercal). The lateral-line canals on the head, body and tail, are superficially prominent, in many species appearing as open grooves, sometimes with large dilations on the snout.

Chimaeroids are predatory, eating primarily hard foods that they crush with their tooth plates. Their diet consists primarily of benthic invertebrates including bivalves, gastropods, various crustaceans, polychaetes, and echinoderms. They also eat other fishes including chimaeroids. These fishes are entirely marine and have their greatest diversity in the deep temperate waters of the shelf and slope, generally at depths greater than 500 m up to 3 000 m; however, most species occur between 200 and 2 000 m. Species of chimaeroid fishes are distributed in all of the world's oceans from the arctic and subantarctic to the tropics, where they are deep-water slope inhabitants. They tend to occur on or near the bottom, none are known to be oceanic, and most occur near continental land masses or off oceanic islands and on the slopes of seamounts and underwater ridges. Some species are locally migratory and congregate in large breeding aggregations inshore, and many species tend to segregate into unisexual groups that are additionally separated by age. Many species are known from a very widespread geographic range, sometimes throughout an ocean basin spanning the northern and southern hemisphere, while other species appear to be more restricted in their range both vertically and horizontally; however, data on the geographic distribution of most species is based primarily on fishing records and more comprehensive sampling in deep waters will be needed to establish a complete picture of the geographic range for most species.

All chimaeroid fishes are oviparous. Males possess elaborate copulatory organs on their pelvic fins, which they use to transfer sperm to the female oviducts. Males also possess 2 additional organs used copulation. Unique to chimaeroids is a club-like frontal tenaculum armed with multiple rows of denticles which emerges from the top of the head in sexually mature males. It has been observed that the frontal tenaculum is used to


grasp the posterior edge of the pectoral fin of the female to aid in positioning the male during copulation. Additionally, a pair of blade-like pre-pelvic tenaculae armed with a row of spinous denticles are located in pouches anterior to the pelvic fins. These also aid in anchoring the male during copulation. Sperm storage has been observed in one species, and is likely to occur in all species. Females will deposit 2 large egg capsules, 1 from each oviduct, each of which contains a single egg. The egg capsules are generally spindle shaped, sometimes with broad lateral web-like flanges that vary in size and shape depending on the species. Egg capsules are laid in pairs on the bottom and the embryos may take from 6 to 12 months to develop. The hatchlings are formed like miniature adults. Mature chimaeroids range in size from 40 to over 100 cm in total length and sexual maturity in males and females usually occurs at > 40 cm body length. Very little is known about reproduction and development in chimaeroids and egg capsules and embryos have not been collected for most species.

The Chimaeroid fauna of the Western Central Atlantic is not especially diverse with only 2 of the 3 families represented, although of the 5 species present, 4 of the 6 genera are represented. Increased fishing in deep waters in this region indicates that species of chimaeroids may be more abundant in this region than previously reported. In addition, a sixth species may be present in this area in extremely great depths; however, this record is based only on a single captured video image and needs to be verified. In the Western Central Atlantic chimaeroid fishes are apparently little utilized and are unlikely to become an important fishery resource, although they are occasionally taken as minor bycatch in trawls. They are suitable for human consumption and can be processed for oil and fish meal. However, species of chimaeroids may be inadvertently subjected to overexploitation from fisheries due to a poor understanding of probable biological constraints, such as low abundance, long lives, and low fecundity.

KEY TO FAMILIES OCCURRING IN THE AREA

- 1a. Snout elongated and pointed; caudal-fin axis weakly raised (diphycercal but appears heterocercal) with the fin asymmetrical, epaxial caudal-fin lobe narrower than hypaxial lobe **Rhinochimaeridae**
- 1b. Snout short and bluntly rounded; caudal-fin axis horizontal (diphycercal) with the fin nearly symmetrical, epaxial and hypaxial lobes equal sized **Chimaeridae**

LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA


The symbol  is given when species accounts are included.

RHINOCHIMAERIDAE: Longnose chimaeras

 *Neoharriotta carri* Bullis and Carpenter, 1966.

 *Rhinochimaera atlantica* Holt and Byrne, 1909.

CHIMAERIDAE: Shortnose chimaeras

 *Chimaera cubana* Howell Rivero, 1936.

 *Hydrolagus alberti* Bigelow and Schroeder, 1951.

 *Hydrolagus mirabilis* (Collett, 1904).

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Western North Atlantic memoir 1, part 2. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Sears Found. for Mar. Res.*, New Haven, Yale Univ., pp. 515-562.

