



Food and Agriculture
Organization of the
United Nations

Identification Guide to the Deep-sea Cartilaginous Fishes of the Southeastern Pacific Ocean



Ebert, D.A. and Mostarda, E. 2016. *Identification guide to the deep-sea cartilaginous fishes of the Southeastern Pacific Ocean*. FishFinder Programme, FAO, Rome, Italy.

Supervision: Merete Tandstad (FAO, Rome)

Technical editor: Edoardo Mostarda (FAO, Rome)

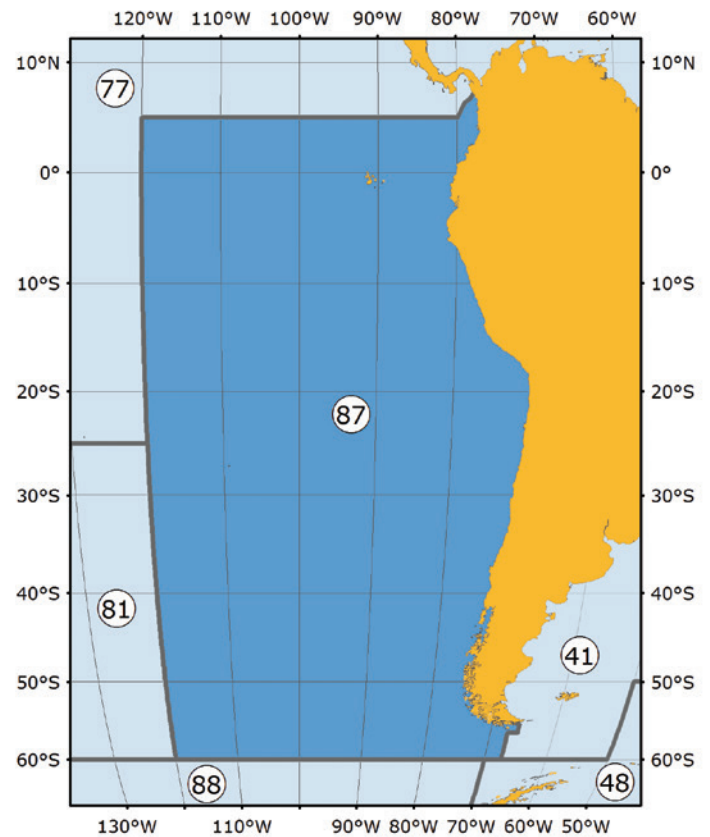
Colour illustrations, cover and graphic design: Emanuela D'Antoni (FAO, Rome)

This guide was prepared under the “FAO Deep-sea Fisheries Programme” thanks to generous funding from the Government of Norway (*Support to the implementation of the International Guidelines on the Management of Deep-Sea Fisheries in the High Seas* project) for the purpose of assisting states, institutions, the fishing industry and Regional Fisheries Management Organizations and Arrangements (RFMO/As) in the implementation of FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas. It was developed in close collaboration with the FishFinder Programme of the Marine and Inland Fisheries Branch, Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations (FAO).

The present guide covers the deep-sea southeastern Pacific Ocean (**FAO Fishing Area 87**). It includes a selection of cartilaginous fish species of major, moderate and minor importance to fisheries as well as those of doubtful or potential use to fisheries. It also covers those little known species that may be of research, educational, and ecological importance.

In this region, the deep-sea chondrichthyan fauna is currently represented by 33 shark, 26 batoid and 9 chimaera species. This guide includes full species accounts for 23 shark, 6 batoid and 4 chimaera species selected as being the more difficult to identify and/or commonly caught. Each species is described, depicted with a colour illustration and photo, and key distinguishing features of similar-looking species occurring in the same area are highlighted allowing for easy and accurate identification in the field. Keys to the shark and batoid orders and families, together with keys to chimaera and skate genera are also provided.

This guide is intended to help fishery workers collecting catch data in the field in the identification of the cartilaginous fish species they might encounter. It is conceived to be updatable, offering the possibility to add new species accounts as new species are described.



For feedback and questions contact:

FishFinder Programme, Marine and Inland Fisheries Branch (FIAF),
Food and Agriculture Organization of the United Nations, Viale delle
Terme di Caracalla, 00153 Rome, Italy.

Email: FishFinder@fao.org

Identification Guide to the Deep-sea Cartilaginous Fishes of the Southeastern Pacific Ocean

by

David A. Ebert

Pacific Shark Research Center
Moss Landing Marine Laboratories
Moss Landing, California
United States of America

and

Edoardo Mostarda

Fisheries and Aquaculture Policy
and Resources Division
Food and Agriculture Organization
of the United Nations
Rome, Italy

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

ISBN 978-92-5-109472-3

© FAO, 2016

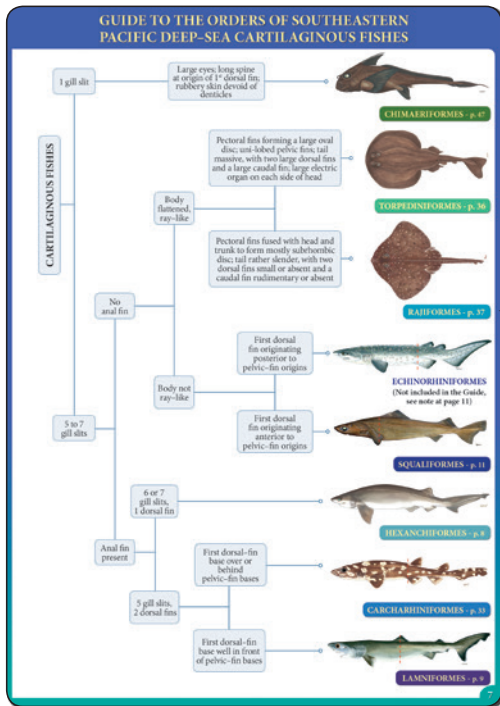
FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO as the source and copyright holder is given and that FAO's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via www.fao.org/contact-us/licence-request or addressed to copyright@fao.org.

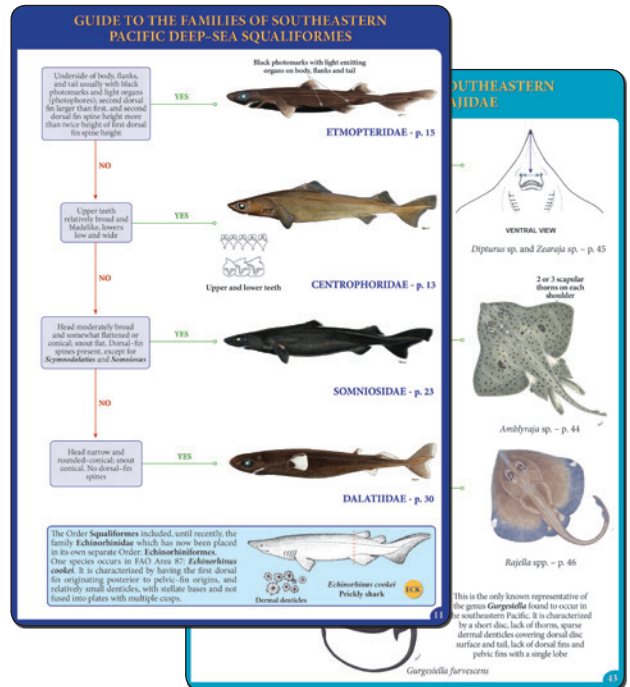
FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org.

HOW TO USE THIS GUIDE

1) The first step the user should take is to check the caught specimen against the Guide to the Orders (Page 7) to determine to which Order it belongs and follow the colour code or page number to reach the Identification Sheets.



2) If the specimen seems to belong to the Orders **Squaliformes**, **Chimaeriformes**, or **Rajiformes**, it should be checked against the respective Guide to the Families or Genera to determine to which group it belongs. If it belongs to one of the other Orders, the user should go directly to the Identification Sheets.



3) Thereafter, the species can be determined by looking at all the Species Sheets for the Family or Genus.

■ The species that are more difficult to identify and/or commonly caught are displayed with full species accounts, occupying one or two pages, that include their main distinctive characters and other useful information. The species that look similar and with which the species could be misidentified are displayed at the bottom of the page and when numerous, on the back page.

■ The species having very peculiar characteristics and/or rarely caught are displayed with simplified species accounts showing their main distinctive features as captions with arrows, and other useful information.

Bathyrhaja griseocauda (Norman, 1937)
Graytail skate

This broadly rhomboid-shaped, wide-headed skate has a single continuous row of 12 to 20 median thorns extending along tail to first dorsal fin.

Ventral surface colour uniform, lighter than dorsal surface, usually white to yellowish. All other similar species (see below) have colour of ventral surface different from or darker than dorsal surface.

Coloration
Dorsal surface uniformly brownish, darker on posterior pectoral-fin margins, dusky on pelvic fins, but without blackish, striped or spotted; ventral surface uniformly white or yellowish.

Size
Maximum total length is about 157 cm.

Similar species

- Bathyrhaja pinnacea**: Lighter areas on ventral surface, around mouth, and bases of pelvic fins and tail.
- Bathyrhaja taylorianae**: No lighter areas on ventral surface around mouth, and bases of pelvic fins and tail.

Bathyrhaja griseocauda
of southern Chile and into the southwestern Atlantic of occurs on the outer continental shelf and upper slopes or depth range off Chile at 137 to 995 m. It, but with slight peaks in the spring and autumn months, and about 18 years for males. The diet is mostly composed for skates tend to feed more on crustaceans, while larger Island Islands (Malvinas) where it was once the dominant species of *B. griseocauda* in catches dropped to around 10% throughout its range as it is taken in both targeted and fisheries it is taken as a retained bycatch in toothfish.

Chlamydoselachidae - Frilled sharks

Chlamydoselachus anguineus (Günther, 1864)
Frilled shark - Requin lézard - Tiburón anguila

Head length less than 17% of total length

Head oval-like, with short snout and terminal mouth

Teeth with three points in both jaws

Body elongated and eel-like

Size: Max. total length 196 cm.

Depth range: 20-1500 m

Distribution: In FAO Area 87 a single record from Chile (37°03'N, 73°13'W).

Note: A distinct species, *Chlamydoselachus africana* Ebert and Compagno, 2009 occurs in the north-eastern Atlantic Ocean. Since these two species are morphologically very similar (*C. africana* has a longer head, more than 17% TL), tissue samples and photographs should be taken when possible.

Hexanchidae - Cow sharks

Hexanchus griseus (Bonaparte, 1798)
Bluntnose steghli shark - Requin gris - Calabota gris

Black blotch on the dorsal fin (inconspicuous in large individuals)

Dorsal-fin base separated from upper caudal-fin origin by a distance about equal than its length

Size: Max. total length 139 cm.

Depth range: 100-1000 m

Distribution: In FAO Area 87 it is known to occur from Colombia to Chile.

HOW TO USE THIS GUIDE

Scientific Name Authorship Common names, when available FAO 3-alpha code

FAO Names (English - French - Spanish, when available)

Colour illustration and main field marks

Additional details

Other similar species

A different colour for each Order

Species coloration and size given as Total Length (TL)

Photo of a specimen immediately after capture

Family common name

Family

Order

Etmopterus granulosus (Günther, 1880)
Southern lanternshark (Lucifer) - Sagre long nez
Tollo lucero (Chile)

Note: The region above pelvic fin, below anterior branch of flank marking is naked (no dermal denticles). Trawl-caught specimens usually have scuff marks - white patches where the skin has rubbed off.

Colour: Grey-brown on dorsal surface, underside of snout, branchial region and abdomen abruptly black.

Size: Maximum total length about 88 cm.

Underside of head

Photo of specimen immediately after capture

Similar species

Etmopterus litvinovi ***Etmopterus pycnolepis***

Denticles on dorsal surface of head and flanks not in longitudinal rows Lateral flank markings absent Denticles on dorsal surface of head arranged in linear rows, which extend to the flanks, caudal peduncle and caudal-fin base

Dermal denticles Underside of head Upper and lower teeth Dermal denticles Underside of head Upper and lower teeth

Squaliformes Etmopteridae - Lantern sharks

Etmopterus pusillus See page 21

***Centroscyllium* spp.** See page 17

Aculeola nigra

Mouth very broadly arched Lower teeth similar to uppers, not compressed and blade-like, with cusps and cusplets Teeth similar in upper and lower jaws, small, not fang-like, with conical hooked cusps, without cusplets or with at most one pair of reduced cusplets

Underside of head Upper and lower teeth Upper and lower teeth

Main distinctive characters of similar-looking species

Information on the biology, ecology, distribution and fisheries of the species

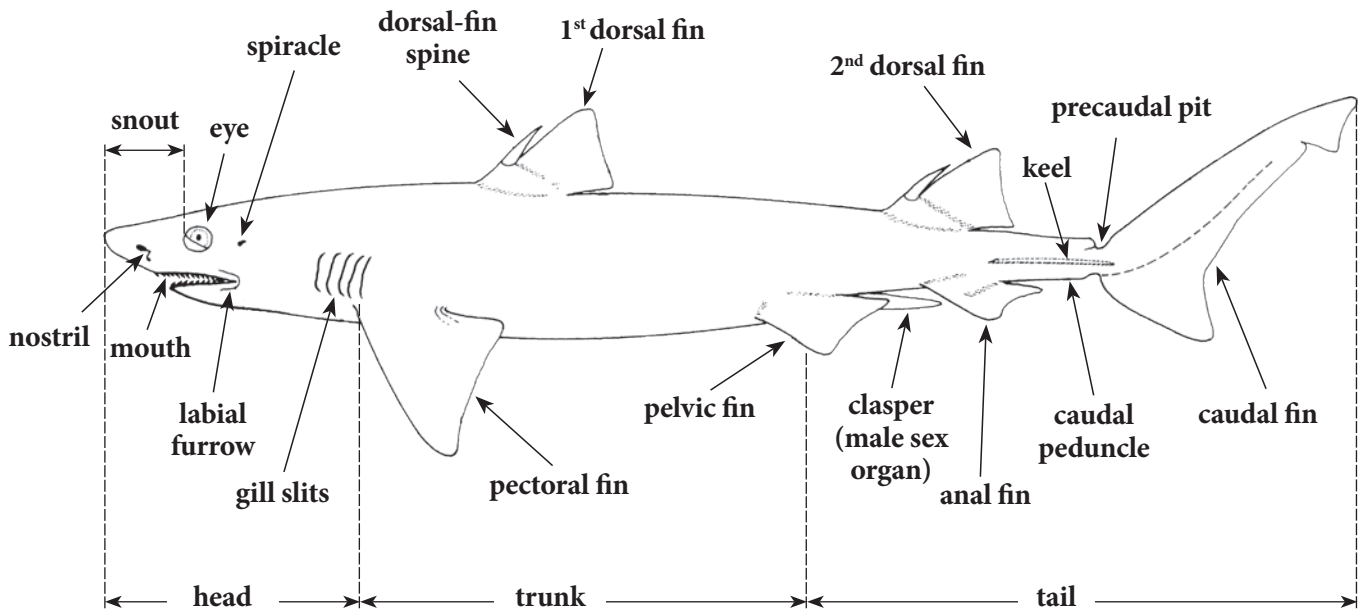
Bio-Ecology, Distribution and Fisheries of *Etmopterus granulosus*

A large lanternshark from the upper continental and insular slopes, found on or near the bottom at depths of about 220 to 1500 m, commoner below 600 m. In FAO Area 87 it is known to occur off Chile, and it is also wide-ranging in the Southern Ocean, including the southern Indian, southern Pacific and southwestern Atlantic oceans, but records of large etmopterids from Southern Ocean islands and seamounts should be closely examined for this species.

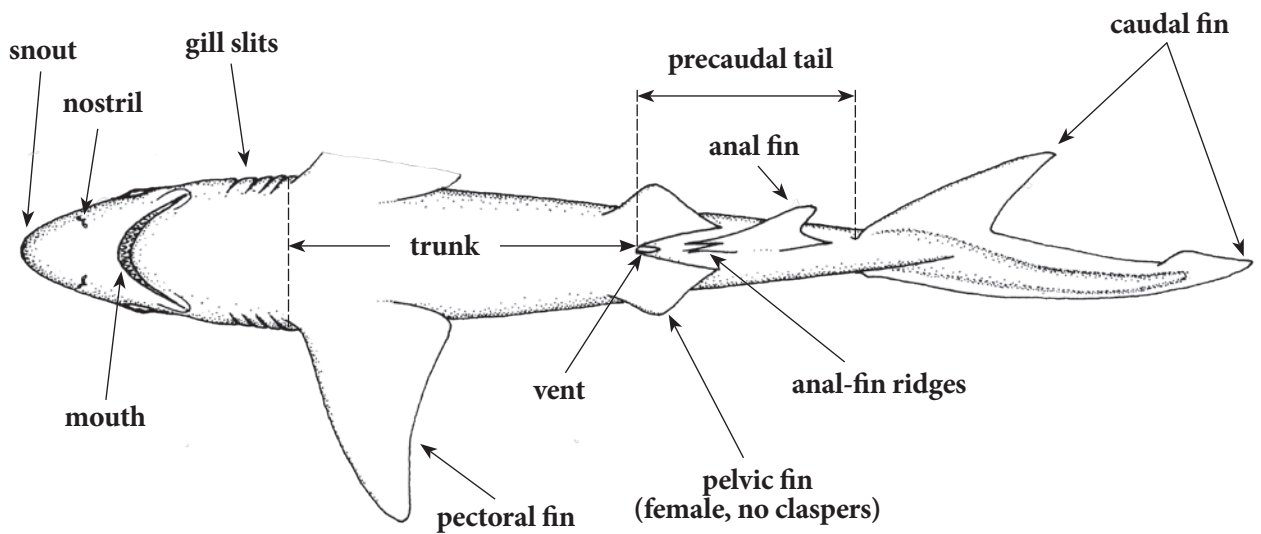
Viviparous with a yolk-sac, with litter size of 9 to 16 off Australia and 6 to 15 off New Zealand.

Interest to fisheries none, although taken as incidental bycatch of trawl fisheries.

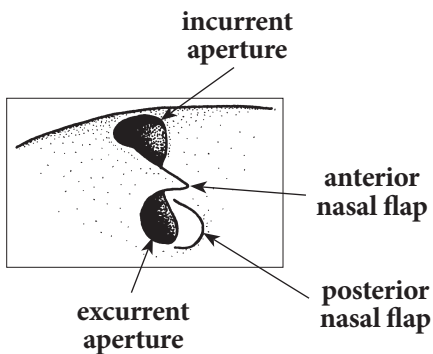
ILLUSTRATED GUIDE OF EXTERNAL TERMINOLOGY USED FOR SHARKS



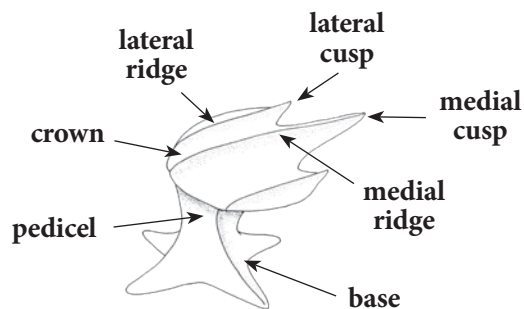
LATERAL VIEW



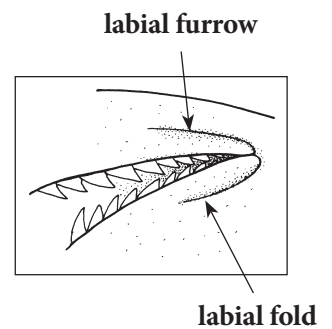
VENTRAL VIEW



Detail of nostril

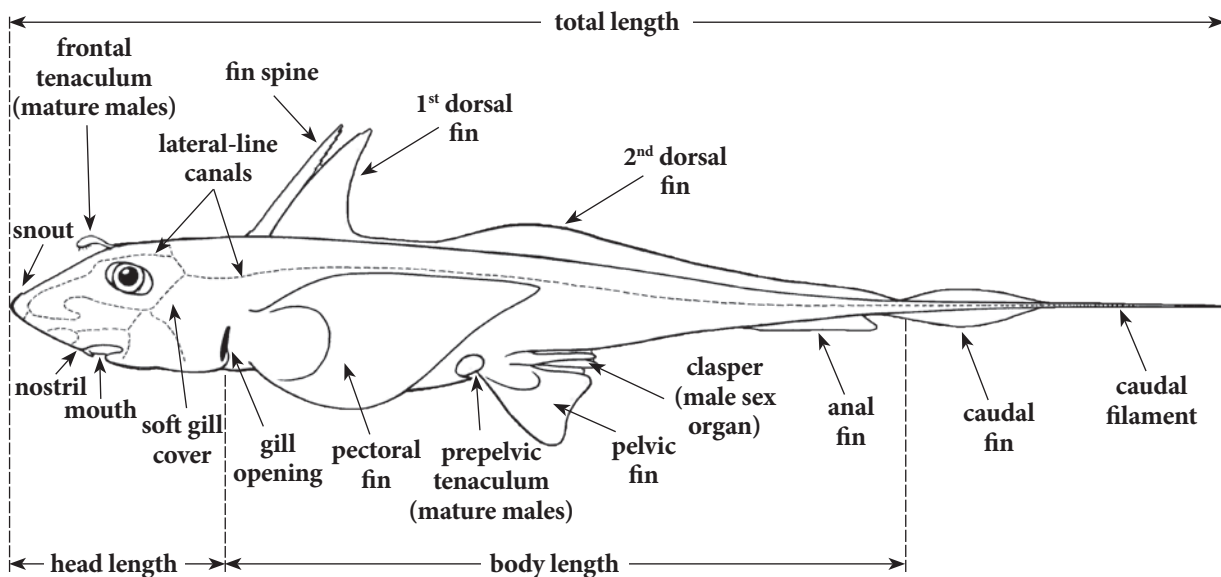
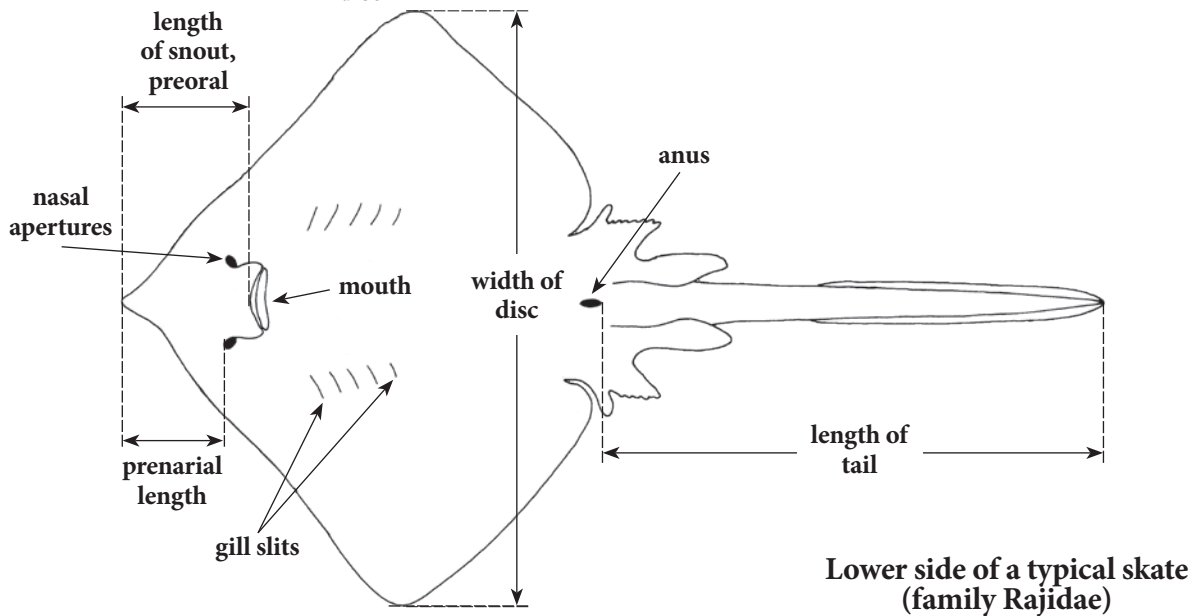
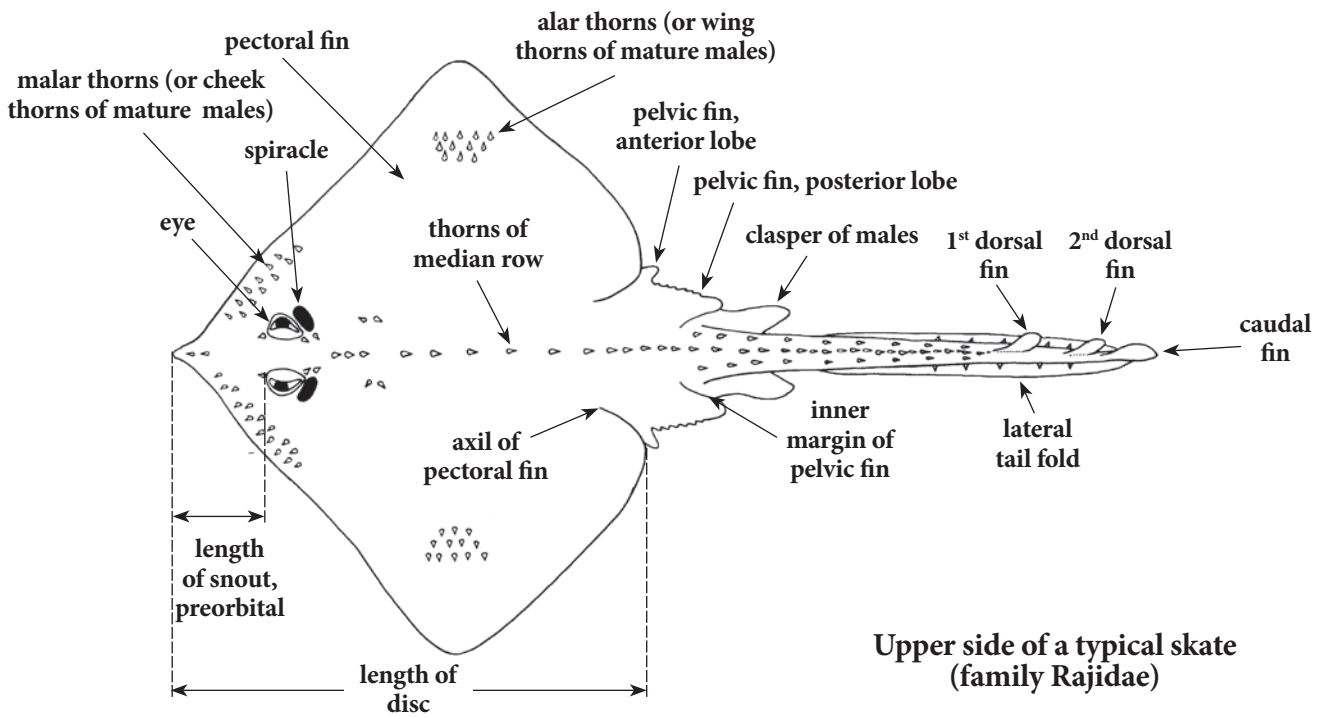


View of a lateral trunk dermal denticle



Mouth corner

ILLUSTRATED GUIDE OF EXTERNAL TERMINOLOGY USED FOR BATOIDS AND CHIMAERAS



Lateral view of a typical Chimaera

GLOSSARY OF TECHNICAL TERMS

Anterior margin: In precaudal fins, the margin from the fin origin to its apex.

Benthic or **Demersal:** referring to organisms that are bottom-dwelling.

Caudal keels: A dermal keel on each side of the caudal peduncle that may extend onto the base of the caudal fin, and may, in a few sharks, extend forward as a body keel to the side of the trunk.

Caudal peduncle: That part of the precaudal tail extending from the insertions of the dorsal and anal fins to the front of the caudal fin.

Circumglobal: Occurring around the world.

Circumtropical: Occurring around the tropical regions of the world.

Claspers: The paired copulatory organs present on the pelvic fins of male cartilaginous fishes, for internal fertilization of eggs.

Cusp: A usually pointed large distal projection of the crown of dermal denticles or oral teeth. **Multicuspid** refers to oral teeth or denticles with more than one cusp. In lateral trunk denticles, the posterior ends of the crown may have **medial** and **lateral cusps**, sharp or blunt projections associated with the medial and lateral ridges.

Cusplet: As with a cusp, but a small projection in association with a cusp, and usually mesial and distal but not medial on the crown foot.

Dermal denticle or **placoid scale:** A small tooth-like scale found in cartilaginous fishes.

Endemic: A species or higher taxonomic group of organisms that is only found in a given area.

Free rear tips: The pectoral, pelvic, dorsal, and anal fins all have a movable rear corner or flap, the free rear tip, that is separated from the trunk or tail by a notch and an inner margin. In some sharks the rear tips of some fins are very elongated.

Head: That part of a cartilaginous fish from its snout tip to the last or (in chimaeras) only gill slits.

Inner margin: In precaudal fins with free rear tips, the margin from the fin insertion to the rear tip.

Insertion: The posterior or rear end of the fin base in precaudal fins. The caudal fin lacks insertions except with many batoids and some chimaeroids that have a caudal filament that extends posterior to the fin. See **origin**.

Labial folds: Lobes of skin at the lateral angles of the mouth, usually with labial cartilages inside them, separated from the sides of the jaws by pockets of skin (labial grooves or furrows).

Labial furrows or **labial grooves:** Grooves around the mouth angles on the outer surface of the jaws of many cartilaginous fishes, isolating the labial folds. Primitively there is a distinct **upper labial furrow** above the mouth corner and a **lower labial furrow** below it.

Nictitating lower eyelid: In the ground sharks (order Carcharhiniformes), a movable lower eyelid that has special posterior eyelid muscles that lift it and, in some species, completely close the eye opening (or palpebral aperture).

