



# Fishes of the Ross Sea Region

A field guide to common species  
caught in the longline fishery

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Manatū Ahu Matua



New Zealand Aquatic Environment  
and Biodiversity Report No. 134

ISSN 1176-9440 (print)  
ISSN 1179-6480 (online)  
ISBN 978-0-478-43745-4 (print)  
ISBN 978-0-478-43741-6 (online)  
2014



FISHES OF THE ROSS SEA REGION. A field guide to common species caught in the longline fishery.

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Published by Ministry for Primary Industries (MPI)  
Wellington  
2014

ISSN 1176-9440 (print)  
ISSN 1179-6480 (online)  
ISBN 978-0-478-43745-4 (print)  
ISBN 978-0-478-43741-6 (online)

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Citation:

McMillan, P.J.; Marriott, P.; Hanchet, S.M.; Fenaughty, J.M.; Mackay, E.; Sui, H.; Wei, F. (2014).  
Fishes of the Ross Sea region. A field guide to common species caught in the longline fishery.  
*New Zealand Aquatic Environment and Biodiversity Report No. 134. 54 p.*

Requests for further copies should be directed to:

Publications Logistics Officer  
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PO Box 2526  
WELLINGTON 6140

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Telephone: 0800 00 83 33  
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This publication is also available on the Ministry for Primary Industries websites at:  
<http://www.mpi.govt.nz/news-resources/publications.aspx>  
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Cover photos:

Top – Icebergs, Ross Sea, Stuart Hanchet  
Centre – Catch of Antarctic toothfish (*Dissostichus mawsoni*), Stuart Hanchet, NIWA  
Bottom – Antarctic toothfish (*Dissostichus mawsoni*), Peter Marriott, NIWA

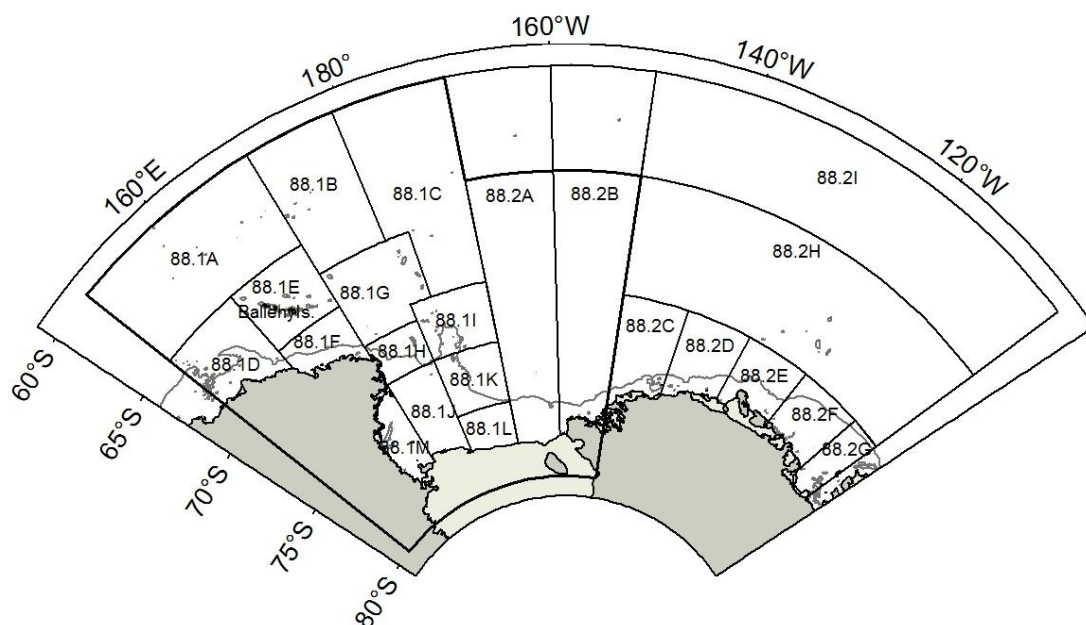
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## 1. PURPOSE OF THE GUIDE

This field guide was prepared to help observers, fishers, and biologists working on toothfish longline fishing vessels to identify the main species of fishes taken in the Ross Sea region of Antarctica (Figure 1). Technical terms are kept to a minimum, and identification features are mostly those that can be readily observed on freshly caught specimens without dissection or microscopic examination. The guide covers 30 fishes from 11 families including cartilaginous fishes (skates) and bony teleost fishes. It includes species that are commonly caught on longline hooks as well as smaller species that are not usually caught on hooks but are eaten by toothfish and observed in stomach contents, i.e., Antarctic dragonfishes (Bathypagrus), snailfishes (Liparidae), and eelpouts (Zoaridae), plus some species of crocodile icefishes (Channichthyidae), and cod icefishes (Nototheniidae). It does not cover all fishes caught in the Ross Sea region longline fishery over time. This is because there is uncertainty about the identification of some of the fishes, and taxonomic study (beyond the scope of this guide) is required to resolve problems with several species groups (Stewart & Roberts 2001, Roberts & Stewart 2001).



**Figure 1: CCAMLR Subareas 88.1 and 88.2 and small scale statistical areas (SSRUs), showing the Ross Sea region and SSRU 88.2C-G. Depth contours plotted at 1000 m.**

For each species there is an annotated colour image (if available), and text covering distinguishing features, colour, size, distribution, depth, similar species, notes on biology and ecology, and references. The information included for each species is largely based on literature rather than from field experience so we welcome suggested improvements to the text, and any additional photographs. The main source of information for this guide was “Fishes of the Southern Ocean” (Gon & Heemstra, 1990). The fish fauna of the Ross Sea was also summarised by Eastman & Hubold (1999). But the work of Clive Roberts and Andrew Stewart from the department of fishes at the Museum of New Zealand Te Papa Tongarewa (Te Papa) was pioneering with regards to knowledge of the fishes collected by Ministry for Primary Industries or MPI (formerly Ministry of Fisheries or MFish) observers from the Ross Sea (Roberts & Stewart 2001, Stewart & Roberts 2001). Observers have collected and returned material to Te Papa since about 1999. That material was preserved and registered and consequently Te Papa has a large and very valuable collection of Ross Sea region fishes taken as bycatch or extracted from the stomachs of fishes caught in the toothfish fishery. Particular species or families of fishes should be retained for Te Papa in future, and where this applies



a note has been added in the “Specimens required” field. In addition any fish species that does not appear in this guide should also be retained.

This guide is adapted from a format that was developed for earlier field identification guides prepared by NIWA and Te Papa staff (Naylor et al. 2005, Tracey et al. 2005). An earlier unpublished version of this guide was tested during the 2006–07 toothfish season and was then revised for the 2007–08 season. We envisage that the guide will continue to be updated in future as more species are returned to Te Papa and recorded in the literature. The information and images enabling this guide to be produced is stored on a database and can therefore be updated and improved to facilitate the production of future versions.

## **2. ORGANISATION OF THE GUIDE**

The guide has four main sections:

1. **External features of fishes.** Labelled illustrations of fishes showing the main features that are used in their identification, and clarifying some technical terms.
2. **Guide to families.** Recognising the family to which a species belongs is often the first step in identification. This species guide is arranged in taxonomic order by family. The family guide provides distinguishing features for each of the families covered here, plus a small image of an example species from each family.
3. **Guide to species.** This section makes up most of the guide, and consists of detailed species accounts.
4. **References, and indexes** for species common and scientific names, three-letter CCAMLR species code codes, and family common and scientific names.

## **3. METHODS USED FOR THE FAMILY AND SPECIES GUIDES**

### **(a) Guide to families**

Families are arranged in taxonomic order following Nelson (2006) “Fishes of the World”; so the first family listed is the Rajidae (hardnose skates) a group of relatively primitive cartilaginous fishes. Family scientific names and most of the family common names are also taken from Nelson (2006). Family names are numbered using the numbers in Nelson (2006) to aid locating the relevant part of the species guide. The text listing the distinguishing features for each family was adapted mainly from Gon & Heemstra (1990), and Nelson (2006). An ‘example species’ image for each family is provided as a quick visual guide to general body shape, although naturally there is considerable variation within a family. We have followed other researchers who have elevated Rajidae (numbered 48a) and Arhynchobatidae (48b) to family rather than the subfamilies of Nelson (2006).

### **(b) Guide to species**

Species within each family are arranged alphabetically by scientific name, i.e., by genus name then by species name. Selection of species for this guide was mainly based on lists of fishes recorded from the Ross Sea longline fishery (Hanchet et al. 2006), and from identification of specimens deposited in the Te Papa fishes collection (Roberts & Stewart 2001, Stewart & Roberts 2001).

The species guide contains the following fields:

1. Family scientific name. Eschmeyer (2010) and Nelson (2006) were used as the source of most family names but in a few cases individual researchers used their own knowledge of the recent literature to establish the family name. Family name numbers were largely those of Nelson (2006) supplemented by 'a' or 'b' where subfamilies listed in Nelson (2006) were elevated to family in the guide.
2. Family common name. Mostly taken from Nelson (2006).
3. Species scientific name. These were mostly taken from Gon & Heemstra (1990), and were then checked using Eschmeyer (2010) to verify that they were valid, current, and spelt correctly. In some cases Gon & Heemstra (1990) names were retained until changes can be confirmed, e.g., *Trematomus* was retained instead of *Pseudotrematomus*. Inevitably, a number of species require further taxonomic study to establish their valid scientific name, and the name used in this guide will be superseded.
4. Species common name. These were taken mainly from Gon & Heemstra (1990). For some species there is no common name and the family name was used instead, e.g., some of the icefishes.
5. Three letter CCAMLR species code. Codes for family or genus are listed where identification to species is not provided.
6. Species image. Where possible a new colour image of each species was taken and adjusted, sized and annotated with the principal distinguishing features and a size scale. Many of these images were taken specifically for this project during research surveys. Good specimens were selected from the catch, washed, fins and other structures pinned out on a polystyrene board, and painted with concentrated formalin. Images were captured using a digital SLR camera using photographic lights on a dove grey background. In some cases images were taken by observers. A line drawing was used for one species (*Coryphaenoides armatus*) because no image was available. The illustrations, as presented in the guide, are annotated with the principal distinguishing features and a size scale.
7. Distinguishing features. The main features that distinguish the species are provided.
8. Colour. The colours of live or freshly caught fish are described.
9. Size. The approximate maximum size was obtained from research length records and literature sources. FL = fork length, TL = total length, SL = standard length, all in cm.
10. Distribution. Mainly based on literature records, principally Gon & Heemstra (1990).
11. Depth. The commonly encountered depth range (m) from fisheries and literature records is listed, rather than the extreme depth records.
12. Similar species. The distinguishing features of similar species are given to enable comparison with the species initially identified. Similar species include some that are not covered in this guide.
13. Notes on biology and ecology. Data on mode of life such as spawning season, spawning area, behaviour, feeding are given where these are known.
14. Specimens required. A note is added if Te Papa requires specimens.
15. References. The literature used to compile the account for each species is listed alphabetically by author (year).

#### **4. DATA STORAGE AND RETRIEVAL**

Text and images are stored in a relational database (Species) created and maintained by NIWA. A web application built on top of the database allows the stored data to be retrieved in a specified format; the report that generates each species identification sheet was designed specifically for this project. Advantages of this database include easy editing of text or images, addition of new fields or tables, addition or deletion of species, and on-line access to the database.

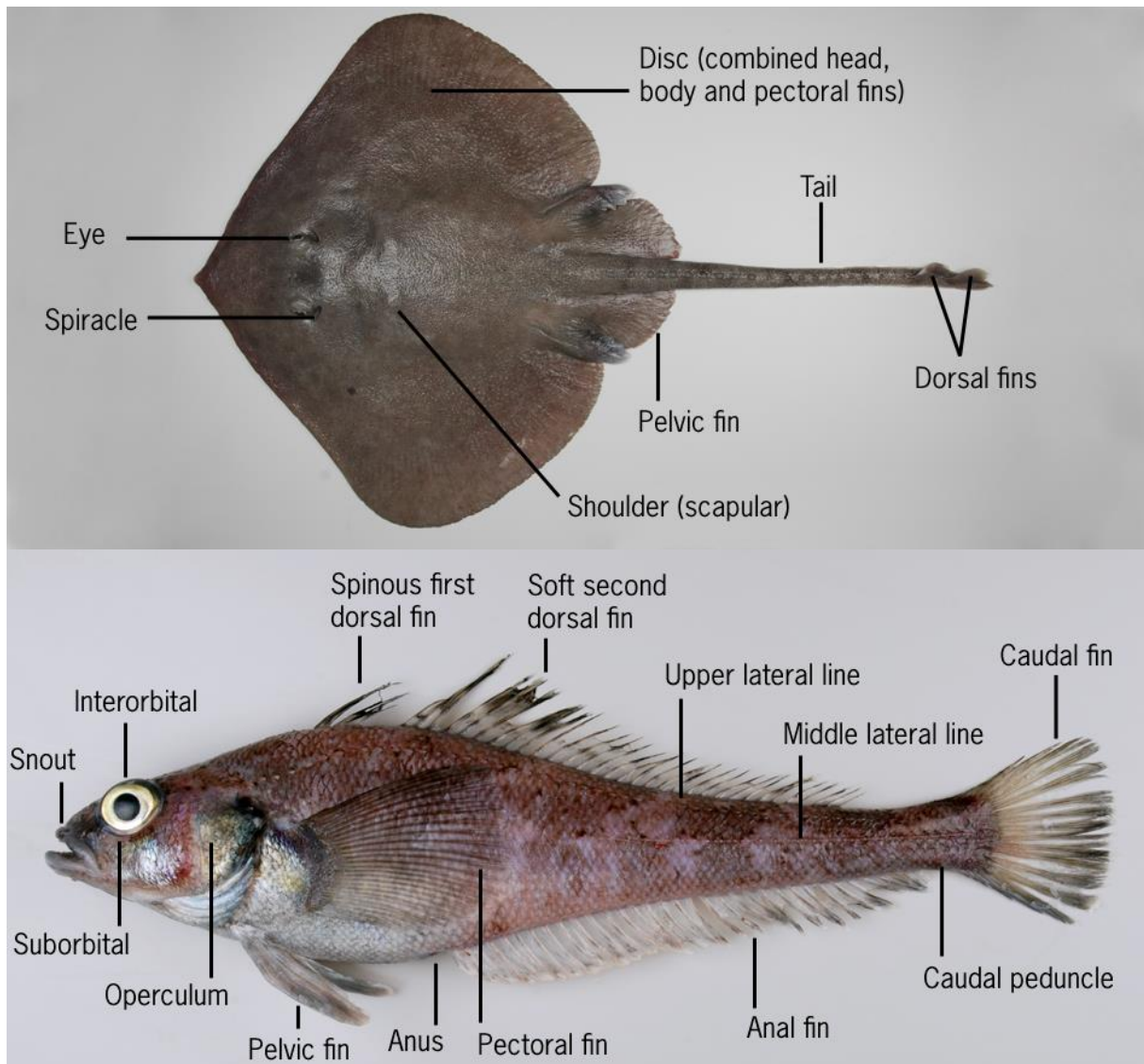
## 5. ACKNOWLEDGMENTS

Funding to produce this guide was provided initially by the Ministry for Primary Industries under research projects ANT200601, ANT200901, and ANT201201. We invited our Te Papa colleagues A. Stewart and C. Roberts to participate in this project but they were unable to take part because of prior work commitments. We are grateful for the help of a number of people who gave valuable advice or assistance including: Dr I. Everson (formerly British Antarctic Survey) provided advice about Antarctic fishes during the 2004 BIOROSS survey and also kindly provided a draft of the “CCAMLR Species Identification Sheets for Longline Fishing”. A. Stewart (Te Papa) for help with the list of fishes and with useful identifying features; M. Francis (NIWA) for help with skate identification; D. Tracey for advice on the methods used for previous guides; the observers who collected specimens for Te Papa and who took some of the images used in this guide including the right hand images of *Amblyraja georgiana*, *Bathyraja* cf. *eatonii*, and *Bathyraja maccaini*, and the images of *Macrourus holotrachys*, and *Lepidion* sp. M. Beardsell (NIWA) and M. Vignaux (MPI) edited the guide and S. Singh (NIWA) compiled the final version.



# **SECTION 1. EXTERNAL FEATURES OF FISHES**

The two illustrations below are labelled to show the principal features of skates and bony fishes that are used in their identification.



## GLOSSARY

Adapted from Gon & Heemstra (1990).

**Abdomen.** Belly region, containing stomach, intestines and reproductive organs (ovaries, testes).

**Anal fin.** Median fin on the underside of the body usually between the anus and the caudal fin.

**Anterior.** Front or head end.

**Anus.** The rear opening of the intestine located on the underside of the body usually just in front of the anal fin in bony fishes.

**Barbel.** Fleishy filament lacking rays or spines, usually located on the head and often sensory. Mostly only one, but there may be several, e.g., hagfish.

**Branchiostegal.** Rays and membrane inside and below the gill opening in bony fishes, located on the throat and lower head.

**Canine tooth.** Pointed cone-like tooth used for penetrating or holding prey.

**Cartilage.** Firm elastic tissue. In comparison bone is hard and solid.

**Caudal.** Tail.

**Caudal peduncle.** The part of the body just in front of the caudal fin and behind the rear base of the anal fin. Often narrow and sometimes bearing lateral (sideways-projecting) keels.

**Ctenoid scale.** A scale with fine spines or teeth on the rear surface and/or margin.

**Cusp.** The point or projection on a tooth. Some shark species have a central large cusp and smaller cusps on each side, i.e., total of three cusps per tooth.

**Cycloid scale.** A scale that is smooth and lacking fine spines or teeth on the rear surface and/or margin.

**Deciduous scale.** Scale that is easily removed or rubbed off.

**Demersal.** Living on or near the seafloor.

**Denticle.** Small tooth or tooth-like projection, usually on the body surface. Most sharks have skin covered with denticles giving a rough texture.