Didier, D.A. 1995. Phylogenetic systematics of extant chimaeroid fishes (Holocephali, Chimaeroidei). *Amer. Mus. Nov.*, 86 p.

Didier, D.A. and M. Stehmann. 1996. *Neoharriotta pumila*, a new species of longnose chimaera from the northwestern Indian Ocean (Pisces, Holocephali, Rhinochimaeridae). *Copeia*, 1996:955-965.

McEachran, J.D. and J.D. Fechehelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1*. Austin, University of Texas Press, 1 120 p.

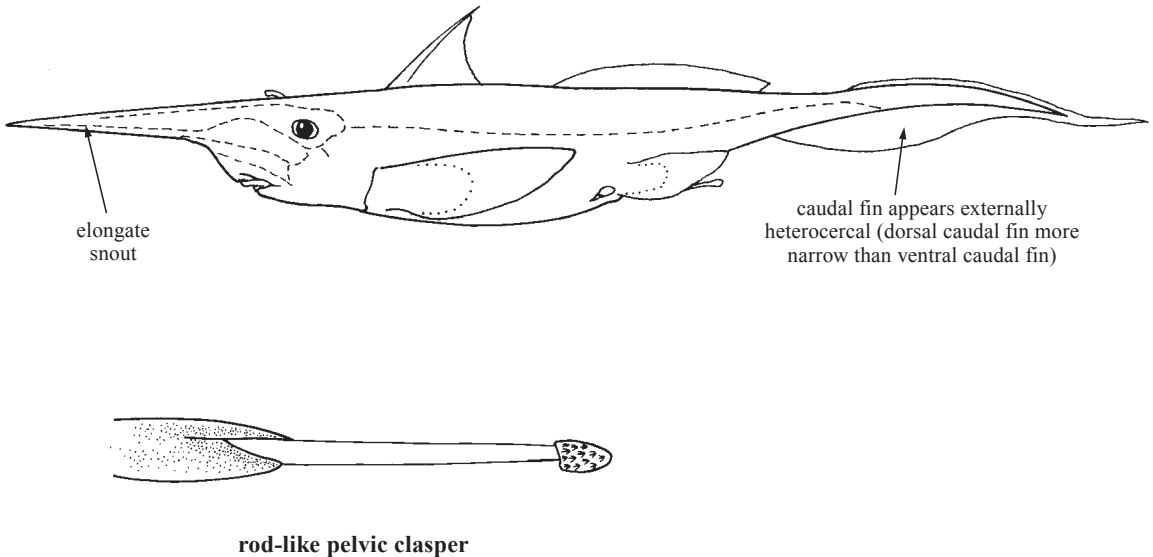
Whitehead, P.J.P., M.-L. Bauchot, J.-C. Hureau, J. Nielsen, and E. Tortonese (eds). 1984. *Fishes of the North-eastern Atlantic and the Mediterranean, Vol. 1*. Paris, UNESCO, 510 p.

RHINOCHIMAERIDAE

Longnose chimaeras (spookfishes)

by D.A. Didier, Academy of Natural Sciences, Philadelphia, Pennsylvania, USA

Diagnostic characters: Medium to large-sized shark-like fishes with large head, elongate spear-like snout, and somewhat compressed, elongate bodies with tail tapering to an elongate filament. Eyes large and prominent, bright green in fresh specimens. **Long, fleshy snout extends anterior to head tapering to a blunt point. Skin smooth**, often deciduous, flaking off in patches after capture. Gills covered by a fleshy operculum with only a single gill opening present anterior to pectoral fins; no spiracle present. Mouth small, ventral, connected to nostrils by deep grooves. **Teeth in the form of 3 pairs of non-replaceable tooth plates** with 2 pairs in the upper jaw, and a single pair in the lower jaw. Tooth plates appear as smooth shearing blades or robust with patches of dense hypermineralized tissue that appears as ridges and bumps on the surface. Pectoral and pelvic fins broad, somewhat ovoid in shape, with delicate external fin webs supported by cartilaginous rays (ceratotrichia). Two dorsal fins, the first erectile, preceded by an elongate, serrate spine, in some species toxic; the second elongate and spineless. Tail diphycercal; **caudal fin with narrow dorsal lobe and large ventral lobe appearing externally heterocercal. Lateral line canals appear as open grooves on the head and sides of body.** Adult males with bulbous, denticulate frontal tenaculum that rests in a pouch atop the head anterior to eyes; prepelvic tenaculae blade-like with large denticles along the medial edge, hidden in pouches anterior to the pectoral fins; and slender, rod-like pelvic claspers extending from pelvic fins with small, fleshy denticulate tip. **Colour:** greyish or brownish, often lighter or white ventrally, without distinct colour pattern.