Origin: The anterior or front end of the fin base in all fins. The caudal fin has **upper** and **lower** origins but no insertion. See **insertion**.

Paired fins: The pectoral and pelvic fins.

Posterior margin: In precaudal fins, the margin from the fin apex to either the free rear tip (in sharks with distinct inner margins) or the fin insertion (for those without inner margins).

Postventral margin: In the caudal fin, the margin from the ventral tip to the subterminal notch of the caudal fin. See **lower** and **upper** postventral margins.

Preanal ridges: A pair of low, short to long, narrow ridges on the midline of the caudal peduncle extending anteriorly from the anal fin base.

Precaudal fins: All fins in front of the caudal fin, including the pectoral, pelvic, dorsal and anal fins.

Precaudal pit: A depression at the upper and sometimes lower origin of the caudal fin where it joins the caudal peduncle.

Snout: That part of a cartilaginous fish in front of its eyes (preorbital) or mouth (preoral), including the nostrils.

Subterminal notch: On the caudal fin of most non-batoid sharks and at least one batoid, the notch in the lower distal end of the caudal fin, between the postventral and subterminal margins, and defining the anterior end of the terminal lobe.

Symphysis: The midline of the upper and lower jaws, where the paired jaw cartilages articulate with each other.

Ventral margin: In the caudal fin, the entire ventral margin from lower origin to posterior tip, either a continuous margin or variably subdivided into preventral, postventral, subterminal and terminal margins.

PHOTOGRAPHING AND PRESERVING SPECIMENS FOR IDENTIFICATION

Experience over many years has shown that the identification of cartilaginous fish species can be problematic. Sometimes rare species may be encountered, and if possible these specimens in addition to being photographed fresh, should be saved and forwarded to experts for possible identification. This can benefit both the scientists, most of whom are interested in these observations, and the public who are interested in having their specimen identified.

Taking photographs for easing identification:

If possible try to place a ruler or other measuring scale alongside the specimen; if no ruler is available, place some other object that may serve as a size reference, e.g. a lens cap, pencil or some object to show a size relationship. A handwritten label that includes a number, the date, location, and other relevant capture information, and may include the person's name should also be included. Plain coloured or an artificial background contrasting with the specimen's colour is fine.

Sharks and chimaeras: Take photographs in total lateral, dorsal and ventral views, if possible with fins erected and spread. Add close-ups of details catching your eye, e.g. lateral and ventral view of head to gill slits or to origin of pectoral fins, mouth–nasal region, both sides of the saw of sawsharks the jaws with dentition and scale cover detail, individual fins, colour marks.

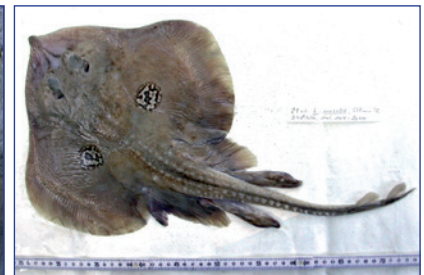
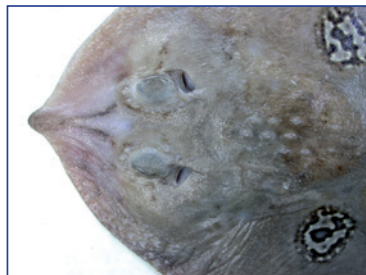
Rays, skates, guitar- and sawfishes: Take photographs in total upper and lower views. Add close-ups of details, such as upper and lower side of head, both sides of the saw of sawfishes, mouth–nasal region, dorsal and caudal fins (if present), details of scale coverage (mainly in saw- and guitarfish) and obvious thorn pattern on upper side of disc and tail, colour pattern details like eye-spots.

Preservation of unknown, rare or strange specimens and where to send these:

Beyond, of course, taking photographs of the fresh specimen first, preserving and forwarding such individuals may be very important for science, e.g. these may document the first geographical records, or first records of small young or fully grown adults in a given location, or you may even have found a species so far unknown to science. On board fishing or angling vessels, preservation by deep-freezing, on ice, or in a refrigerator may be an option. Alternatively, preserving in 4% formaldehyde may be preferable (caution: dangerous to skin, eyes and when inhaled!). One may get concentrated (40%) formaldehyde from pharmacies or drugstores. If possible, inject formalin into the belly cavity, or cut a small slit through belly to allow formalin into the belly cavity to prevent the organs from disintegrating. With large specimens also inject formalin into the flesh. Place specimens in thick, water- and leakage-proof plastic bags or boxes for storage, but be careful to ensure that the spines do not pierce the bags. Dilute the concentrated formalin 1:9 with water and add the liquid to the specimen in the bag or box, and close firmly – the liquid and its gas are caustic! Specimens take one to several days to be preserved, depending on their size and thickness. When the specimen is preserved, pour the formalin off, rinse specimen under water, wrap it in moist cloths or paper to prevent it from drying out and keep it in a plastic bag or box. Contact the nearest marine, fishery, or zoological institute or museum and take the specimen there, or post it in leakage-proof packing. Internet search may help to find an appropriate addressee nearby.

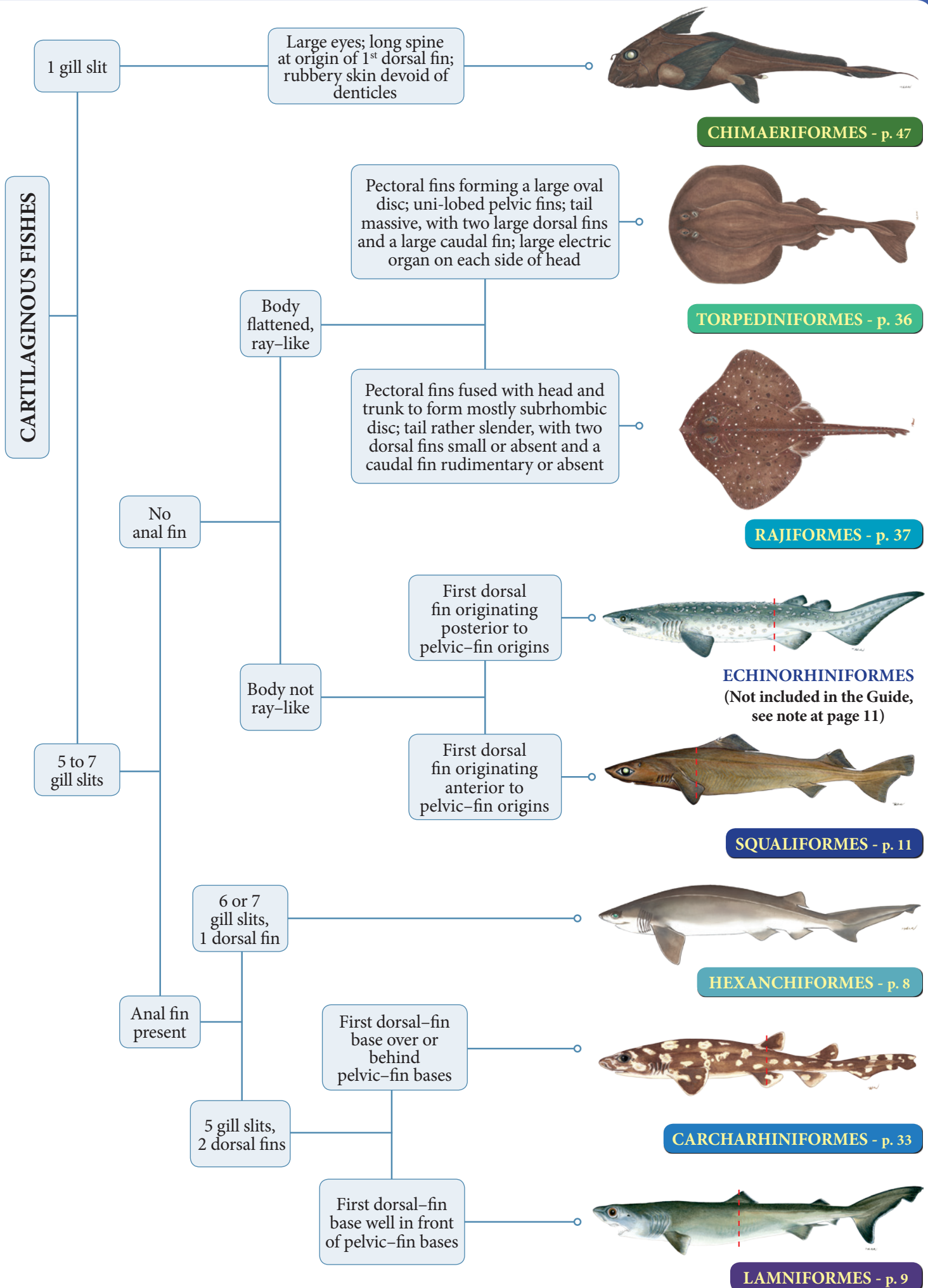


Photos of *Apristurus laurussonii*: © J. Poulsen



Photos of *Leucoraja naevus*: © M. Stehmann

GUIDE TO THE ORDERS OF SOUTHEASTERN PACIFIC DEEP-SEA CARTILAGINOUS FISHES



Chlamydoselachidae – Frilled sharks

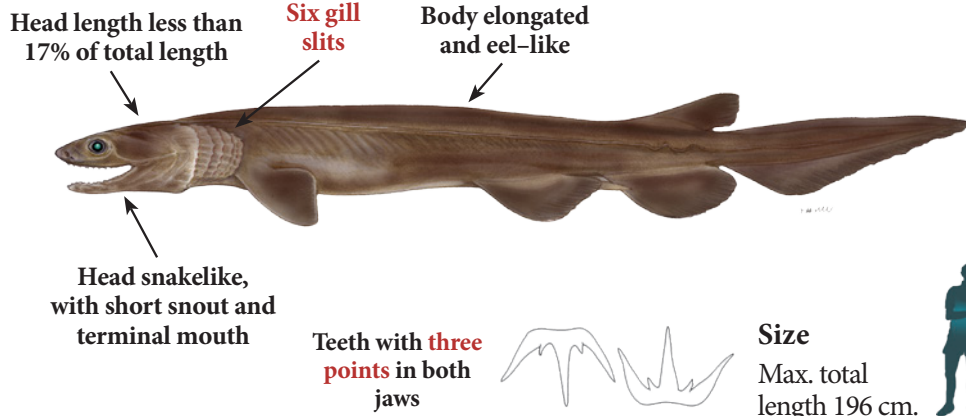
Chlamydoselachus anguineus Garman, 1884

Frilled shark – Requin lézard – Tiburón anguila

HXC



Photo: © Oddgeir Alvheim, IMR



Depth range

20–1500 m

Distribution

In FAO Area 87 a single record from Chile (37°03'S, 73°31'W).

Size

Max. total length 196 cm.



Note: A distinct species, *Chlamydoselachus africana* Ebert and Compagno, 2009 occurs in the south-eastern Atlantic Ocean. Since these two species are morphologically very similar (*C. africana* has a longer head, more than 17% TL), tissue samples and photographs should be taken when possible.

Hexanchidae – Cow sharks

Heptranchias perlo (Bonnaterre, 1788)

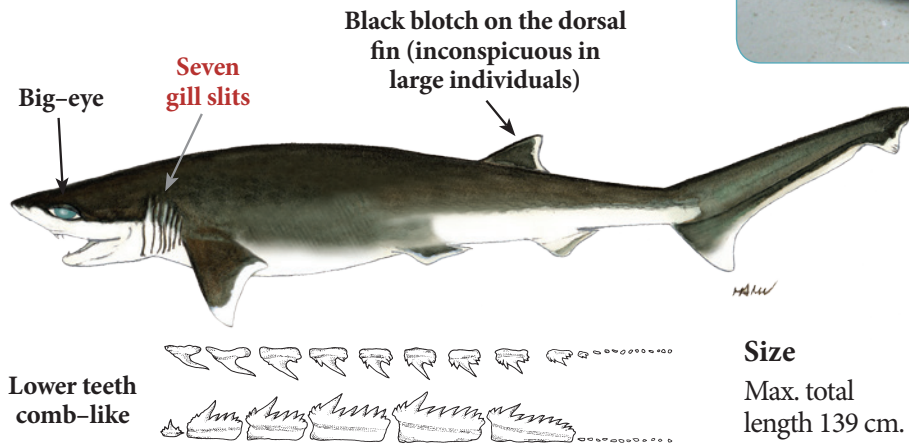
Sharpnose sevengill shark – Requin perlon

Cañabota bocadulce

HXT



Photo: © Oddgeir Alvheim, IMR



Depth range

100–1000 m

Distribution

In FAO Area 87 it is known to occur off Peru and possibly northern Chile, but records from the latter location require confirmation.

Size

Max. total length 139 cm.



Hexanchus griseus (Bonnaterre, 1788)

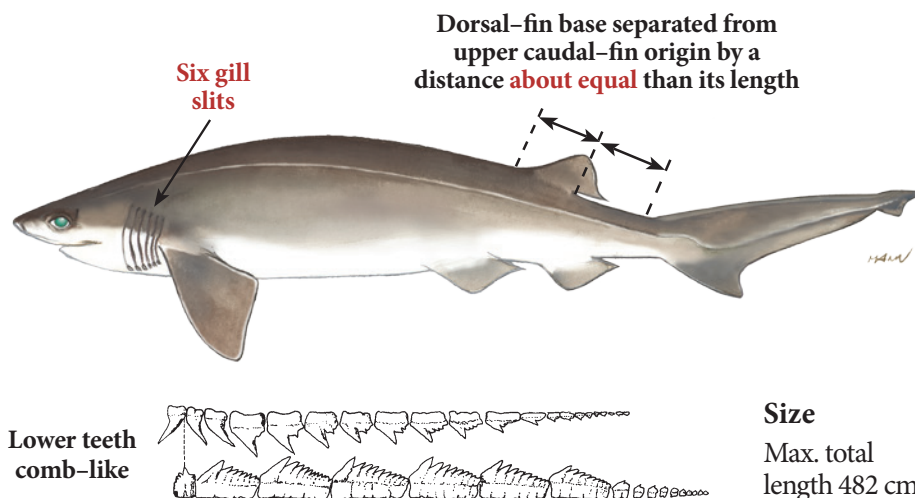
Bluntnose sixgill shark – Requin gris

Cañabota gris

SBL



Photo: © Oddgeir Alvheim, IMR



Depth range

100–2500 m

Distribution

In FAO Area 87 it is known to occur from Colombia to Chile.

Size

Max. total length 482 cm.

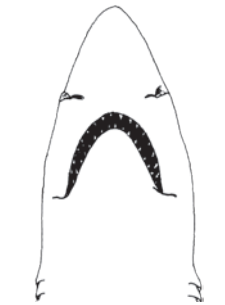
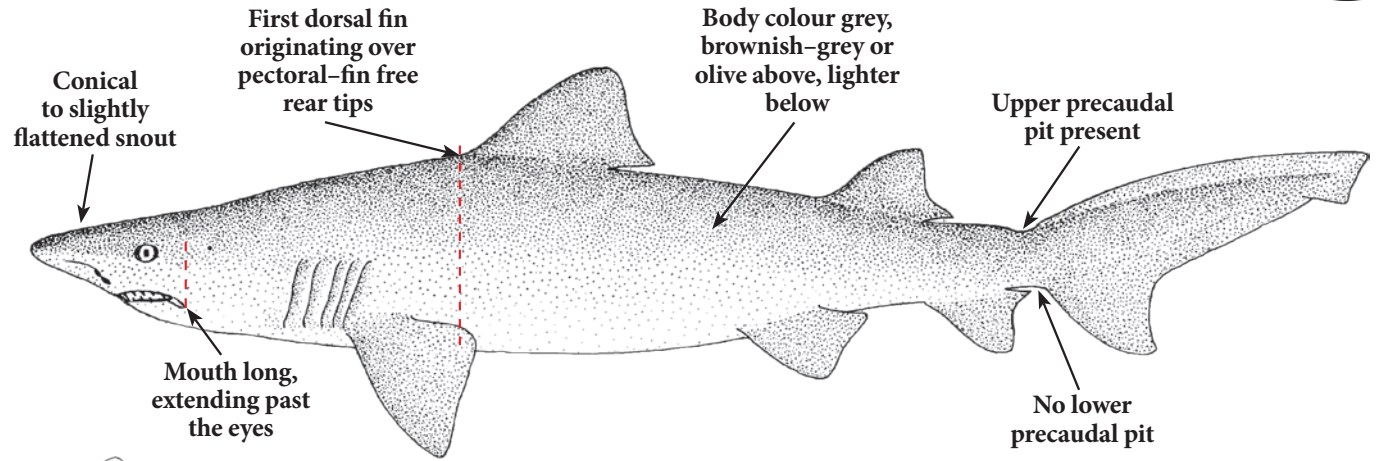


Odontaspidae – Sand tiger sharks

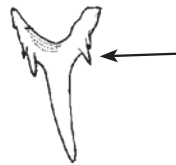
Odontaspis ferox (Risso, 1810)

Smalltooth sand tiger – Requin féroce – Solrayo

LOO



Underside of head



Upper tooth

Teeth prominent, long and narrow with a central cusp flanked by two or three smaller cusplets

Size
Max. total length 450 cm.



Depth range
10–880 m

Distribution
In FAO Area 87 reported from San Ambrosio Island (Chile), the Galapagos Islands (Ecuador), and Malpelo Island off Colombia.

Pseudocarchariidae – Crocodile sharks

Pseudocarcharias kamoharai (Matsubara, 1936)

Crocodile shark – Requin crocodile – Tiburón cocodrilo

PSK

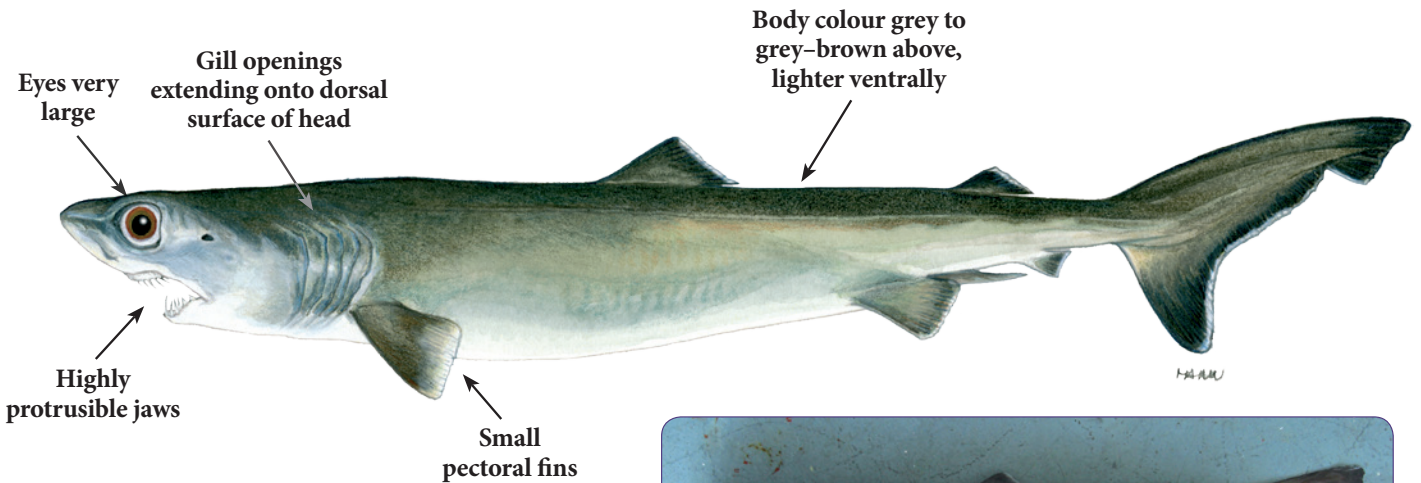
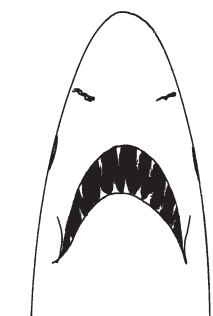
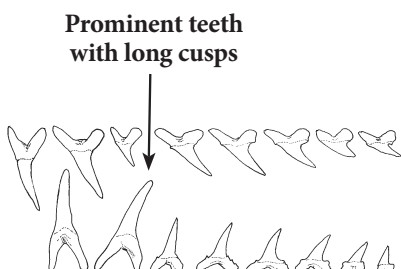


Photo: © Evgeny Romanov



Underside of head



Upper and lower teeth

Prominent teeth with long cusps

Size
Max. total length 122 cm.



Depth range
0–590 m

Distribution
Oceanic in FAO Area 87, also reported inshore off Chile, Peru, Ecuador, and Colombia.

Alopiidae – Thresher sharks

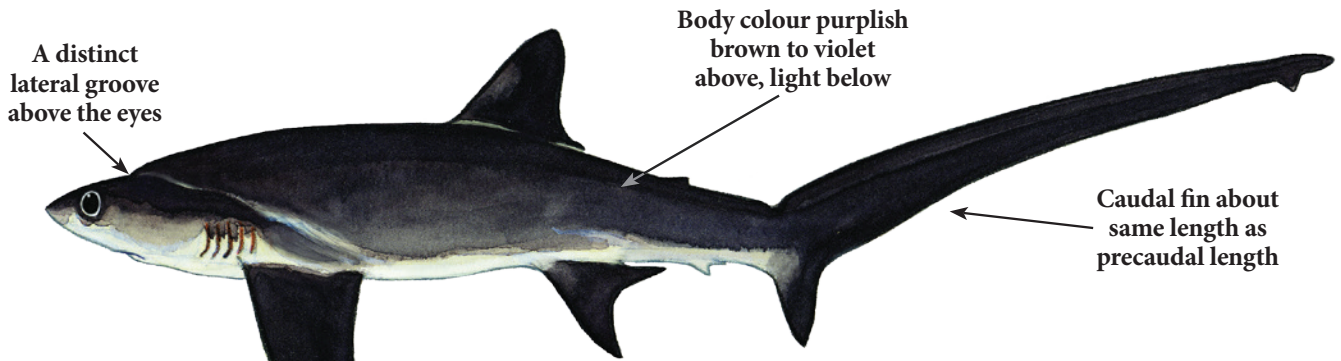
Alopias superciliosus Lowe, 1841

Bigeye thresher – Renard à gros yeux – Zorro ojón

Peje zorro ojón (Chile)

Tiburón zorro de ojo grande (Peru)

BTH



Eyes extending onto dorsal surface of head

Pectoral fin with curved anterior margin

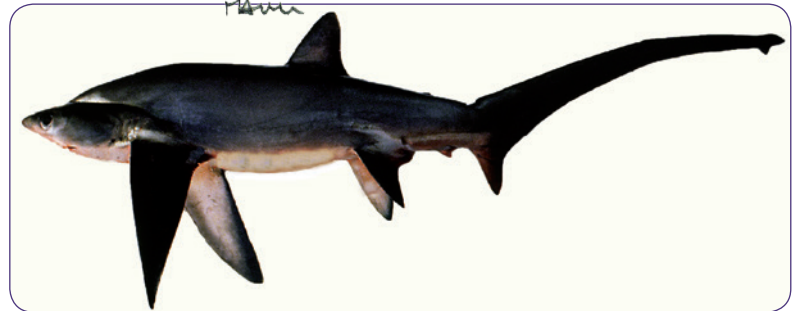
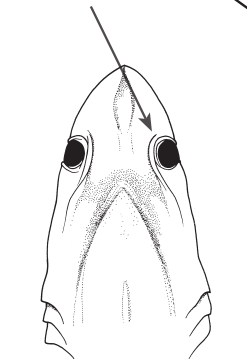


Photo: © Ramon Bonfil



Dorsal view of head

Size

Max. total length 485 cm.



Depth range

0–723 m

Distribution

Oceanic in FAO Area 87, also coastal from off Chile, Peru, Ecuador, and Colombia.

Cetorhinidae – Basking sharks

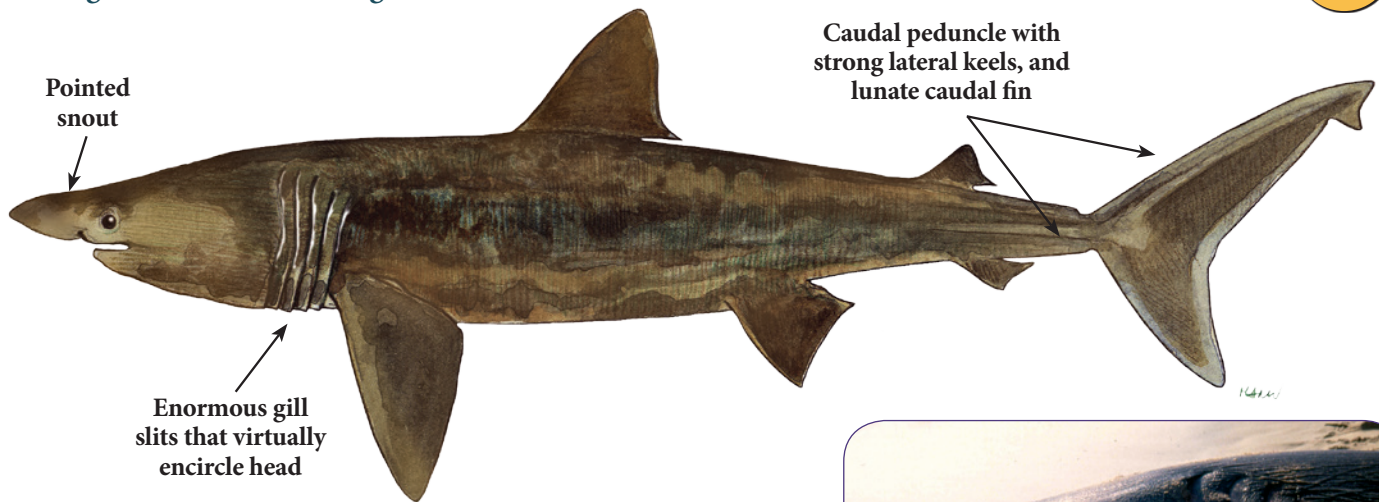
Cetorhinus maximus Lowe, 1841

Basking shark – Pèlerin – Peregrino

Tiburón peregrino, Playero (Chile)

Tiburón canasta (Peru)

BSK

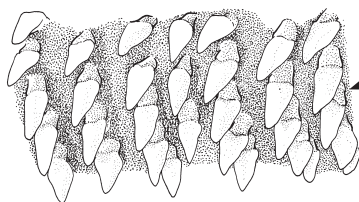


Enormous gill slits that virtually encircle head

Teeth minute, with a single smooth-edged, hook-shaped cusp



Photo: © Fabrizio Serena



Upper teeth

Size

Max. total length 12 m.



Depth range

0–1200 m

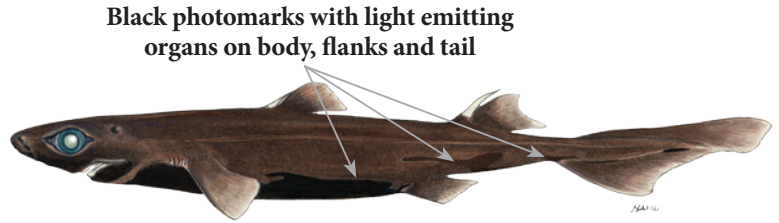
Distribution

Oceanic in FAO Area 87, also coastal from off Chile, Peru, Ecuador, and Colombia.

GUIDE TO THE FAMILIES OF SOUTHEASTERN PACIFIC DEEP-SEA SQUALIFORMES

Underside of body, flanks, and tail usually with black photomarks and light organs (photophores); second dorsal fin larger than first, and second dorsal fin spine height more than twice height of first dorsal fin spine height

YES

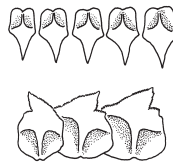


ETMOPTERIDAE - p. 15

NO

Upper teeth relatively broad and bladelike, lowers low and wide

YES



Upper and lower teeth

CENTROPHORIDAE - p. 13

NO

Head moderately broad and somewhat flattened or conical; snout flat. Dorsal-fin spines present, except for *Scymnodalatias* and *Somniosus*

YES



SOMNIOSIDAE - p. 23

NO

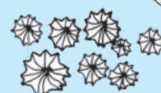
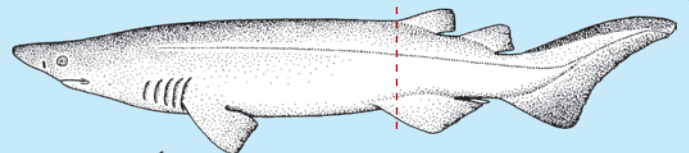
Head narrow and rounded-conical; snout conical. No dorsal-fin spines

YES



DALATIIDAE - p. 30

The Order **Squaliformes** included, until recently, the family **Echinorhinidae** which has now been placed in its own separate Order: **Echinorhiniformes**. One species occurs in FAO Area 87: *Echinorhinus cookei*. It is characterized by having the first dorsal fin originating posterior to pelvic-fin origins, and relatively small denticles, with stellate bases and not fused into plates with multiple cusps.