**Disc.** The flattened body of skates and rays consisting of the head, trunk, and enlarged pectoral fins.

**Disc width.** The straight-line distance between the widest points on the disc of skates and rays, measured from wingtip to wingtip.

**Dorsal.** Upper side or surface.

**Eye (orbit) diameter or length.** The greatest straight-line distance (often horizontal) between the bony margins of the eye.

**Fork length (FL).** The straight-line distance from the tip of the snout to the fork ("V") of the tail, usually measured for fishes that have a forked tail fin.

**Gill raker.** A bony tooth-like or brush-like projection on the gill arch, pointing into the throat cavity.

**Head length (HL).** The straight-line distance from the tip of the snout to the rear (most posterior part) of the bony operculum (gill cover).

**Interorbital.** The area between the eyes on the top of the head.

**Isthmus.** The ventral extension of the body below the head that separates the two gill chambers

**Lateral line.** A row of sensory pores or tubed (pored) scales in the skin, starting behind the head and running along the side of the body. Some of the Antarctic fishes have more than one lateral line.

**Maxilla.** A bone in the upper jaw located behind and above the other upper jaw bone – the premaxilla. Often flattened and broad posteriorly.

**Median fins.** Unpaired fins located in the middle of the upper or lower surface of the body, i.e., dorsal (one or more), caudal, and anal fins. In contrast to (see also) paired fins.

**Midwater.** Any part of the water column between the surface and the seafloor.

**Nape.** Upper part of the head behind the eyes.

**Nostril.** Small external opening for the nasal organs (smell, taste) on the head or upper body. Usually paired but sometimes single.

**Operculum.** Large flat bony plate on the side and rear of the head just behind the preoperculum; together they form the gill cover.

**Paired fins.** Fins that are paired and usually located on the sides of the body, i.e., pectoral and pelvic fins. In contrast to (see also) median fins.

**Papilla.** A small fleshy projection. Often found on the head, usually numerous and sensory.

**Pectoral fin.** Large paired fins on the side of the body just behind the gill opening(s). May be lost or reduced in some species.

**Pelagic.** Free swimming in the sea, and not usually associated with the seafloor. See also midwater.

**Pelvic fin.** Paired fins on the underside of the body and usually behind the pectoral fins. May be reduced and located on the throat in some species, e.g., eel cods (*Muraenolepis* spp.). Alternatively called ventral fin.

**Pored scale.** Also tubed scale. A lateral line scale that is associated with a sensory pore and has a hole or tube connecting the pore to the sea.

**Posterior.** Rear end.

**Predorsal.** The upper body just in front of the first dorsal fin.

**Premaxilla.** A bone in the upper jaw located in front of and below the other upper jaw bone – the maxilla. Often toothed.

**Preoperculum.** A flat bony plate on the side of the head in front of the operculum.

**Pyloric caeca.** Small tubes or sacs located at the rear end of the stomach and opening into the gut. Probably provide additional surface area for the digestion of food.

**Rostral.** Pertaining to the snout or rostrum.

**Scapular.** Relating to the front or shoulder region of the pectoral fin skeleton.

**Scute.** Enlarged, thickened scale relative to other body or lateral line scales. Usually arranged in rows along the body.

**Snout.** The head in front of the eyes. Snout length is the straight-line distance between the tip of the snout and the bony front rim of the eye.

**Spinule.** Small spine on the surface of some scales. May have distinctive shapes, e.g., spear-like, cone-like, can be very numerous, and are often arranged in rows.

**Spiracle.** An opening behind the eye in skates, rays, and some sharks, used for maintaining a flow of oxygenated water over the gills when the mouth is closed, e.g., when the fish is resting or slightly buried on the seafloor. See also nostril.

**Standard length (SL).** The straight-line distance from the tip of the snout to the rear end of the caudal skeleton (vertebra), usually measured for fishes that have a soft tail fin that is easily damaged.

**Suborbital ridge.** The ridge below the eye and running along the head, sometimes from the snout to near the rear of the lower head. May be armed with scutes or spines.

**Terminal.** Located at the end, e.g., terminal mouth is located at the front of the head as opposed to a sub-terminal mouth which is behind (and below) the tip of the snout.

**Total length (TL).** is the straight-line distance from the tip of the snout to the tip of the tail, usually measured for fishes which have a robust tail fin lacking a deep fork.

**Tubed/tubular scale.** Also pored scale. A lateral line scale that is associated with a sensory pore and has a hole or tube connecting the pore to the sea.

**Tubercle.** A projection on the surface of the skin, usually not sensory. See also papilla.

**Ventral.** Lower side or surface.

**Vomerine teeth.** Vomer is a bone on the midline of the roof of the mouth, often near the front, which may bear teeth.

## **SECTION 2. GUIDE TO FAMILIES**

**48a. Rajidae (hardnose skates)**

Snout supported by stout rostral cartilage in most species, broad disc with narrow slender tail, sharp hooked denticles or thorns on dorsal surface, no barbed sting on tail, five small ventral gill openings, oral teeth small rounded-oval shape, usually two small dorsal fins present.



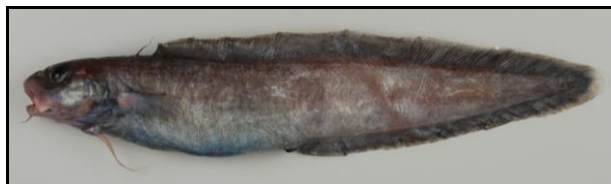
**48b. Arhynchobatidae (softnose skates)**

Snout supported by reduced soft slender rostral cartilage in most species, large broad flat disc with narrow slender tail, usually denticles or thorns on dorsal surface, no barbed sting on tail, five small ventral gill openings, oral teeth small rounded-oval shape, usually two small dorsal fins.



**212. Muraenolepididae (eel cods)**

Two dorsal fins, the first with two rays (one reduced), second dorsal, caudal, and anal fins connected, small chin barbel present, pelvic fins on throat with five rays, lateral line only on front part of body.



**215. Macrouridae (grenadiers, rattails)**

Elongate tapering tail, chin barbel usually present, two dorsal fins first with the front two rays spinous, exposed part of body scales usually covered with spinules.



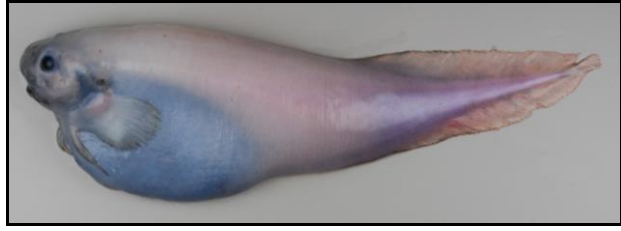
**216. Moridae (deepsea cods)**

No spines in fins, two or three dorsal fins, first dorsal fin short, second (and third if present) long, caudal fin separate from dorsal and anal fins.



**328. Liparidae (snailfishes)**

Tear-drop body shape with scale-less jelly-like skin, single dorsal and anal fin continuous with caudal fin, no fin spines and all rays un-branched, pectoral fin often divided with lower lobe looking like the pelvic fin, pelvic fin (sucking disc) absent in species of *Paraliparis*.



**416. Zoarcidae (eelpouts)**

Body and tail elongate (eel-shaped), single dorsal and anal fins continuous with caudal fin, pelvic fins tiny with 2–3 rays or absent, scales minute and embedded in the skin or absent.



**427. Nototheniidae (cod icefishes)**

Two separate dorsal fins, first with 3–11 flexible spines, second with 25–42 soft rays, body scaled, 1–3 lateral lines, branchiostegal membranes joined to and forming a fold across the isthmus.



**429. Artedidraconidae (barbeled plunderfishes)**

Operculum with a flattened hook at top rear, two separate dorsal fins, first with 1–7 flexible spines, second with 22–30 soft rays, scales absent on body and head, two lateral lines (upper and middle), chin barbel present.



**430. Bathydraconidae (Antarctic dragonfishes)**

Long body, one long-based dorsal fin without spines, anal fin usually shorter than dorsal fin and also without spines, body scaled, with bony plates, or lacking scales.



**431. Channichthyidae (crocodile icefishes)**

Snout spatulate, two separate dorsal fins, pectoral fin large and fan-like, operculum with small, simple, or branched spines at top rear, 2–3 lateral lines, body otherwise scale-less, gill rakers small or absent.



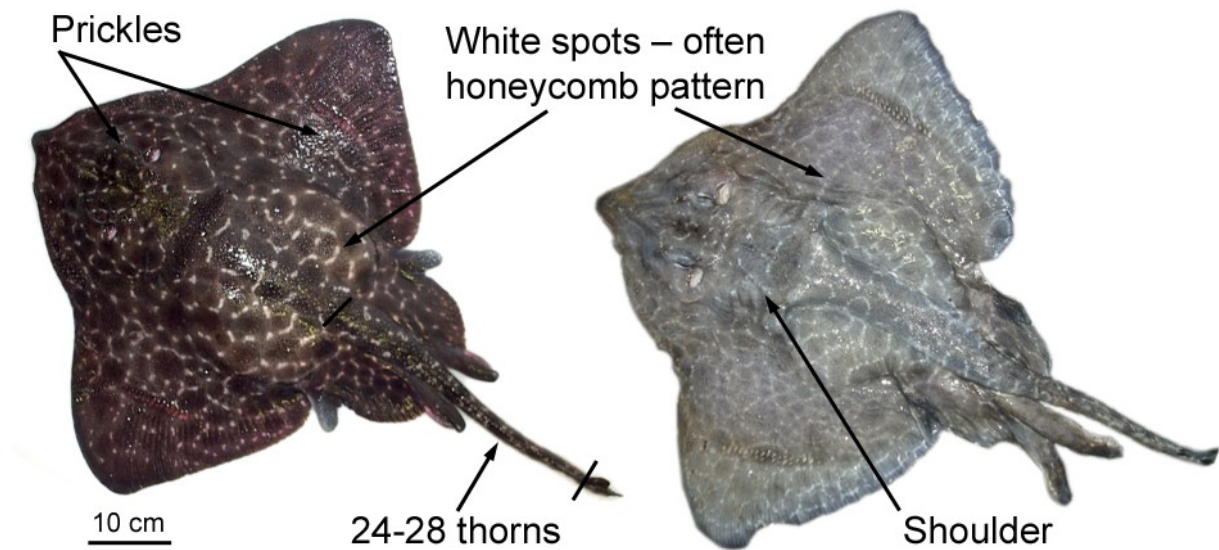




## **SECTION 3. GUIDE TO SPECIES**

**Family** 48 a. Rajidae (hardnose skates)

***Amblyraja georgiana* (Antarctic starry skate) (SRR)**



**Distinguishing features:** Entire upper surface of disc covered with coarse prickles. Prominent thorns present just in front of each eye and on each shoulder. 24 to 28 thorns in a median row from behind the shoulder to the first dorsal fin on tail. Upper surface of disc dark brownish-grey with numerous small whitish spots and lines often forming a reticulate or honeycomb pattern.

**Colour:** Upper surface of disc dark brownish-grey with numerous small whitish spots and lines sometimes forming a reticulate or honeycomb pattern. The upper surface of the disc in large/old individuals may be pale greyish with faint honeycomb pattern of pale lines and blotches. Lower surface of disc with off white and grey-brown patches and not a reliable character for identification.

**Size:** To about 120 cm TL.

**Distribution:** May be widespread in the Antarctic.

**Depth:** 20 to about 1600 m.

**Similar species:** Allometric skate (*Bathyraja* cf. *eatonii*) lacks thorns in front of eye and on shoulder, has 8 to 18 thorns on midline of tail, and prickles only on front margin and midline of upper disc. Macain's skate (*B. maccaini*) has upper disc with dark and pale oval spots, thorns in front of eye but only one thorn on shoulder, 9 to 15 large thorns on midline of tail, prickles on upper disc around outer margins and midline.

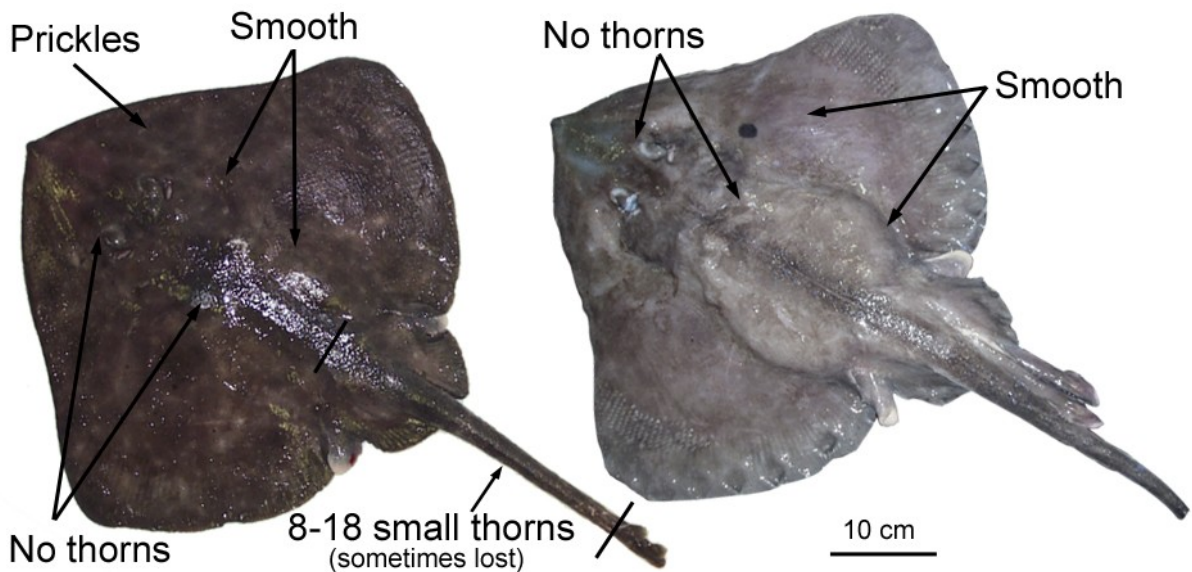
**Notes on biology / ecology:** Little known. Reach age of about 37 years.

**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Roberts & Stewart (2001), Stehmann & Bürkel (1990).

**Family** 48b. Arhynchobatidae (softnose skates)

***Bathyraja cf. eatonii* (Antarctic allometric skate) (BEA)**



**Distinguishing features:** Prickles on upper surface of disc confined to the anterior margin and midline with most of the rest of the disc smooth. No thorns in front of eyes and usually none or 1 to 2 (small individuals) thorns on midline in shoulder region. 8 to 18 small thorns in a median row along the tail ahead of first dorsal fin.

**Colour:** Upper surface of disc usually greyish-brown, sometimes with indistinct dark and pale oval spots. Lower surface of disc whitish, sometimes with blackish spots and not a reliable character for identification.

**Size:** To about 125 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 15 to about 1600 m.

**Similar species:** Antarctic starry skate (*Amblyraja georgiana*) has many small white spots and lines on upper disc, thorns in front of eye, 2 to 3 thorns on shoulder, 24 to 28 thorns on midline of tail, upper disc covered with prickles. Macain's skate (*Bathyraja maccaini*) has thorns in front of eye but only 1 thorn on shoulder, 9 to 15 large thorns on midline of tail, prickles on upper disc around outer margins and midline. Dwarf skate (*Bathyraja* sp.) has upper disc entirely covered with prickles, lacks thorns in front of eye and on shoulder, and has 18 to 29 thorns on midline of tail.

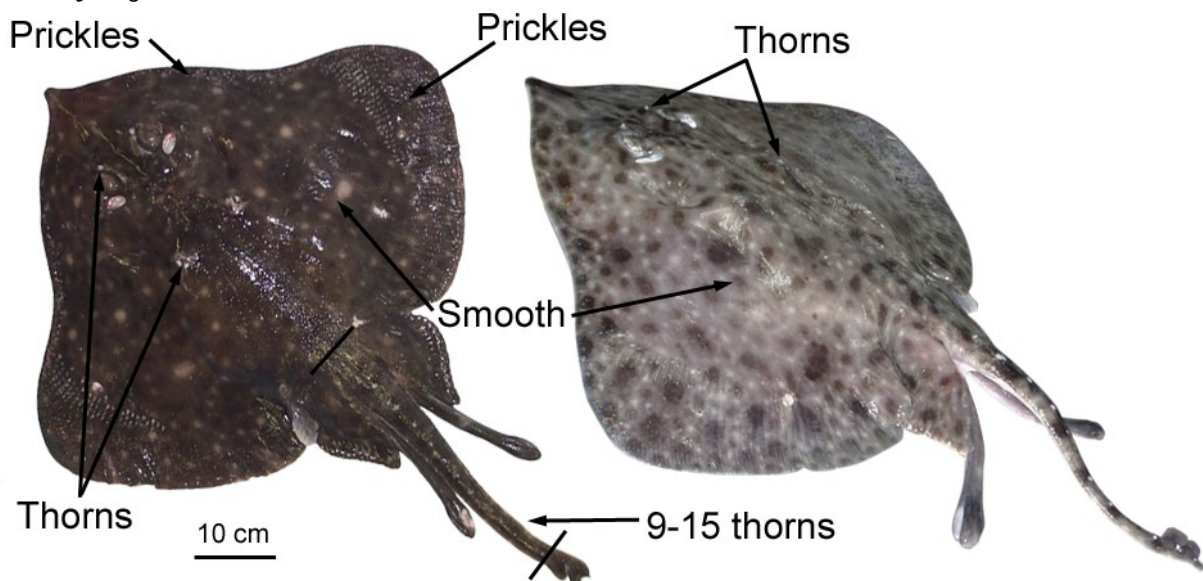
**Notes on biology / ecology:** Little known.

**Specimens required:** Please refer to any separate annual request for this species.

**References:** Roberts & Stewart (2001), Smith et al. (2008), Stehmann & Bürkel (1990).

**Family** 48b. Arhynchobatidae (softnose skates)

***Bathyraja maccaini* (Maccain's skate) (BAM)**



**Distinguishing features:** Prickles on upper surface of disc confined to broad bands around outer margins and along midline. Large area in the central part of the wing (pectoral fin) smooth. One prominent thorn present just in front of each eye, and sometimes one thorn behind each eye (may be lost resulting in a scar). Also one thorn on each shoulder, and 9 to 15 thorns on midline along the tail ahead of first dorsal fin.