Habitat, biology, and fisheries: These fishes generally inhabit deep waters and are usually found at depths around 1 000 to over 2 000 m. They appear to live on muddy bottoms where they primarily feed on a variety of benthic invertebrates as well as other fishes. Most species reach sexual maturity at about 40 cm body length measured from the distal edge of the gill opening to the origin of the dorsal caudal-fin lobe, females generally larger than males. All species are oviparous. Females lay pairs of eggs encased in an ovoid egg capsule with a fan-like lateral web that surrounds a hollow central chamber that is ovoid with lateral indentations in the centre. Due to their deep-water habitat, they have been poorly studied and almost nothing is known of their biology and reproduction. At present they are of minimal interest to fisheries and are primarily caught as bycatch in bottom trawl fisheries and may be utilized for fish meal or other fish products.

Similar families occurring in the area

This family is distinguished from the closely related family Chimaeridae by an elongate snout. The presence of slender rod-like claspers with a small bulbous, denticulate tip also characterizes members of this family.

Key to the species of Rhinochimaeridae occurring in the area

- 1a. Anal fin present (Fig. 2a); distal margin of dorsal caudal fin smooth; tooth plates with hypermineralized bumps and ridges; profile of head rounded at top of snout *Neoharriotta carri*
- 1b. Anal fin absent (Fig. 2b); distal margin of dorsal caudal fin in adults with 20 to 40 paired tubercles, large in males, just visible in females; tooth plates appear as smooth shearing blades; head and snout form a straight profile (Fig. 1) *Rhinochimaera atlantica*

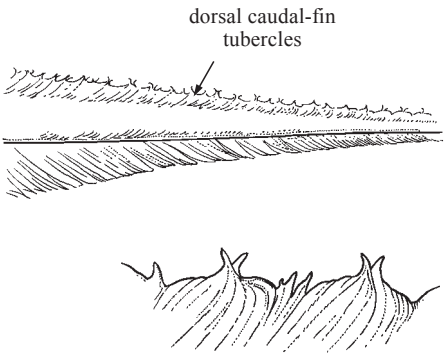


Fig. 1 caudal tubercles

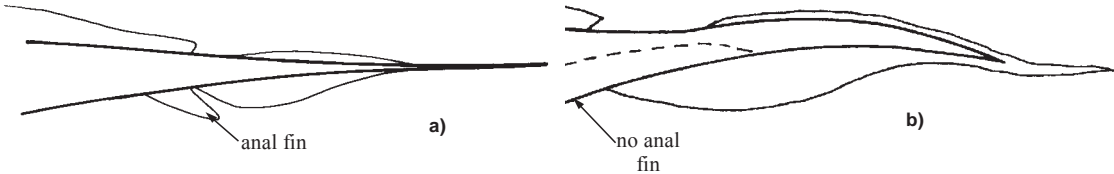


Fig. 2 lateral view of tails

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Neoharriotta carri* Bullis and Carpenter, 1966.

 *Rhinochimaera atlantica* Holt and Byrne, 1909.

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Western North Atlantic memoir 1, part 2. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Sears Found. for Mar. Res.*, New Haven, Yale Univ., pp. 515-562.

Didier, D.A. 1995. Phylogenetic systematics of extant chimaeroid fishes (Holocephali, Chimaeroidei). *Amer. Mus. Nov.*, 86 p.

Didier, D.A. and M. Stehmann. 1996. *Neoharriotta pumila*, a new species of longnose chimaera from the northwestern Indian Ocean (Pisces, Holocephali, Rhinochimaeridae). *Copeia*, 1996:955-965.

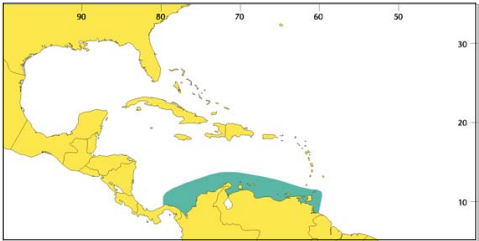
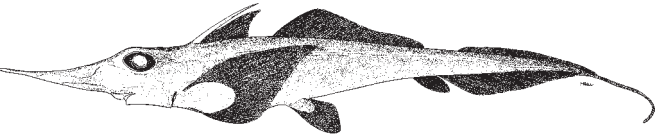
McEachran, J.D. and J.D. Fechhelm. 1998. *Fishes of the Gulf of Mexico, Vol. 1*. Austin, University of Texas Press, 1 120 p.