Dermal denticles

Echinorhinus cookei
Prickly shark



FAMILIES AND SPECIES OF SQUALIFORMES INCLUDED IN THE GUIDE

CENTROPHORIDAE



Centrophorus squamosus



Deania calcea

ETMOPTERIDAE



Aculeola nigra



Centroscyllium nigrum



Etmopterus granulosus



Etmopterus pusillus

SOMNIOSIDAE



Centroscymnus owstonii



Centroselachus crepidater



Zameus squamulosus



Somniosus antarcticus

DALATIIDAE



Euprotomicrus bispinatus



Heteroscymnoides marleyi



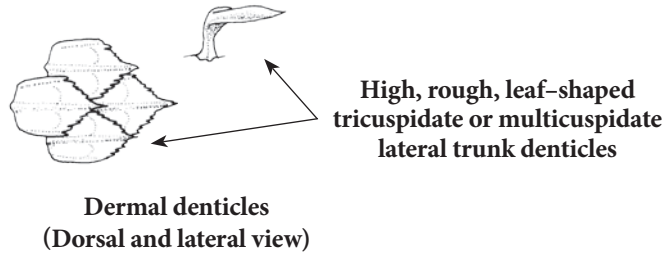
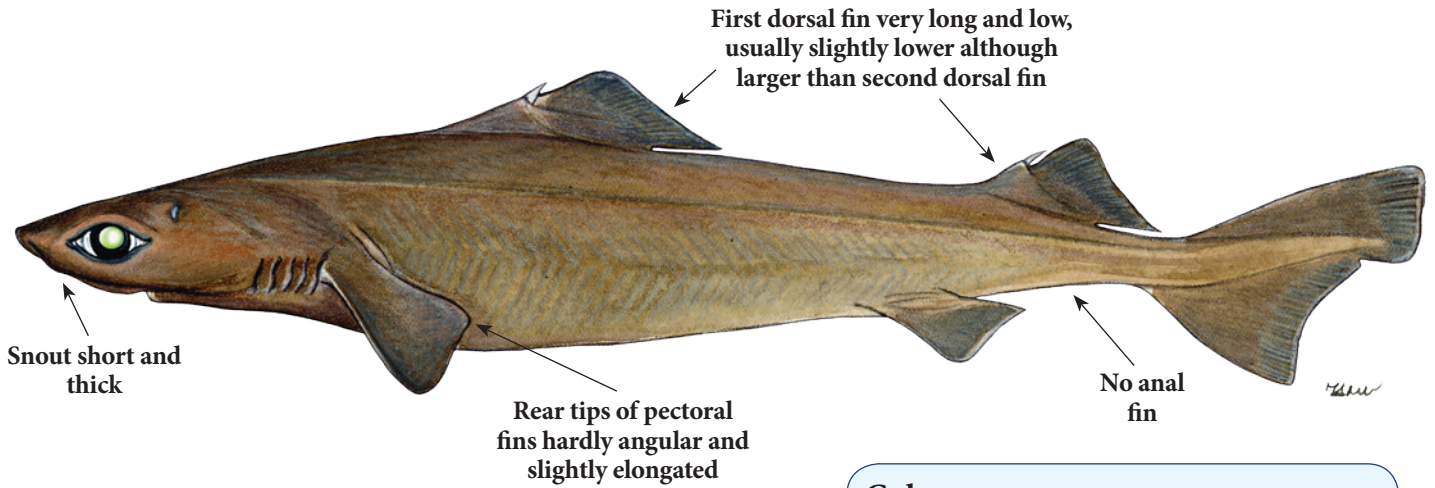
Isistius brasiliensis



Mollisquama parini

Centrophorus squamosus (Bonnaterre, 1788)

Leafscale gulper shark – Squale-chagrin de l'Atlantique
Quelvacho negro



Colour
Uniform dark grey, medium to light greyish brown, or brown above and below; underside may be slightly lighter although not conspicuously so.

Size
Maximum total length about 164 cm.



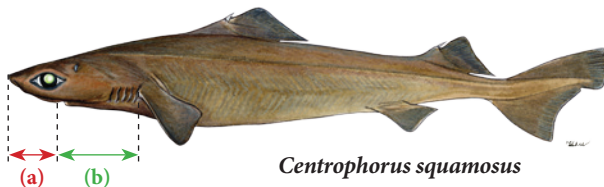
Photo: © Paul Clerkin



Photo: © Oddgeir Alvheim, IMR

Similar species

Centrophorus squamosus is the only *Centrophorus* species reported from the southeastern Pacific Ocean. It belongs to the same family of *Deania calcea* (see page 14) but it can be distinguished by the fact that it has a preoral snout length (a) less than distance from mouth to pectoral-fin origin (b).



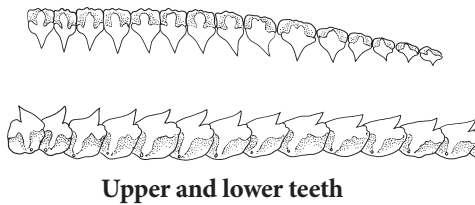
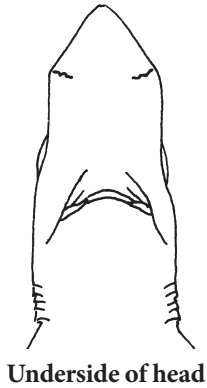
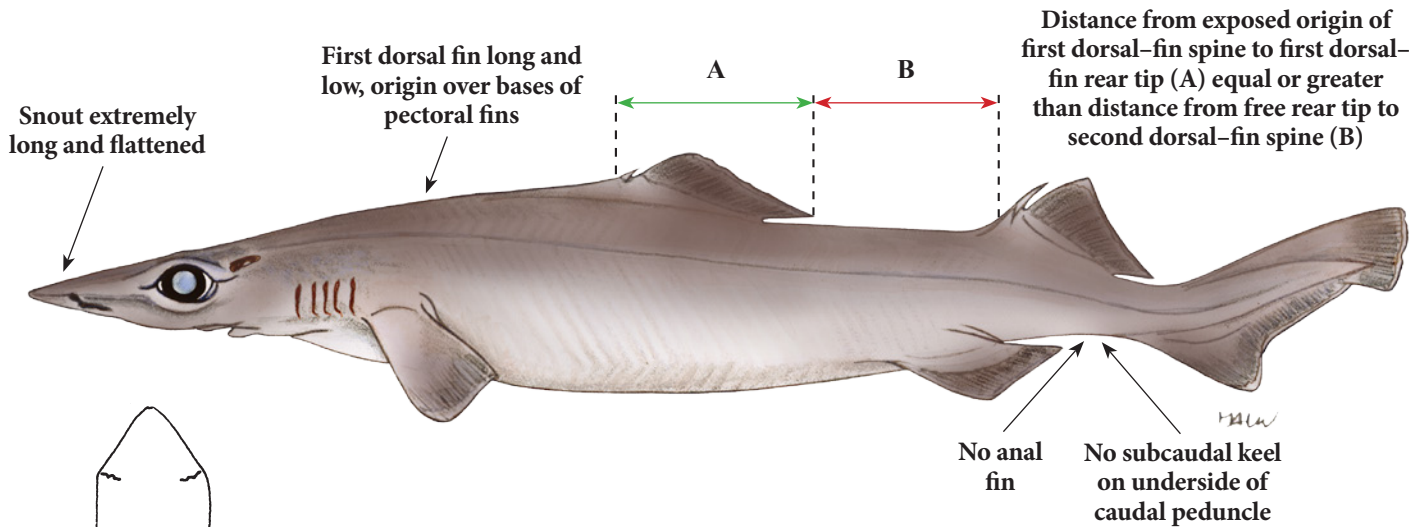
Centrophorus squamosus



Deania calcea

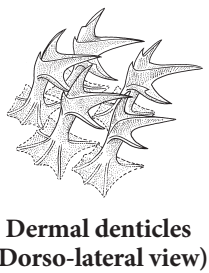
Bio-ecology, distribution and fisheries of *Centrophorus squamosus*

In FAO Area 87 it is known to occur off Chile (Gulf of Ancud) and Galápagos Islands (Ecuador). Although a common species in some localities, it does not appear to be very common in the southeastern Pacific. It inhabits the continental slopes from 229 to 2359 m deep. Also found in the epipelagic or mesopelagic zone between the surface and 1250 m depth over water 1000 to over 3900 m deep, but it is uncertain if this species regularly occurs in oceanic waters. Viviparous with a yolk-sac, with litters of four to eight or possibly nine young. Age at maturity is about 30 years for males and 35 years for females, with a maximum estimated age of 70 years. Eats bony fishes, chimaeras (Chimaeridae), cephalopods (including ommastrephid and histioteuthid squids), and crustaceans (euphausiid and penaeid shrimps). The species is only taken occasionally as bycatch in the southeastern Pacific.



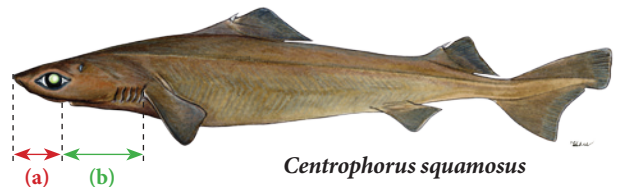
Colour
Varying from uniform light or dark grey or grey-brown above and below to dark brown; fins darker, fin webs dusky to blackish.

Size
Maximum total length about 122 cm.



Similar species

Deania calcea is the only *Deania* species reported from the southeastern Pacific Ocean. It belongs to the same family of *Centrophorus squamosus* (see page 13) but it can be distinguished by the fact that it has a preoral snout length (a) greater than distance from mouth to pectoral-fin origin (b).



Bio-ecology, distribution and fisheries of *Deania calcea*

In FAO Area 87 it is known to occur off Chile and Peru. It is common on the outer continental and insular shelves and upper, middle, and lower slopes from 60 to 1490 m depth, on or near the bottom or well above it. Viviparous with a yolk sac, with litters of 1 to 17, averaging 7. Estimated ages range from 11 to 35 years for females and 13 to 29 years for males.

Diet includes hatchetfish (Sternoptychidae), scaly dragonfishes, black dragonfishes (Stomiidae), barracudinas (Paralepididae), lanternfish (Myctophidae), cod-like fishes, scorpionfish (Scorpaenidae), squids (Ommastrephidae) and shrimps (including penaeids).

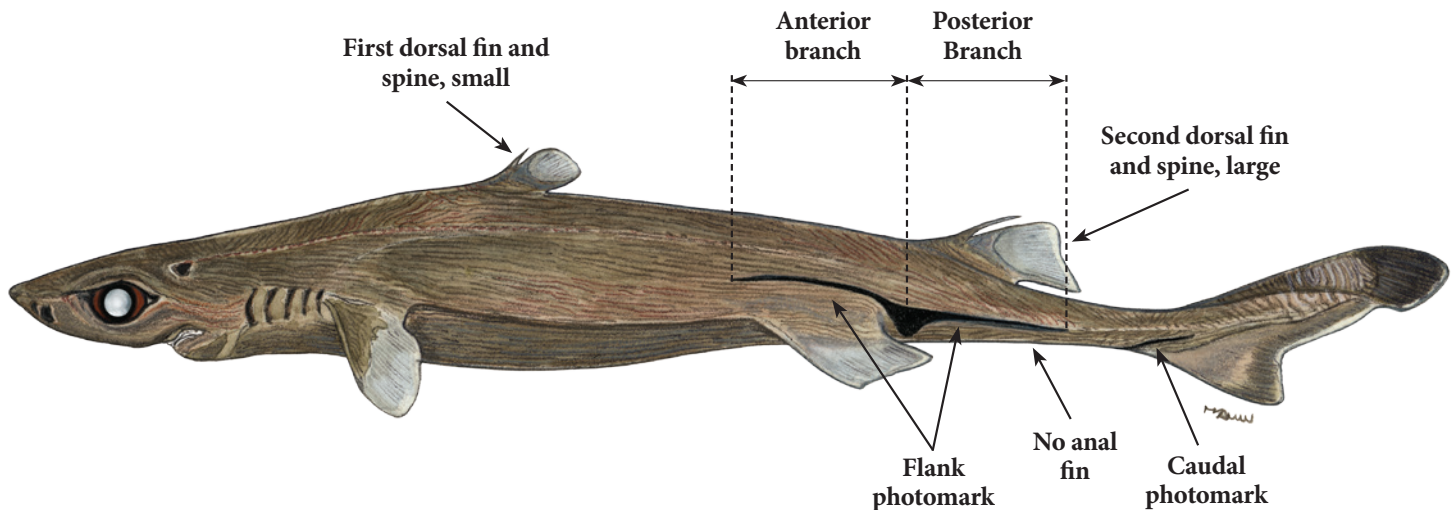
The species is not common and only taken occasionally as bycatch in the southeastern Pacific.

Etmopteridae – Lantern sharks

Three genera of lantern sharks, *Etmopterus*, *Centroscyllium*, and *Aculeola* are present in the southeastern Pacific Ocean.

It is an *Etmopterus* if:

- It does not have an anal fin
- Upper and lower teeth are not similar
- Second dorsal fin and fin-spine are larger than the first dorsal fin and fin-spine
- Usually underside of body, flanks, and tail with more or less conspicuous black photomarks with light organs



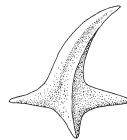
Types of Denticles



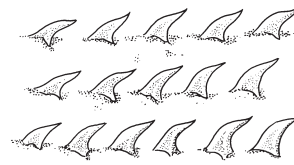
Flat
(make the skin feel smooth)



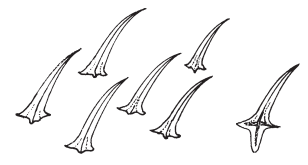
Pointed
(make the skin feel rough)



Stout



In longitudinal lines



Randomly arranged

Teeth



Upper teeth with a slender **cusp** and one or more pairs of **cusplets**

Upper tooth

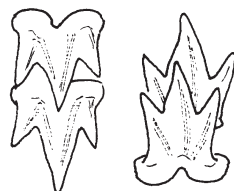


Lower teeth compressed and knife-like

Lower tooth

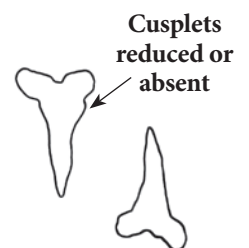
Note: Because the teeth in the lower jaw have oblique cusps pointing away from the midline, things (e.g. finger) slide easily towards side of mouth, but not towards middle of mouth.

The genus *Centroscyllium* can be distinguished from *Etmopterus* and *Aculeola* by looking at the upper and lower teeth which are similar shaped in the upper and lower jaws.



Upper and lower teeth
Centroscyllium spp.

The genus *Aculeola* can be distinguished from *Etmopterus* and *Centroscyllium* by looking at the teeth which have strong narrow cusps, but cusplets absent or greatly reduced.



Upper and lower tooth
Aculeola nigra

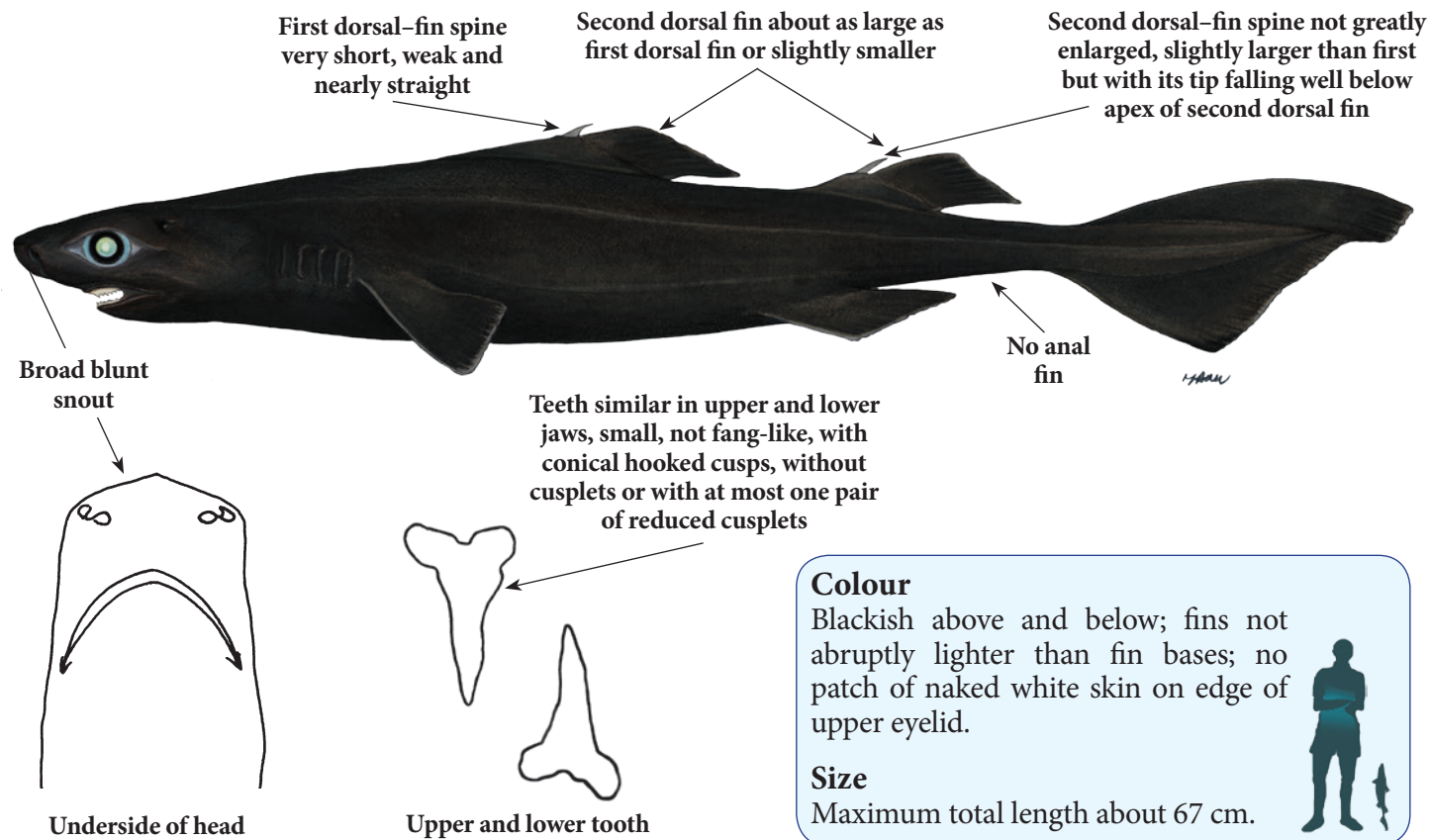
Aculeola nigra de Buen, 1959

Hooktooth dogfish – Squale noir

Tollo negro de cachos

Tollo negro (Chile)

ACN



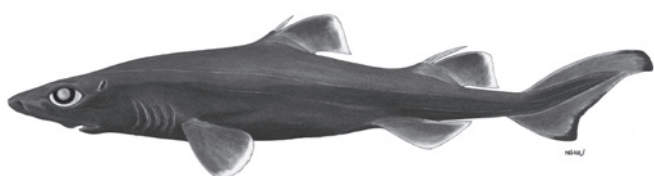
Similar species

Centroscyllium spp.

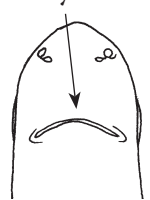
See page 17

Etmopterus spp.

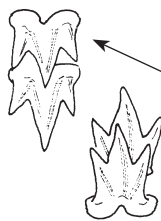
See pages 19 to 22



Mouth very broadly arched

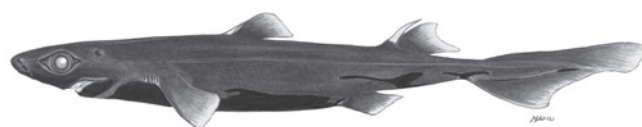


Underside of head



Upper and lower teeth

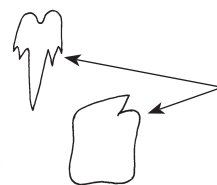
Lower teeth similar to uppers, not compressed and blade-like, with cusps and cusplets



Mouth short, nearly straight and transverse



Underside of head



Upper and lower tooth

Lower teeth dissimilar to uppers, compressed and blade-like, with cusps and cusplets

Bio-ecology, distribution and fisheries of *Aculeola nigra*

In FAO Area 87 it is known to occur from off Peru to central Chile. It is a benthic, pelagic and mesopelagic shark of the Pacific South American continental shelf and upper slope, at depths of 110 to 735 m, with most records between 200 to 500 m.

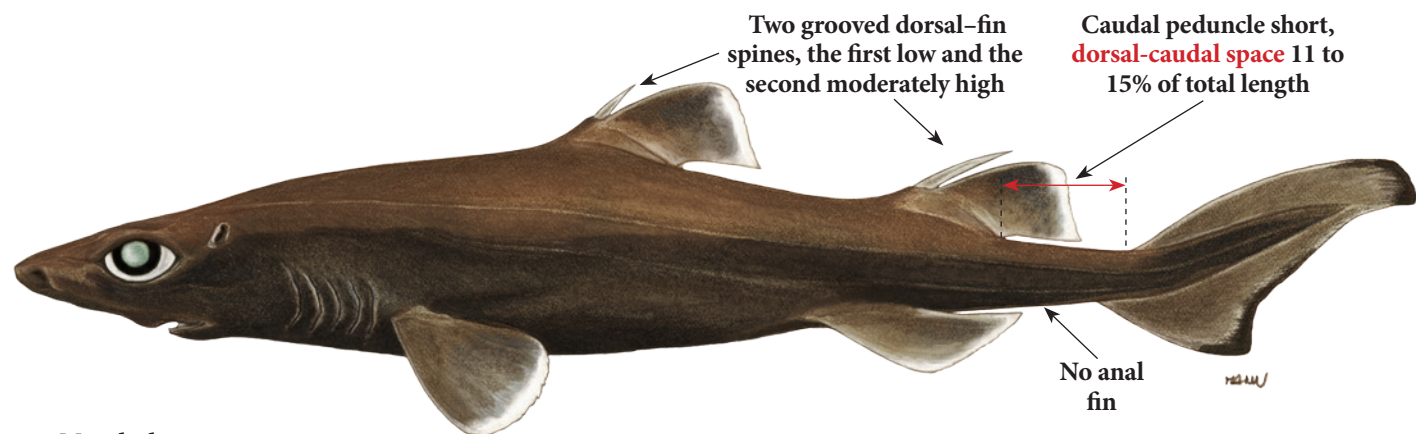
Viviparous with a yolk-sac, number of young 3 to 19, with an increase in the number of embryos with increased size of the female. Feeding habits of this shark includes deep-sea shrimps, euphausiids, and hake (*Merluccius gayi*). This species appears to migrate into the water column where it commonly feed on mesopelagic and pelagic prey items. Interest to fisheries none, probably taken as bycatch in deep-sea bottom fisheries.

Centroscyllium nigrum (Garman, 1899)

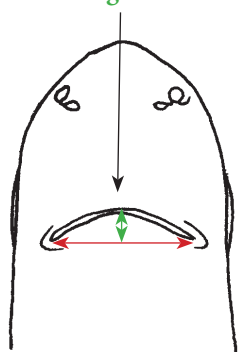
Combtooth dogfish – Aiguillat peigne

Tollo negro peine

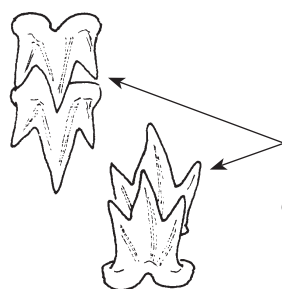
Tollo negro peine (Chile)
Tiburón perro (Colombia)
Tollo negro (Spanish)



Mouth short, about 22 to 36% as long as wide



Underside of head



Upper and lower teeth

Teeth similar in both jaws, with a large central cusp flanked by one or two lateral cusplets

Colour

Body blackish brown above and below, without conspicuous black markings on ventral surface or sides of tail; fins with prominent white tips and margins.

Size

Maximum total length 51.4 cm.



Photo: © Dave Ebert

Similar species

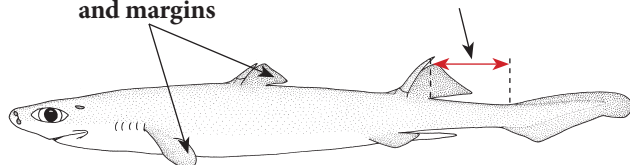
Centroscyllium granulatum

Etmopterus spp.

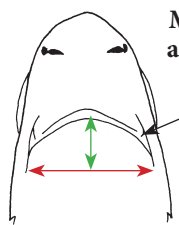
See pages 19 to 22

Fins without prominent white tips and margins

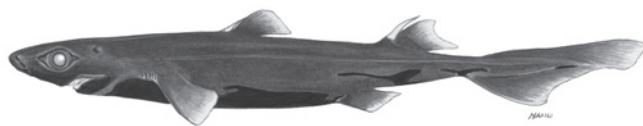
Caudal peduncle elongated, dorsal-caudal space about 15% of TL



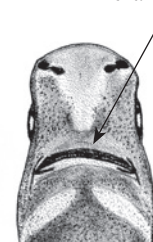
Mouth elongated and about 50% as long as wide



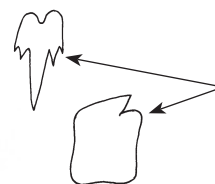
Underside of head



Mouth short, nearly straight and transverse

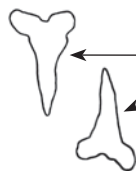
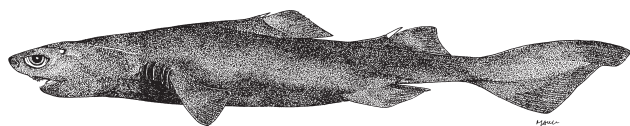


Underside of head



Upper and lower tooth

Lower teeth dissimilar to uppers, compressed and blade-like, with cusps and cusplets



Teeth similar in upper and lower jaws, small, not fang-like, with conical hooked cusps, without cusplets or with at most one pair of reduced cusplets

Upper and lower tooth

Bio-ecology, distribution and fisheries of *Centroscyllium nigrum*

In FAO Area 87 it is known to occur from off Colombia, Ecuador, Galapagos Islands, Peru, and Chile to the Straits of Magellan. It is a little known deepwater dogfish of the eastern Pacific and Hawaiian continental and insular slopes, on or near the bottom at depths of 400 to 1145 m. Caught on soft mud and sand bottom.

Viviparous with a yolk-sac, litter size 4 to 15 young.

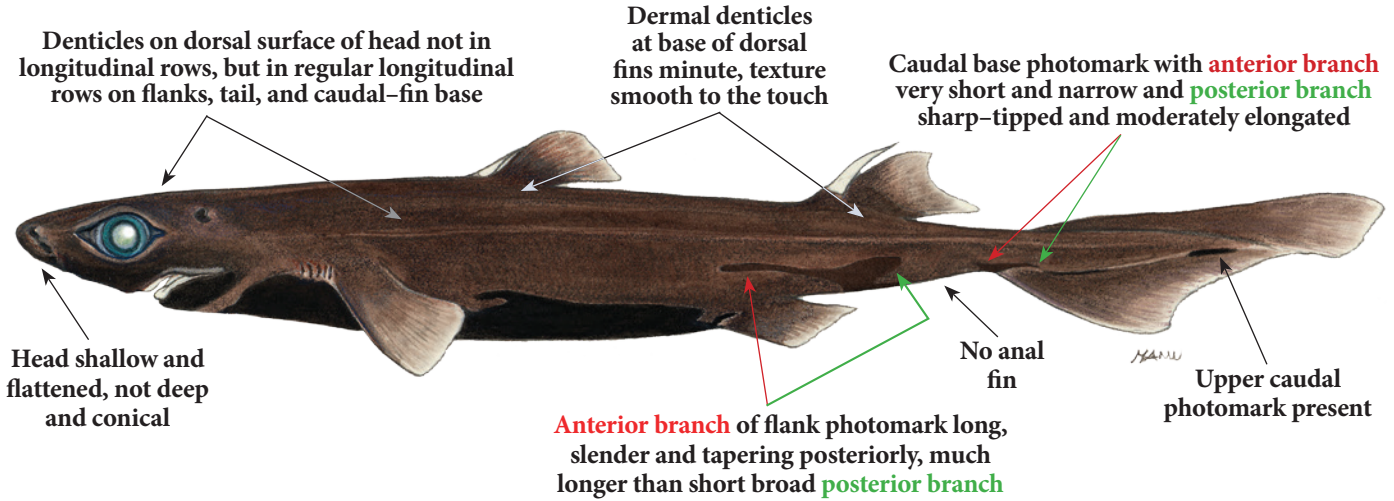
Feeds on deepwater shrimp, cephalopods, and mesopelagic bony fishes, suggesting that it feeds off the bottom as well as on it.

Interest to fisheries none, although taken as bycatch in deep-sea shrimp fisheries.

Etmopterus granulosus (Günther, 1880)
Southern lanternshark (Lucifer) – Sagre long nez
Tollo negro narigón

Tollo lucero (Chile)

ETM



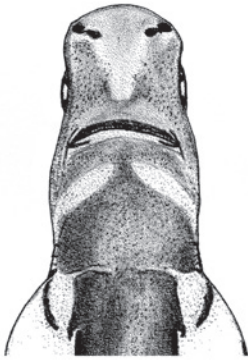
Note: The region above pelvic fin, below anterior branch of flank marking is naked (no dermal denticles). Trawl-caught specimens usually have scuff marks – white patches where the skin has rubbed off.

Colour

Grey-brown on dorsal surface, underside of snout, branchial region and abdomen abruptly black.

Size

Maximum total length about 88 cm.