**Colour:** Upper surface of disc greyish-brown usually with small distinct pale oval spots and less distinct dark mottling and dark oval spots. Lower surface of disc whitish but large specimens may have some dark blotches and not a reliable character for identification.

**Size:** To about 120 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 10 to about 600 m.

**Similar species:** Antarctic starry skate (*Amblyraja georgiana*) has many small white spots and lines on upper disc, thorns in front of eye, 2 to 3 thorns on shoulder, 24 to 28 thorns on midline of tail, upper disc covered with prickles. Antarctic allometric skate (*Bathyraja* cf. *eatonii*) lacks thorns in front of eye and on shoulder, has 8 to 18 thorns on midline of tail, and prickles only on front margin and midline of upper disc. Dwarf skate (*Bathyraja* sp.) has upper disc entirely covered with prickles, lacks thorns in front of eye and on shoulder, and has 18 to 29 thorns on midline of tail.

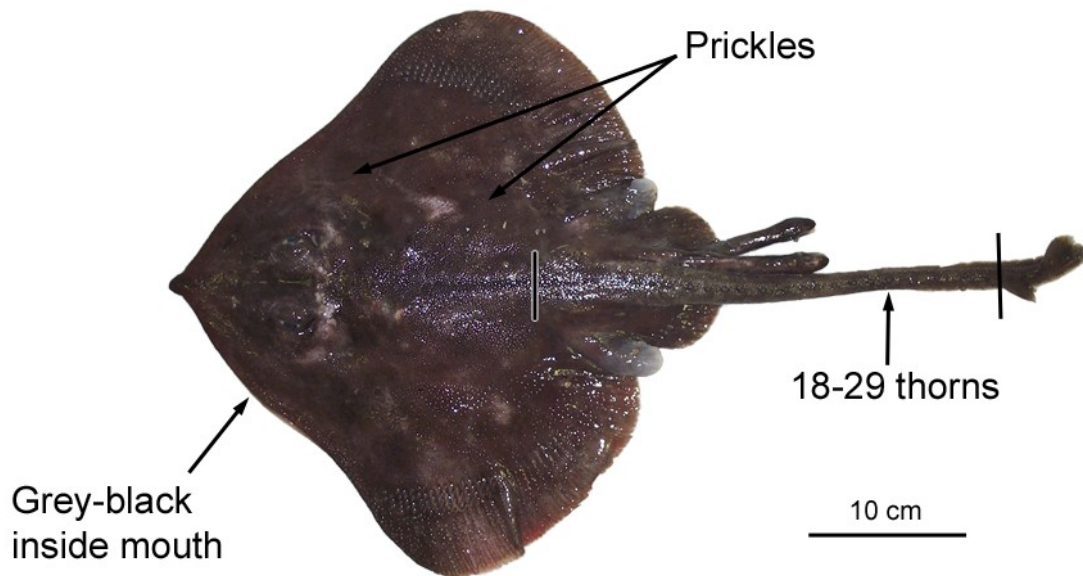
**Notes on biology / ecology:** Little known.

**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Roberts & Stewart (2001), Smith et al. (2008), Stehmann & Bürkel (1990).

**Family** 48b. Arhynchobatidae (softnose skates)

***Bathyraja* sp. (Antarctic dwarf skate) (BHY)**



**Distinguishing features:** Upper surface of disc entirely covered with coarse prickles. 18 to 29 thorns on the midline of the tail ahead of the first dorsal fin. Inside of mouth and nasal openings (underside) greyish or blackish.

**Colour:** Upper surface of disc greyish-brown often with indistinct pale spots and squiggles. Greyish to blackish inside mouth and nasal area. Lower surface of disc usually whitish and not a reliable character for identification.

**Size:** To about 80 cm TL.

**Distribution:** Probably widespread in the Antarctic.

**Depth:** Unknown.

**Similar species:** Antarctic allometric skate (*Bathyraja* cf. *eatonii*) has prickles only on front margin and midline of upper disc, and has 8 to 18 thorns on midline of tail. Macain's skate (*B. macaini*) has thorns in front of eye and on shoulder, and 9 to 15 large thorns on midline of tail. Antarctic starry skate (*Amblyraja georgiana*) has many small white spots and lines on upper disc, thorns in front of eye, 2 to 3 thorns on shoulder, and 24 to 28 thorns on midline of tail.

**Notes on biology / ecology:** Little known.

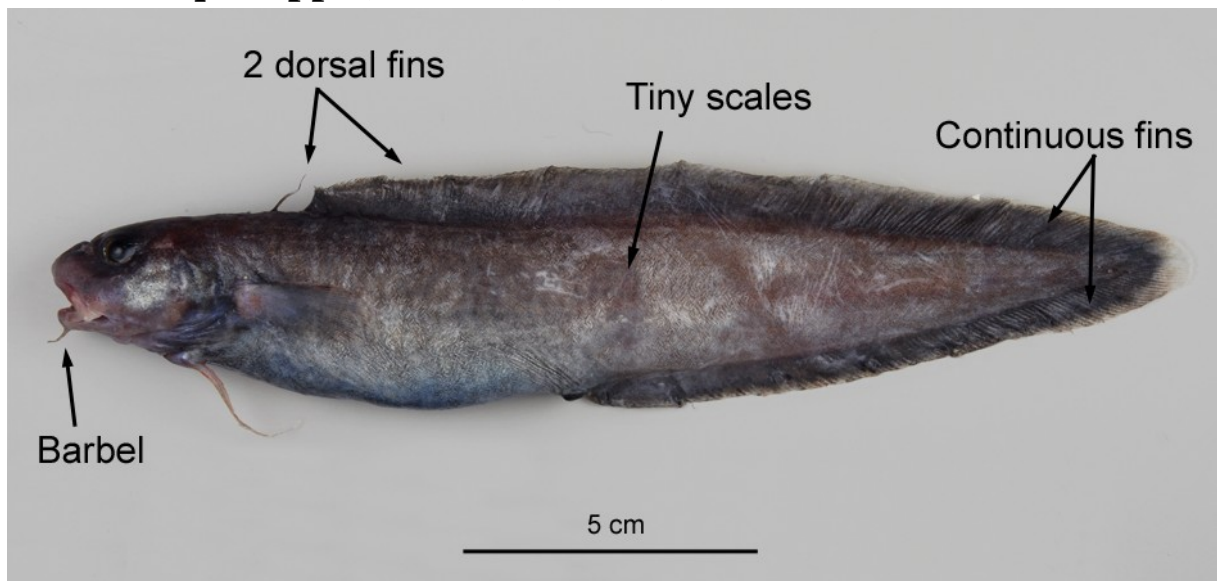
**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Roberts & Stewart (2001), Smith et al. (2008), Stehmann & Bürkel (1990).



**Family** 212. Muraenolepididae (eel cods)

***Muraenolepis* spp. (Eel cods) (MRL)**



**Distinguishing features:** Body elongate. Two dorsal fins, the first small with only 2 rays. Chin barbel present. Second dorsal, caudal, and anal fins are joined giving a continuous fin around the tail. Body scales (tiny) forming a basket-work pattern on the skin.

**Colour:** Variably brownish or reddish upper and paler lower body. Fading to grey on death.

**Size:** To at least 40 cm TL.

**Distribution:** Widespread in the Subantarctic and Antarctic.

**Depth:** 10 to about 2000 m.

**Similar species:** There are five nominal species in the genus *Muraenolepis* but published differences do not reliably separate the species. Eelpouts (Zoarcidae) and snailfishes (Liparidae) have a single dorsal fin, and lack a chin barbel.

**Notes on biology / ecology:** Little known. Reach age of about 10 years.

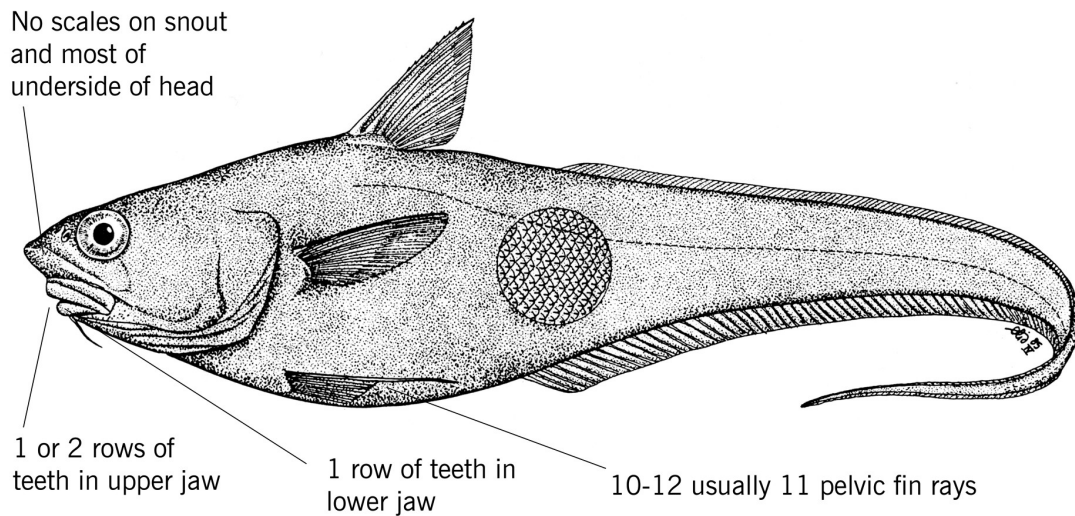
**Specimens required:** Please return a selection for the Museum.

**References:** Chiu & Markle (1990), Roberts & Stewart (2001).



**Family** 215. Macrouridae (grenadiers, rattails)

***Coryphaenoides armatus* (Cosmopolitan grenadier) (CKH)**



**Distinguishing features:** No scales on most of underside of head including snout, below most of suborbital ridge, tip of lower jaw. 1 (large adults) or 2 rows of teeth in upper jaw (premaxilla) and 1 row in lower jaw. Pelvic fin with 10 to 12, usually 11 rays. Body scales thin and deciduous. Scales on head ridges (snout, eye, suborbital ridge) spiny and adherent. 11 to 14 pyloric caeca. Eye small, about same as snout length.

**Colour:** Dark brown to blackish overall. Fins blackish in large but paler in small specimens.

**Size:** To about 102 cm TL.

**Distribution:** Worldwide.

**Depth:** 2000 to 4700 m.

**Similar species:** Other grenadiers, genus *Macrourus* have a large eye, greater than snout length, strong raised spinules on body scales, and 8 to 9 pelvic fin rays. Antarctic grenadier (*Coryphaenoides ferrieri*) has underside of head lacking scales, 10 to 11 pelvic fin rays, body scales with coarse spinules, greyish-brown body and dark brownish fins. *C. lecointei* has underside of head mostly covered with scales except for naked underside of snout, 10 to 11 pelvic fin rays, body and fins pale brownish or off-white.

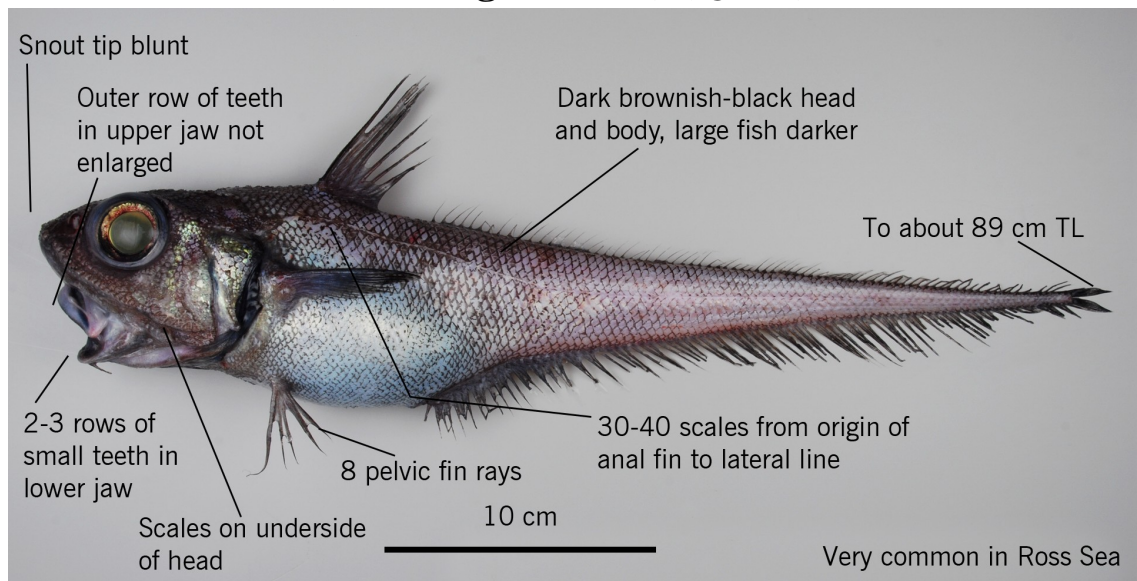
**Notes on biology / ecology:** Little known.

**Specimens required:** Please retain a selection for the Museum.

**References:** Iwamoto (1990a & b), Günther (1887).

**Family** 215. Macrouridae (grenadiers, rattails)

***Macrourus caml* (CAML grenadier) (QMC)**



**Distinguishing features:** 8 pelvic fin rays. 2 to 3 rows of small uniform teeth in lower jaw. 4 to 5 rows of small uniform teeth in upper jaw. Snout tip blunt. Dark brownish-black head and body, larger fish darker. Scales on most of underside of head and lower jaw but no scales under snout in front of mouth. 30 to 40 scales in a diagonal row from origin of anal fin to (not including) lateral line scale.

**Colour:** Dark brownish-black head and body, larger fish darker. Fins dark brownish-black.

**Size:** To about 89 cm TL.

**Distribution:** Probably widespread in the Antarctic.

**Depth:** 350 to 1660 m.

**Similar species:** Whitson's grenadier (*Macrourus whitsoni*) has 9 pelvic fin rays, 1 row of slightly enlarged teeth in lower jaw, outer row of enlarged teeth in upper jaw. Ridge scaled grenadier (*M. carinatus*) has 2 to 5 rows of small uniform sized teeth in lower jaw, 19 to 25 scales from origin of anal fin to lateral line. Bigeye grenadier (*M. holotrachys*) has no scales on underside of head.

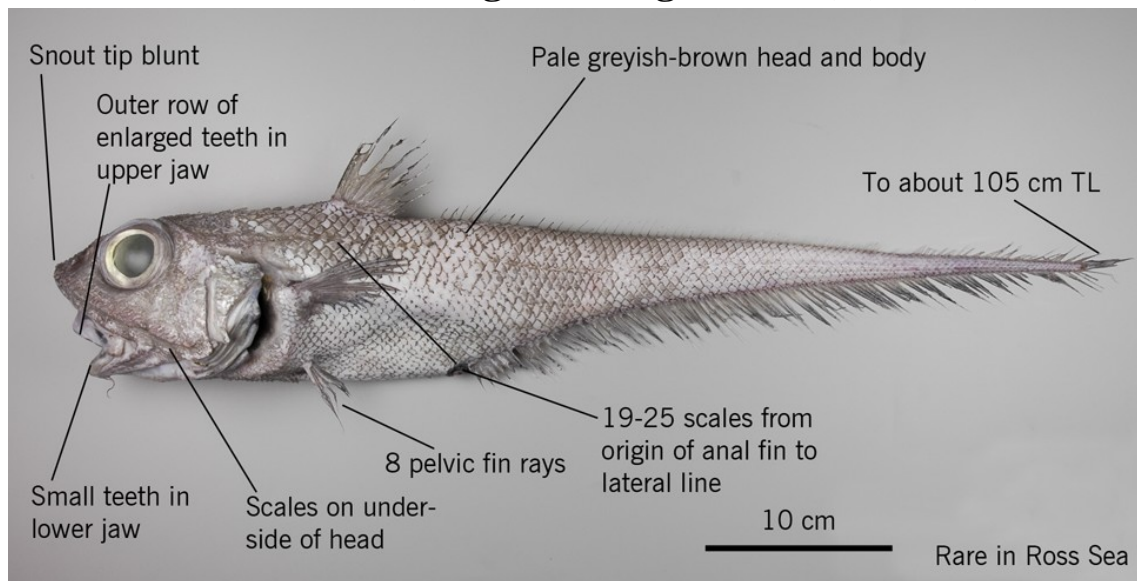
**Notes on biology / ecology:** May reach age of about 55 years.

**Specimens required:** Please refer to any annual requests for this species.

**References:** Iwamoto (1990a & b), McMillan et al. (2012), Roberts & Stewart (2001), Smith et al. (2011).

**Family** 215. Macrouridae (grenadiers, rattails)

***Macrourus carinatus* (Ridge scaled grenadier) (MCC)**



**Distinguishing features:** 8 pelvic fin rays. 2 to 5 rows of small uniform sized teeth in lower jaw. Outer row of enlarged teeth (3 to 6 rows total) in upper jaw. Snout tip blunt. Pale greyish-brown head and body. Scales on most of underside of head and lower jaw but no scales under snout in front of mouth. 19 to 25 scales in a diagonal row from origin of anal fin to (not including) lateral line scale.

**Colour:** Pale greyish-brown head and body. Greyish-brown fins.

**Size:** To about 105 cm TL.

**Distribution:** Probably widespread in temperate to Subantarctic waters of the southern hemisphere from about 37 to 65 S.

**Depth:** 400 to 1500 m.

**Similar species:** Whitson's grenadier (*Macrourus whitsoni*) has 1 row of slightly enlarged teeth in lower jaw, 36 to 45 scales from origin of anal fin to lateral line scale. CAML grenadier (*Macourus caml*) has 8 pelvic fin rays, 4 to 5 rows of small uniform teeth in upper jaw, 30 to 40 scales from origin of anal fin to lateral line. Bigeye grenadier (*M. holotrachys*) has no scales on underside of head.