Whitehead, P.J.P., M.L. Bauchot, J.C. Hureau, J. Nielsen, and E. Tortonese (eds). 1984. *Fishes of the North-eastern Atlantic and the Mediterranean, Vol. 1*. Paris, UNESCO, 510 p.

Neoharriotta carri Bullis and Carpenter, 1966

En - Pale sicklefin chimaera, **Fr** - Chimère à nex mou pâle; **Sp** - Quimera pálida con hocico largo.

Small-bodied rhinochimaerid with maximum total length about 75 cm; maximum body length about 25 cm. A rare species typically found at the edge and slope of the continental shelf at depths of 240 to 600 m. Nothing is known of their biology, and no adult males have been recorded. Probably taken as bycatch in deep bottom trawls and bottom longlines, but not known to be utilized. Known distribution in the southern Caribbean off Panama, Colombia, and Venezuela.

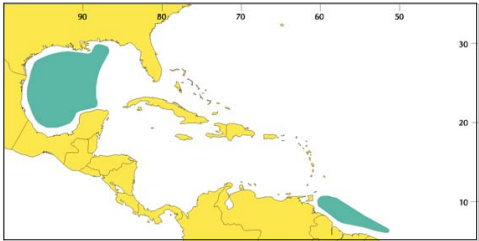
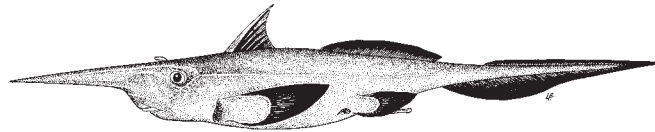


Rhinochimaera atlantica Holt and Byrne, 1909

RCT

En - Atlantic Spearnose chimaera; **Fr** - Chimère à nex mou; **Sp** - Quimera con hocico largo.

Large-bodied rhinochimaerid with maximum total length 1.5 m; maximum body length 65 cm. Not known to be part of the commercial catch in this region, but may be caught as bycatch in the northern Atlantic where it is more common. Typically found at depths greater than 1 000 m, ranging from 800 to 1 800 m depth. Rare in this region with specimens recorded from the Gulf of Mexico and off Suriname and French Guiana.

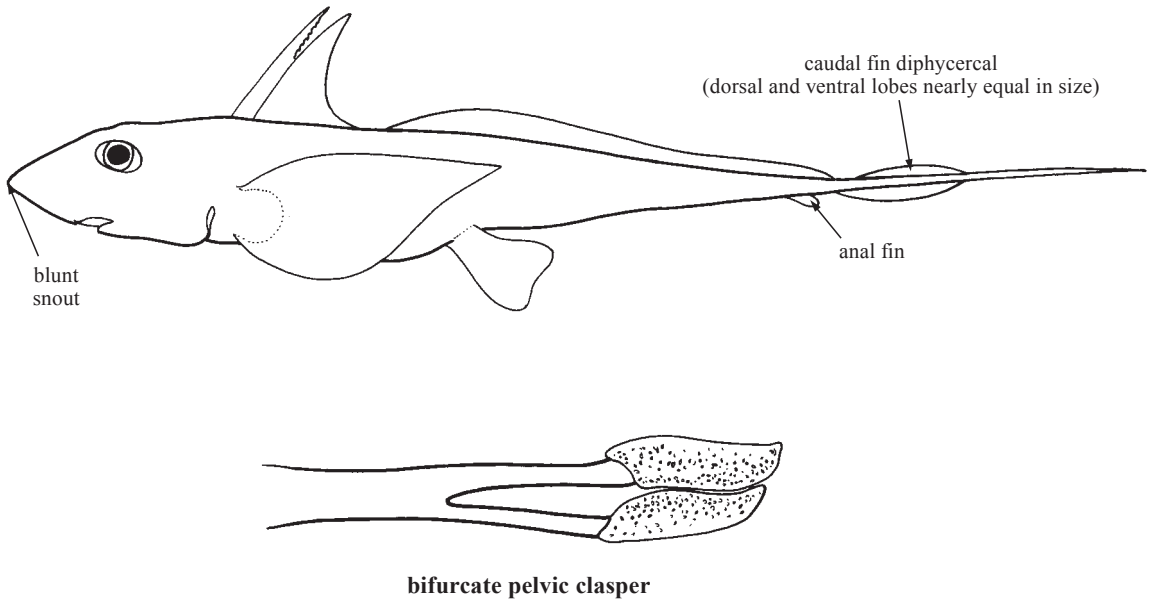


CHIMAERIDAE

Shortnose chimaeras (ratfishes, rabbitfishes, ghostsharks)