Underside of head

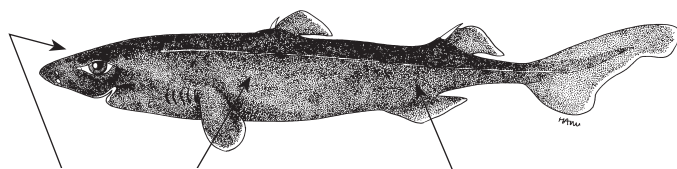


Photo: © Paul Clerkin

Similar species

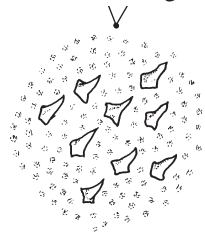
Etmopterus litvinovi

Etmopterus pycnolepis



Denticles on dorsal surface of head, flanks, caudal peduncle and caudal-fin base not in longitudinal rows

Lateral flank markings absent



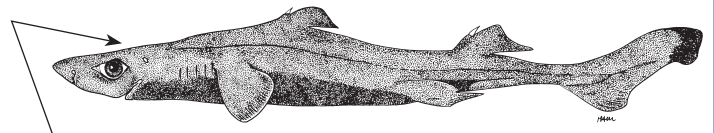
Dermal denticles



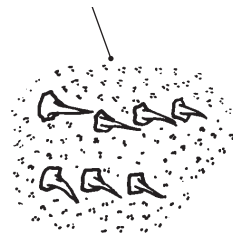
Underside of head



Upper and lower teeth



Denticles on dorsal surface of head arranged in linear rows, which extend to the flanks, caudal peduncle and caudal-fin base



Dermal denticles



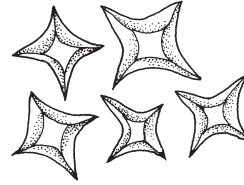
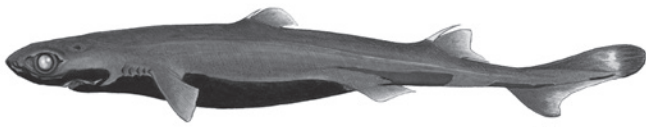
Underside of head



Upper and lower tooth

Etmopterus pusillus

See page 21

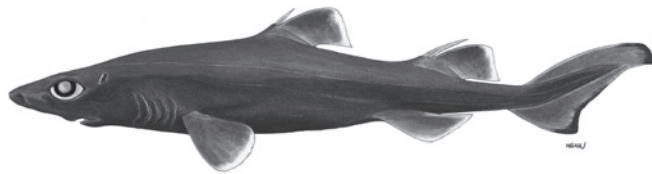


Dermal denticles
(Dorsal view)

Lateral trunk denticles
cusplless, truncated and
wide-spaced, giving the
body a smooth texture

Centroscyllium spp.

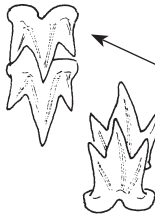
See page 17



Mouth very
broadly arched



Underside of
head

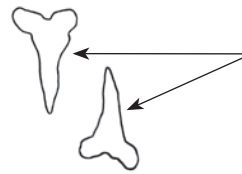
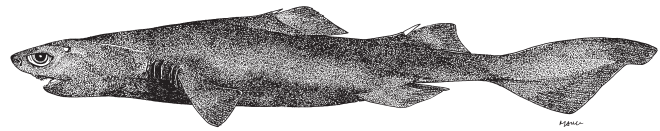


Upper and
lower teeth

Lower teeth similar
to uppers, not
compressed and
blade-like, with
cusps and cusplets

Aculeola nigra

See page 16



Upper and lower
tooth

Teeth similar in upper and
lower jaws, small, not fang-
like, with conical hooked
cusps, without cusplets or
with at most one pair of
reduced cusplets

Bio-ecology, distribution and fisheries of *Etmopterus granulosus*

A large lanternshark from the upper continental and insular slopes, found on or near the bottom at depths of about 220 to 1500 m, commoner below 600 m. In FAO Area 87 it is known to occur off Chile, and it is also wide-ranging in the Southern Ocean, including the southern Indian, southern Pacific and southwestern Atlantic oceans, but records of large etmopterids from Southern Ocean islands and seamounts should be closely examined for this species.

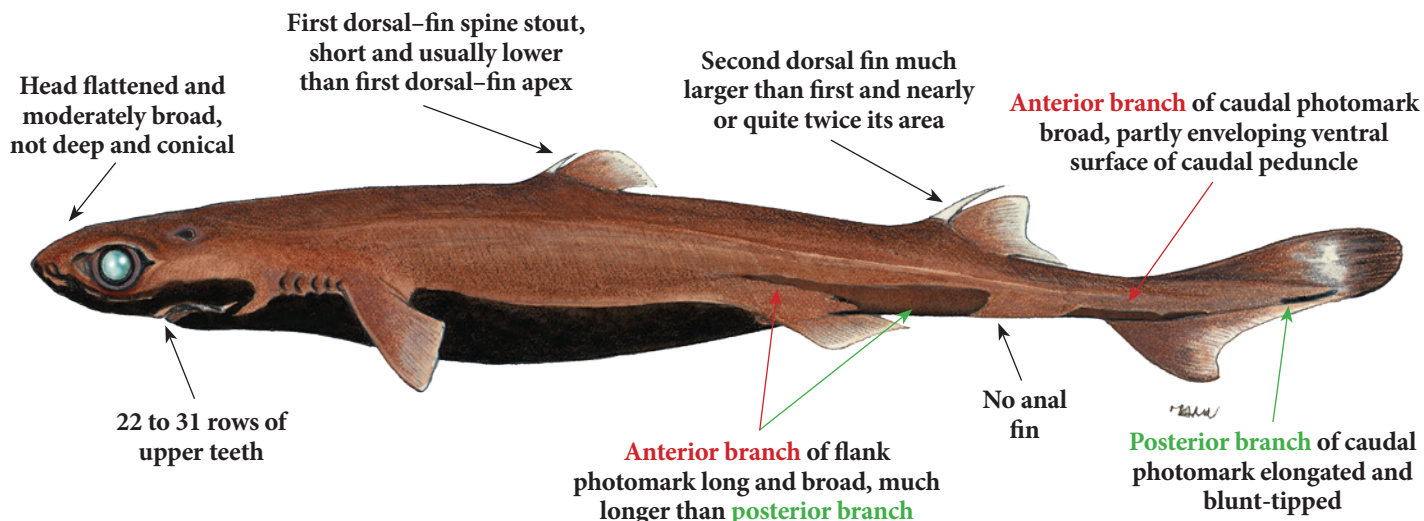
Viviparous with a yolk-sac, with litter size of 9 to 16 off Australia and 6 to 15 off New Zealand.

Interest to fisheries none, although taken as incidental bycatch of trawl fisheries.

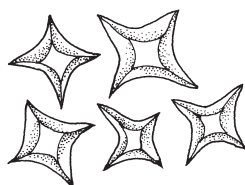
Etmopterus pusillus (Lowe, 1839)

Smooth lanternshark – Sagre nain
Tollo lucero liso

ETP



Lateral trunk denticles cusplless, truncated and wide-spaced, giving the body a smooth texture



Dermal denticles (Dorsal view)



Upper teeth with a slender cusp and one or more pairs of cusplets



Lower teeth compressed and blade-like

Upper and lower tooth

Colour

Pale or dark brown to blackish on dorsal surface, underside of snout and abdomen abruptly black. Precaudal fins light distally.

Size

Size moderate with adults to about 50 cm total length.



Photos: © Dave Ebert

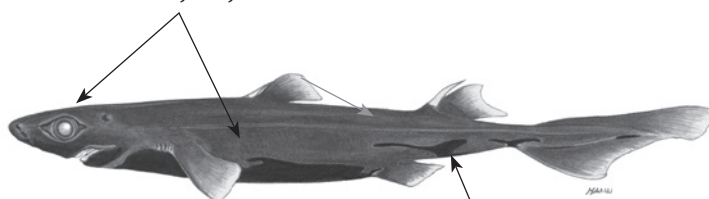
Similar species

The following species can be distinguished from *Etmopterus pusillus* by the fact that their skin has a fuzzy or rough texture due to denticles with erect, thorn-like, cuspidate crowns, more or less elevated from their bases.

Etmopterus granulosus

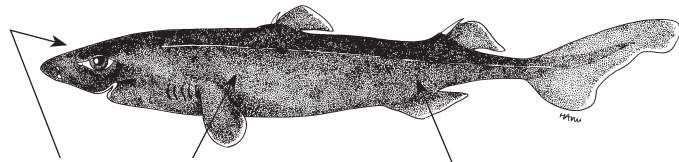
See page 19

Denticles on dorsal surface of head not in longitudinal rows, but in regular longitudinal rows on flanks, tail, and caudal-fin base



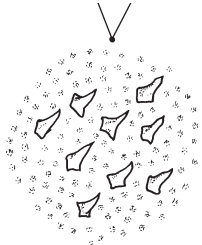
Lateral flank markings present, but indistinct

Etmopterus litvinovi



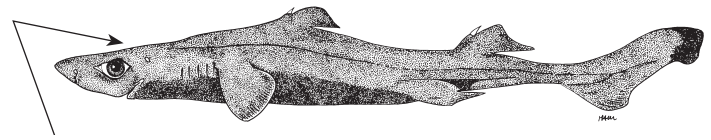
Denticles on dorsal surface of head and flanks not in longitudinal rows

Lateral flank markings absent



Dermal denticles

Etmopterus pycnolepis



Denticles on dorsal surface of head arranged in linear rows, which extend to the flanks, caudal peduncle and caudal-fin base



Dermal denticles

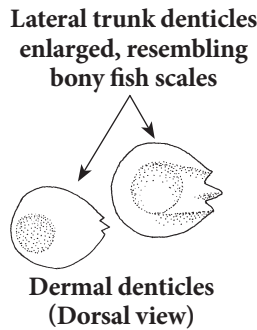
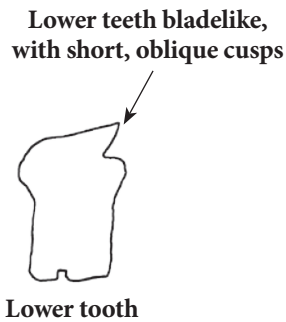
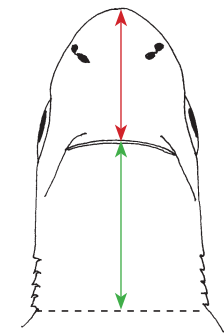
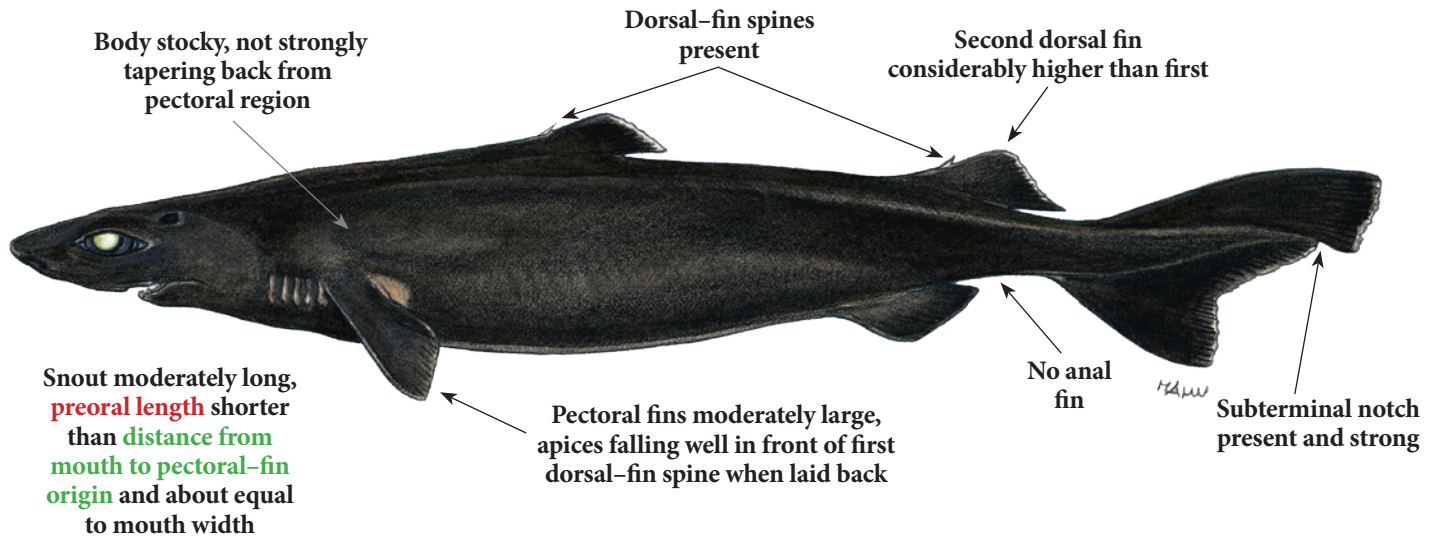
Bio-ecology, distribution and fisheries of *Etmopterus pusillus*

A lantern shark of the continental slopes, on or near bottom at a depth of 274 to 1000 m or more (possibly to 1998 m); also oceanic in the South Atlantic and central North Pacific, at depths between the surface and 110 to 708 m over deepwater. In FAO Area 87 it was recorded off Chile.

Viviparous with yolk-sac, litters range from 1 to 6 with an average of 3.5 embryos; the number of ovarian eggs present in adult females is slightly higher, ranging from 2 to 18 (averaging 10 to 11), suggesting that fecundity may be slightly higher than reported. Males mature between 5 and 9 years, and females between 8 and 11 years. Maximum age estimates range up to 13 years for males and 17 years for females.

Diet includes fish eggs, lanternfishes, cephalopods, teleost fishes, and other small dogfish.

Interest to fisheries none, although may be taken as incidental bycatch of trawl, nets and longline fisheries.



Colour
Light grey or brown to dark brown or black, without any conspicuous markings.

Size
Moderately large, up to 120 cm total length.

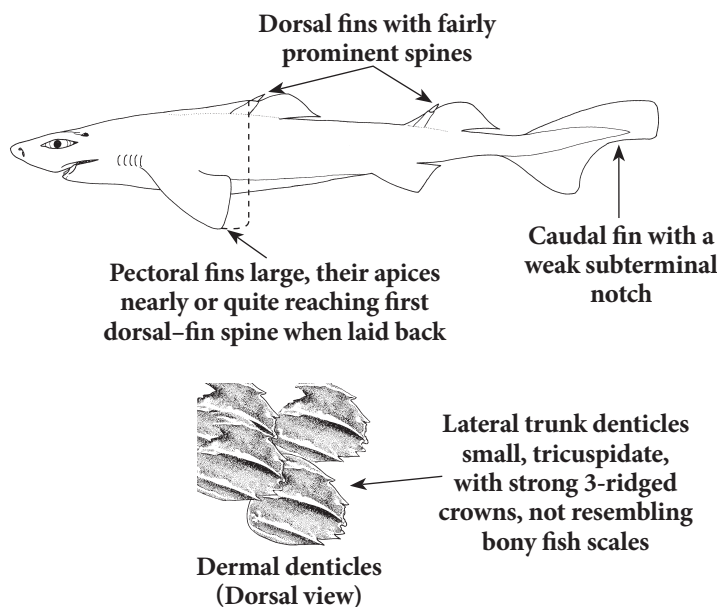
Note: When placed on side, the skin on the belly typically forms a ridge-like fold between pectoral and pelvic fins. Depending on how the animal is positioned it can be very prominent.



Photo: © Paul Clerkin

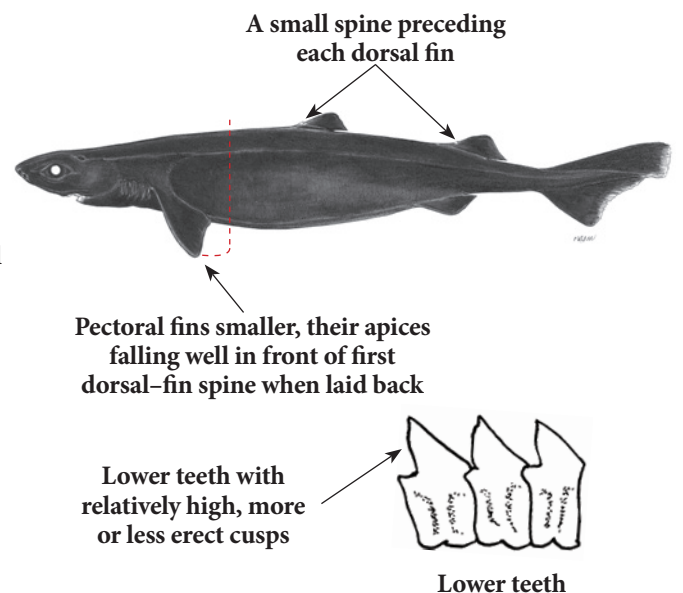
Similar species

Scymnodon macracanthus



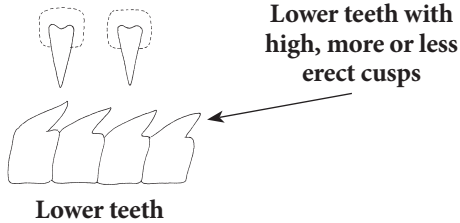
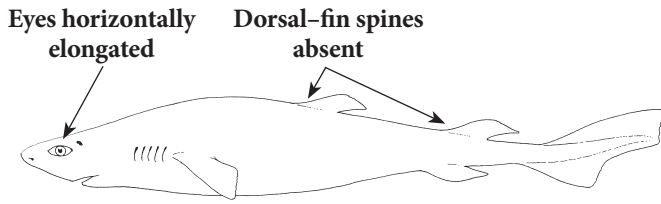
Zameus squamulosus

See page 27



Other similar species

Scymnodalatias oligodon



Centroselachus crepidater

See page 25



Snout greatly elongated, preoral length about equal to distance from mouth to pectoral-fin origin

Upper labial furrows extremely long, separated by less than the distance between nostrils

Underside of head

Bio-ecology, distribution and fisheries of *Centroscymnus owstonii*

A little known deepwater dogfish of the outer continental shelves and upper continental slopes on or near bottom at depths of 150 to 1459 m, but mostly below 600 m. In FAO Area 87 it is known to occur off Chile.

Viviparous with yolk-sac, females with litters of 5 to 31 fertilized eggs or embryos in utero, but females may have as many as 34 ovarian eggs. The number of embryos or eggs increases slightly with the total length of the mother. There does not appear to be a defined reproductive season since parturition appears to occur year-round. These sharks segregate by size, sex, and reproductive stage with depth with adult females occurring at greater depths than males.

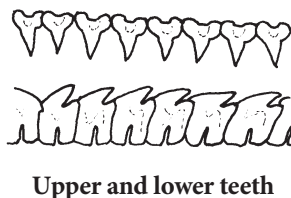
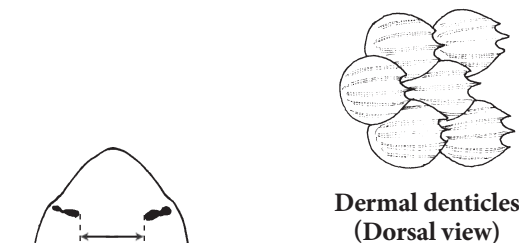
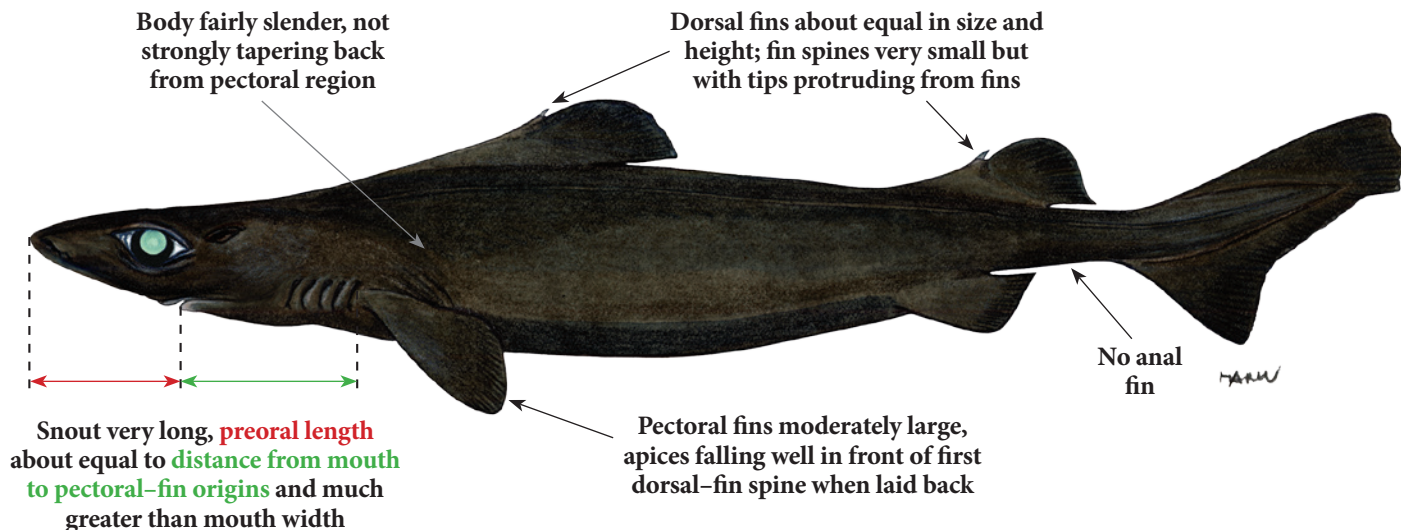
The diet of this shark is poorly known, but includes bony fishes and cephalopods. As far as known it does not appear to remove core flesh from live cetaceans, deep-diving pinnipeds, or large fishes, as does its congener *Centroscymnus coelolepis*.

Of no interest to fisheries in the southeastern Pacific, the species is uncommon, and mostly discarded bycatch.

Centroselachus crepidater (Bocage & Capello, 1864)


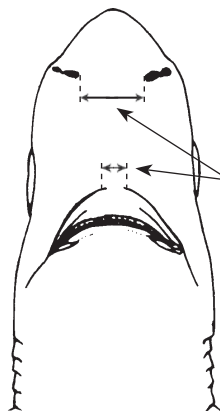
Longnose velvet dogfish – Pailona à long nez
Sapata negra

Tollo, Sapata negra (Chile)



Colour
Uniform black or blackish brown.

Size
Moderate sized, with a maximum length of 105 cm total length.

Underside of head



Photo: © Paul Clerkin

Similar species

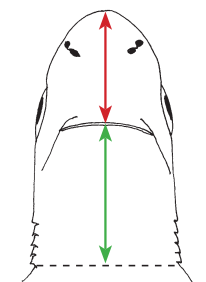
Centroselachus owstonii

See page 23

Scymnodon macracanthus

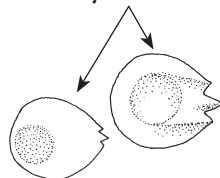


Snout shorter, **preoral length** much less than **distance from mouth to pectoral-fin origins**

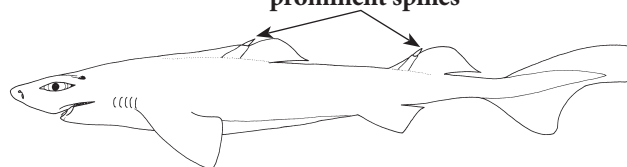


Underside of head

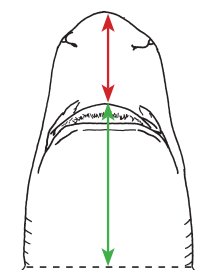
Lateral trunk denticles enlarged, resembling bony fish scales



Dermal denticles (Dorsal view)

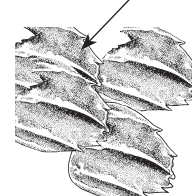


Snout shorter, **preoral length** much less than **distance from mouth to pectoral-fin origins**



Underside of head

Lateral trunk denticles small, tricuspidate, with strong 3-ridged crowns, not resembling bony fish scales



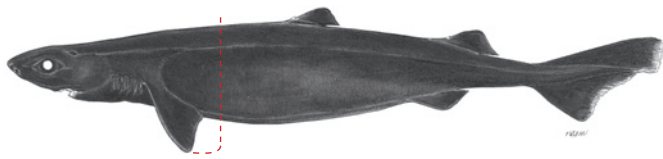
Dermal denticles (Dorsal view)

Other similar species

Zameus squamulosus

See page 27

Scymnodalatias oligodon

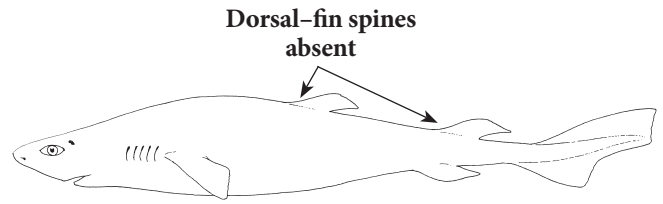


Pectoral fins smaller, their apices falling well in front of first dorsal-fin spine when laid back

Lower teeth with relatively high, more or less erect cusps

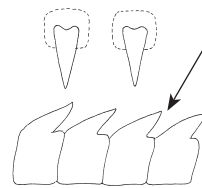


Lower teeth



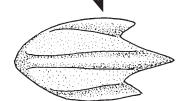
Dorsal-fin spines absent

Lower teeth with high, more or less erect cusps



Lower teeth

Lateral trunk denticles tricuspidate, with 3 ridged crowns in adults, not resembling bony fish scales



Dermal denticle (Dorsal view)

Bio-ecology, distribution and fisheries of *Centroselachus crepidater*

A little-known but common deepwater dogfish found on the upper continental and insular slopes on or near the bottom at depths of 200 to 1500 m. In FAO Area 87 it is known to occur off Chile and Peru.

Yolk-sac viviparous, litters range from 1 to 9, with an average of 6. Females appear capable of breeding throughout the year. Age at maturity is about 9 years for males and 20 years for females; oldest individual was a female estimated at 54 years and the oldest male about 34 years.

Diet consists of bony fishes, including lanternfishes (Myctophidae), crustaceans and cephalopods.

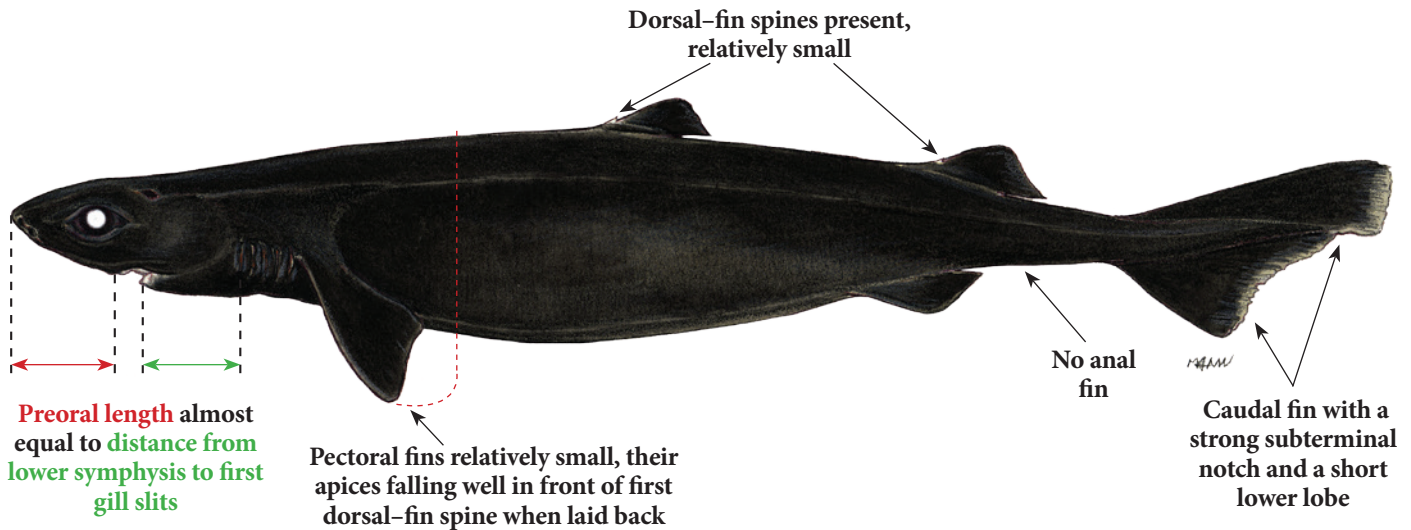
Interest to fisheries limited. It is caught as bycatch, but not utilized in the southeastern Pacific.

Zameus squamulosus (Günther, 1877)

Velvet dogfish – *Squale-grogneur velouté*
Bruja terciopelo

Tollo, Bruja terciopelo (Chile)

SSQ



Snout rather narrow and long, preoral length greater than mouth width

Lower teeth with relatively high, more or less erect cusps

Colour

Uniformly black to dark brownish with no conspicuous markings.

Size

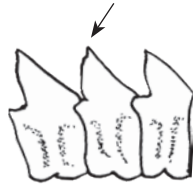
Moderate size with a maximum total length of 84 cm.