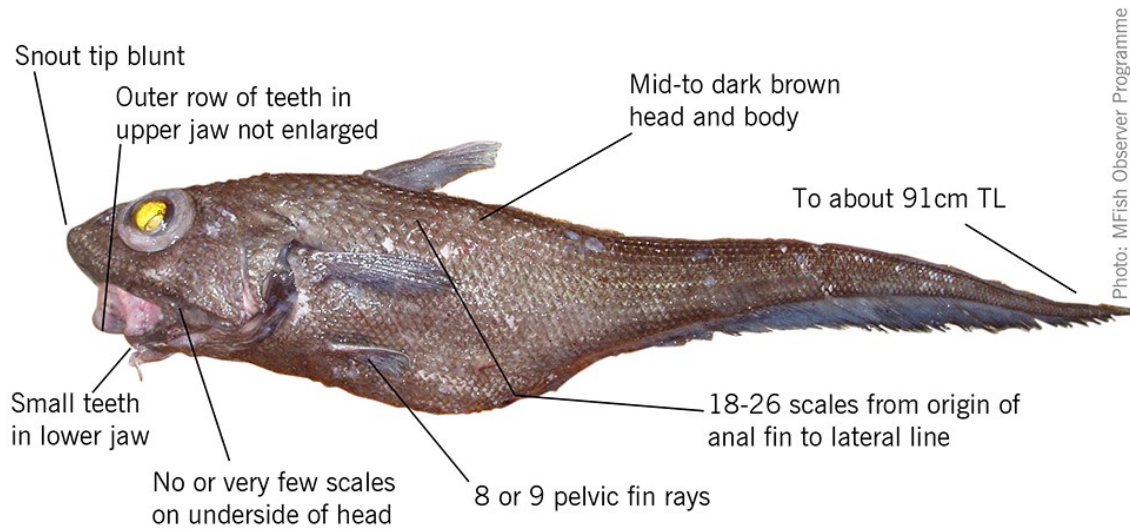
**Notes on biology / ecology:** Little known.

**Specimens required:** Please retain any specimens identified from the Ross Sea for the Museum.

**References:** Iwamoto (1990a & b), McMillan et al. (2012), Roberts & Stewart (2001), Smith et al. (2011).

**Family** 215. Macrouridae (grenadiers, rattails)

***Macrourus holotrachys* (Bigeye grenadier) (MCH)**



**Distinguishing features:** 8 or 9 pelvic fin rays. 2 to 5 rows of small uniform sized teeth in lower jaw. 4 to 6 rows of small uniform sized teeth in upper jaw. Snout tip blunt. Mid to dark brown head and body. No scales on most of underside of head but may be a few small scales near rear of head and on lower jaw. 18 to 26 scales in a diagonal row from origin of anal fin to (not including) lateral line scale.

**Colour:** Mid to dark brown head and body. Fins dark greyish-black.

**Size:** To about 91 cm TL.

**Distribution:** Probably widespread in Southern Ocean from 37 to 65 S.

**Depth:** 1050 to 2000 m.

**Similar species:** CAML grenadier (*Macrourus caml*), ridge scaled grenadier (*M. carinatus*), and Whitson's grenadier (*M. whitsoni*) all have scales on the underside of the head.

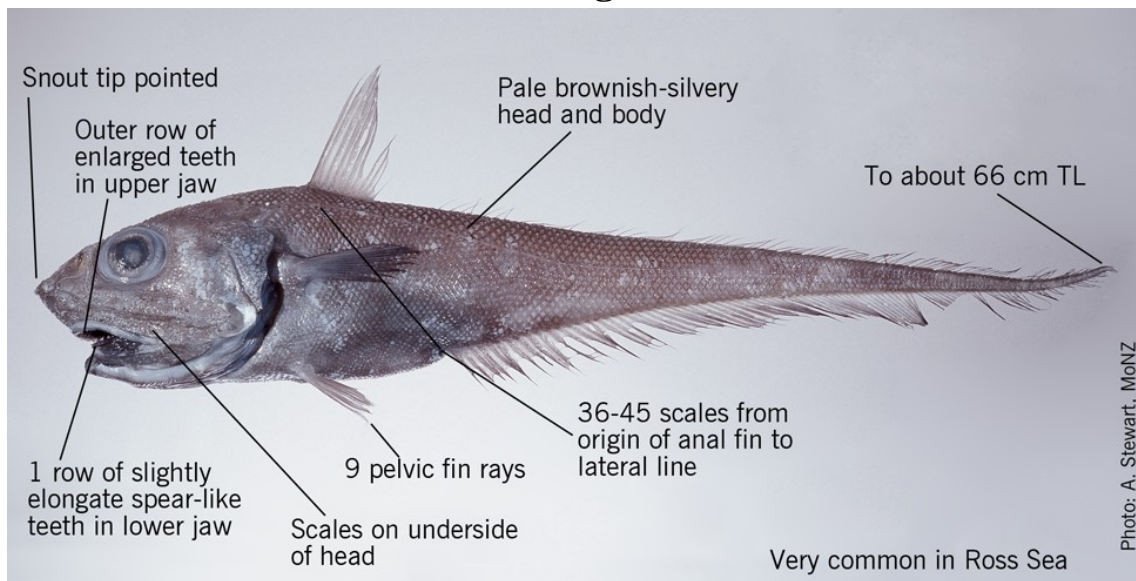
**Notes on biology / ecology:** Little known.

**Specimens required:** Please retain a selection for the Museum.

**References:** Iwamoto (1990a & b), McMillan et al. (2012), Roberts & Stewart (2001), Smith et al. (2011).

**Family** 215. Macrouridae (grenadiers, rattails)

***Macrourus whitsoni* (Whitson's grenadier) (WGR)**



**Distinguishing features:** 9 pelvic fin rays. 1 row of slightly enlarged teeth in lower jaw. Outer row of enlarged teeth (2 to 5 rows total) in upper jaw. Snout tip slightly pointed. Pale brownish-silvery head and body. Scales on most of underside of head and lower jaw but no scales under snout in front of mouth. 36 to 45 scales in a diagonal row from origin of anal fin to (not including) lateral line scale.

**Colour:** Pale brownish-silvery head and body. Fins greyish-brown.

**Size:** To about 66 cm TL.

**Distribution:** Probably widespread in the Antarctic.

**Depth:** 760 to 3190 m.

**Similar species:** CAML grenadier (*Macrourus caml*) has 8 pelvic fin rays, 2 to 3 rows of small uniform teeth in lower jaw, 4 to 5 rows of small uniform teeth in upper jaw, 30 to 40 scales from origin of anal fin to lateral line. Ridge scaled grenadier (*M. carinatus*) has 2 to 5 rows of small uniform sized teeth in lower jaw, 19 to 25 scales from origin of anal fin to lateral line. Bigeye grenadier (*M. holotrachys*) has no scales on underside of head.

**Notes on biology / ecology:** May reach age of about 55 years.

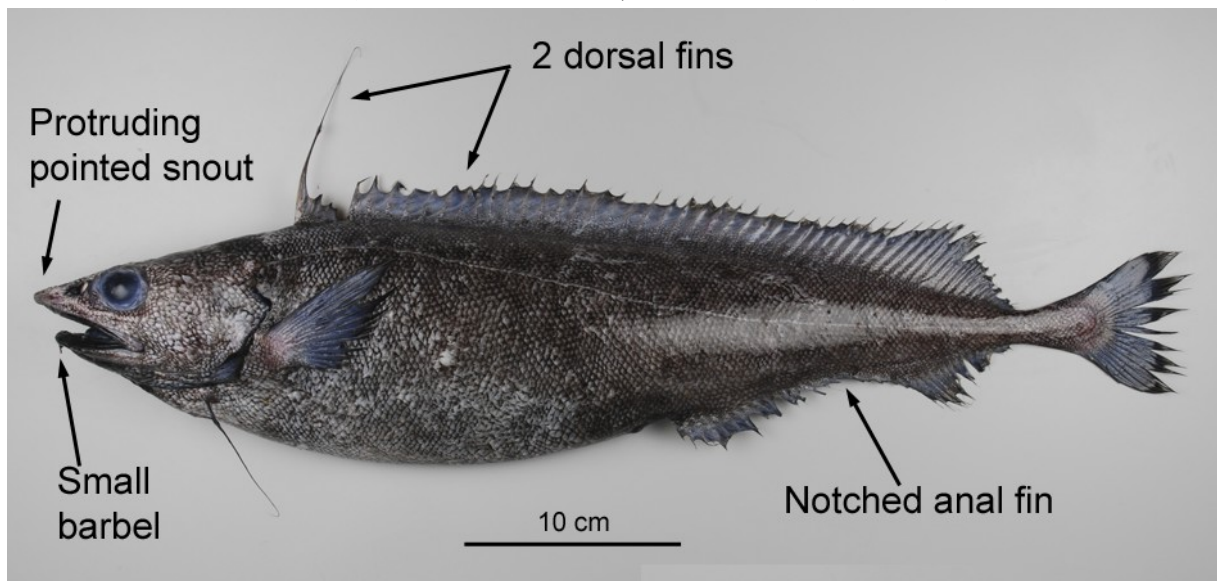
**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Iwamoto (1990a & b), McMillan et al. (2012), Roberts & Stewart (2001), Smith et al. (2011).



**Family** 216. Moridae (deepsea cods)

***Antimora rostrata* (Blue antimora, violet cod) (ANT)**



**Distinguishing features:** Protruding pointed snout. Two dorsal fins with an elongated ray in the first dorsal fin. Single notched anal fin. Small chin barbel present. Scales deciduous and usually lost.

**Colour:** Larger individuals bluish-black, but paler grey-brown in smaller specimens.

**Size:** To at least 65 cm TL.

**Distribution:** Worldwide.

**Depth:** Reported from 400 to 2900 m but usually found at 800 to 1800 m.

**Similar species:** Similar to giant morid cod (*Lepidion* sp.) but that species lacks a protruding snout (level with mouth), and lacks a notched anal fin.

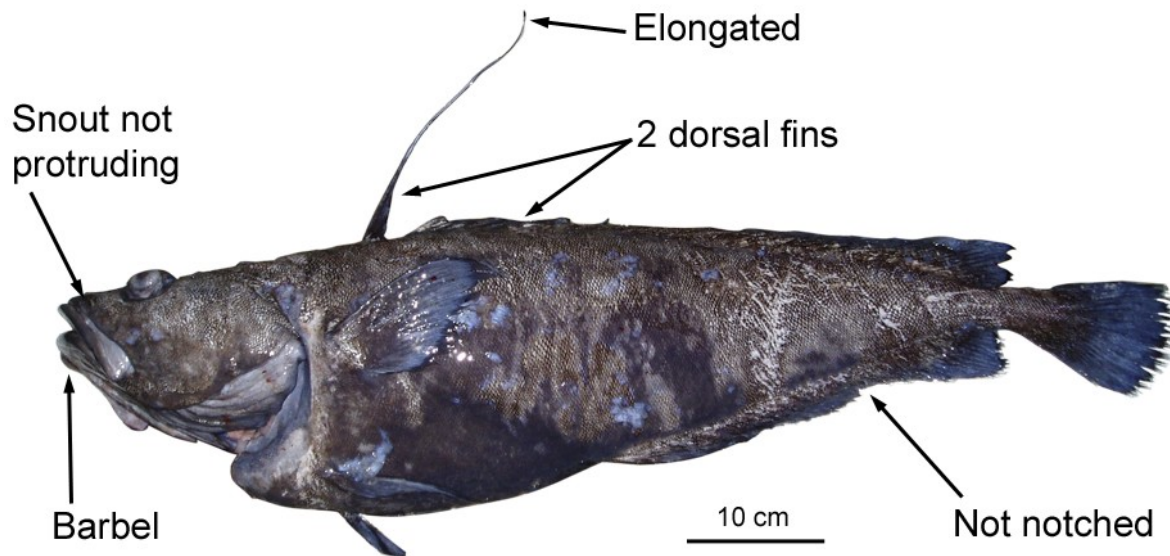
**Notes on biology / ecology:** Reach age of about 42 years.

**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Chiu et al. (1990), Cohen et al. (1990).

**Family** 216. Moridae (deepsea cods)

***Lepidion* sp. (Giant morid cod) (LEV)**



**Distinguishing features:** Snout not protruding in front of mouth. Two dorsal fins with an elongated ray in the first dorsal fin. Single anal fin. Chin barbel present. Scale pockets in the skin extending onto the bases of the anal and second dorsal fin rays.

**Colour:** Silvery-grey to brownish-black.

**Size:** To over 100 cm TL.

**Distribution:** Poorly known.

**Depth:** Unknown but probably greater than about 700 m.

**Similar species:** See comments on similar species for blue antimora (*Antimora rostrata*). Identification to species is not possible until the Ross Sea material has been studied in detail.

**Notes on biology / ecology:** Little known.

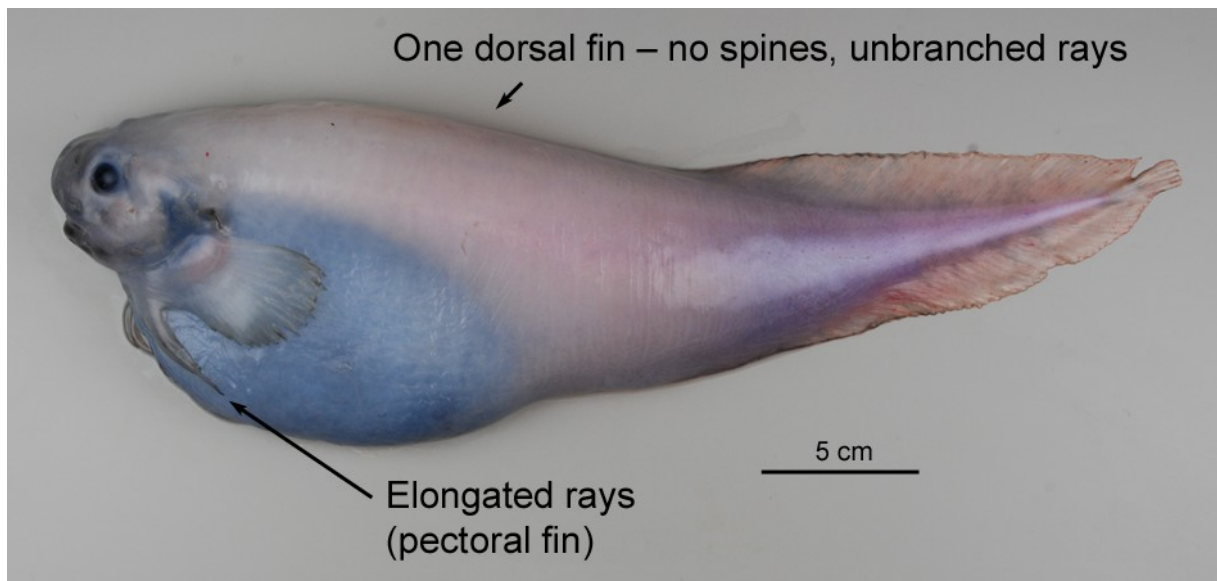
**Specimens required:** Please retain for the Museum.

**References:** Chiu et al. (1990), Stewart & Roberts (2001).



**Family** 328. Liparidae (snailfishes)

**(Snailfishes) (ZLS)**



**Distinguishing features:** Body tear-drop shaped and fragile with thin skin and gelatinous flesh. Single dorsal and anal fins continuous with the tail fin. No fin spines and all fin rays unbranched. Pectoral fin often with elongated lower rays almost separated from upper part of fin. Pelvic fins if present forming a ventral sucking disc.

**Colour:** Variable. Many are pale cream, grey, pink.

**Size:** To less than about 40 cm TL.

**Distribution:** Worldwide.

**Depth:** 600 to 3000 m.

**Similar species:** The species illustrated, possibly a *Paraliparis*, is an example of the family. Species can only be separated by close study and from skeletal counts using x-ray images. Eelpouts (Zoarcidae) are more elongated (eel-like) in shape, lack or have greatly reduced pelvic fins, and lack elongated lower rays in the pectoral fin. There are at least 13 species of snailfishes known from the Ross Sea region.

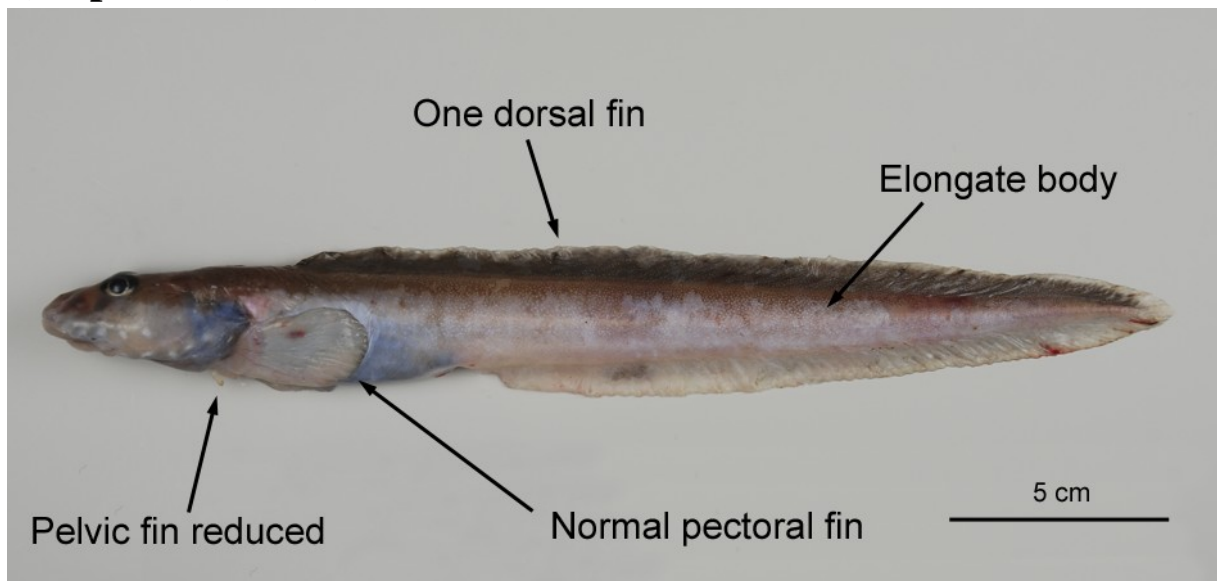
**Notes on biology / ecology:** Most snailfishes are very small, less than 30 cm TL, and little is known about their biology. Some species may be associated with sponge beds on the seafloor.