by D.A. Didier, Academy of Natural Sciences, Philadelphia, Pennsylvania, USA

Diagnostic characters: Medium-sized shark-like fishes with **large head, blunt snout, and somewhat compressed, elongate bodies, tail tapering to an elongate filament.** Eyes large and prominent, bright green in fresh specimens. Snout fleshy and bluntly pointed at tip. Mouth small, ventral, connected to nostrils by deep grooves. **Teeth in the form of 3 pairs of non-replaceable tooth plates** with 2 pairs in the upper jaw, and 1 pair in the lower jaw. Tooth plates robust with patches of dense hypermineralized tissue that appear as ridges and bumps on the surface. **Skin smooth**, often deciduous, flaking off in patches after capture. Gills covered by a fleshy operculum with only a **single gill opening present anterior to pectoral fins; no spiracle present.** Two dorsal fins, the first erectile, preceded by an elongate, serrate spine, in some species toxic; the second elongate and spineless. **Tail diphycercal with dorsal and ventral caudal-fin lobes of nearly equal size.** Pectoral and pelvic fins broad with delicate external fin webs supported by cartilaginous rays (ceratotrichia). **Lateral-line canals appear as open grooves on head and sides of body; canals on snout with large dilations.** Adult males with bulbous, denticulate frontal tentaculum that rests in a pouch atop the head anterior to eyes; prepelvic tenaculae blade-like with large denticles along medial edge, hidden in pouches anterior to pectoral fins; and **pelvic claspers bifurcate** with fleshy, denticulate tips. In some species the fleshy lobes separate, appearing as a third division of the clasper, but are not supported by an internal cartilaginous rod. **Colour:** pale to dark brown, darker dorsally, lighter or white ventrally, usually without distinct colour pattern.



Habitat, biology, and fisheries: These fishes generally inhabit deep waters and are usually found at depths greater than 200 m to over 1 000 m. They appear to live on or near muddy bottoms where they primarily feed on a variety of benthic invertebrates as well as other fishes. Most species reach sexual maturity at about 40 cm body length (measured from the distal edge of the gill opening to the origin of the dorsal caudal-fin lobe), females generally larger than males. All species are oviparous. Females lay pairs of spindle-shaped eggs that are deposited on the bottom. Embryological studies indicate that development may take as long as 9 to 12 months. At present they are of minimal interest to fisheries and are primarily caught as bycatch in bottom trawl fisheries and may be utilized for fish meal and other fish products. Some related species in the Pacific are being commercially fished and the commercial potential of species in the Atlantic is being explored.

Similar families occurring in the area

This family is easily distinguished from the closely related family Rhinochimaeridae by a blunt snout and lateral-line canals on the snout with large dilations.

Key to the species of Chimaeridae occurring in the area

- 1a.** Anal fin present, separated from ventral caudal fin by a deep notch (Fig. 1a); preopercular and horizontal lateral-line canals branch separately from the suborbital canal *Chimaera cubana*
- 1b.** Anal fin absent (Fig. 1b); origin of ventral caudal fin is a narrow, fleshy lobe along base of tail; preopercular and horizontal lateral line canals share a common branch from the suborbital canal → 2

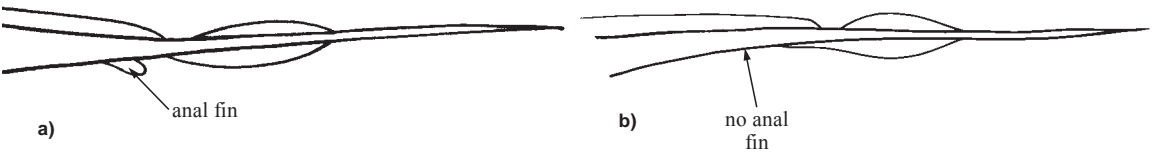






Fig. 1 lateral view of tail

- 2a.** Second dorsal fin elongate with straight distal margin *Hydrolagus alberti*
- 2a.** Second dorsal fin with distal margin deeply indented in the middle. *Hydrolagus mirabilis*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Chimaera cubana* Howell Rivero, 1936.
-  *Hydrolagus alberti* Bigelow and Schroeder, 1951.
-  *Hydrolagus mirabilis* (Collett, 1904).