Photo: © Paul Clerkin



Underside of head



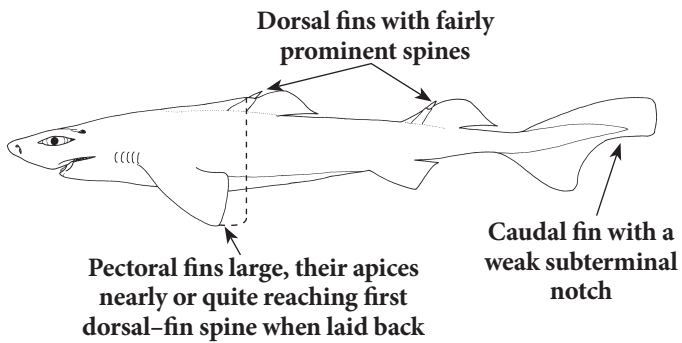
Lower teeth



Photo: © Evgeny Romanov, CAP RUN-ARDA

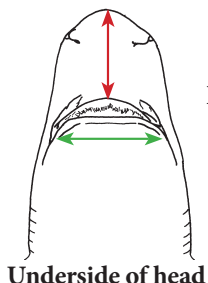
Similar species

Scymnodon macracanthus



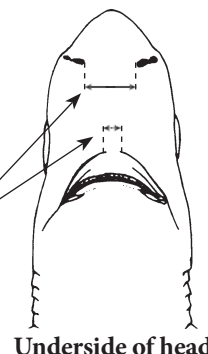
Centroselachus crepidater

See page 25



Underside of head

Upper labial furrows extremely long, separated by less than the distance between nostrils



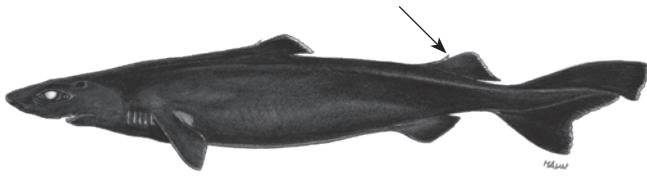
Underside of head

Other similar species

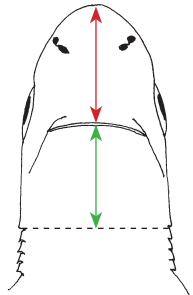
Centroscymnus owstonii

See page 23

Second dorsal fin considerably higher than first

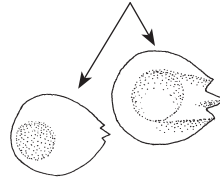


Snout moderately long, **preoral length** about as long as **distance from mouth to first gill slits** and about equal to mouth width



Underside of head

Lateral trunk denticles enlarged, resembling bony fish scales



Dermal denticles (Dorsal view)

Scymnodalatias oligodon

Dorsal-fin spines absent



Lower teeth with high, more or less erect cusps



Upper and lower teeth

Bio-ecology, distribution and fisheries of *Zameus squamulosus*

A poorly known epipelagic and oceanic deepwater shark usually found off continental and insular slopes, on or near the bottom at depths of 550 to 1450 m, but also well off the bottom at depths between 0 to 580 m in water 2000 to 6000 m deep. In FAO Area 87 it is known to occur off Chile and Peru. Elsewhere, it occurs throughout the Atlantic, Indian, and Pacific Oceans.

Viviparous with a yolk sac, litter of 3 to 10, but little else known about their reproductive cycle.

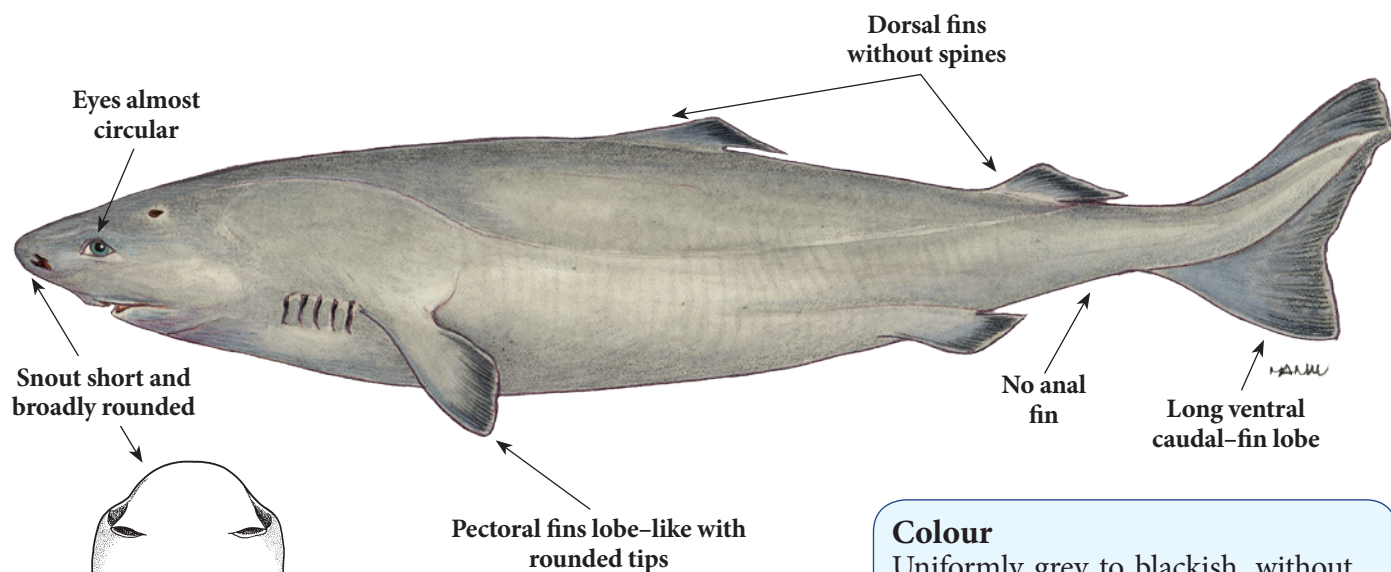
A predator on bottom fishes and invertebrates, but its smaller teeth and mouth, and weaker jaws suggest that it is a predator less capable of killing large prey.

This relatively small somniosid is of limited fisheries interest. It is caught incidentally by bottom trawls and by bottom and pelagic longline gear. There is no species-specific information on the numbers of these sharks that are caught as bycatch, but it is likely low since they do not seem to be abundant where they are known to occur. Also caught infrequently by tuna longliners in the epipelagic zone.

Somniosus antarcticus Whitley, 1939

Southern sleeper shark – Laimargue de l'Antarctique
Tollo meridional dormilón

Gata grande, Tiburón dormilón (Chile)

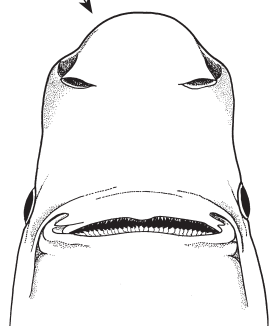


Colour

Uniformly grey to blackish, without conspicuous light or dark fin edges.

Size

Size large, to at least 456 cm, and possibly 600 cm total length.

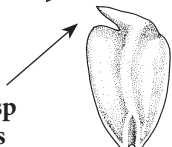


Underside of head

Upper teeth long and slender



Lower teeth with a short and low, strongly oblique cusp and very high roots



Upper and lower tooth



Photo: © Pablo Reyes

Similar species

Somniosus antarcticus is the only somniosid known to occur in FAO Area 87 with the following combination of characters: large size, eyes almost circular, long and slender upper teeth, two spineless dorsal fins, long ventral caudal-fin lobe, and grey to blackish coloration.

Bio-ecology, distribution and fisheries of *Somniosus antarcticus*

An abundant littoral and epibenthic shark of the continental and insular shelves and upper slopes down to at least 1440 m. In FAO Area 87 it is known to occur off Chile and Peru. It is commonly encountered on seamounts and submarine ridges in the southern oceans. Water temperatures of places inhabited by these sharks range from 0.6 to 12 °C.

Viviparous with a yolk sac, but litter sizes mostly unknown.

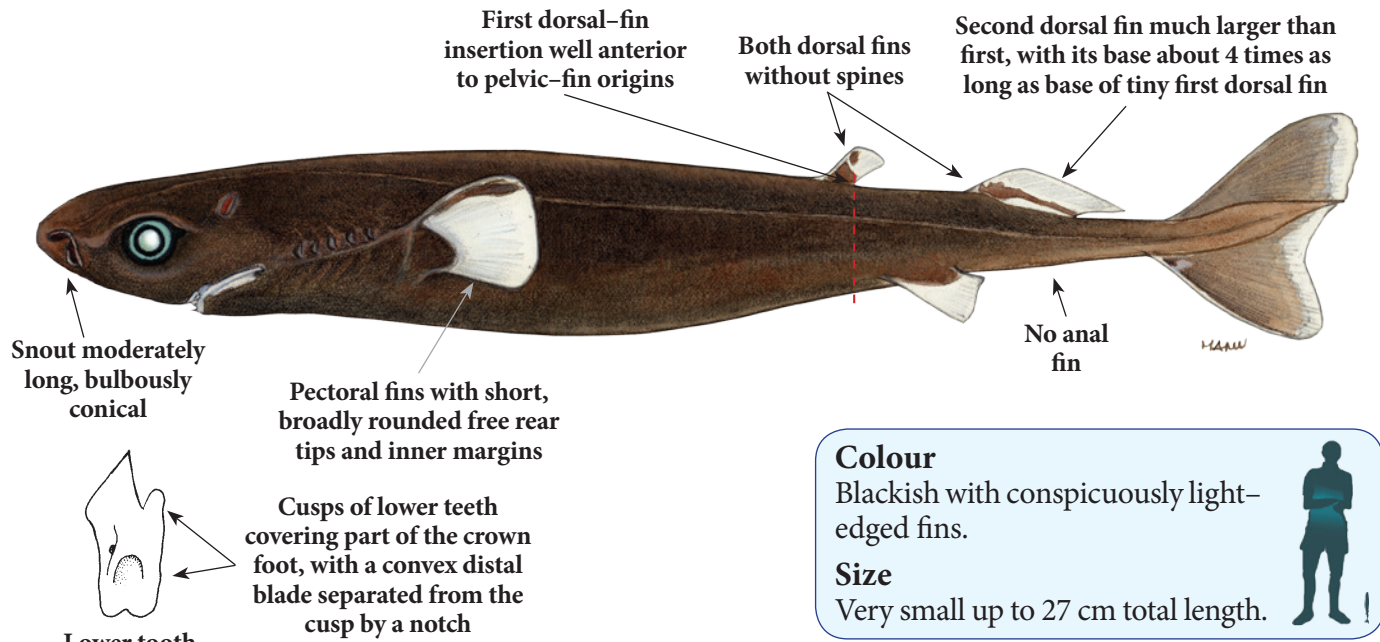
Diet consists of fishes, pinnipeds, cetaceans, and especially cephalopods where they appear to target giant squid (*Mesonychoteuthis hamiltoni*). Much like the other giant members of this genus these sharks consume fast-swimming prey, but whether it is taken as carrion or alive is unknown.

Taken as non-utilized bycatch of trawl and longline fisheries for hake, Patagonian toothfish (*Dissostichus eleginoides*, Nototheniidae), and other bottom fishes throughout most of its range.

Euprotomicrus bispinatus (Quoy & Gaimard, 1824)

Pigmy shark – *Squale pygmée* – Tollo pigmeo

Tollo pigmeo (Chile)

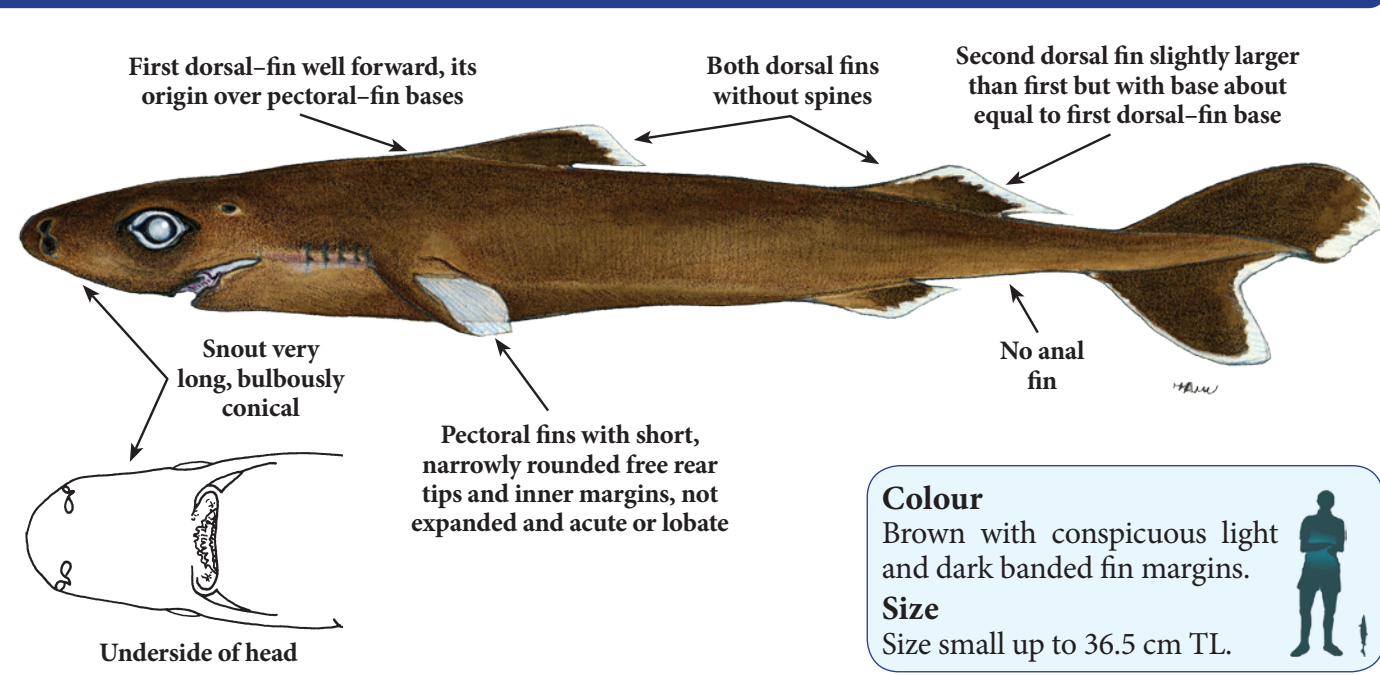


Bio-ecology and distribution of *Euprotomicrus bispinatus*

The pigmy shark is an epipelagic, mesopelagic, and perhaps bathypelagic inhabitant of the central water masses of the North and South Pacific, South Atlantic, and southern Indian Ocean, at water depths from 1829 to 9938 m. In FAO Area 87 it is known to occur off Chile and Peru. It occurs at or near the surface at night and apparently descends to at least midwater depths during the day.

Heteroscymnoides marleyi Fowler, 1934

Longnose pigmy shark – *Squale mignon*
Tollo pigmeo trompudo



Bio-ecology and distribution of *Heteroscymnoides marleyi*

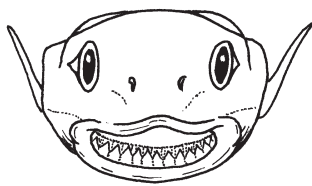
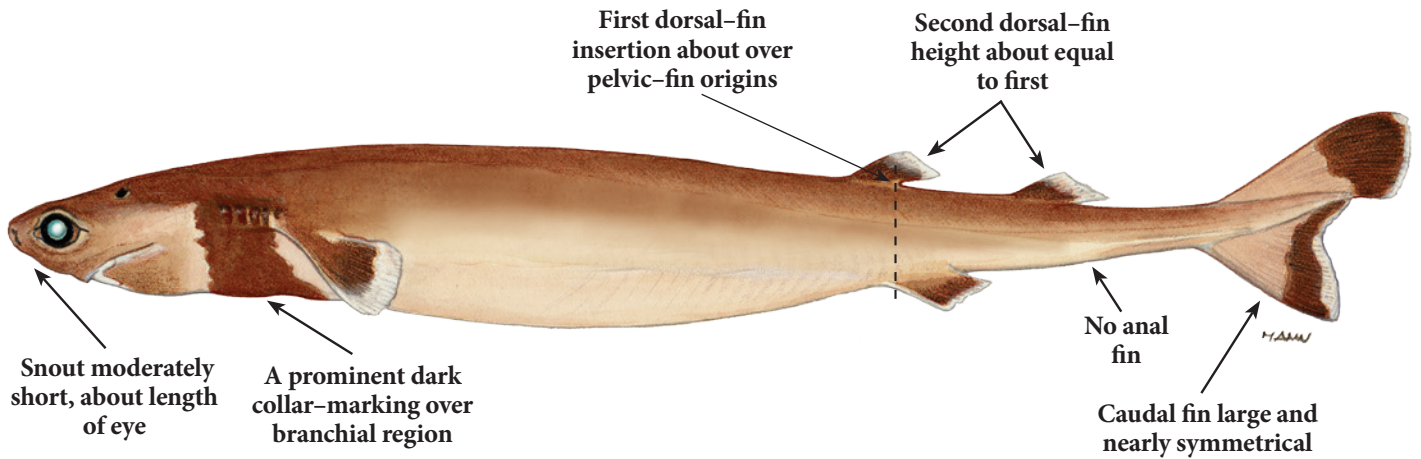
A dwarf oceanic shark. The holotype was found on a beach in a subtropical area (KwaZulu-Natal, South Africa), but additional specimens have been collected in the open ocean in the epipelagic zone in cold southern waters, in the South Atlantic and eastern South Pacific (32° 35.7'S, 85° 25.2'W), between the surface and 502 m in water over 830 to over 4000 m deep.

Isistius brasiliensis (Quoy & Gaimard, 1824)

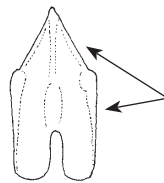
Cookie cutter shark – Squallet féroce – Tollo cigarro

Tollo cigarro (Chile)
Tiburón cigarro (Spanish)

ISB



Frontal view of head



Lower tooth

Cusps of lower teeth covering the entire crown foot, without a convex distal blade separated from the cusp by a notch

Colour

Pale brown above, becoming lighter below, with a conspicuous dark collar-like marking around the gill region; fins dark, but with pale to translucent edges.

Size

A small shark with a maximum length of about 56 cm TL.



Photo: © Evgeny Romanov, CAP RUN-ARDA

Similar species

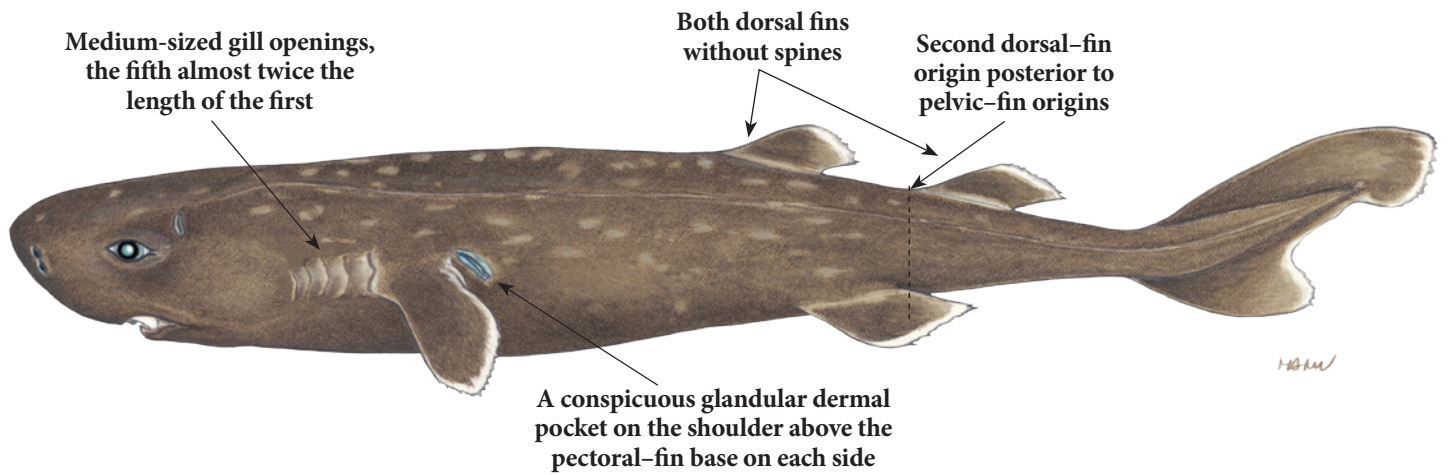
Isistius brasiliensis can be distinguished from other similar species for the fact that it has the first dorsal-fin insertion about over pelvic-fin origins and a conspicuous dark collar-like marking around the gill region.

Bio-ecology and distribution of *Isistius brasiliensis*

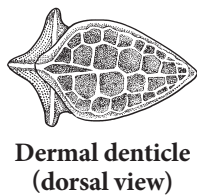
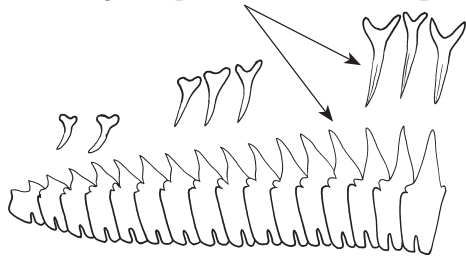
A wide-ranging tropical epipelagic to bathypelagic oceanic shark, oceanic known from scattered records throughout the Atlantic, Indian, and Pacific oceans. It is caught at night, sometimes at the surface, but usually below it at depths between 85 to 3500 m, however its preferred depth range and maximum depth are uncertain. Apart from those captured at the surface specimens are generally taken in midwater nets fished over a wide depth range, and it is difficult to tell at what depth these sharks were captured. This shark is thought to be a vertical migrator on a diel cycle, coming to the surface and to the level of midwater trawl hauls at night and presumably dropping below this during the daytime as few if any of these sharks have been taken during the daytime. This implies a long vertical distance travelled, in excess of 2000–3000 m up and down in the ocean basins.

Mollisquama parini Dolganov, 1984

Pocket shark - Squale à peau douce - Tiburón bolsillo



Teeth dissimilar in upper and lower jaws; uppers erect, single-cusped, dagger-like, with prominent medial ridge; lowers oblique, erect, single cusped with no lateral cusplets



Colour

Dark brown with small lighter spots on the back and sides. Fins dark, with lighter margins on all fins; the mouth cavity is light.

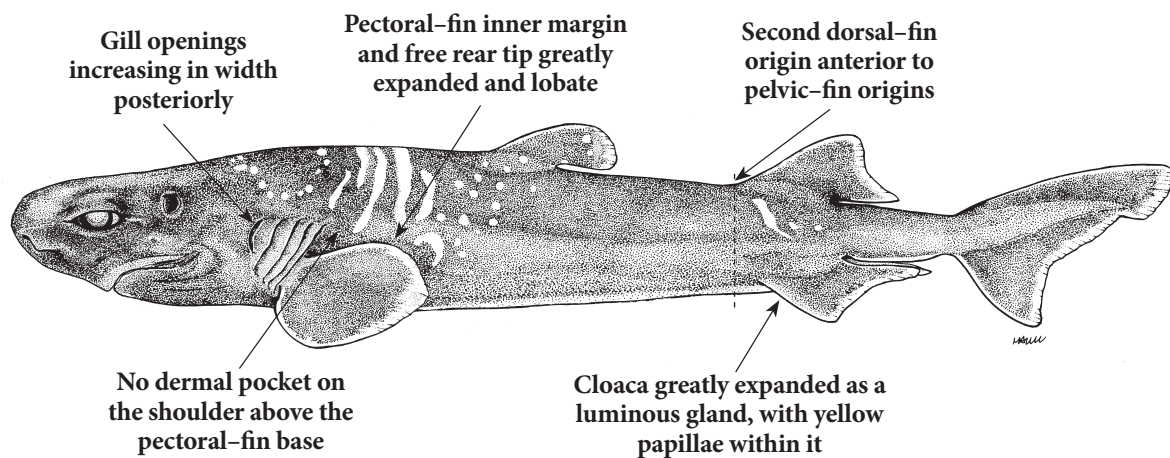
Size

A small shark with a maximum total length of about 40 cm.



Similar species

Euprotomicroides zantedeschia



Bio-ecology and distribution of *Mollisquama parini*

A rare species known only from a specimen collected in the southeastern Pacific on the Nazca submarine ridge off Chile. A second specimen of this rare species was recently caught in the Gulf of Mexico. The shoulder glands are equally large on both sides and have their lumens lined with fine papillae. These might secrete pheromones for attracting other pocket sharks. It is also possible that the shoulder glands secrete a luminous fluid similar to the cloacal gland of *Euprotomicroides zantedeschia*.

Apristurus nasutus de Buen, 1959
 Largenose catshark – Holbiche cyrano
 Pejegato hocicón

Pejegato hocicón (Chile)
 Tiburón negro narigón
 (Spanish)

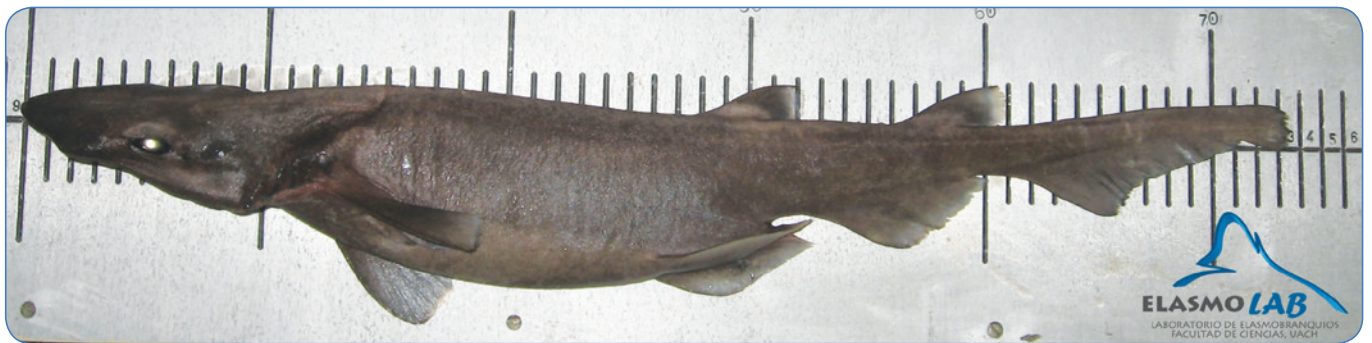
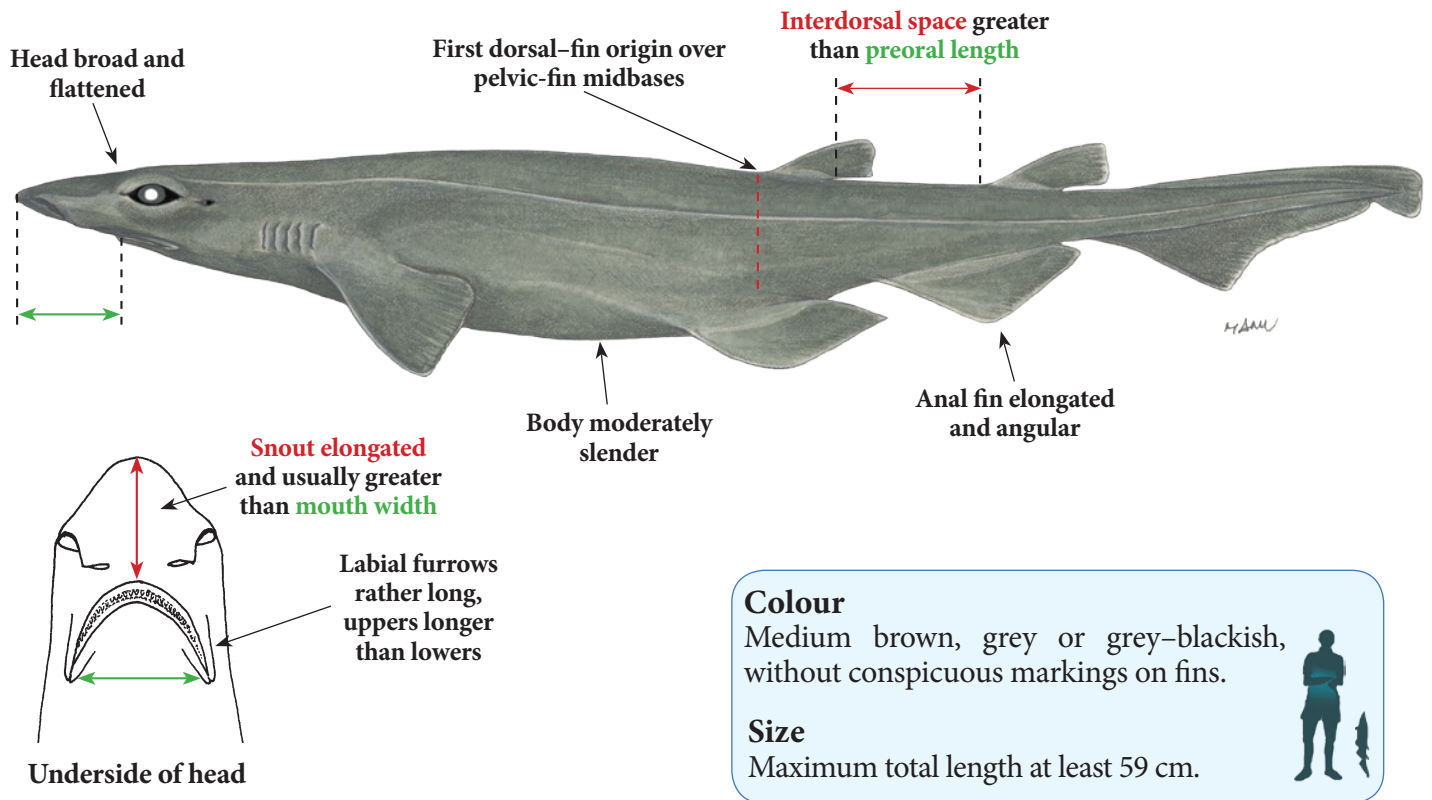
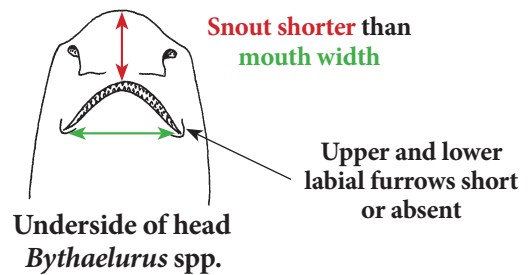


Photo: © Elasmolab, Universidad Austral de Chile

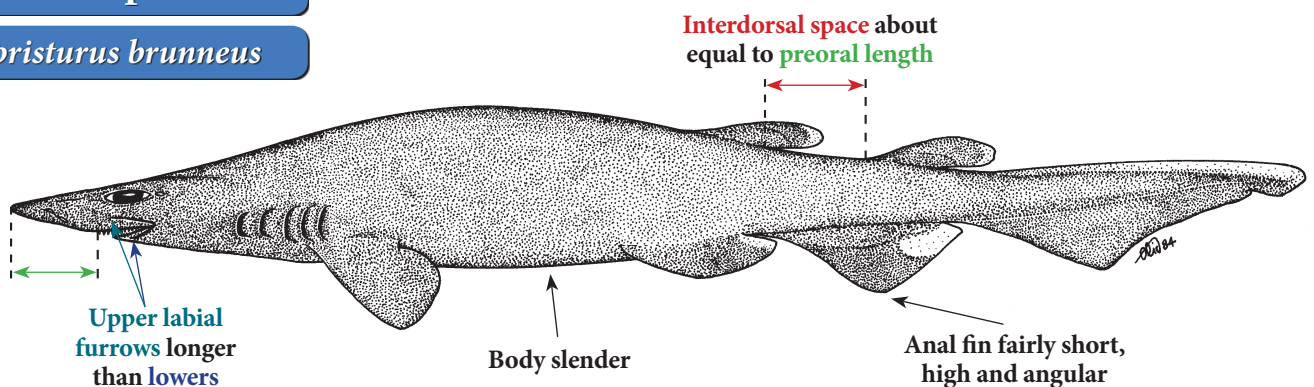
Similar genus

Species of the genus *Bythaelurus* (see page 35) can be distinguished from the *Apristurus* by the fact that their head is moderately or little-flattened, not spatulate, the snout is equal or usually less than mouth width and the labial furrows are short or absent.