**Specimens required:** Please retain all specimens for the Museum.

**References:** Stein & Andriashev (1990).

**Family** 416. Zoarcidae (eelpouts)

### **(Eelpouts) (ELZ)**



**Distinguishing features:** Body and tail elongate (eel-shaped), with single dorsal and anal fins continuous with the tail fin. Pelvic fins reduced and positioned below gill slit or absent. Pectoral fins present but variable in size. Scales (when present) are small, round and non-overlapping.

**Colour:** Variable according to species. Many are dark (browns, reds), some are mottled or patterned, and some are pale.

**Size:** To about 35 cm TL.

**Distribution:** Worldwide.

**Depth:** Some at less than 600 m, but many are at greater depths.

**Similar species:** The species illustrated (*Pachycara brachycephalum*) is an example of the family. Species can only be separated by microscopic study and morphological counts. There are about 7 species of eelpouts recorded from the Ross Sea region. Snailfishes (Liparidae) have elongated lower rays in the pectoral fin, often almost separated from the upper part of the fin, and either lack pelvic fins or these are modified into a sucking disc. Eel cods (Muraenolepididae) have two dorsal fins and a chin barbel.

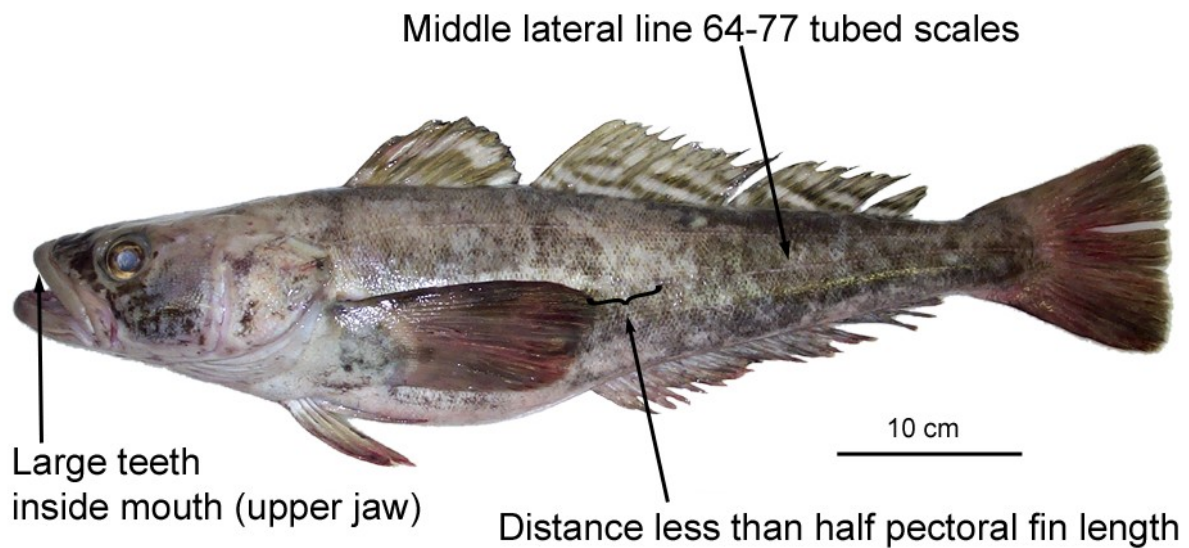
**Notes on biology / ecology:** Little known. Some species may burrow in fine sediment while others live in midwater.

**Specimens required:** Please retain all specimens for the Museum.

**References:** Anderson (1990).

**Family** 427. Nototheniidae (cod icefishes)

***Dissostichus eleginoides* (Patagonian toothfish) (TOP)**



**Distinguishing features:** Middle lateral line with 64 to 77 tubed scales, extending forward to near the rear edge of the pectoral fin and separated from it by less than about half the length of the pectoral fin. A few enlarged canine-like teeth near the middle of the upper jaw.

**Colour:** Large individuals are brownish-grey on the upper surface of the body with darker blotches, and pale greyish on the lower surface. Fins dark or dusky. Smaller individuals are paler with blotchy dark body marking and diagonal dark stripes on the dorsal fins but other fins are dusky.

**Size:** To about 215 cm TL.

**Distribution:** Widespread between about 40 and 60 S in the Southern Ocean. Sometimes extending south to about 72 S in the Ross Sea region.

**Depth:** Down to about 2000 m.

**Similar species:** Antarctic toothfish (*D. mawsoni*) has a short middle lateral line of 35 to 48 tubed scales, with the front end of the line separated from the rear edge of the pectoral fin by about the length of the pectoral fin, less in smaller and more in larger fish. The teeth near the middle of the upper jaw are also not markedly enlarged.

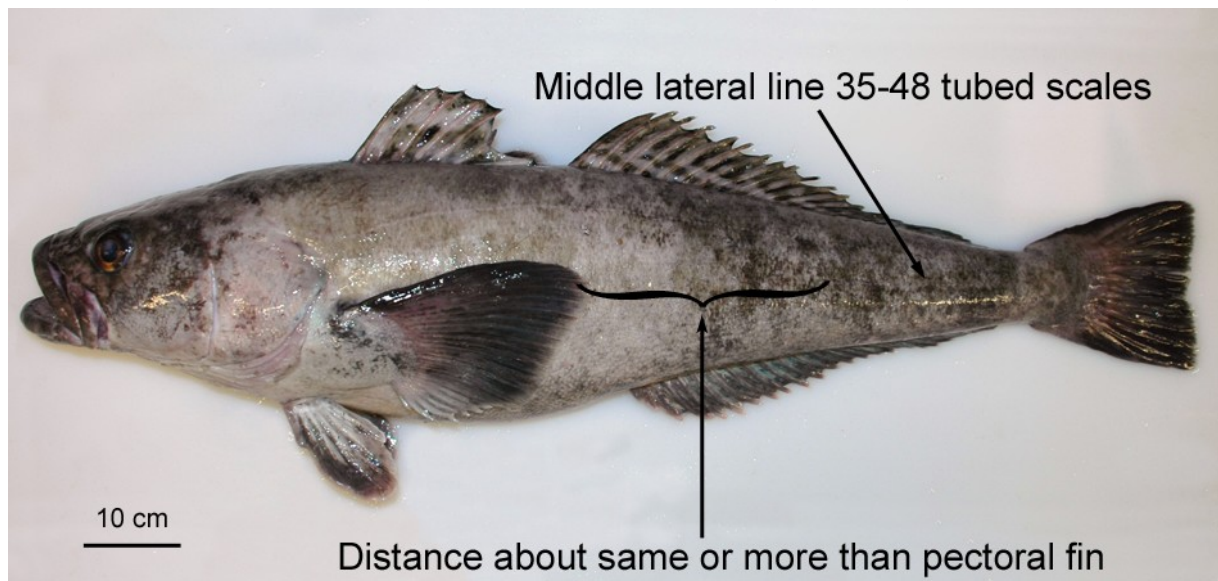
**Notes on biology / ecology:** Reach age of at least 50 years.

**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Dewitt et al. (1990).

**Family** 427. Nototheniidae (cod icefishes)

***Dissostichus mawsoni* (Antarctic toothfish) (TOA)**



**Distinguishing features:** Middle lateral line with 35 to 48 tubed scales, with the forward end separated from the rear edge of the pectoral fin by about the length of the pectoral fin, less in smaller and more in larger fish. Teeth near middle of upper jaw not enlarged.

**Colour:** Body of large fish greyish, sometimes with broad dark saddles on the upper surface and sides, pale greyish on the lower surface, fins dark or dusky. Smaller fish are paler with blotchy dark body marking and diagonal dark stripes on the dorsal fins but other fins are dusky.

**Size:** To at least 250 cm TL.

**Distribution:** Widespread in the Antarctic but uncommon north of 60 S.

**Depth:** Down to about 2200 m.

**Similar species:** Patagonian toothfish (*D. eleginoides*) has a middle lateral line with 64 to 77 tubed scales, extending forward to near the rear edge of the pectoral fin and separated from it by less than about half the length of the pectoral fin, and has a few enlarged canine-like teeth near the middle of the upper jaw.

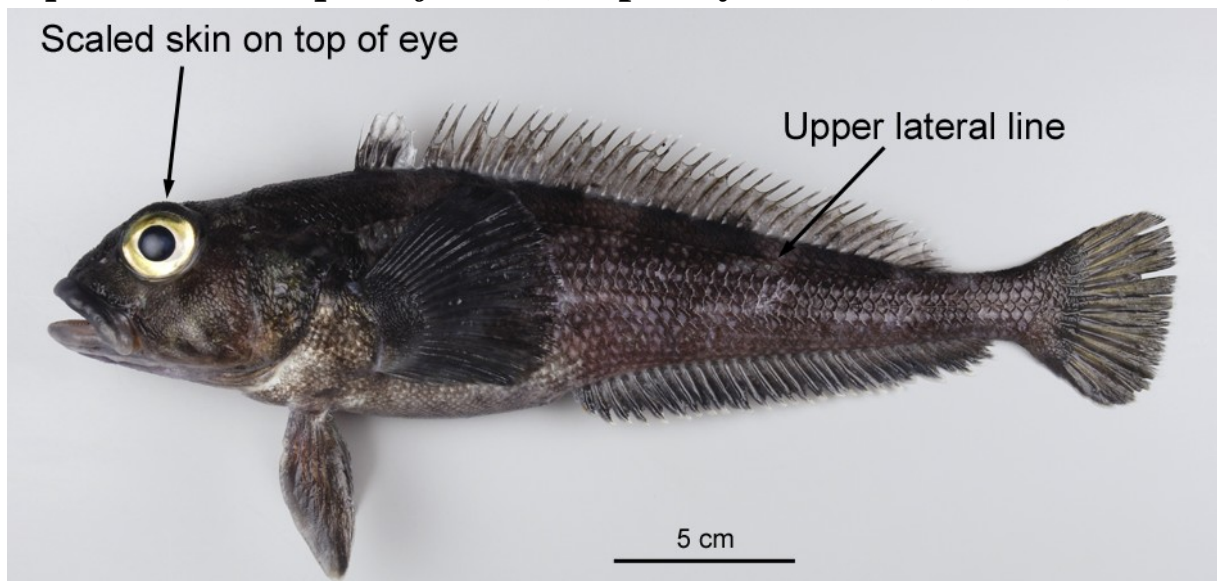
**Notes on biology / ecology:** Reach age of at least 35 years.

**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Dewitt et al. (1990).

**Family** 427. Nototheniidae (cod icefishes)

***Lepidonotothen squamifrons* (Striped-eye notothen) (NOK)**



**Distinguishing features:** Scales on skin on top of the head extending onto the top of the eyes. Rest of head including snout, pre-orbitals (forward of eyes), lower jaw mostly covered with scales. Long distinct upper lateral line and short indistinct middle lateral line near the tail.

**Colour:** Upper body greyish with about 9 dark (obliquely forward) bars that merge on the sides of the body. Pectoral fin base and belly pale silvery. Two dark (obliquely back) bars on the head behind the upper jaw and on the cheek. Dorsal and anal fins with dark central stripe but base and tips pale whitish.

**Size:** To about 50 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 100 to 900 m.

**Similar species:** Other small species of cod icefishes (notothens) including *Trematomus* lack scaly skin extending onto the top of the eyes.

**Notes on biology / ecology:** Little known.

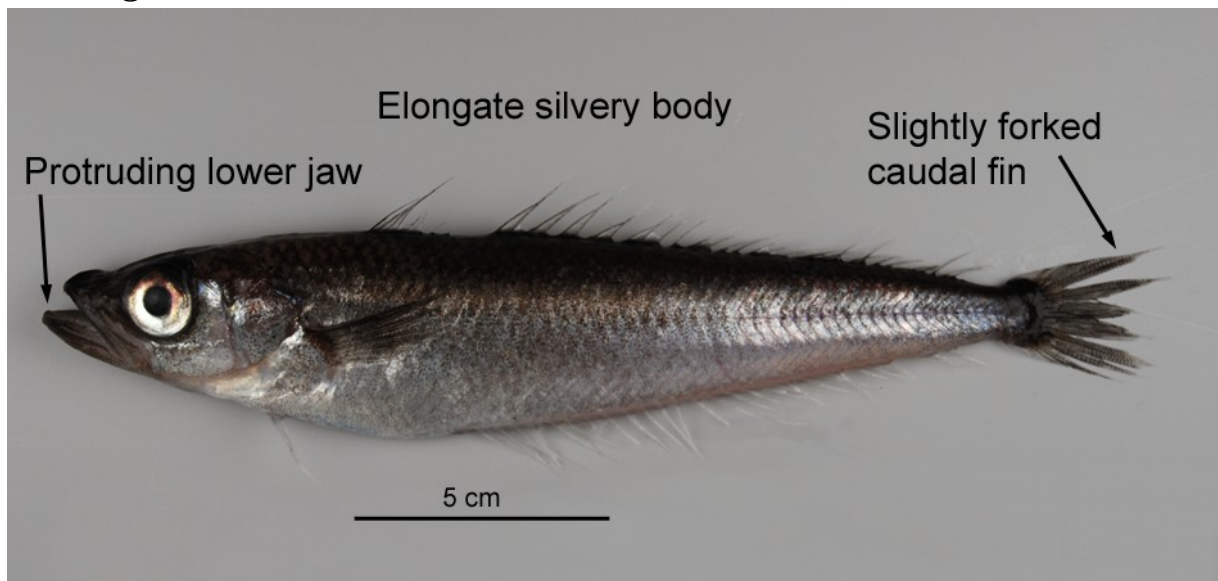
**Specimens required:** Please retain a selection for the Museum.

**References:** Dewitt et al. (1990).



**Family** 427. Nototheniidae (cod icefishes)

***Pleuragramma antarctica* (Antarctic silverfish) (ANS)**



**Distinguishing features:** Elongate silvery body. Flat thin deciduous scales on body and sides of head (usually lost). Projecting lower jaw. Slightly forked caudal fin.

**Colour:** Head and body silvery, slightly darker on top. Dorsal, pectoral, and caudal fins may be dark or dusky, anal and pelvic fins pale.

**Size:** To about 25 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 0 to 700 m.

**Similar species:** Other small cod icefishes (notothens) lack the combination of long slender silvery body with thin deciduous scales (usually lost) on body and sides of head, protruding lower jaw, and slightly forked caudal fin. Pilchards, used as bait in the longline fishery, have a single short dorsal fin and a series of small dark spots running along the body.

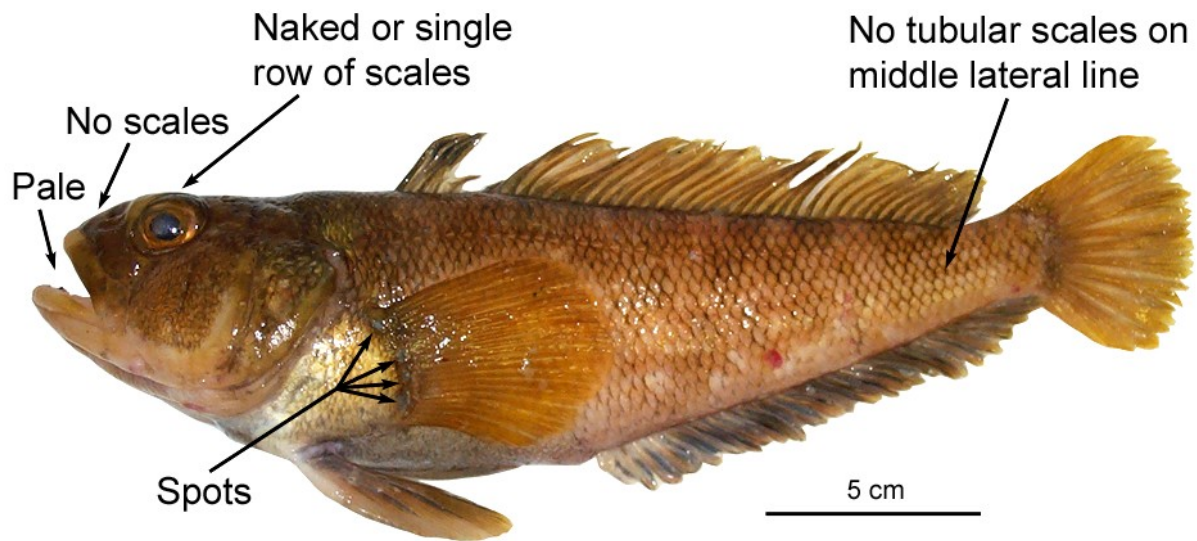
**Notes on biology / ecology:** Pelagic. Reach age of about 14 years.

**Specimens required:** Please retain good examples for the Museum.

**References:** Dewitt et al. (1990).

**Family** 427. Nototheniidae (cod icefishes)

***Trematomus bernacchii* (Emerald notothen) (ERN)**



**Distinguishing features:** Distance from tip of snout to anterior end of anal fin much longer than the length of the anal fin base. Mouth pale. Snout naked (no scales). Tubular middle lateral line scales absent. Interorbital distance short (6 to 16% HL). Interorbital naked or with a single row of scales. Three or four pale greenish spots along the base of the pectoral fin.

**Colour:** Body pale brown or reddish-brown, darker dorsally with black or dark brown spots and bars. Pectoral fins brownish with three or four pale greenish spots along the base of the fin. Deepwater specimens have a more uniform reddish brown body colour and less prominent dorsal dark spots and bars.