References

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Western North Atlantic memoir 1, part 2. Sawfishes, guitarfishes, skates and rays, and chimaeroids. *Sears Found. for Mar. Res.*, New Haven, Yale Univ., pp. 515-562.

Didier, D.A. 1995. Phylogenetic systematics of extant chimaeroid fishes (Holocephali, Chimaeroidei). *Amer. Mus. Nov.*, 86 p.

Didier, D.A. and M. Stehmann. 1996. *Neoharriotta pumila*, a new species of longnose chimaera from the northwestern Indian Ocean (Pisces, Holocephali, Rhinochimaeridae). *Copeia*, 1996:955-965.

McEachran, J.D. and J.D. Fechtel. 1998. *Fishes of the Gulf of Mexico, Vol. 1*. Austin, University of Texas Press, 1 120 p.

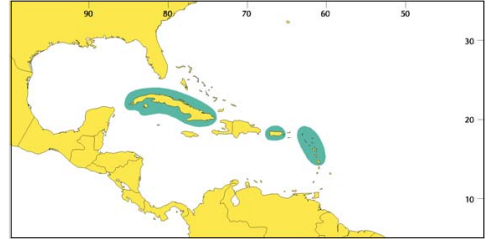
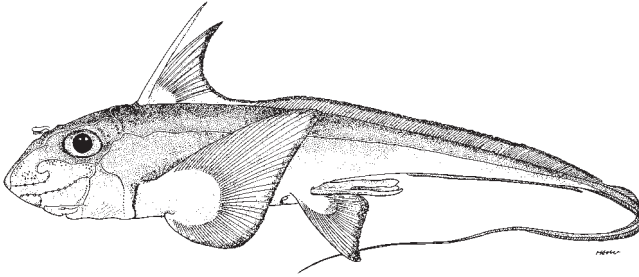
Whitehead, P.J.P., M.-L. Bauchot, J.-C. Hureau, J. Nielsen, and E. Tortonese (eds). 1984. *Fishes of the North-eastern Atlantic and the Mediterranean, Vol. 1*. Paris, UNESCO, 510 p.

Chimaera cubana Howell Rivero, 1936

CMU

En - Cuban chimaera; **Fr** - Chimère de Cuba; **Sp** - Quimera cubano.

Small bodied form with maximum total length about 75 cm; maximum body length about 43 cm. Occurs in depths of at least 500 m. Nothing is known of its biology. Probably caught in bottom trawls and longlines, but not known to be utilized. Cuba, Puerto Rico, and northern islands of the Lesser Antilles.

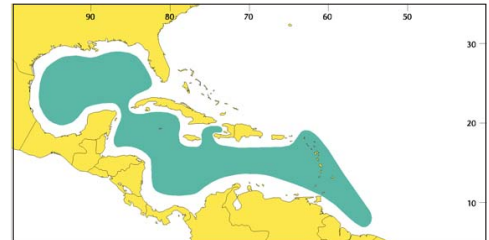
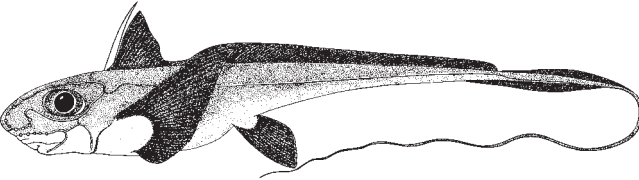


Hydrolagus alberti Bigelow and Schroeder, 1951

CYL

En - Gulf chimaera; **Fr** - Chimère golfe; **Sp** - Quimera del golfo.

Maximum total length about 1 m; maximum body length about 45 cm. The most common species of chimaeroid in this region, common at depths around 500 m, but known from depths up to at least 1 000 m. Probably feeds on bottom invertebrates. Taken as bycatch in bottom trawls and possibly bottom longlines, but not known to be utilized. Found throughout the Gulf of Mexico and Caribbean.



Hydrolagus mirabilis (Collett, 1904)

CYH

En - Large-eyed rabbitfish; **Fr** - Chimère à gros yeux; **Sp** - Quimera ojón.

Small-bodied form with maximum total length about 75 cm; maximum body length about 35 cm. Rare in this region, currently known only from a few specimens collected in the Gulf of Mexico and off Suriname at depths ranging from 450 to over 1 000 m. Likely to have a wider distribution throughout the Gulf and Caribbean, probably at depths greater than 1 000 m. Not known to be taken as part of the commercial catch.