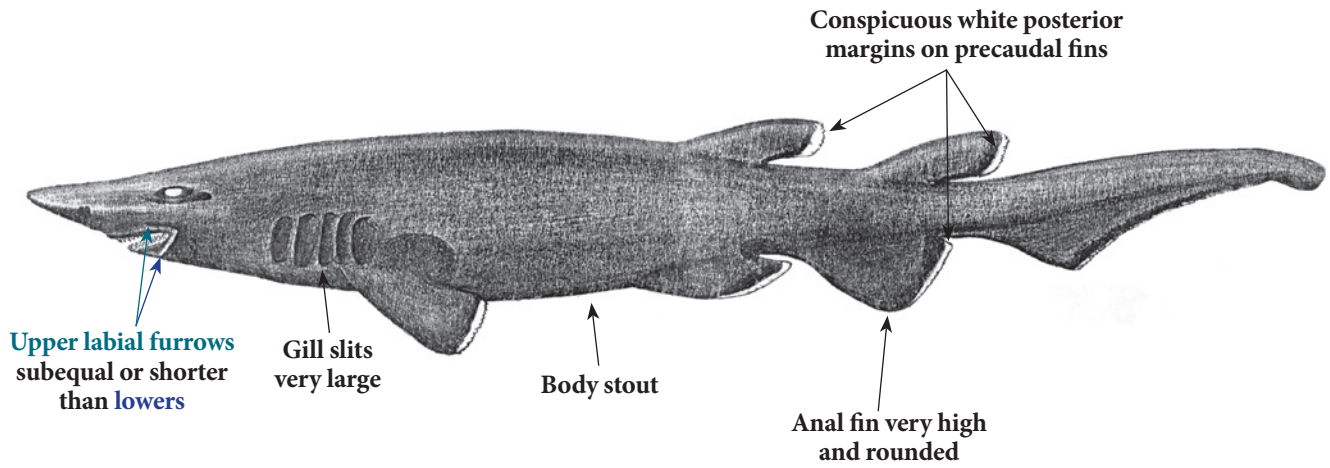


Similar species

Apristurus brunneus



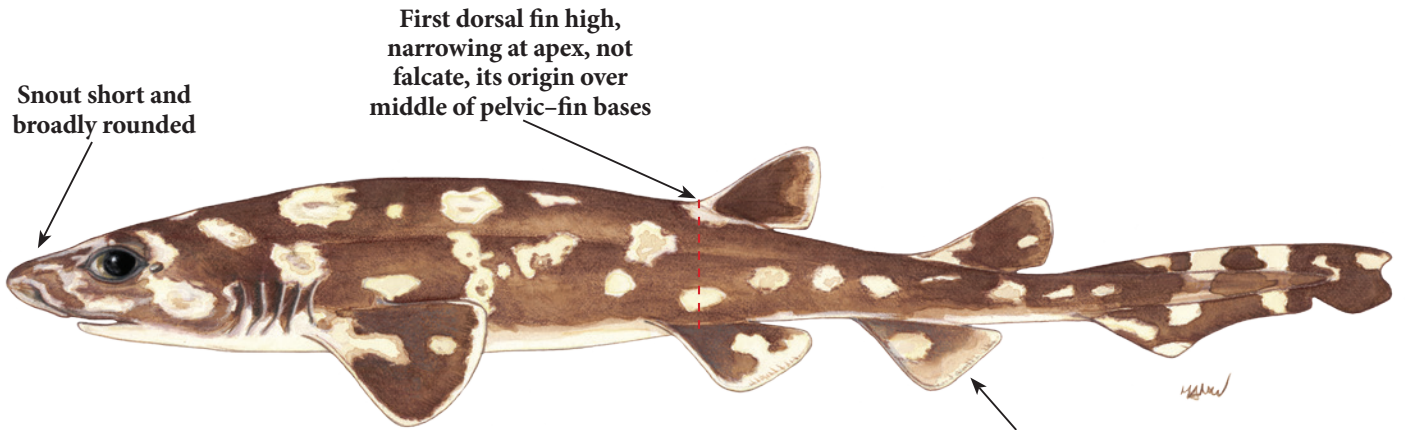
Apristurus kampa



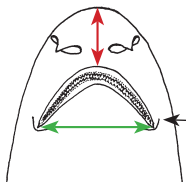
Bio-ecology and distribution of *Apristurus nasutus*

A little-known bottom shark of the upper continental slopes on or near the bottom at 400 to 925 m depth. In FAO Area 87, it is known to occur off the Gulf of Panama, Ecuador, Peru and central Chile.

Galápagos catshark – Gata de las Galápagos



Snout shorter than mouth width



Underside of head

Anal-fin base about 0.7 to 1.1 times second dorsal-fin base

Colour

A rather strikingly variegated coloured catshark with a pattern of large white spots and blotches on a chocolate brown background above; lighter coloured below.

Size

Maximum total length at least 43.5 cm.

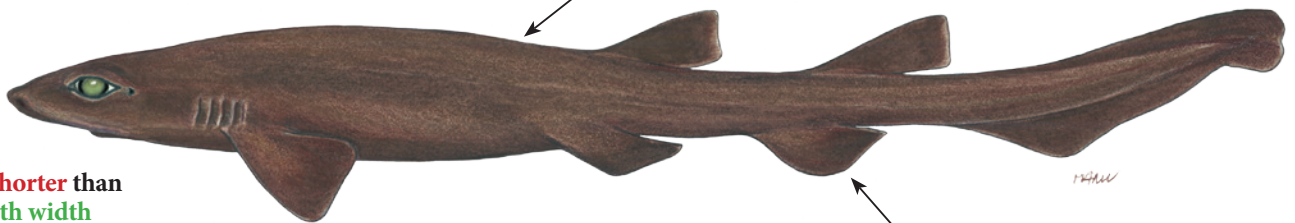


Photo: © McCosker, Long and Baldwin, 2012

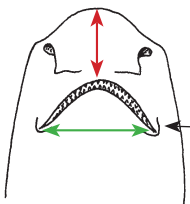
Similar species

Bythaelurus canescens

Colour dark chocolate brown, without markings except for white fin tips in young



Snout shorter than mouth width



Underside of head

Bio-ecology and distribution of *Bythaelurus giddingsi*

A little-known deepwater catshark, found on or near the bottom over flat or sloping sand and mud bottoms near lava boulders, from 428 to 562 m. In FAO Area 87, it is known only from the Galápagos Islands.

Small disc torped ray

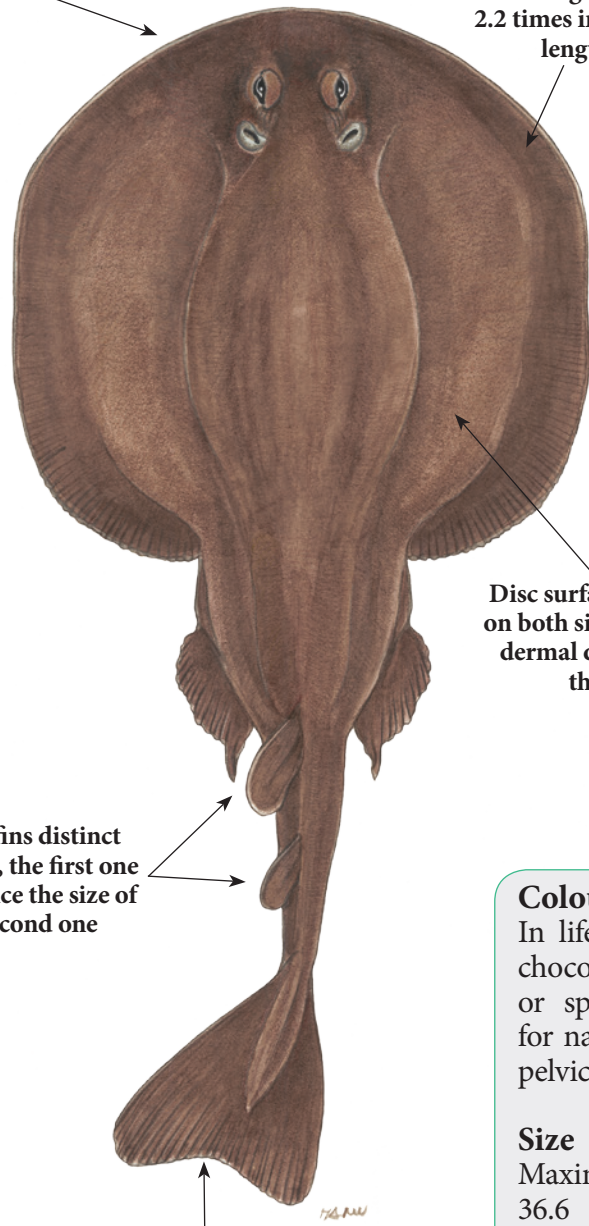
Anterior disc margin broadly curved

Disc length 2.1 to 2.2 times into total length

Disc surfaces smooth on both sides, without dermal denticles or thorns

Dorsal fins distinct and large, the first one about twice the size of the second one

Caudal fin large, posterior margin concave, with upper and lower lobes of about equal size



Colour

In life dorsal surface is a uniform dark chocolate brown, without any blotches or spots, ventral surface white, except for narrow darker margin along disc and pelvic fins.

Size

Maximum total length is 36.6 cm for an immature male. Known from only two immature specimens.



Bio-ecology, distribution and fisheries of *Tetronarce microdiscus*

A deep-sea species known to occur only from the junction of the Nazca and Sala y Gomez ridges. Collected in the open sea on seamounts between 180 and 280 m deep; one of the two known specimens was caught in a midwater trawl, the other specimens on a bottom trawl.

Presumed to be yolk-sac viviparous, but nothing known about its litter size or reproductive cycle.

Interest to fisheries unknown, but maybe taken as bycatch in deep-sea fisheries for orange roughy, but nothing else is known about fishery impacts on this species.

Tetronarce microdiscus maybe synonymous with *T. semipelagica*, a species that was also collected on the same cruise and in the same area. Furthermore, both these species should be compared closely with *T. tremens* (de Buen, 1959).

GUIDE TO THE FAMILIES OF SOUTHEASTERN PACIFIC DEEP-SEA RAJIFORMES

RAJIFORMES

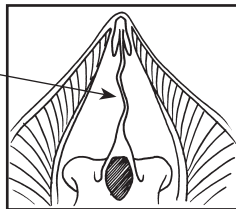
Pectoral fins completely fused with sides of head and greatly flattened dorsoventrally to form a large disc. Tail distinctly marked off from body disc, rather slender and, if present, dorsal fin(s) and caudal fin very small to rudimentary

Snout soft, flabby, flexible, due to delicate, flexible rostral cartilage

Snout rigid, stiff, not flexible, due to solid, stiff rostral cartilage



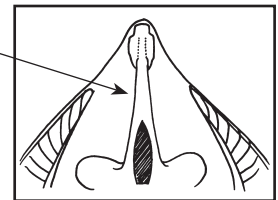
Flexible and delicate rostral cartilage, when present



Detail of snout skeleton

After Stehmann and Bürkel in Whitehead *et al.* (1984)

Stiff rostral cartilage extended to snout tip



Detail of snout skeleton

After Stehmann and Bürkel in Whitehead *et al.* (1984)

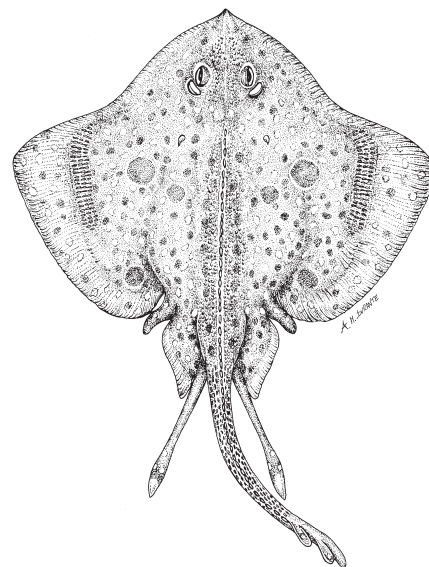
ARHYNCHOBATIDAE – p. 38

RAJIDAE – p. 43

GUIDE TO THE GENERA OF SOUTHEASTERN PACIFIC DEEP-SEA ARHYNCHOBATIDAE

Moderate to large softnose skates with subrhombic disc shape

YES

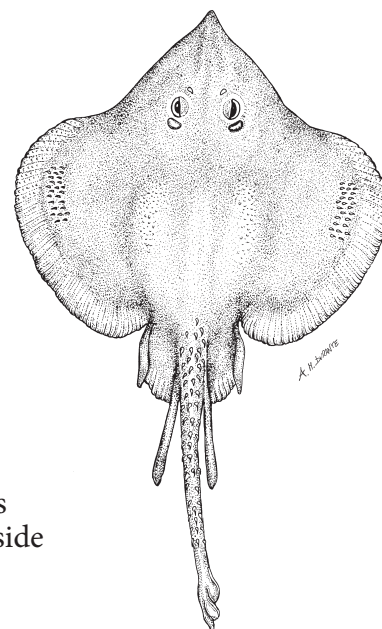


Bathyraja spp. – p. 39 to 42

NO

Small softnose skates with heart-shaped to subcircular disc; nuchal, scapular, and midback thorns absent; tail with numerous large, irregularly arranged thorns giving it a barbedwired-like appearance

YES



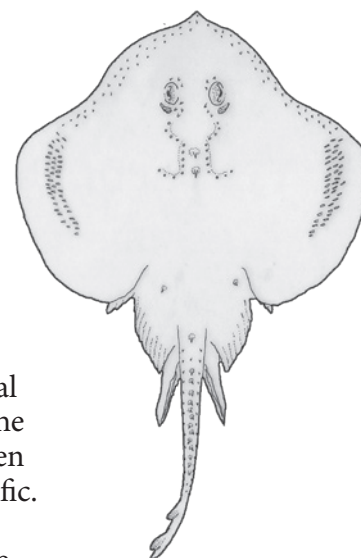
This is the only known representative of the genus *Notoraja* found to occur outside the western Indo-Pacific

Notoraja martinezi

NO

Small softnose skates with heart-shaped to subcircular disc; nuchal, scapular, and midback thorns present; 1 to 5 rows of tail thorns, lacking barbedwired-like appearance

YES



This is the most common coastal and deep-sea representative of the genus *Psammobatis* that has been reported in the southeastern Pacific.

The two other species, *P. rudis* and *P. normani* are rare.

Psammobatis scobina

Bathyraja albomaculata (Norman, 1937)

Whitedotted skate

Raya de manchas blancas (Chile)
Raya de lunares (Spanish)

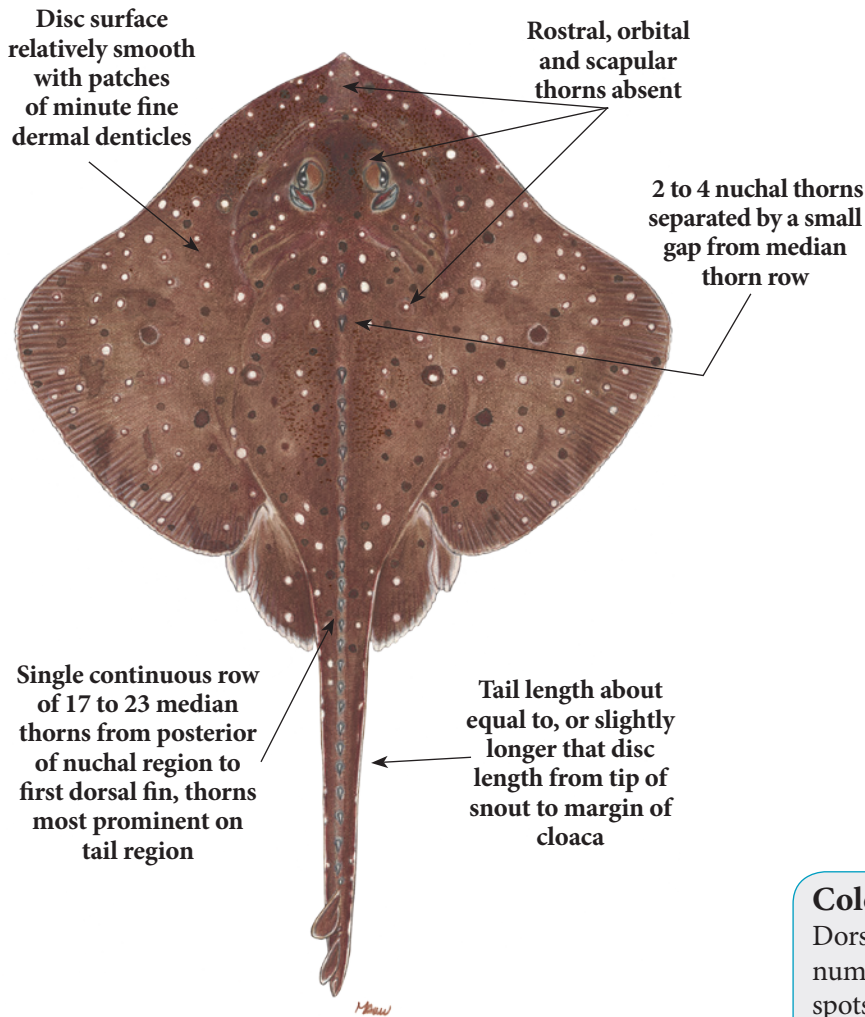


Photo: © É. Garcés Santana

Colour

Dorsal surface dark brownish or grey, with numerous conspicuous small, scattered white spots, sometimes with dark brown margins; pelvic fins with narrowly edged white margins; ventral surface uniformly white.

Size

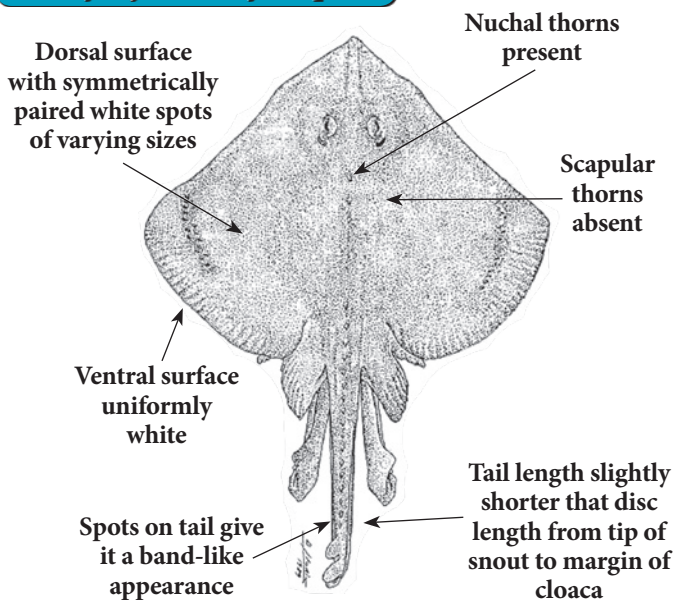
Maximum total length is about 96 cm.



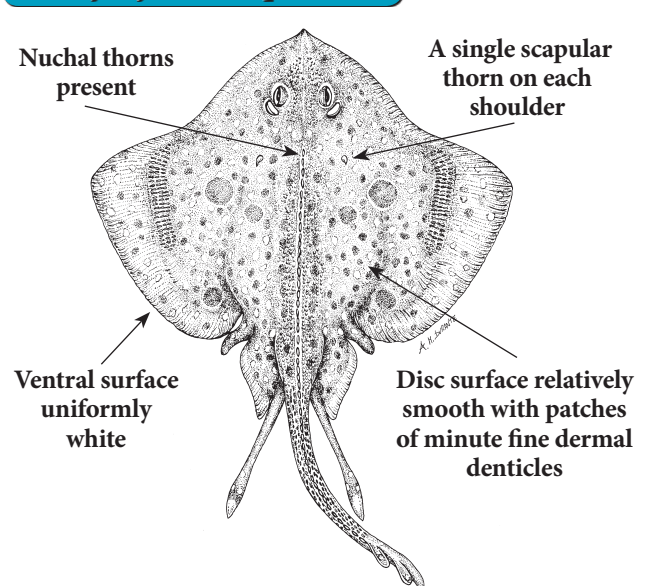
! The *Bathyraja* species included in this and the next page are all characterized by having a dorsal surface uniformly colored, and with blotches or spots. On the contrary, all *Bathyraja* species included in page 41 and 42 have a uniform dorsal surface coloration without blotches or spots.

Similar species

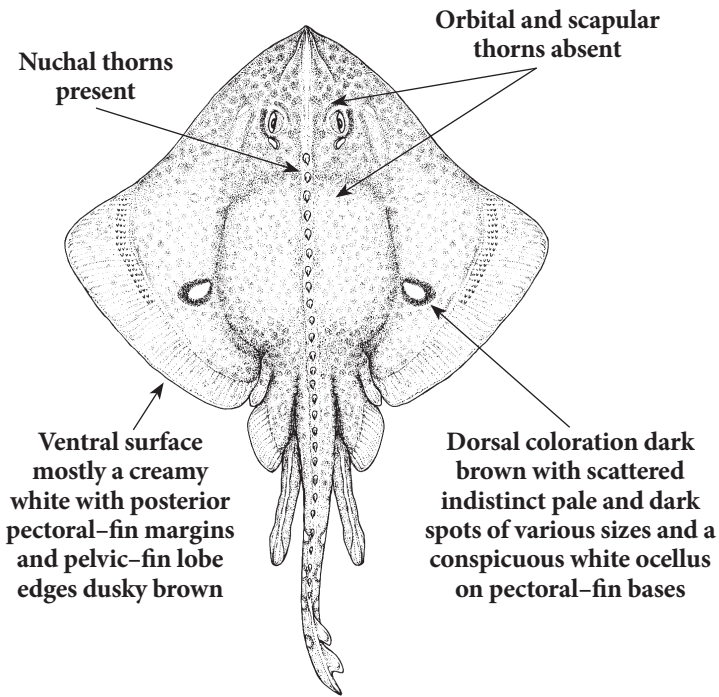
Bathyraja brachyurops



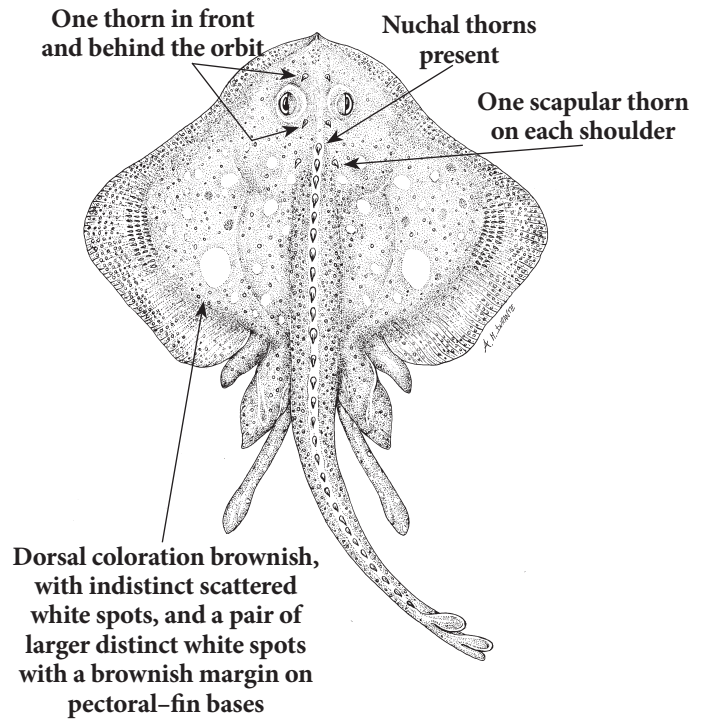
Bathyraja multispinis



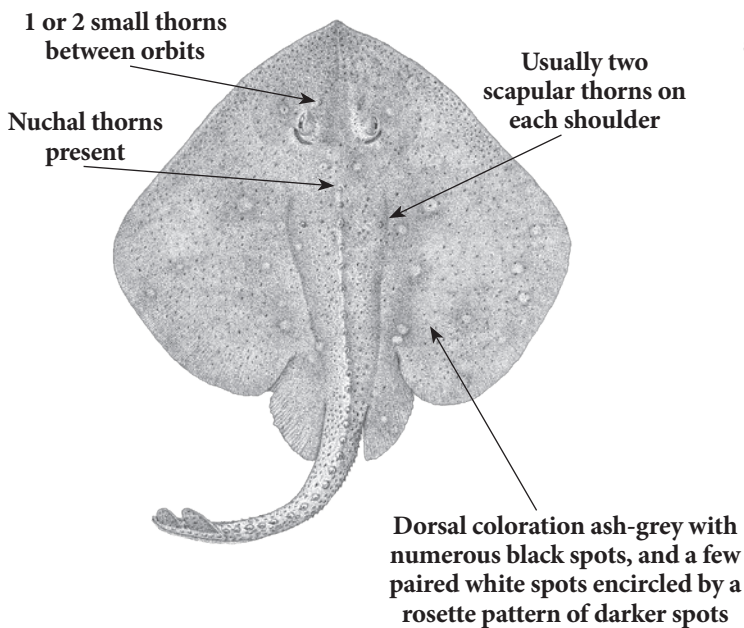
Bathyraja cousseauae



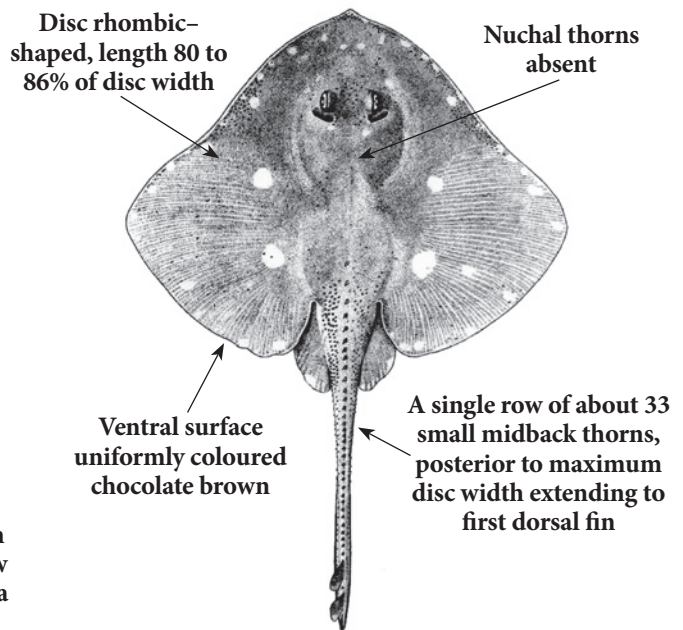
Bathyraja macloviana



Bathyraja magellanica



Bathyraja aguja



Bio-ecology, distribution and fisheries of *Bathyraja albomaculata*

A common *Bathyraja* skate known to occur off central and southern Chile and in the southwestern Atlantic from the southern Patagonia shelf to Uruguay and around the Falkland Islands (Malvinas). Found on the outer continental shelves and upper slopes from 55 to 861 m, and with a preferred water temperature ranging from 2.8 to 6.8 °C.

Oviparous with an estimated ovarian fecundity of 4 to 32. Eggs are deposited year round, with the autumn and winter months showing a slight increase in the proportion of gravid females. The diet of this skate, unlike many skate species, is highly specialized as they consume primarily benthopelagic gammarids and polychaetes, and to a lesser extent isopods.

A regular bycatch in bottom trawl fisheries for bony fishes. Skates fisheries in Argentina have increased in recent years, but species-specific data is lacking for most fisheries.

Bathyraja griseocauda (Norman, 1937)

Graytail skate

Raya austral (Chile)

Disc broadly rhombic-shaped, width broader than disc length

Rostral, orbital, scapular, and midback thorns absent

A single continuous row of 12 to 20 median thorns extending along tail to first dorsal fin

Ventral surface colour uniform, lighter than dorsal surface, usually white to yellowish

All other similar species (see below) have colour of ventral surface different from, or darker than dorsal surface



Photo of ventral surface: © Sebastián Kraft, Elasmolab, Universidad Austral de Chile

Colour

Dorsal surface uniformly brownish, darker on posterior pectoral-fin margins, dusky on pelvic fins, but without blotches, rings, or spots; ventral surface uniformly white or yellowish.

Size

Maximum total length is about 157 cm.