**Size:** To about 35 cm TL.

**Distribution:** Widespread in Antarctic coastal waters.

**Depth:** To about 700 m.

**Similar species:** Bigeye notothen (*T. tokarevi*) has a scaled interorbital and lacks pale greenish spots along the pectoral fin base. There are possibly 3 colour morphs of *T. bernacchii* with one having a pale central blotch on the nape before the first dorsal fin, the second with a central blotch plus smaller lateral blotches and the third lacking these pale blotches.

**Notes on biology / ecology:** Reach age of at least 10 years.

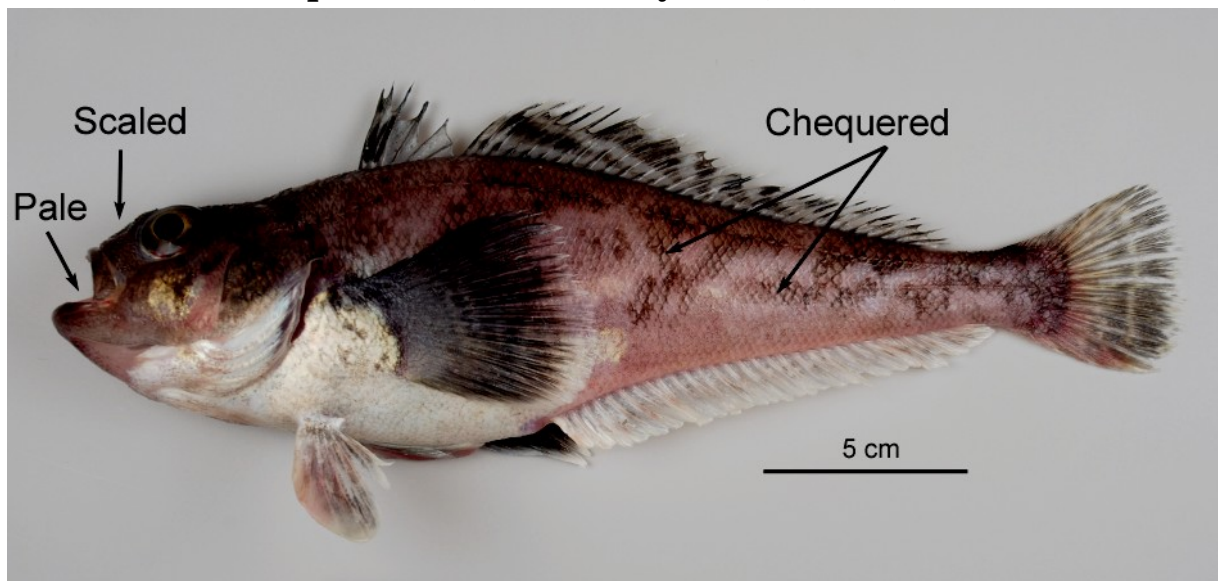
**Specimens required:** Please retain for the Museum.

**References:** Dewitt et al. (1990).



**Family** 427. Nototheniidae (cod icefishes)

***Trematomus eulepidotus* (Blunt scalyhead) (TRL)**



**Distinguishing features:** Distance from tip of snout to anterior end of anal fin usually longer than the length of the anal fin base. Mouth pale. Snout scaled. Moderate length middle lateral line (11 to 21 tubed scales). Chequered (dark and pale) body markings.

**Colour:** Body with chequered pattern of pale and dark markings.

**Size:** To about 34 cm TL.

**Distribution:** Widespread in Antarctic coastal waters.

**Depth:** 70 to 550 m.

**Similar species:** Slender scalyhead (*T. lepidorhinus*) has distance from tip of snout to anterior end of anal fin shorter than the length of the anal fin base, mouth lining black, snout scaled, long middle lateral line (18 to 30 tubed scales).

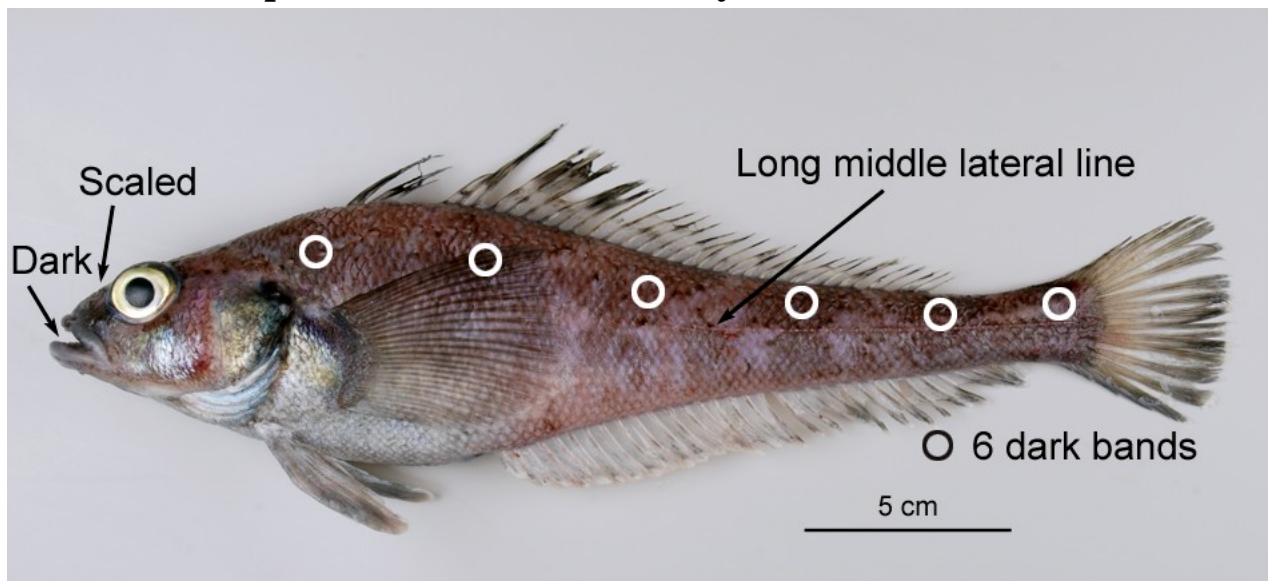
**Notes on biology / ecology:** Little known.

**Specimens required:** Please retain for the Museum.

**References:** Dewitt (1990).

**Family** 427. Nototheniidae (cod icefishes)

***Trematomus lepidorhinus* (Slender scalyhead) (TRD)**



**Distinguishing features:** Distance from tip of snout to anterior end of anal fin shorter than the length of the anal fin base. Mouth lining black. Snout scaled between upper lip and front of eye. Scales present on lower jaw and on branchiostegal membrane. Long middle lateral line, 18 to 30 tubed scales.

**Colour:** Body with 6 vertical dark bands, widest and darkest dorsally with the second to sixth almost reaching ventral side. First band before first dorsal fin, second to fifth below second dorsal fin and the sixth on the caudal peduncle. Upper two-thirds of first dorsal fin dark. Lining of mouth and gill cavity dark. Gill cover and base of pectoral fin yellowish.

**Size:** To about 31 cm TL.

**Distribution:** Widespread in Antarctic coastal waters.

**Depth:** 200 to over 800m.

**Similar species:** Deepwater notothen (*T. loennbergii*) has a naked snout (lacks scales), and short middle lateral line (6 to 19 tubed scales).

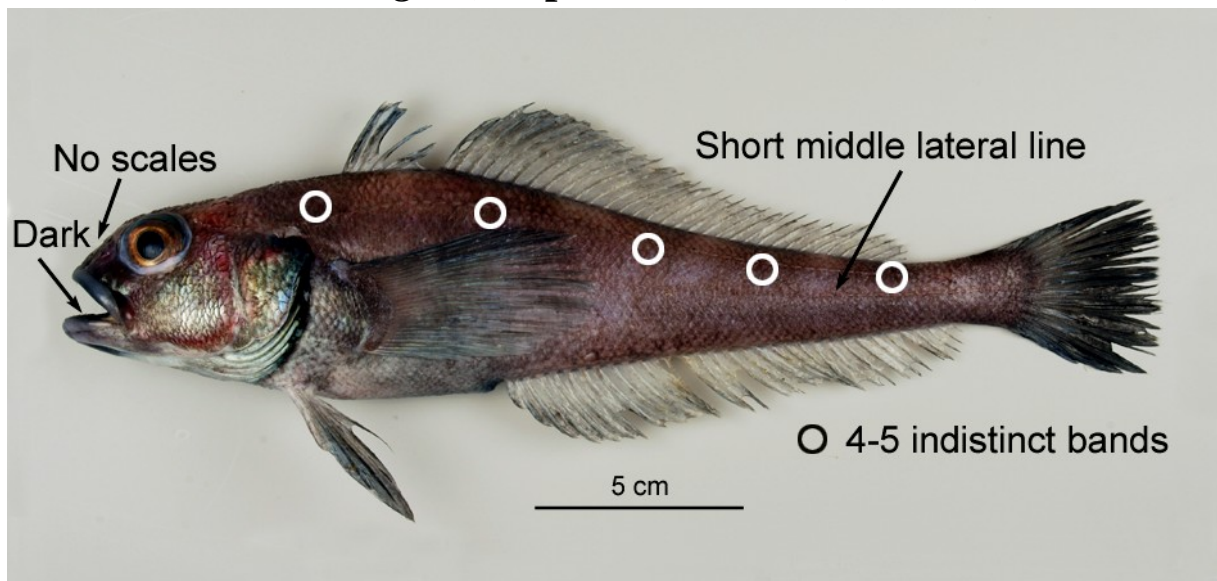
**Notes on biology / ecology:** Little known.

**Specimens required:** Please retain for the Museum.

**References:** Dewitt et al. (1990).

**Family** 427. Nototheniidae (cod icefishes)

***Trematomus loennbergii* (Deepwater notothen) (TLO)**



**Distinguishing features:** Distance from tip of snout to anterior end of anal fin shorter than the length of the anal fin base. Mouth lining black. Upper snout scale-less between upper lip and about nostrils. No scales on lower jaw or branchiostegal membrane. Short middle lateral line, 6 to 19 tubed scales.

**Colour:** Body with 4 to 5 irregular and indistinct dark bands, darkest dorsally. Indistinct dark blotch on first dorsal fin. Lining of mouth and gill cavity blackish, darker in larger specimens. Gill cover and base of pectoral fin yellowish.

**Size:** To about 30 cm SL.

**Distribution:** Widespread in Antarctic coastal waters.

**Depth:** 65 to 832 m.

**Similar species:** Slender scalyhead (*T. lepidorhinus*) has a scaled snout, and long middle lateral line (18 to 30 tubed scales).

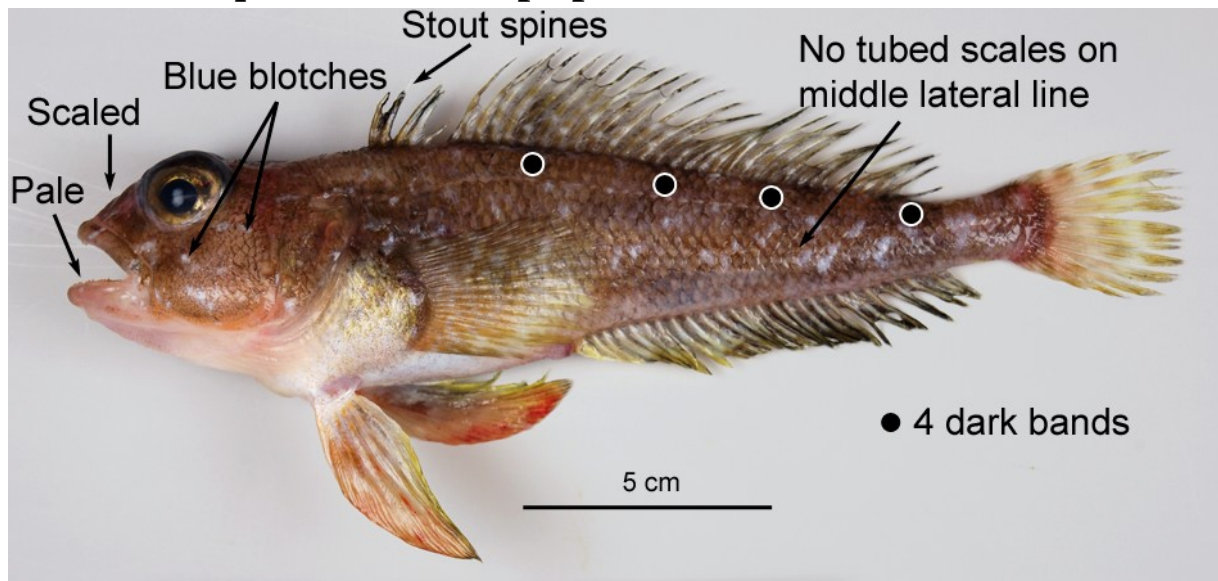
**Notes on biology / ecology:** Little known.

**Specimens required:** Please retain for the Museum.

**References:** Dewitt et al. (1990).

**Family** 427. Nototheniidae (cod icefishes)

***Trematomus pennellii* (Sharp-spinned notothen) (PTC)**



**Distinguishing features:** Distance from tip of snout to anterior end of anal fin much longer than the length of the anal fin base. Mouth pale. Snout scaled. Tubed middle lateral line scales absent. Pale blueish blotches on top and sides of head. Stout spines in first dorsal fin.

**Colour:** Distinctive small pale blueish blotches and lines on the top and sides of the head. Body with 4 broad dark bands, which may be indistinct, darkest dorsally, separated with small pale blueish blotches.

**Size:** To about 24 cm TL.

**Distribution:** Widespread in Antarctic coastal waters.

**Depth:** 0 to 732 m.

**Similar species:** Emerald notothen (*T. bernacchii*) has snout naked (no scales), 3 or 4 pale greenish spots along the base of the pectoral fin, and lacks blueish blotches on the top and sides of the head.

**Notes on biology / ecology:** Little known.

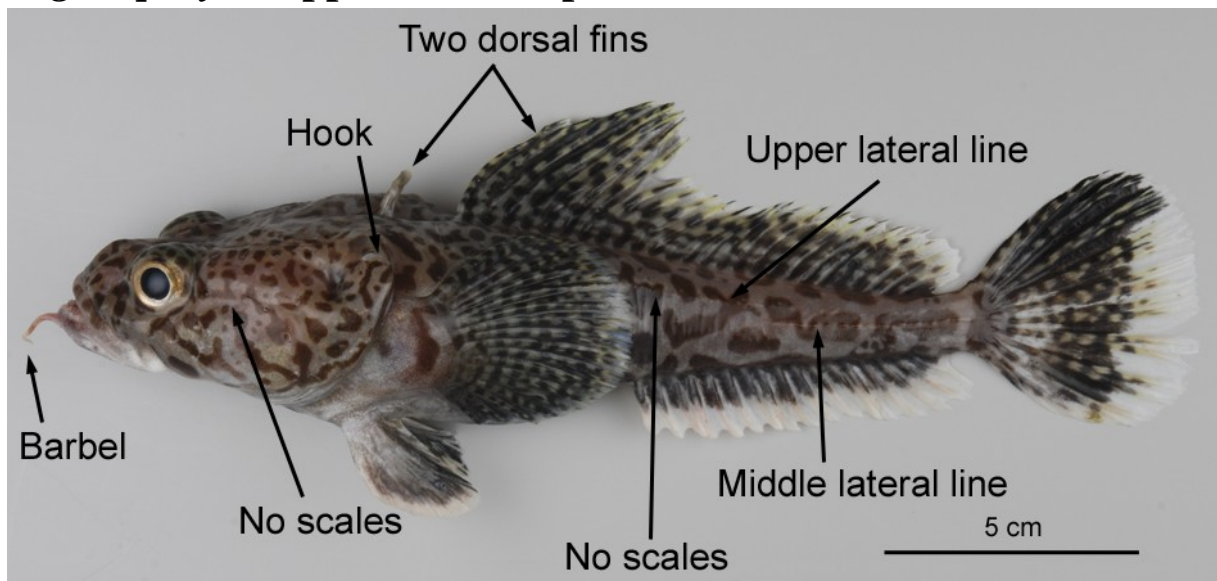
**Specimens required:** Please retain for the Museum.

**References:** Dewitt (1990).



**Family** 429. Artedidraconidae (barbeled plunderfishes)

***Pogonophryne* spp. (Barbeled plunderfishes) (POG)**



**Distinguishing features:** Operculum armed at the upper rear end with a flattened upward curved hook. Chin barbel present, sometimes bearing an elaborate club or process, 2 dorsal fins, the first small and low with 2 to 3 rays, the second long-based sometimes high (males). Upper and middle lateral lines present, scales absent on body and head.

**Colour:** Variable with some species dull or pale and others with dark blotches or mottling.

**Size:** To about 40 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** Down to about 2500 m.

**Similar species:** The genus *Pogonophryne* was divided into 5 species groups by Balushkin & Eakin (1998) who used the presence or absence of dark blotches on the head and body, along with other characters to allocate species to these groups. Identification to species is not possible until the taxonomy is formally clarified.

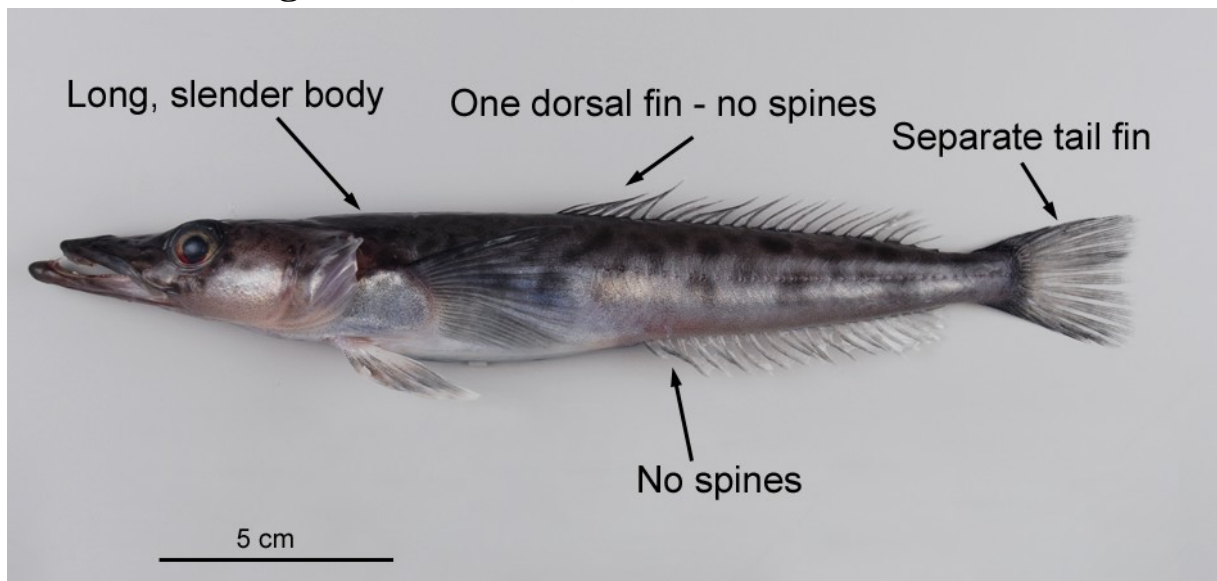
**Notes on biology / ecology:** Probably demersal. Little known.

**Specimens required:** Please retain all material for the Museum.

**References:** Balushkin & Eakin (1998), Eakin (1990), Roberts & Stewart (2001).

**Family** 430. Bathydraconidae (Antarctic dragonfishes)

### (Antarctic dragonfishes) (BTL)



**Distinguishing features:** Long slender body, a single long-based dorsal fin without spines, long anal fin (usually shorter than dorsal fin) without spines, and separate tail fin.

**Colour:** Depends on species but some have dark banding or mottling on greyish or brownish body.

**Size:** To about 60 cm but many species are small, less than 20 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** To about 3000 m.

**Similar species:** The sharp toothed Antarctic dragonfish *Gymnodraco acuticeps* (GDR) is used here as an example of the fishes in this family and has canine-like teeth at tip of both jaws, hook on upper rear end of operculum. Another Antarctic dragonfish *Bathydraco marri* (BDJ) has 2 wide dark vertical bars sometimes encircling the body, small teeth in jaws, and no hook. Other families of Antarctic fishes lack the combination of a single dorsal fin and separate tail fin.

**Notes on biology / ecology:** Little known.

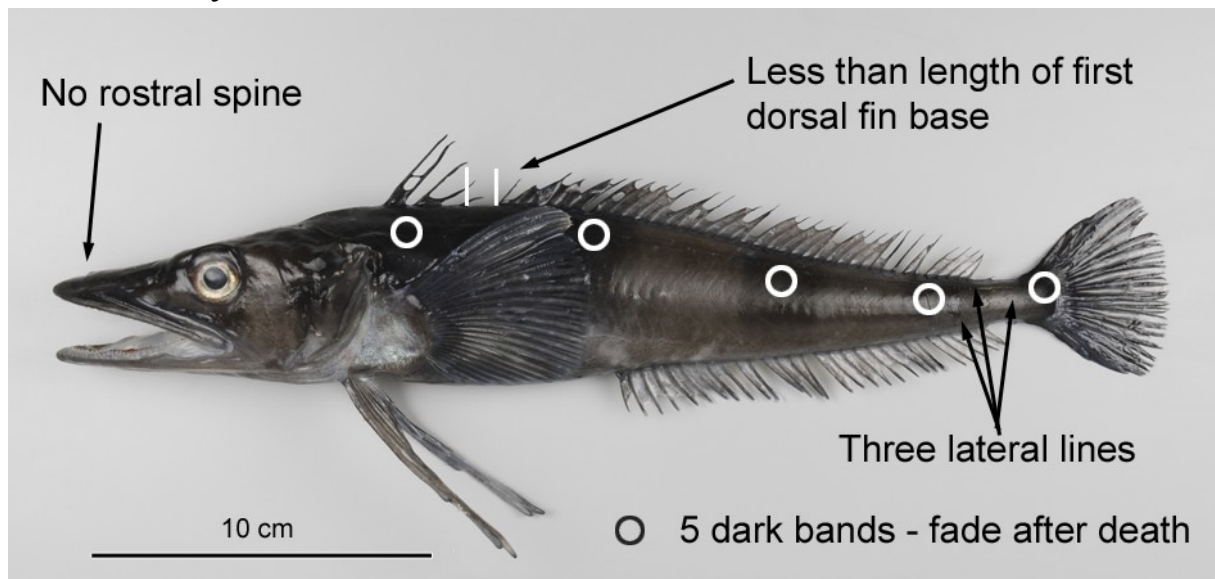
**Specimens required:** Please retain for the Museum.

**References:** Gon (1990), Roberts & Stewart (2001).



**Family** 431. Channichthyidae (crocodile icefishes)

***Chionobathyscus dewitti* (Dewitt's icefish) (CHW)**



**Distinguishing features:** No obvious rostral spine, 3 lateral lines, 5 dark bands or saddles on the upper surface and sides of the body (not always obvious), first dorsal fin separated from the second dorsal fin by a short distance, usually less than the length of the first dorsal fin base.

**Colour:** Five dark bands or saddles on the upper surface and sides of the body (not always obvious), first dorsal fin blackish, rear parts of tail and pectoral fin dark/dusky.

**Size:** To about 60 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 500 to 2000 m.

**Similar species:** Antarctic icefish (*Cryodraco antarcticus*) has the first dorsal fin separated from the second dorsal fin by a large distance, usually more than twice the length of the first dorsal fin base, very low first dorsal fin, slightly longer than the eye length.

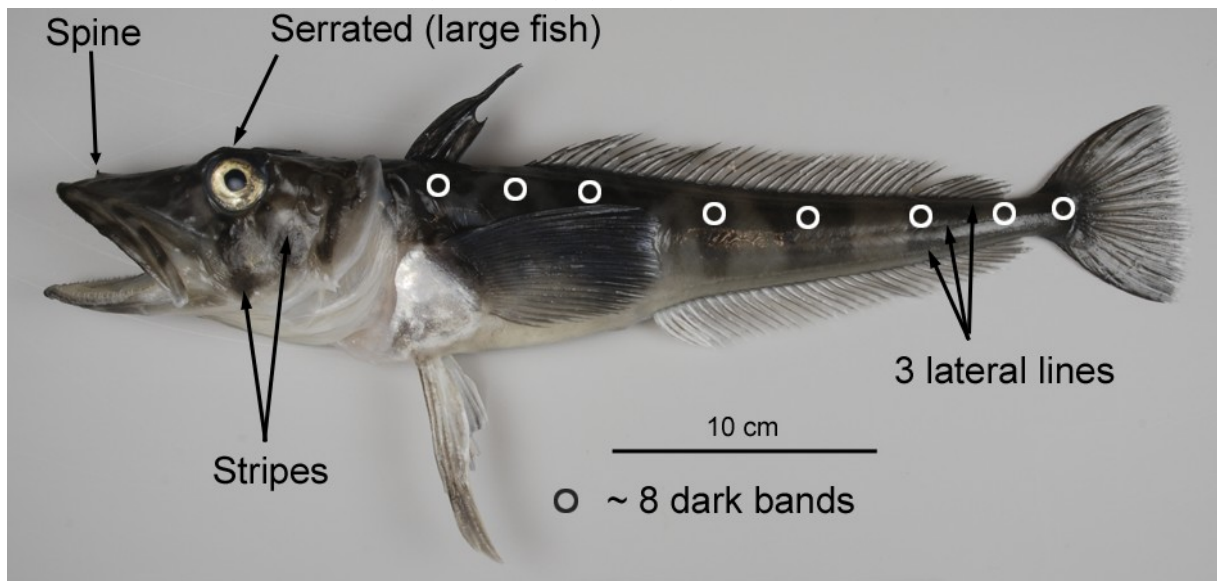
**Notes on biology / ecology:** Reach age of about 11 years.

**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Iwami & Kock (1990), Stewart & Roberts (2001).

**Family** 431. Channichthyidae (crocodile icefishes)

***Chionodraco hamatus* (Icefish) (TIC)**



**Distinguishing features:** Strong rostral spine present sometimes curved backwards, 3 lateral lines, up to 8 dark cross bars on the upper body and sides, cheek with 2 oblique dark stripes, ridge above the eye serrated in large specimens.

**Colour:** Up to 8 dark cross bars on the upper body and sides, cheek with 2 oblique dark stripes. Large mature males have blackish fins and lower parts of the body.

**Size:** To about 49 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 4 to 600 m.

**Similar species:** Other species of icefishes in the Ross Sea lack the strong rostral spine and distinctive head and body markings.

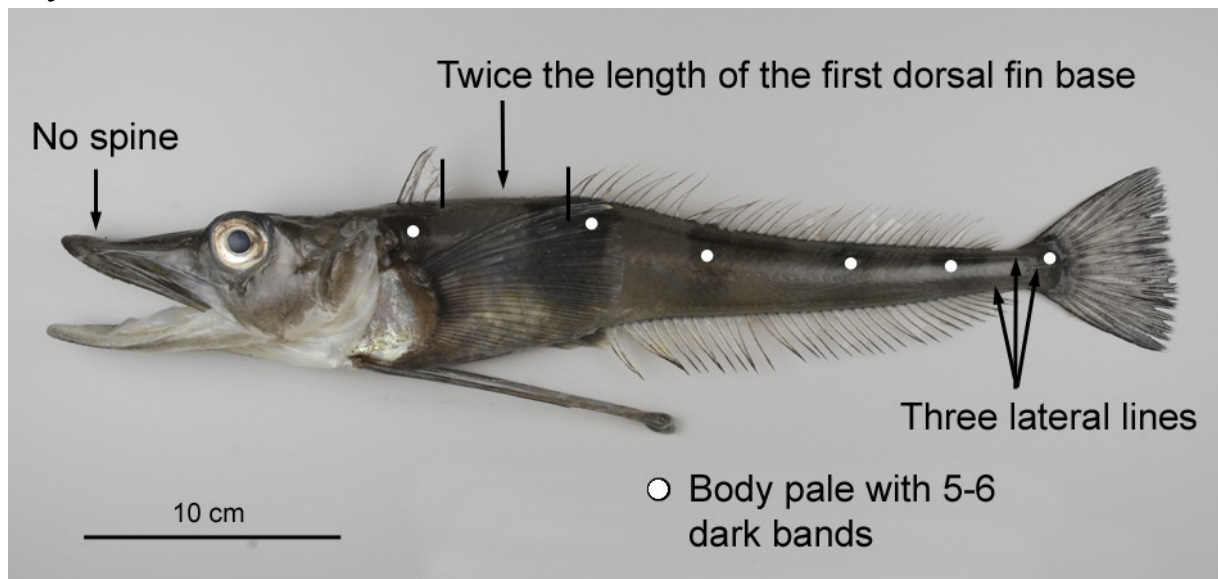
**Notes on biology / ecology:** Little known. Probably spawns in summer.

**Specimens required:** Please refer to any separate annual requests for this species.

**References:** Iwami & Kock (1990), Stewart & Roberts (2001).

**Family** 431. Channichthyidae (crocodile icefishes)

***Cryodraco antarcticus* (Antarctic icefish) (FIC)**



**Distinguishing features:** No obvious rostral spine, 3 lateral lines, body pale with 5 to 6 dark bands or saddles on the upper surface and sides, first dorsal fin low and separated from the second dorsal fin by a large distance, usually more than twice the length of the first dorsal fin base.

**Colour:** Body pale with 5 to 6 dark bands or saddles on the upper surface and sides.

**Size:** To about 57 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 250 to 800 m.

**Similar species:** Dewitt's icefish (*Chionobathyscus dewitti*) has first dorsal fin separated from the second dorsal fin by a short distance, usually less than the length of the first dorsal fin base, and first dorsal fin height is usually much greater than eye length.

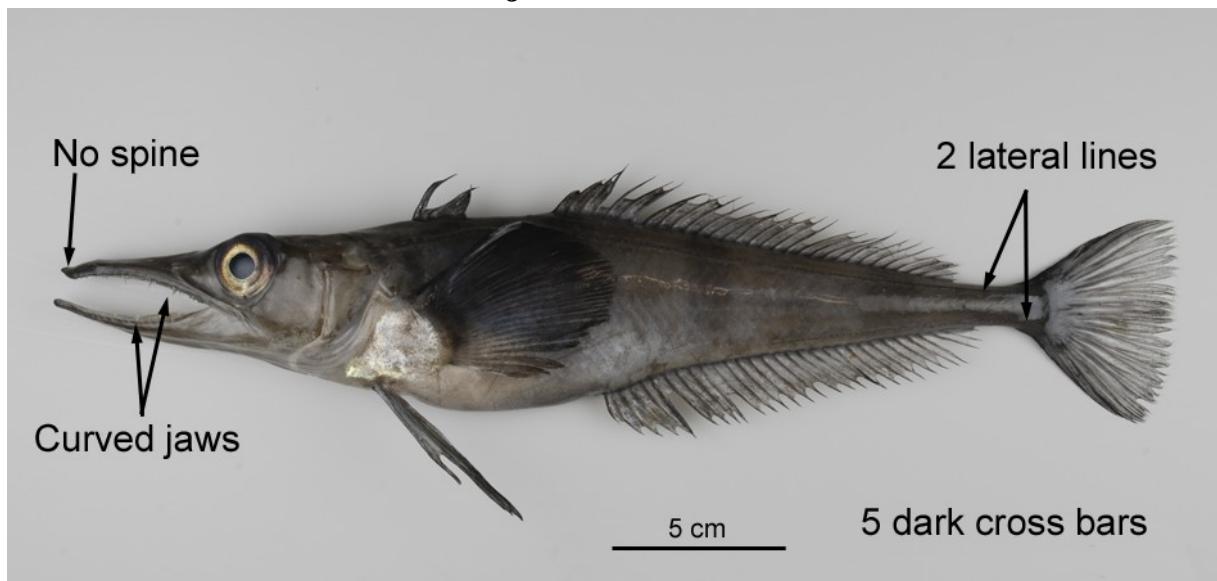
**Notes on biology / ecology:** Little known. Probably spawns in summer.

**Specimens required:** Please retain a selection, especially very large individuals, for the Museum.

**References:** Iwami & Kock (1990), Roberts & Stewart (2001), Stewart & Roberts (2001).

**Family** 431. Channichthyidae (crocodile icefishes)

***Dacodraco hunteri* (Bowed jaw icefish) (DAH)**



**Distinguishing features:** No obvious rostral spine, 2 lateral lines, middle lateral line absent, upper and lower jaws curved or bowed and only meeting at the tip of the snout, upper body and sides and tail with 5 dark cross bars.

**Colour:** Upper body, sides, and tail with 5 dark cross bars (indistinct after death).

**Size:** To about 29 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 300 to 800 m.

**Similar species:** Other species of icefishes from the Ross Sea lack the bowed upper and lower jaws.

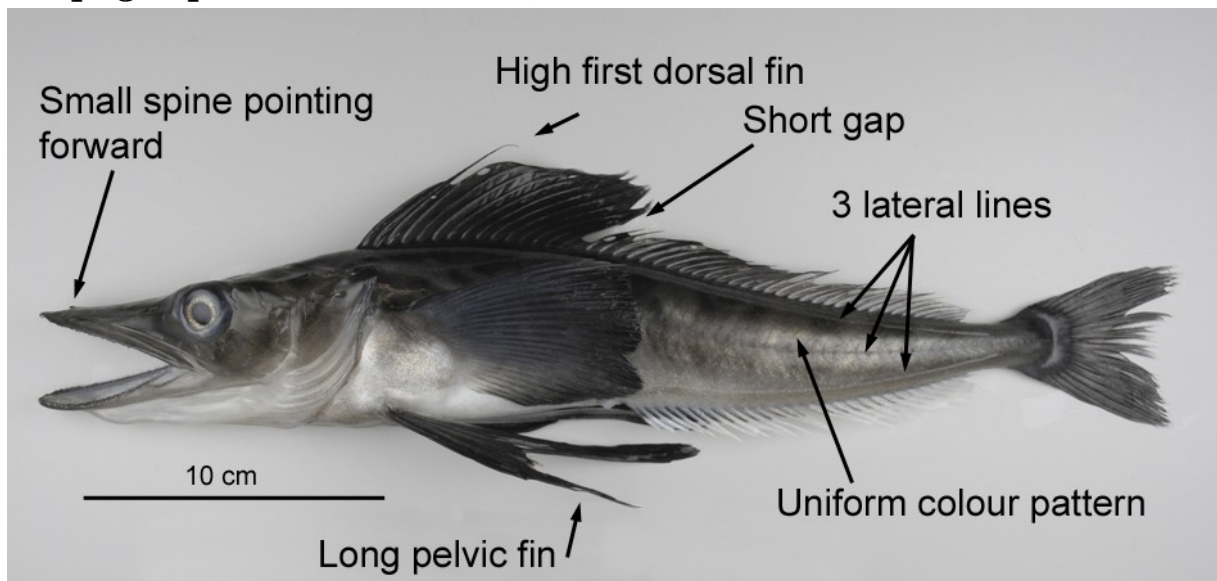
**Notes on biology / ecology:** Little known.

**Specimens required:** Please retain all material for the Museum.

**References:** Iwami & Kock (1990).

**Family** 431. Channichthyidae (crocodile icefishes)

***Neopagetopsis ionah* (Icefish) (JIC)**



**Distinguishing features:** Small rostral spine pointing forward, 3 lateral lines, first dorsal fin high and scarcely separated from the second dorsal fin, pelvic fins long. Upper body surface of large adults uniform dark blackish-green or brown.

**Colour:** Upper body and sides of large adults dark blackish-green or brown, smaller individual sometimes have irregular darker markings.

**Size:** To about 56 cm TL.

**Distribution:** Widespread in the Antarctic.

**Depth:** 20 to 900 m.

**Similar species:** Other species of icefishes lack the combination of long, high first dorsal fin, and uniform dark blackish-green or brown body.