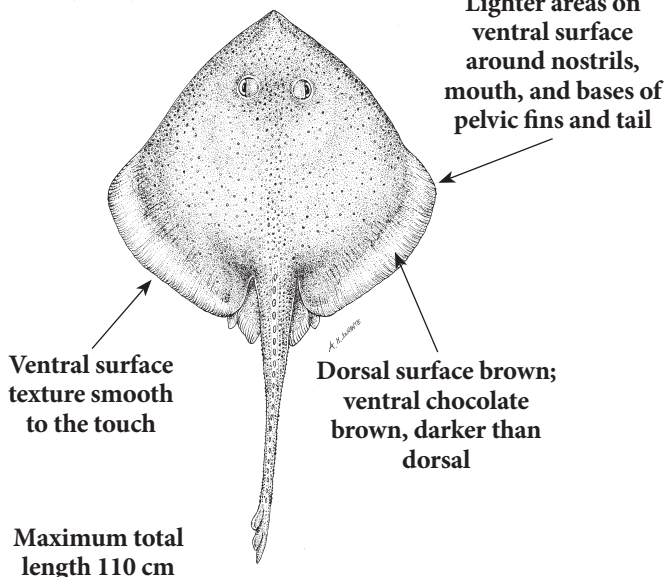


The *Bathyraja* species included in this and the next page are all characterized by having a uniform dorsal surface coloration without blotches or spots.

On the contrary, all *Bathyraja* species included in page 39 and 40 have the dorsal surface uniformly coloured, and with blotches or spots.

Similar species

Bathyraja peruana



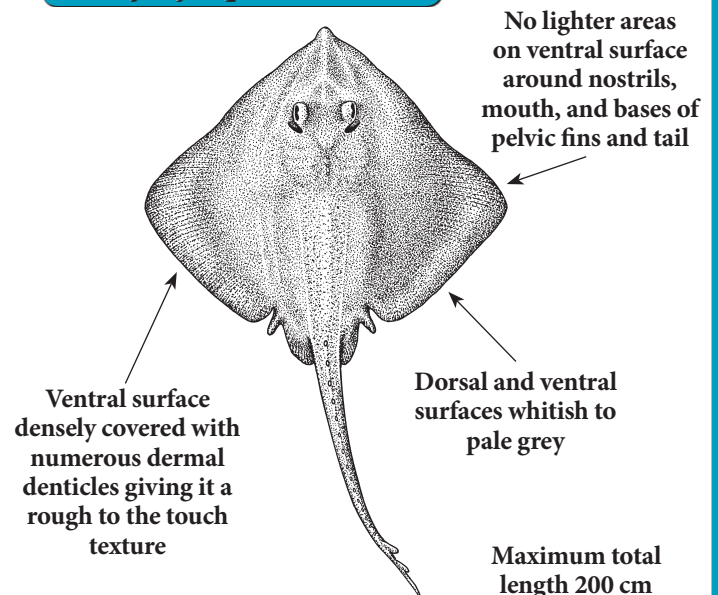
Lighter areas on ventral surface around nostrils, mouth, and bases of pelvic fins and tail

Dorsal surface brown; ventral chocolate brown, darker than dorsal

Ventral surface texture smooth to the touch

Maximum total length 110 cm

Bathyraja spinosissima



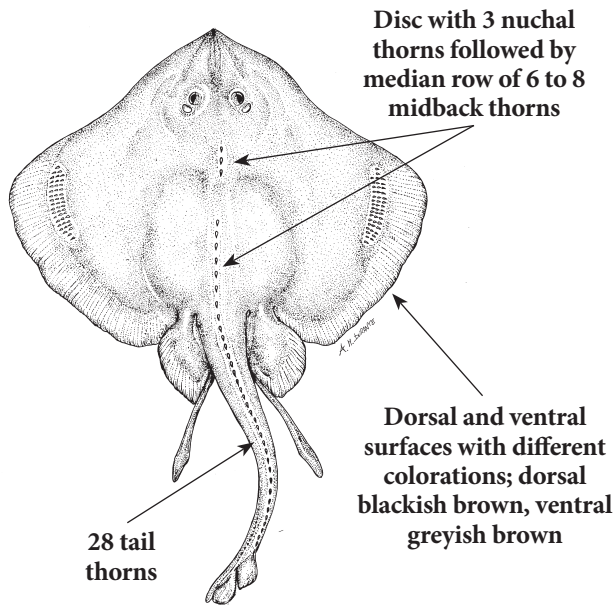
No lighter areas on ventral surface around nostrils, mouth, and bases of pelvic fins and tail

Dorsal and ventral surfaces whitish to pale grey

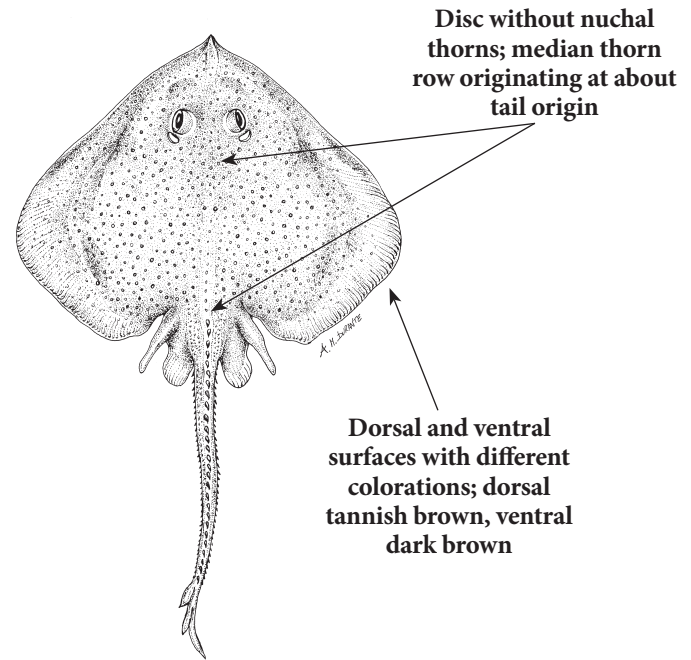
Ventral surface densely covered with numerous dermal denticles giving it a rough to the touch texture

Maximum total length 200 cm

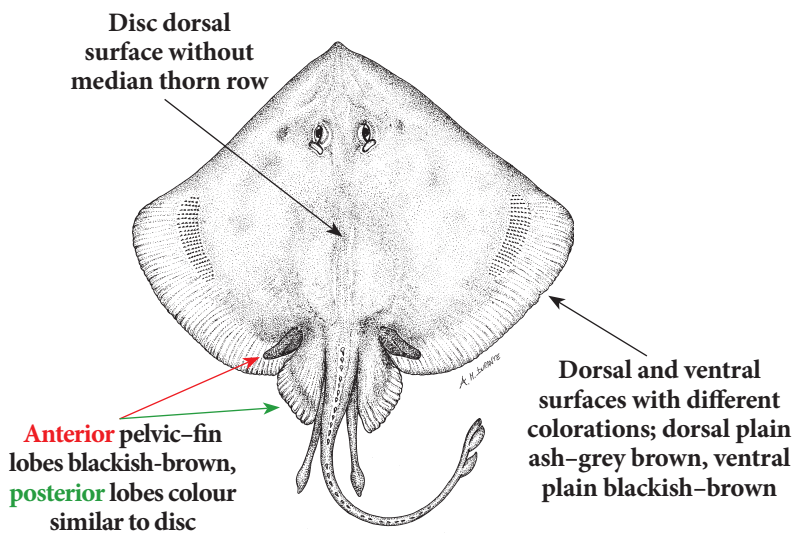
Bathyraja meridionalis



Bathyraja longicauda



Bathyraja schroederi



Bio-ecology, distribution and fisheries of *Bathyraja griseocauda*

A little-known *Bathyraja* skate known to occur off southern Chile and into the southwestern Atlantic off Argentina and the Falkland Islands (Malvinas). It occurs on the outer continental shelf and upper slopes from 82 to 1010 m off Argentina, but has a narrower depth range off Chile at 137 to 595 m.

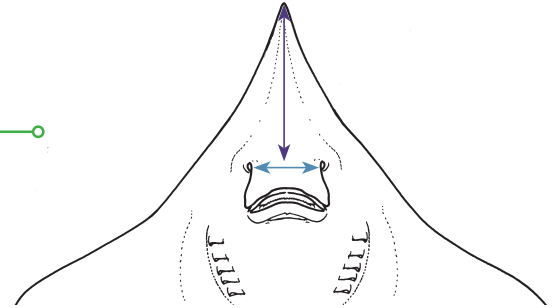
Oviparous, with females laying egg cases year-round, but with slight peaks in the spring and autumn months. Age at maturity is about 17 to 18 years for females and about 14 years for males. The diet is mostly composed of crustaceans and small benthic bony fishes. Smaller skates tend to feed more on crustaceans, while larger skates feeding more on bony fishes.

Taken in multispecies skate fisheries around the Falkland Islands (Malvinas) where it was once the dominant species, comprising around 70% of the catch. The proportion of *B. griseocauda* in catches dropped to around 5% in the mid-1990's. Similar declines have been reported throughout its range as it is taken in both targeted and non-targeted fisheries. In addition to bottom trawl fisheries it is taken as a retained bycatch in toothfish fisheries off Chile.

GUIDE TO THE GENERA OF SOUTHEASTERN PACIFIC DEEP-SEA RAJIDAE

Snout distinctly elongated, pointed; internarial width usually less than 70% of prenarial snout length

YES



VENTRAL VIEW

Dipturus sp. and *Zearaja* sp. – p. 45

NO

Tail short, stout, length about equal to or shorter than precaudal length; 2 or 3 scapular thorns on each shoulder; median row of enlarged thorns extending from nuchal area to first dorsal fin may be incomplete or interrupted, but always present

YES



Amblyraja sp. – p. 44

NO

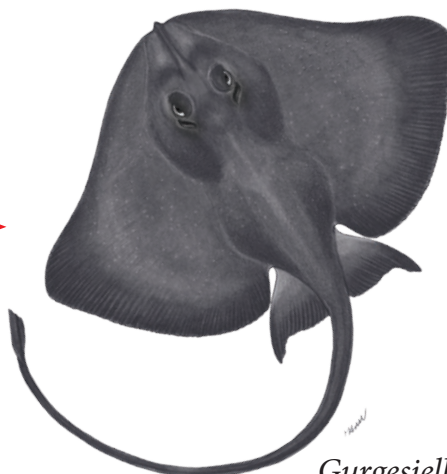
Thorns present on disc, with one to several similar sized thorns along midback of disc

YES



Rajella spp. – p. 46

NO



Gurgesiella furvescens

This is the only known representative of the genus *Gurgesiella* found to occur in the southeastern Pacific. It is characterized by a short disc, lack of thorns, sparse dermal denticles covering dorsal disc surface and tail, lack of dorsal fins and pelvic fins with a single lobe

Amblyraja doellojuradoi (Pozzi, 1935)
Southern thorny skate

Raya erizo (Chile)

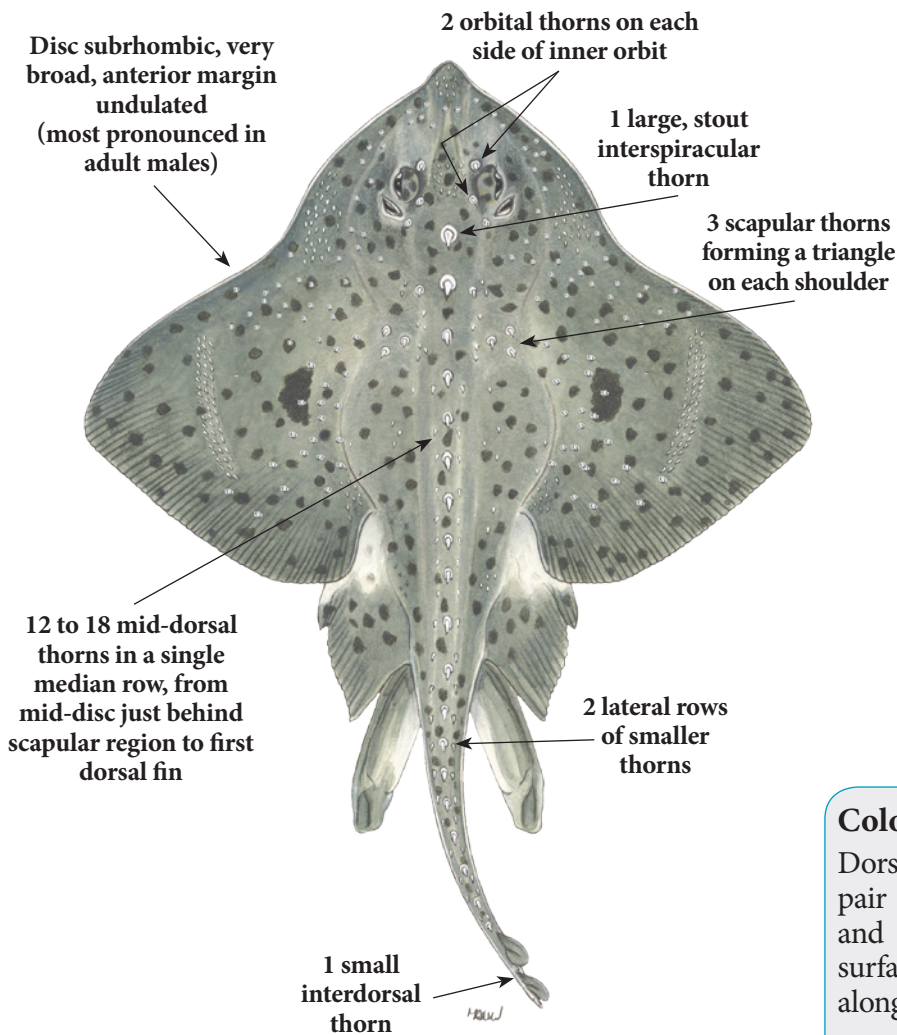


Photo: ©INIDEP

Colour

Dorsal disc surface a pale to ash grey, with a pair of large dark spots at pectoral-fin bases and numerous smaller, darker spots; ventral surface mostly white, becoming a darker bluish along disc margins.

Size

Maximum total length is 91.5 cm.



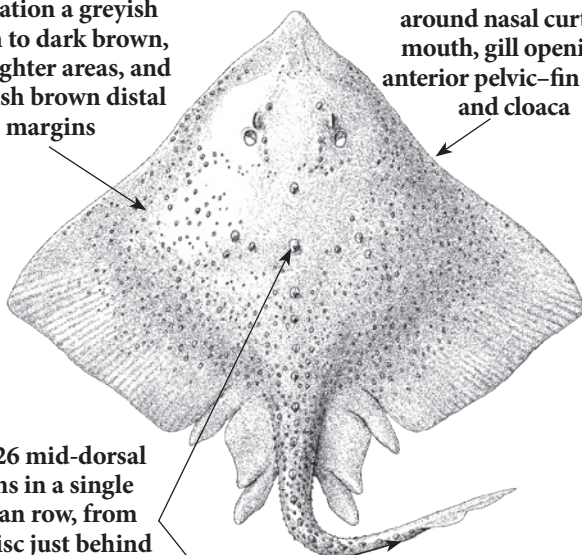
Similar species

Amblyraja frerichsi

Dorsal disc surface coloration a greyish brown to dark brown, with lighter areas, and blackish brown distal margins

Ventral surface dark-brown with whitish areas around nasal curtain, mouth, gill openings, anterior pelvic-fin lobes, and cloaca

18 to 26 mid-dorsal thorns in a single median row, from mid-disc just behind scapular region to first dorsal fin



Maximum total length is 176 cm

Bio-ecology, distribution and fisheries of *Amblyraja doellojuradoi*

A relatively common skate known to occur in the southeastern Pacific and southwestern Atlantic oceans: Punta Arenas, Chile through the Magellan Straits, to Argentina and the Falkland Islands (Malvinas). It occurs on the continental shelf and upper slopes from 51 to 967 m.

Oviparous, the species appears to breed in the autumn month in Argentinean waters, but very little else is known of its reproductive biology.

A regular bycatch in bottom trawl fisheries, but of minor commercial value in Chilean waters, it is increasingly being retained in Argentinean fisheries.

Dipturus trachyderma (Krefft and Stehmann, 1975)

Roughskin skate – *Raya espinuda*

Raya volantín espinosa (Chile)

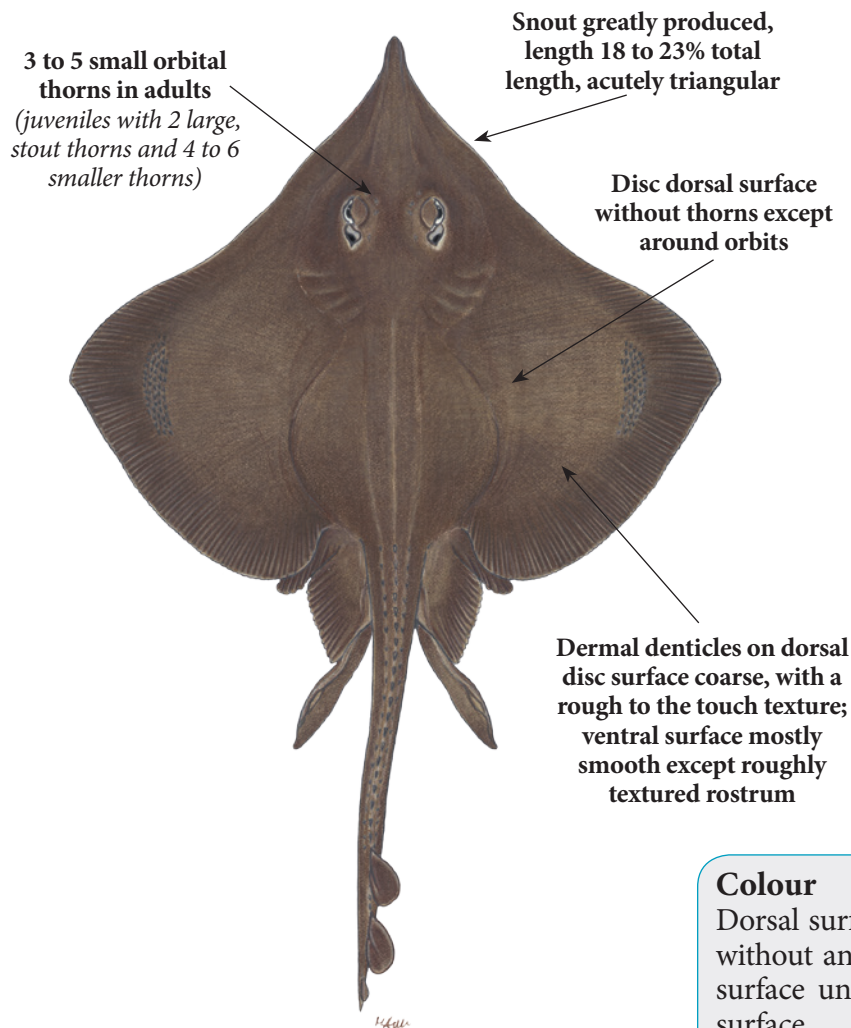
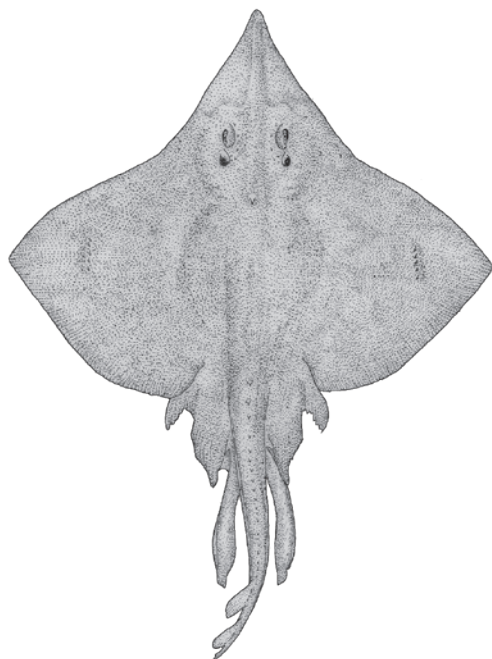


Photo source: eFish

Similar species

Zearaja chilensis

Externally the genera *Dipturus* and *Zearaja* cannot be separated morphologically; these two genera are only distinguished from each other based on adult male clasper characteristics



Colour

Dorsal surface uniformly dark grey to almost black, without any distinctive blotches or patterns; ventral surface uniformly grey, slightly lighter than dorsal surface.

Size

Maximum total length is at least 250 cm.



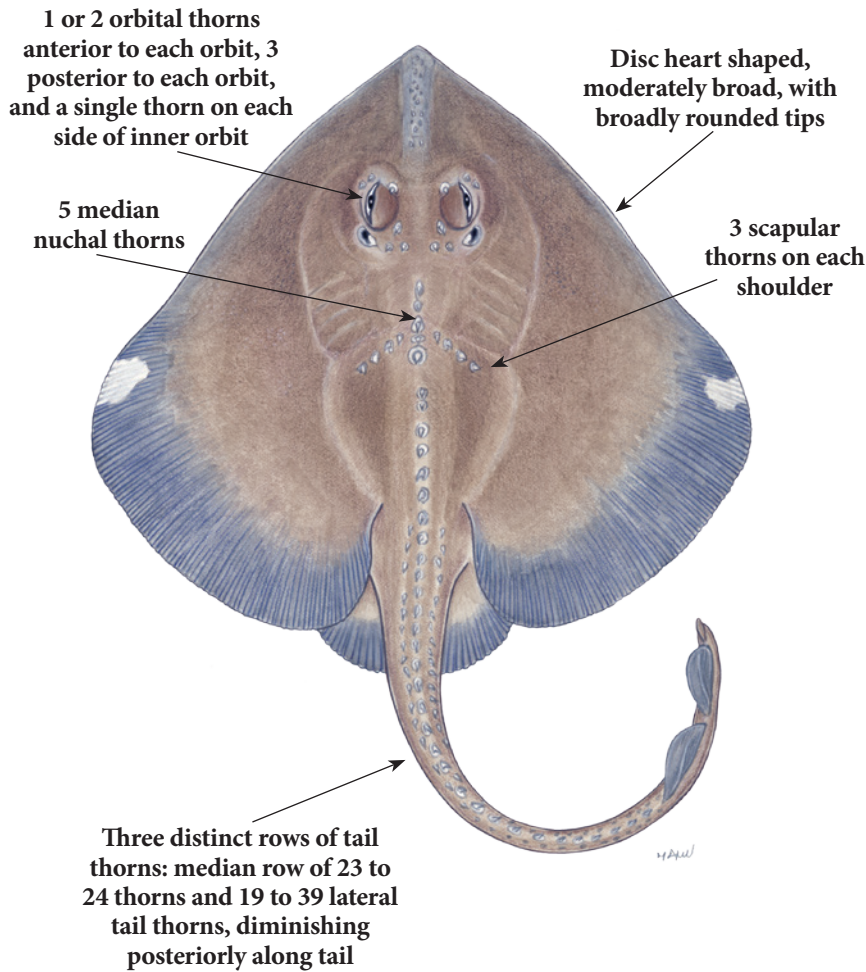
Bio-ecology, distribution and fisheries of *Dipturus trachyderma*

In FAO Area 87 it is known to occur from central Chile to the Beagle Channel. It occurs in deep temperate waters of the continental shelf and upper slope from 93 to 450 m deep, most common from 180 to 350 m deep. Oviparous, with very large, possibly the largest of any elasmobranch species, stout shaped egg capsules.

This is mainly a piscivorous feeding skate consuming *Macruronus novaezelandiae*, *Helicolenus lengerichi*, *Merluccius australis* and *Merluccius gayi*, but also crustaceans, mainly *Pterygosquilla armata*, in shallower depths.

This species is taken in both directed and indirect fisheries operating in central-southern Chile and inner waters off Patagonia, but species-specific data on landings for skates in this region is scarce and lacking for most fisheries only since 2004.

Galápagos skate



Colour

Dorsal coloration purplish grey to light brown, with white blotches on pectoral-fin tips; ventral surface darker than dorsal, except for distinct lighter areas around nasal, mouth, gill, abdomen, cloaca, and pectoral-fin tips.

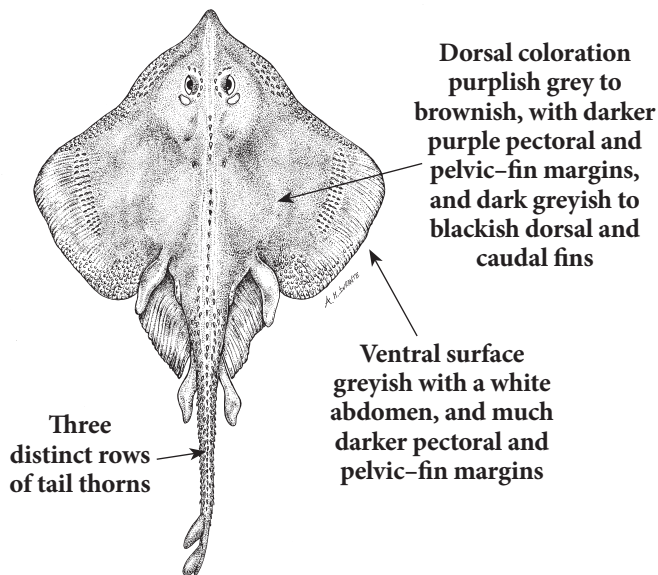
Size

Known only from two immature males measuring 38.5 cm and 24.5 cm total length.

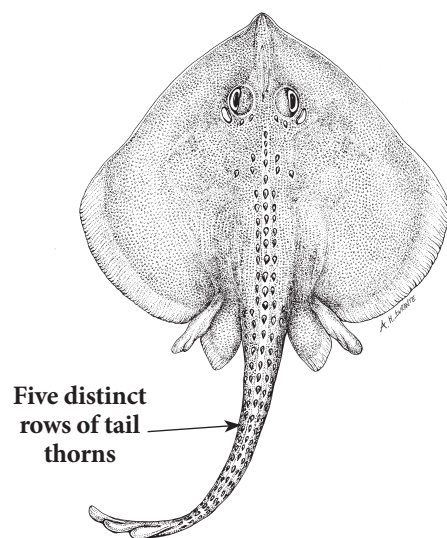


Similar species

Rajella sadowskii



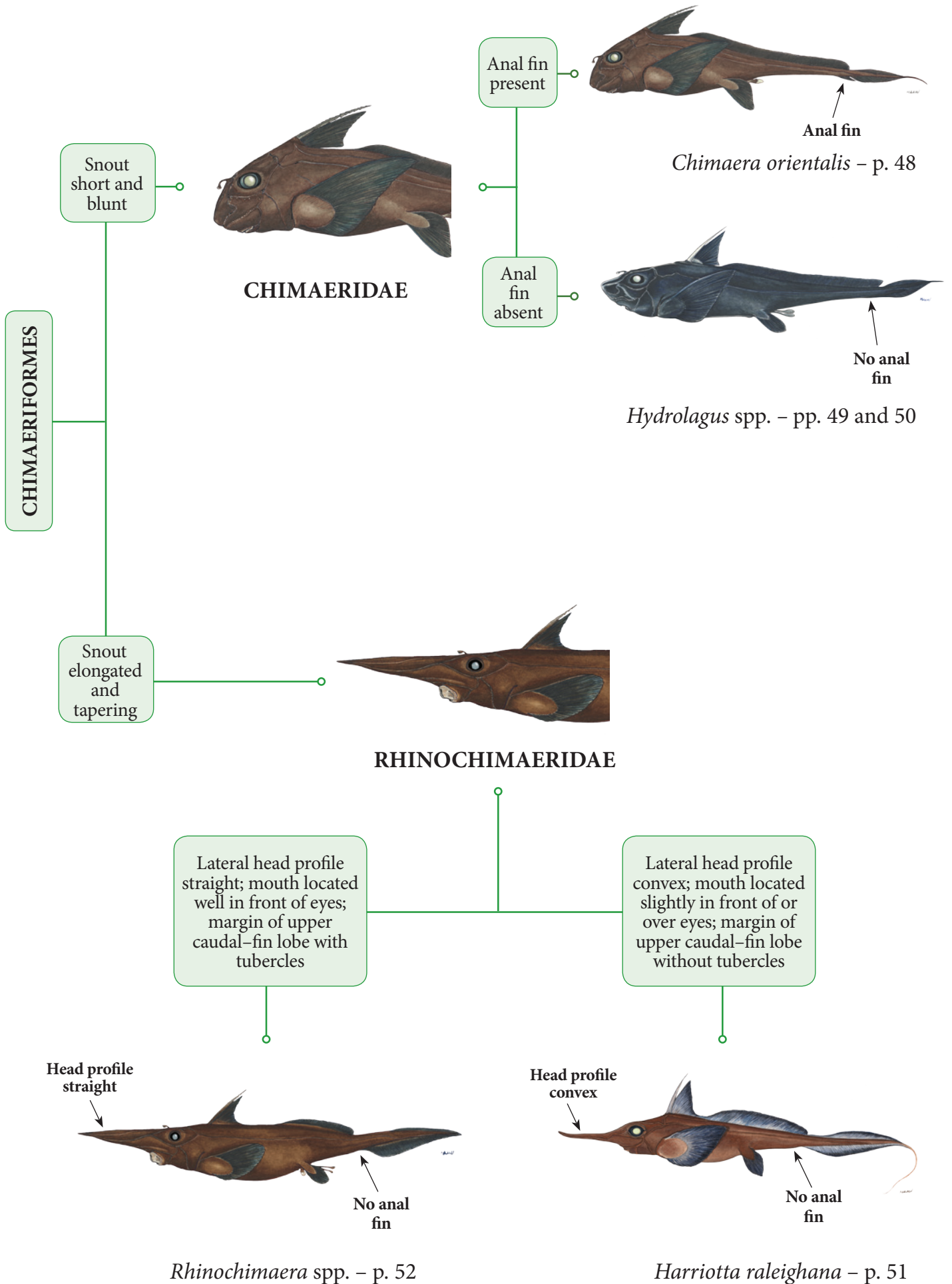
Rajella nigerrima



Bio-ecology and distribution of *Rajella eisenhardti*

In FAO Area 87 it is known to occur along steep slopes around the Galapagos Islands. Oviparous, but nothing else known about its reproductive cycle.

GUIDE TO THE FAMILIES AND GENERA OF SOUTHEASTERN PACIFIC DEEP-SEA CHIMAERIFORMES



Eastern Pacific black chimaera

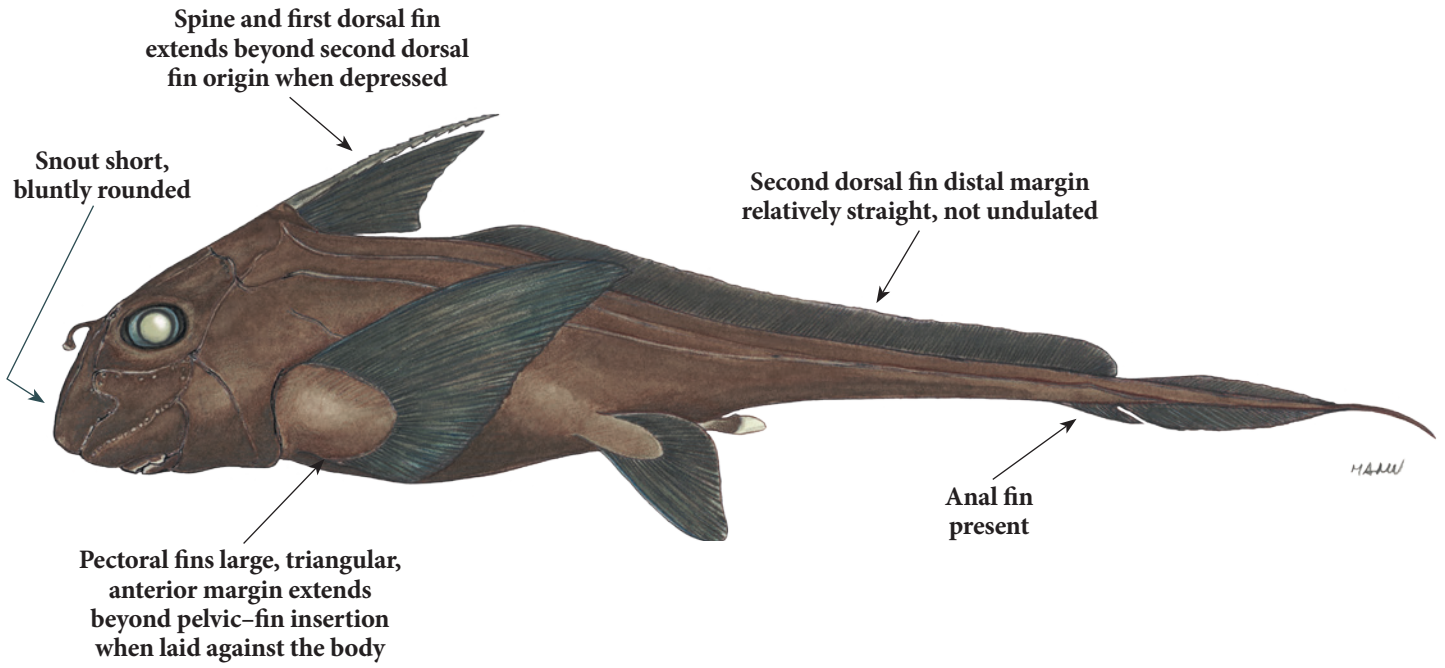


Photo: © Dave Ebert

Colour

Uniform dark brown with no distinct markings, mottling, or patterns; ventral trunk and fin surfaces slightly darker. Clasper bases lighter, becoming darker along rod, and lighter at tips.

Size

Maximum total length at least 85.8 cm (50.5 cm body length).



Similar species

This is the only *Chimaera* species known to occur in the southeastern Pacific Ocean. Five other shortnose chimaeras, belonging to the genus *Hydrolagus*, are present. These *Hydrolagus* species can be separated from the *Chimaera* species based on the fact that they lack the anal fin (see pages 49 and 50).

Bio-ecology and distribution of *Chimaera orientalis*

The Eastern Pacific black chimaera is known only from Costa Rica and Peru. Little is known about this species other than it occurs from 560 to 1138 m deep.

Interest to fisheries none, although maybe caught as bycatch in deep-sea fisheries.

Hydrolagus melanophasma James, Ebert, Long, and Didier, 2009

Eastern Pacific black ghostshark

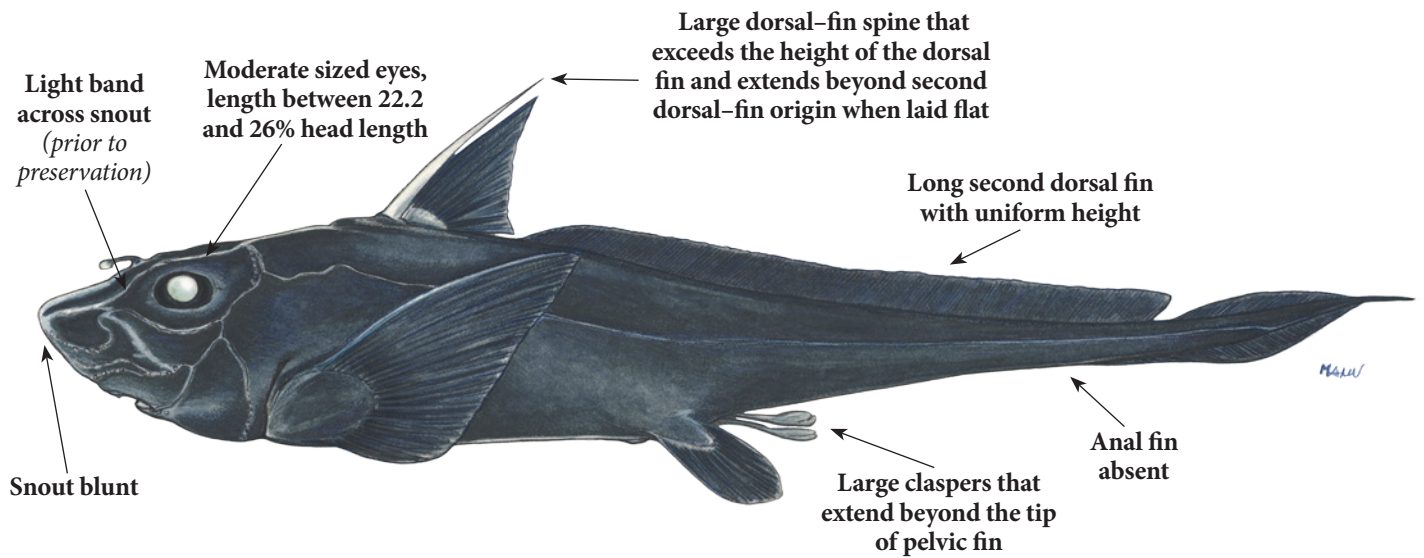


Photo: © D. Ross Robertson, www.stri.org/sfgc

Colour

In life, a uniform black with a lighter band over snout and slightly anterior to midpoint between eyes. After preservation lighter band fades with specimens becoming a uniform dark brown or purplish with no distinct markings or mottling.

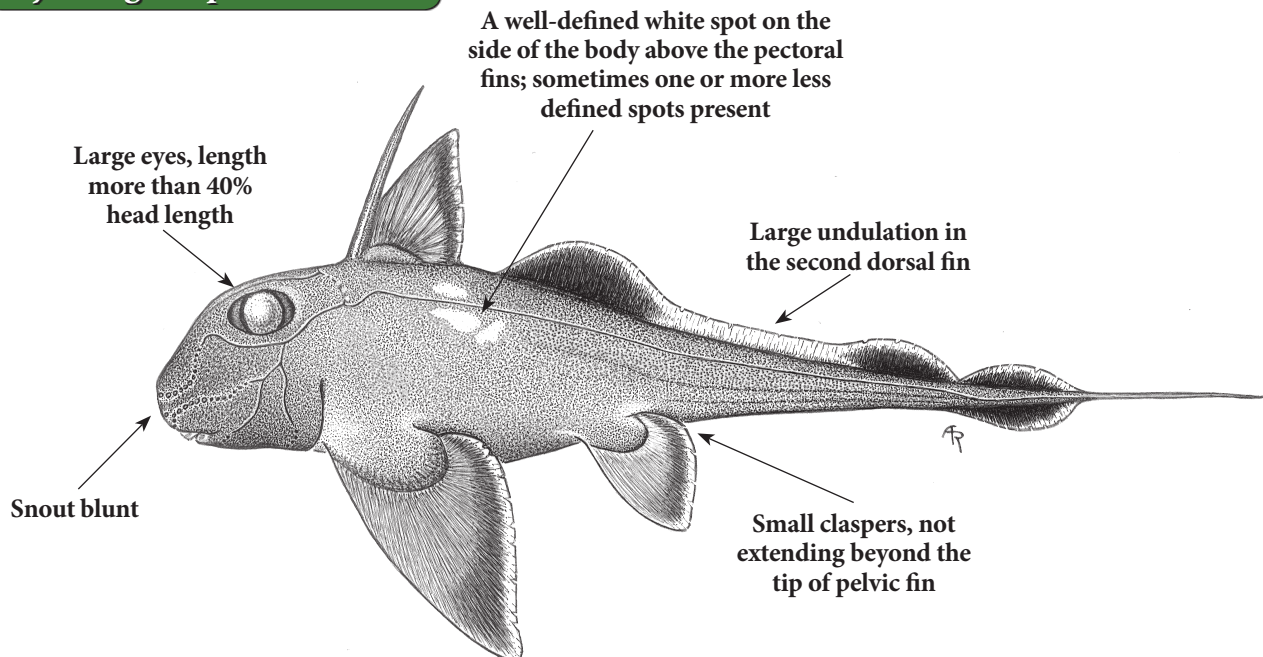
Size

Maximum total length at least 127.7 cm (91.8 cm body length).

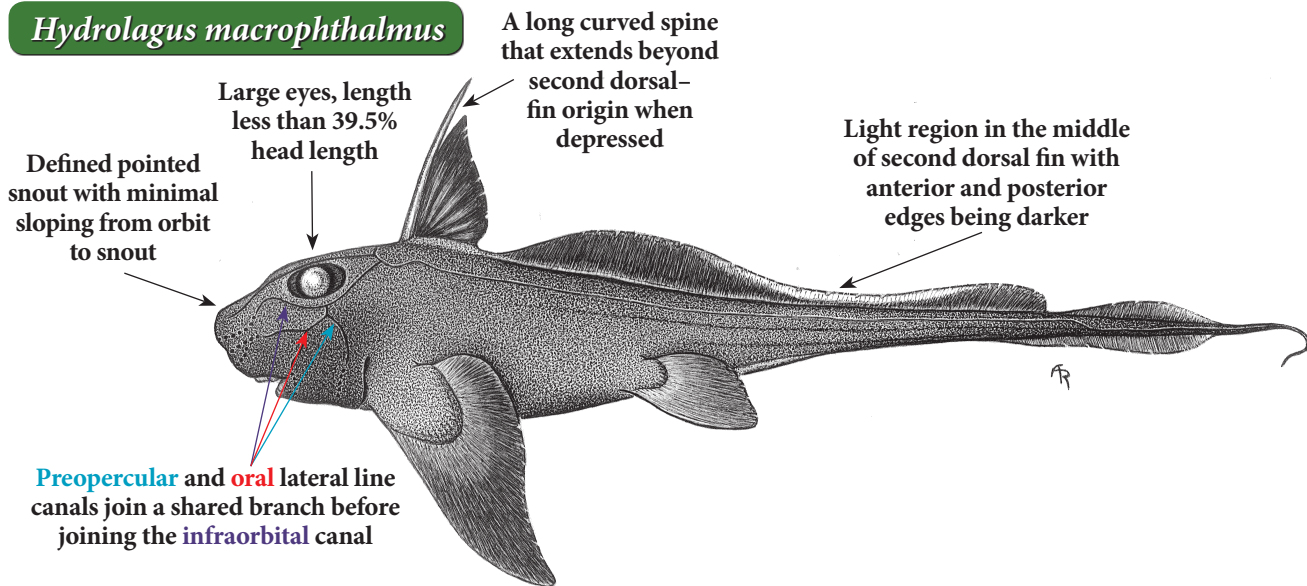


Similar species

Hydrolagus alpinus

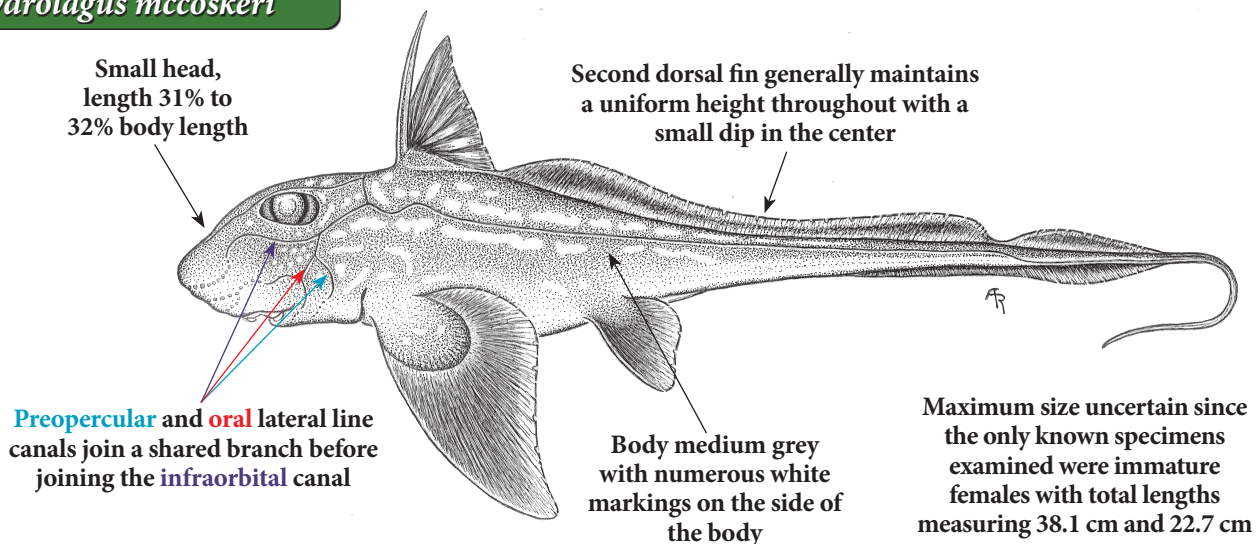


Hydrolagus macrophthalmus



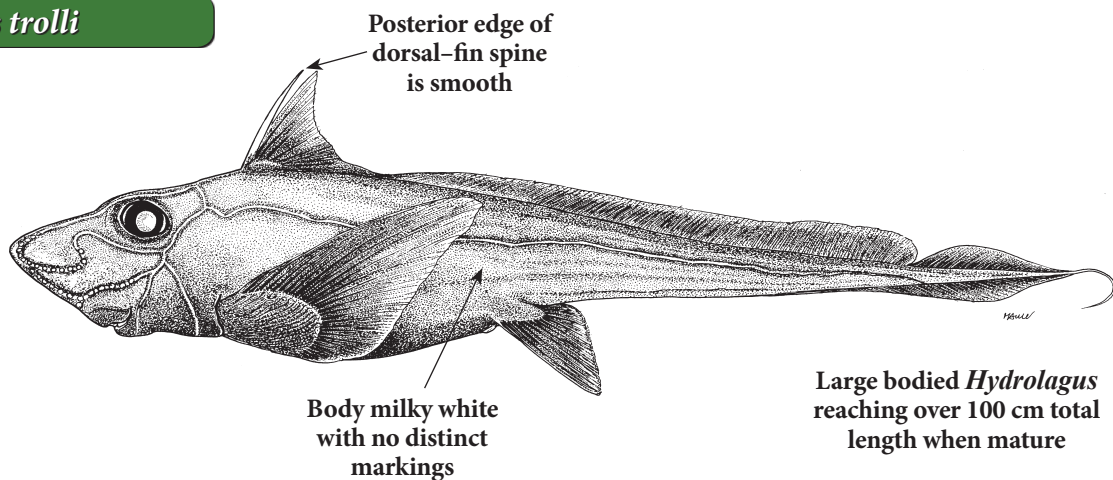
The following species are both lightly colored, either light brown or milky white as opposed to *Hydrolagus albus*, *H. melanophasma* and *H. macrophthalmus* that have all dark brown to black colorations with few or no light markings on body or fins.

Hydrolagus mccoskeri



Maximum size uncertain since the only known specimens examined were immature females with total lengths measuring 38.1 cm and 22.7 cm

Hydrolagus trolli



Large bodied *Hydrolagus* reaching over 100 cm total length when mature

Bio-ecology, distribution and fisheries of *Hydrolagus melanophasma*

A wide-ranging species first described from southern California (U.S.A.) and the Gulf of California (Baja Sur, Mexico), but now known to range from central California (Monterey Bay) all the way to southern Chile.

ROV observations reveal this species commonly inhabits soft-bottom or cobble patch substrates with little vertical relief. Individuals appear to have a close association with the sea floor, usually within a few meters, but not resting on the bottom. Depth range is from 565 to 1720 m.

Of no commercial value, but is occasionally taken as bycatch.

Harriotta raleighana Goode and Bean, 1895

Narrownose chimaera – Chimère de Raleigh – Quimera de Raleigh

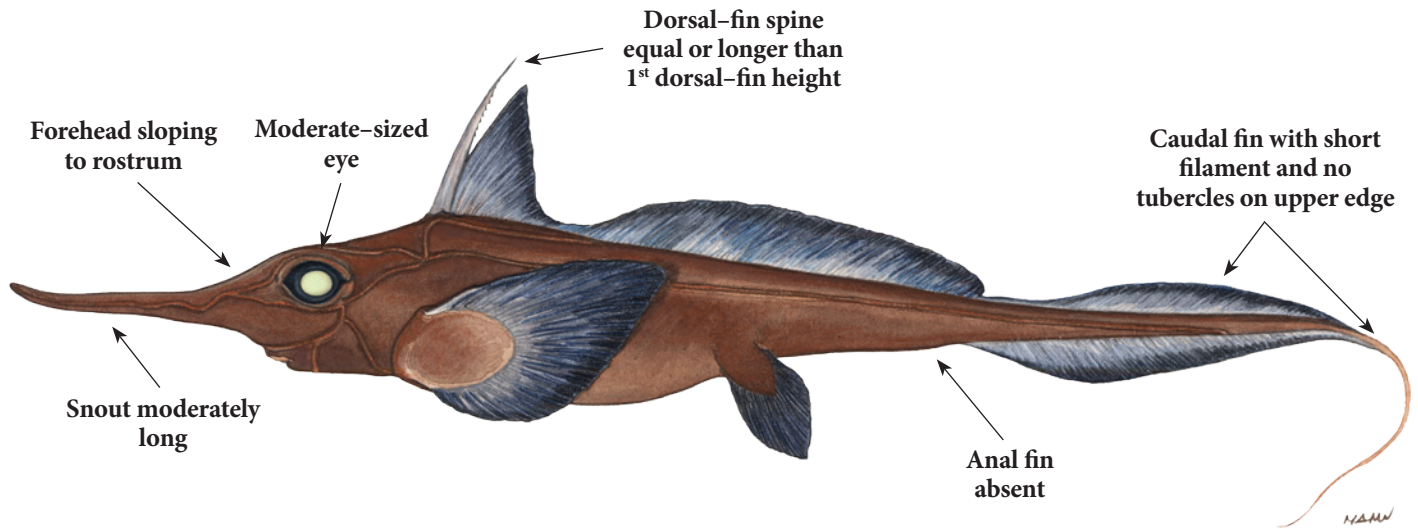


Photo: © M. Stehmann

Colour

Body colour uniform dark brown; fin edges much darker, pelvic fins blackish.

Size

Maximum length about 120 cm TL (70 cm precaudal length).



Similar species

This is the only *Harriotta* species known to occur in the southeastern Pacific Ocean. This wide-ranging longnose chimaera is occasionally mistaken with *Harriotta haeckeli*, another wide-ranging member of this genus characterized by a relatively small eye and dorsal-fin spine significantly shorter than height of first dorsal fin.

Bio-ecology and distribution of *Harriotta raleighana*

Poorly known deepwater longnose chimaera known to occur in FAO Area 87 off Peru. Its depth range is between 380 to 2600 m, although an unconfirmed Indian Ocean record was from only 100 m depth. It has been observed at depth by remote operated vehicles over soft mud and gravelly bottom substrates and on occasion in association with other deepwater chimaeras (*Hydrolagus* spp.).

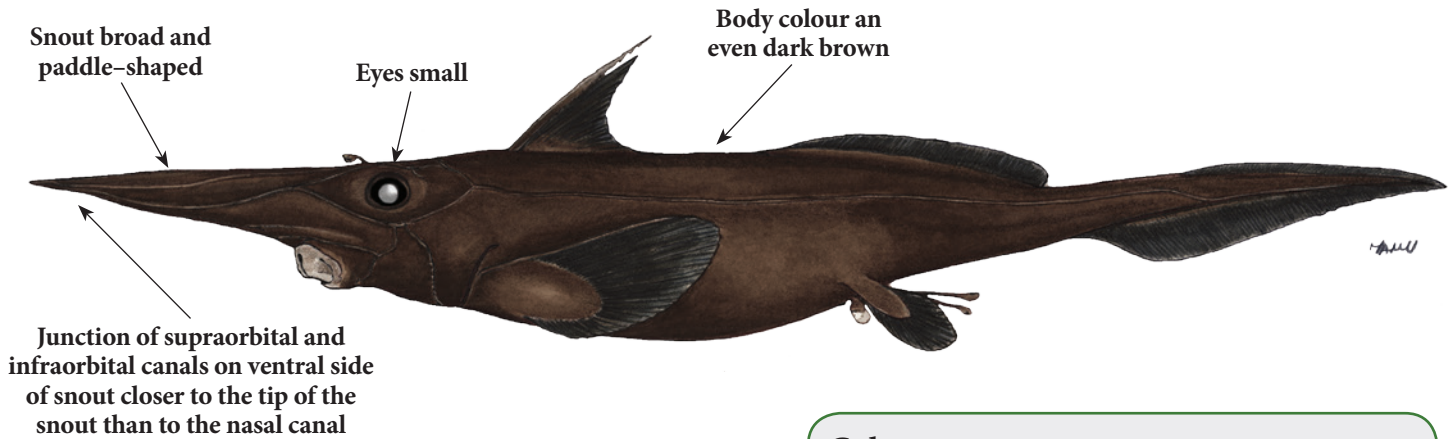
Oviparous, but little else known of its reproductive biology.

Diet little known, but includes a variety of polychaetes, molluscs, and other small benthic invertebrates and teleosts. Smaller *Harriotta raleighana* feed mainly on polychaetes, gastropods, and small crustaceans, but the diet of larger individuals shifts more to crustaceans.

There is no targeted fishery for this species, but it is likely taken as bycatch on occasion.

Rhinochimaera africana Compagno, Stehmann and Ebert, 1990

Paddlenose chimaera



Colour

Uniform dark brown to black, with no distinctive markings on body or fins.

Size

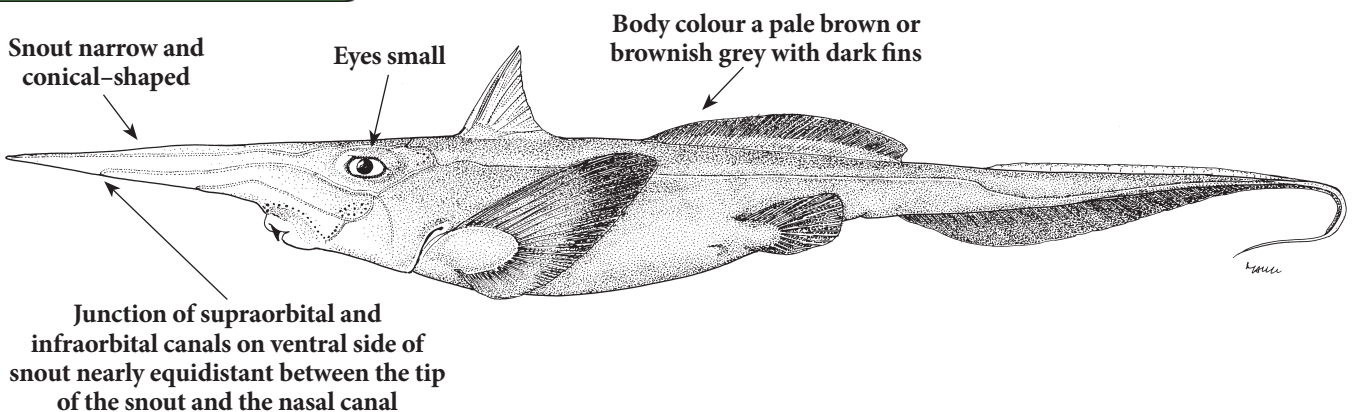
Maximum total length about 112 cm (body length about 65 cm). Adult males at 40 to 50 cm body length; females are adult at about 50 cm body length.



Photo: © D. Dagit

Similar species

Rhinochimaera pacifica



Bio-ecology, distribution and fisheries of *Rhinochimaera africana*

The paddlenose chimaera is known to occur in the southeastern Pacific Ocean from off Costa Rica and Peru. Also known from the western and eastern Indian Ocean, western Pacific and southeastern Atlantic.

It occurs from about 500 to at least 1500 m. It appears to occur mostly on soft-bottom habitats on deep-sea slopes and around seamounts.

Oviparous, but nothing else known of its reproductive biology or feeding habits.

Of no commercial value, this species is taken occasionally as bycatch in bottom trawl fisheries.

DEEP-SEA CARTILAGINOUS FISH SPECIES INCLUDED IN THE GUIDE

SHARKS

HEXANCHIFORMES

<i>Chlamydoselachus anguineus</i> – Frilled shark	8
<i>Heptranchias perlo</i> – Sharpnose sevengill shark	8
<i>Hexanchus griseus</i> – Bluntnose sixgill shark	8

LAMNIFORMES

<i>Odontaspis ferox</i> – Smalltooth sand tiger	9
<i>Pseudocarcharias kamoharai</i> – Crocodile shark	9
<i>Alopias superciliosus</i> – Bigeye thresher	10
<i>Cetorhinus maximus</i> – Basking shark	10

SQUALIFORMES

<i>Centrophorus squamosus</i> – Leafscale gulper shark	13
<i>Deania calcea</i> – Birdbeak dogfish	14
<i>Aculeola nigra</i> – Hooktooth dogfish	16
<i>Centroscyllium nigrum</i> – Combtooth dogfish	17
<i>Etmopterus granulosus</i> – Southern lanternshark	19
<i>Etmopterus pusillus</i> – Smooth lanternshark	21
<i>Centroscyrnus owstonii</i> – Roughskin dogfish	23
<i>Centroselachus crepidater</i> – Longnose velvet dogfish	25
<i>Zameus squamulosus</i> – Velvet dogfish	27
<i>Somniosus antarcticus</i> – Southern sleeper shark	29
<i>Euprotomicrus bispinatus</i> – Pigmy shark	30
<i>Heteroscymnoides marleyi</i> – Longnose pigmy shark	30
<i>Isistius brasiliensis</i> – Cookie cutter shark	31
<i>Mollisquama parini</i> – Pocket shark	32

CARCHARHINIFORMES

<i>Apristurus nasutus</i> – Largenose catshark	33
<i>Bythaelurus giddingsi</i> – Galápagos catshark	35

BATOIDS

TORPEDINIFORMES

<i>Tetronarce microdiscus</i> – Small disc torpedo ray	36
--	----

RAJIFORMES

<i>Bathyraja albomaculata</i> – Whitedotted skate	39
<i>Bathyraja griseocauda</i> – Graytail skate	41
<i>Amblyraja doellojuradoi</i> – Southern thorny skate	44
<i>Dipturus trachyderma</i> – Roughskin skate	45
<i>Rajella eisenhardti</i> – Galápagos skate	46

CHIMAERAS

CHIMAERIFORMES

<i>Chimaera orientalis</i> – Eastern Pacific black chimaera	48
<i>Hydrolagus melanophasma</i> – East Pac. black ghostshark	49
<i>Harriotta raleighana</i> – Narrownose chimaera	51
<i>Rhinochimaera africana</i> – Paddlenose chimaera	52

This fully illustrated guide is designed to assist with the identification of a selection of deep-sea cartilaginous fishes of the southeastern Pacific Ocean (FAO Fishing Area 87), that are of major, moderate or minor importance to fisheries.

In this region, the deep-sea chondrichthyan fauna is currently represented by 33 shark, 26 batoid and 9 chimaera species. This guide includes full species accounts for 23 shark, 6 batoid and 4 chimaera species selected as being the more difficult to identify and/or commonly caught. Each species is described, depicted with a colour illustration and photo, and key distinguishing features of similar-looking species occurring in the same area are highlighted allowing for easy and accurate identification in the field. Keys to the shark and batoid orders and families, together with keys to chimaera and skate genera are also provided.

This guide is intended to help fishery workers collecting catch data in the field in the identification of the cartilaginous fish species they might encounter. It is conceived to be updatable, offering the possibility to add new species accounts as new species are described.

ISBN 978-92-5-109472-3



9 7 8 9 2 5 1 0 9 4 7 2 3

I6349En/1/10.16