**Notes on biology / ecology:** Little known. Feed mainly on krill.

**Specimens required:** Please retain for the Museum.

**References:** Iwami & Kock (1990).





## **SECTION 4. REFERENCES**

- Anderson, M.E. (1990). Zoarcidae, p. 256–276. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Balushkin, A.V.; Eakin, R. (1998). A new toad plunderfish *Pogonophryne fusca* sp. nova (Fam. Artedidraconidae: Notothenioidei) with notes on species composition and species groups in the genus *Pogonophryne* Regan. *Journal of Ichthyology* 38(5): 598–603.
- Chiu, T.S.; Markle, D.F. (1990). Muraenolepididae, p. 179–182. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Chiu, T.S.; Markle, D.F.; Meléndez, R. (1990). Moridae, p. 183–187. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Cohen, D.M.; Inada, T.; Iwamoto, T.; Scialabba, N. (1990). FAO species catalogue. Vol. 10. Gadiform fishes of the world (order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. *FAO Fisheries Synopsis* 125(10): i–x + 1–442.
- Dewitt, H.H.; Heemstra P.C.; Gon, O. (1990). Nototheniidae, p. 279–331. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Eakin, R. (1990). Artedidraconidae, p. 332–356. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Eastman, J.T.; Hubold, G. (1999). The fish fauna of the Ross Sea, Antarctica. *Antarctic Science* 11(3): 293–304.
- Eschmeyer, W.N. (ed.) (2010). Catalog of Fishes electronic version (25 October 2010). <http://research.calacademy.org/ichthyology/catalog/fishcatmain.asp>.
- Gon, O. (1990). Bathydraconidae, p. 364–380. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Gon, O.; Heemstra, P. C. (eds.). (1990). Fishes of the Southern Ocean. J. L. B. Smith Institute of Ichthyology, Grahamstown, 462 pp. 12 pls.
- Günther, A. (1887). Report on the deep-sea fishes collected by H.M.S *Challenger* during the years 1873–76. *Report of the scientific results of the voyage of H.M.S. Challenger during the years 1873–76*, 22 (Zool.), (pt. 1) (text): 335; (pt. 2) (plates): pls 1–73.
- Hanchet, S.M.; Stevenson, M.L.; Dunn, A. (2006). A characterisation of the toothfish fishery in Subareas 88.1 & 88.2 from 1997–98 to 2005–2006. Unpublished CCAMLR document, WG-FSA-06/29. 25 p.
- Iwami, T.; Kock, K.-H. (1990). Channichthyidae p. 381–399. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Iwamoto, T. (1990a). Macrouridae, p. 90–317. *In*: Cohen, D.M.; Inada, T.; Iwamoto, T.; Scialabba, N. FAO species catalogue. Vol. 10. Gadiform fishes of the world (Order Gadiformes). *FAO Fisheries Synopsis* 125(10). FAO, Rome. 442 p.
- Iwamoto, T. (1990b). Macrouridae, p. 192–206. *In*: Gon, O.; Heemstra, P.C. (eds). Fishes of the Southern Ocean. J.L.B. Smith Institute of Ichthyology, Grahamstown.

- McMillan, P.; Iwamoto, T.; Stewart, A.; Smith, P.J. (2012). A new species of grenadier, genus *Macrourus* (Teleostei, Gadiformes, Macrouridae) from the southern hemisphere and a revision of the genus. *Zootaxa* 3165: 1–24.
- Naylor, J.R.; Webber, W.R.; Booth J.D. (2005). A guide to common offshore crabs in New Zealand waters. *New Zealand Aquatic Environment and Biodiversity Report No. 2*. 47 p.
- Nelson J.S. (2006). *Fishes of the World*. Fourth edition. John Wiley & Sons, Hoboken. 601 p.
- Roberts, C.D.; Stewart, A.L. (2001). Museum marine file. Ross Sea fishes. A collection-based biodiversity research programme. *Seafood New Zealand* 9(11): 79–84.
- Smith, P.J.; Steinke, D.; McMillan, P.J.; Stewart, A.L.; McVeagh, S.M.; Diaz de Astarloa, J.M.; Welsford, D.; Ward, R.D. (2011). DNA barcoding highlights a cryptic species of grenadier *Macrourus* in the Southern Ocean. *Journal of Fish Biology*. 78: 355–365 (brief communication).
- Smith, P.J.; Steinke, D.; McVeagh, S.M.; Stewart, A.L.; Struthers, C.D.; Roberts, C.D. (2008). Molecular analysis of Southern Ocean skates (*Bathyraja*) reveals a new species of Antarctic skate. *Journal of Fish Biology* 73: 1170–1182.
- Stehmann, M.; Bürkel, D.L. (1990). Rajidae, p. 86–97. *In*: Gon, O.; Heemstra, P.C. (eds). *Fishes of the Southern Ocean*. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Stein, D.L.; Andriashev, A.P. (1990). Liparidae, p. 231–255. *In*: Gon, O.; Heemstra, P.C. (eds). *Fishes of the Southern Ocean*. J.L.B. Smith Institute of Ichthyology, Grahamstown.
- Stewart A.L.; Roberts, C.D. (2001). Fishes collected during the Ross Sea exploratory fishery (88.1) in 1999-00 & 2000-01, and registered in the national fish collection at the Museum of New Zealand Te Papa Tongarewa. 11 p. Unpublished CCAMLR document, WG-FSA-01/45.
- Tracey, D.M.; Anderson, O.F.; Clark, M.R.; Oliver, M.D. (Comps.) (2005). A guide to common deepsea invertbrates in New Zealand waters. *New Zealand Aquatic Environment and Biodiversity Report No. 1*. 160 p.

## Index 1 – Alphabetical list of family scientific names

Scientific name	Common name	Number	Page
Arhynchobatidae	Softnose skates	48b	10, 15
Artedidraconidae	Barbeled plunderfishes	429	11, 37
Bathydraconidae	Antarctic dragonfishes	430	11, 38
Channichthyidae	Crocodile icefishes	431	11, 39
Liparidae	Snailfishes	328	11, 26
Macrouridae	Grenadiers, rattails	215	10, 19
Moridae	Deepsea cods	216	10, 24
Muraenolepididae	Eel cods	212	10, 18
Nototheniidae	Cod icefishes	427	11, 28
Rajidae	Hardnose skates	48a	10, 14
Zoarcidae	Eelpouts	416	11, 27

## Index 2 – Alphabetical list of family common names

Common name	Scientific name	Number	Page
Antarctic dragonfishes	Bathydraconidae	430	11, 38
Barbeled plunderfishes	Artedidraconidae	429	11, 37
Cod icefishes	Nototheniidae	427	11, 28
Crocodile icefishes	Channichthyidae	431	11, 39
Deepsea cods	Moridae	216	10, 24
Eel cods	Muraenolepididae	212	10, 18
Eelpouts	Zoarcidae	416	11, 27
Grenadiers, rattails	Macrouridae	215	10, 19
Hardnose skates	Rajidae	48a	10, 14
Snailfishes	Liparidae	328	11, 26
Softnose skates	Arhynchobatidae	48b	10, 15

### Index 3 – Alphabetical list of species scientific names

Scientific name	Common name	CCAMLR code	Page
<i>Amblyraja georgiana</i>	Antarctic starry skate	SRR	14
<i>Antimora rostrata</i>	Blue antimora, violet cod	ANT	24
Bathydraconidae	Antarctic dragonfishes	BTL	38
<i>Bathyraja cf. eatonii</i>	Antarctic allometric skate	BEA	15
<i>Bathyraja maccaini</i>	Maccain's skate	BAM	16
<i>Bathyraja</i> sp.	Antarctic dwarf skate	BHY	17
<i>Chionobathyscus dewitti</i>	Dewitt's icefish	CHW	39
<i>Chionodraco hamatus</i>	Icefish	TIC	40
<i>Coryphaenoides armatus</i>	Cosmopolitan rattail	CKH	19
<i>Cryodraco antarcticus</i>	Antarctic icefish	FIC	41
<i>Dacodraco hunteri</i>	Bowed jaw icefish	DAH	42
<i>Dissostichus eleginoides</i>	Patagonian toothfish	TOP	28
<i>Dissostichus mawsoni</i>	Antarctic toothfish	TOA	29
<i>Lepidion</i> sp.	Giant morid cod	LEV	25
<i>Lepidonotothen squamifrons</i>	Striped-eye notothen	NOK	30
Liparidae	Snailfishes	ZLS	26
<i>Macrourus caml</i>	CAML rattail	QMC	20
<i>Macrourus carinatus</i>	Ridge scaled rattail	MCC	21
<i>Macrourus holotrachys</i>	Bigeye rattail	MCH	22
<i>Macrourus whitsoni</i>	Whitson's rattail	WGR	23
<i>Muraenolepis</i> spp.	Eel cods	MRL	18
<i>Neopagetopsis ionah</i>	Icefish	JIC	43
<i>Pleuragramma antarctica</i>	Antarctic silverfish	ANS	31
<i>Pogonophryne</i> spp.	Barbeled plunderfishes	POG	37
<i>Trematomus bernacchii</i>	Emerald notothen	ERN	32
<i>Trematomus eulepidotus</i>	Blunt scalyhead	TRL	33
<i>Trematomus lepidorhinus</i>	Slender scalyhead	TRD	34
<i>Trematomus loennbergii</i>	Deepwater notothen	TLO	35
<i>Trematomus pennellii</i>	Sharp-spined notothen	PTC	36
Zoarcidae	Eelpouts	ELZ	27

## Index 4 – Alphabetical list of species common names

Common name	Scientific name	CCAMLR code	Page
Antarctic allometric skate	<i>Bathyraja</i> cf. <i>eatonii</i>	BEA	15
Antarctic dragonfishes	Bathydraconidae	BTL	38
Antarctic dwarf skate	<i>Bathyraja</i> sp.	BHY	17
Antarctic icefish	<i>Cryodraco antarcticus</i>	FIC	41
Antarctic silverfish	<i>Pleuragramma antarctica</i>	ANS	31
Antarctic starry skate	<i>Amblyraja georgiana</i>	SRR	14
Antarctic toothfish	<i>Dissostichus mawsoni</i>	TOA	29
Barbeled plunderfishes	<i>Pogonophryne</i> spp.	POG	37
Bigeye rattail	<i>Macrourus holotrachys</i>	MCH	22
Blue antimora, violet cod	<i>Antimora rostrata</i>	ANT	24
Blunt scalyhead	<i>Trematomus eulepidotus</i>	TRL	33
Bowed jaw icefish	<i>Dacodraco hunteri</i>	DAH	42
CAML rattail	<i>Macrourus caml</i>	QMC	20
Cosmopolitan rattail	<i>Coryphaenoides armatus</i>	CKH	19
Deepwater notothen	<i>Trematomus loennbergii</i>	TLO	35
Dewitt's icefish	<i>Chionobathyscus dewitti</i>	CHW	39
Eel cods	<i>Muraenolepis</i> spp.	MRL	18
Eelpouts	Zoarcidae	ELZ	27
Emerald notothen	<i>Trematomus bernacchii</i>	ERN	32
Giant morid cod	<i>Lepidion</i> sp.	LEV	25
Icefish	<i>Chionodraco hamatus</i>	TIC	40
Icefish	<i>Neopagetopsis ionah</i>	JIC	43
Maccain's skate	<i>Bathyraja maccaini</i>	BAM	16
Patagonian toothfish	<i>Dissostichus eleginoides</i>	TOP	28
Ridge scaled rattail	<i>Macrourus carinatus</i>	MCC	21
Sharp-spined notothen	<i>Trematomus pennellii</i>	PTC	36
Slender scalyhead	<i>Trematomus lepidorhinus</i>	TRD	34
Snailfishes	Liparidae	ZLS	26
Striped-eye notothen	<i>Lepidonotothen squamifrons</i>	NOK	30
Whitson's rattail	<i>Macrourus whitsoni</i>	WGR	23



## Index 5 – Alphabetical list of CCAMLR species codes

CCAMLR code	Common name	Scientific name	Page
ANS	Antarctic silverfish	<i>Pleuragramma antarctica</i>	31
ANT	Blue antimora, violet cod	<i>Antimora rostrata</i>	24
BAM	Maccain's skate	<i>Bathyraja maccaini</i>	16
BEA	Antarctic allometric skate	<i>Bathyraja cf. eatonii</i>	15
BHY	Antarctic dwarf skate	<i>Bathyraja</i> sp.	17
BTL	Antarctic dragonfishes	Bathyracidae	38
CHW	Dewitt's icefish	<i>Chionobathyscus dewitti</i>	39
CKH	Cosmopolitan rattail	<i>Coryphaenoides armatus</i>	19
DAH	Bowed jaw icefish	<i>Dacodraco hunteri</i>	42
ELZ	Eelpouts	Zoarcidae	27
ERN	Emerald notothen	<i>Trematomus bernacchii</i>	32
FIC	Antarctic icefish	<i>Cryodraco antarcticus</i>	41
JIC	Icefish	<i>Neopagetopsis ionah</i>	43
LEV	Giant morid cod	<i>Lepidion</i> sp.	25
MCC	Ridge scaled rattail	<i>Macrourus carinatus</i>	21
MCH	Bigeye rattail	<i>Macrourus holotrachys</i>	22
MRL	Eel cods	<i>Muraenolepis</i> spp.	18
NOK	Striped-eye notothen	<i>Lepidonotothen squamifrons</i>	30
POG	Barbeled plunderfishes	<i>Pogonophryne</i> spp.	37
PTC	Sharp-spined notothen	<i>Trematomus pennellii</i>	36
QMC	CAML rattail	<i>Macrourus caml</i>	20
SRR	Antarctic starry skate	<i>Amblyraja georgiana</i>	14
TIC	Icefish	<i>Chionodraco hamatus</i>	40
TLO	Deepwater notothen	<i>Trematomus loennbergii</i>	35
TOA	Antarctic toothfish	<i>Dissostichus mawsoni</i>	29
TOP	Patagonian toothfish	<i>Dissostichus eleginoides</i>	28
TRD	Slender scalyhead	<i>Trematomus lepidorhinus</i>	34
TRL	Blunt scalyhead	<i>Trematomus eulepidotus</i>	33
WGR	Whitson's rattail	<i>Macrourus whitsoni</i>	23
ZLS	Snailfishes	Liparidae	26

## APPENDIX 1

Instructions for photography and collecting specimens at sea: observers, researchers

### Background

NIWA has been photographing fishes for identification guides using a standard procedure (see procedure below), but we are missing or have only poor quality images of many species, particularly some of the bigger fishes (sharks, tunas), and less common species. This is a request for either images or specimens. Obviously it is impractical to return bigger, (e.g., sharks) or economically valuable fishes (e.g., tunas, billfishes), but images would be appreciated. Contact Peter McMillan or Peter Marriott, NIWA, Private Bag 14901 Wellington 6241, email [p.mcmillan@niwa.co.nz](mailto:p.mcmillan@niwa.co.nz) or [p.marriott@niwa.co.nz](mailto:p.marriott@niwa.co.nz) for a list of the species required.

### Method

#### Either

1. Collect one good specimen of the fish species caught if this is practical, i.e., a small specimen, and freeze it in a plastic bag filled with some water to reduce damage during transport. Please include a capture location data label. Please freight to: Peter McMillan or Peter Marriott, NIWA, 295-301 Evans Bay Parade, Wellington.

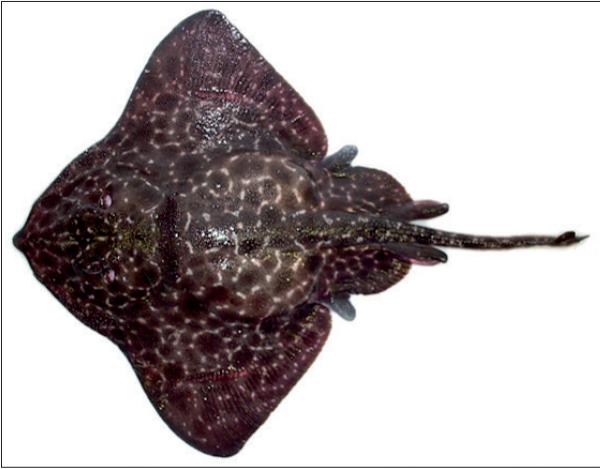
#### Or

2. Prepare and photograph the fish in a standard way (if possible/practical).

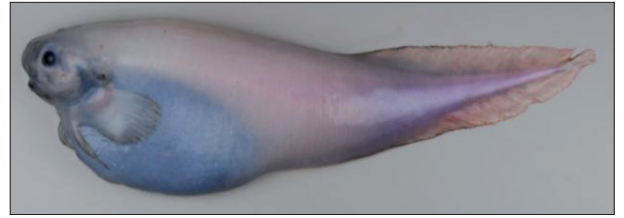
Procedure for fish photography

1. Select the best specimen from the catch. Wash off mud, blood, etc. An undamaged left hand side is preferred as the specimen is always oriented **head to the left for fish photography and illustration**. But we can flip the image later so this is not critical.
2. Take photos on a flat, even background. Ideally grey or a pale uniform colour is best but not critical. Please remove lines, hoses, etc from the fish and from the background of the image. Include a label listing capture location, photographer, identification (if known). Many fish lie at an angle, because of an enlarged belly; put a support under the dorsal margin if necessary to ensure a directly side-on view. Blot off water on fish and on the background. Please ensure that all parts of the fish, i.e., tip of snout to end of tail are in the frame. Sometimes it takes a bit of trial and error with exposures and focus to get a good quality image.
3. Retain the specimen if it is small and rare, with the location label. Freeze in seawater if possible/practical to prevent damage to fin rays once frozen. Please freight to: Peter McMillan or Peter Marriott, NIWA, 295-301 Evans Bay Parade, Wellington.





Page 14, Rajidae



Page 26, Liparidae



Page 27, Zoarcidae



Page 15, Arhynchobatidae



Page 28, Nototheniidae



Page 18, Muraenolepididae



Page 37, Artedidraconidae



Page 19, Macrouridae



Page 38, Bathydraconidae



Page 24, Moridae



Page 39, Channichthyidae