ISSN 0014-5602

FAO Fisheries Synopsis No. 125, Volume 18

FAO SPECIES CATALOGUE

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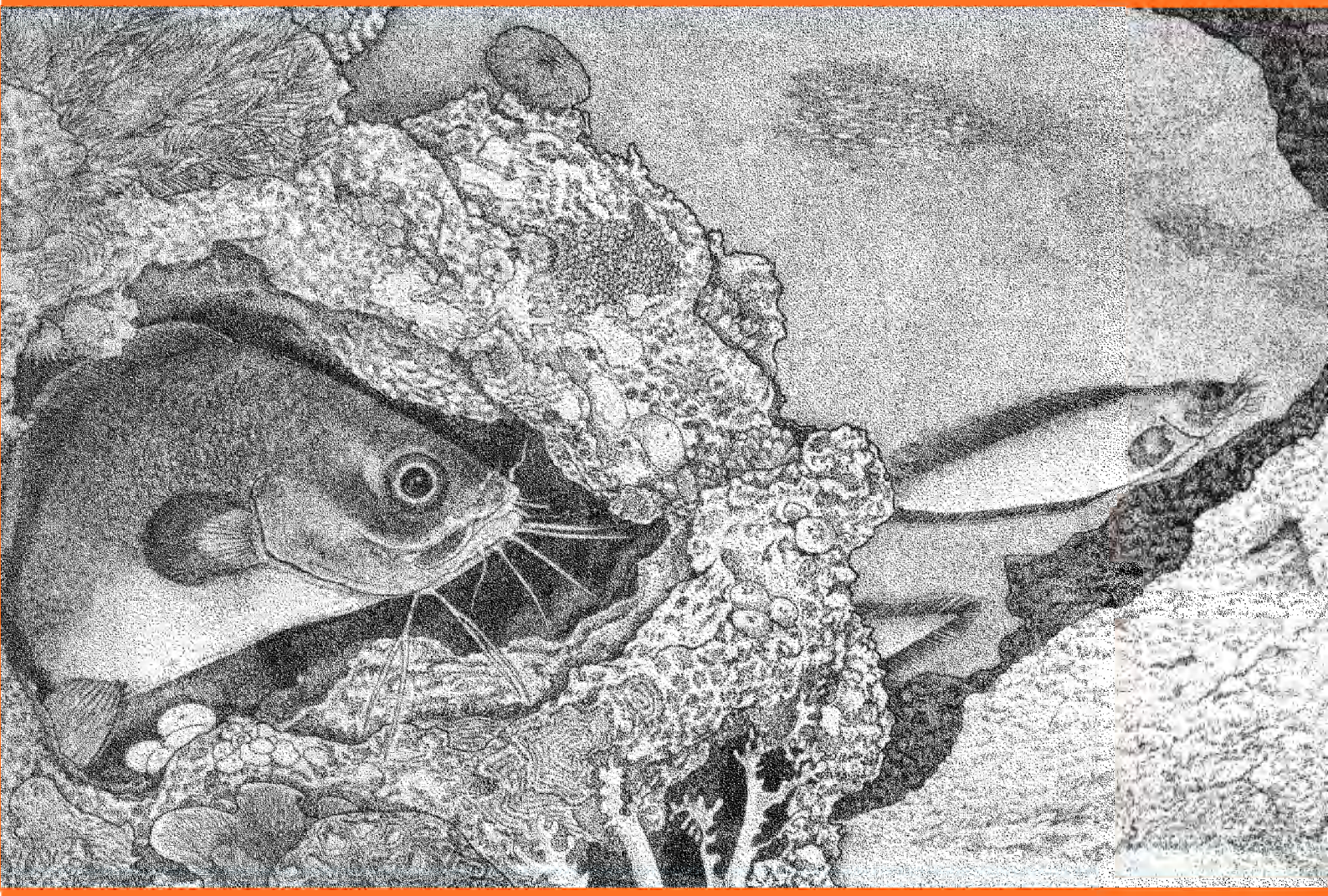
OPHIDIIFORM FISHES OF THE WORLD
(Order Ophidiiformes)

An annotated and illustrated catalogue of pearlfishes, cusk-eels, brotulas and other ophidiiform fishes known to date



Food and Agriculture Organization of the United Nations

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OPHIDIIFORM FISHES OF THE WORLD

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An annotated and illustrated catalogue of pearlfishes, cusk-eels, brotulas and other ophidiiform fishes known to date

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 1999

M-40
ISBN 92-5-104375-2

PREPARATION OF THIS DOCUMENT

This document was prepared under the FAO Fisheries Department Regular Programme by the Species Identification Programme in the Marine Resources Service of the Fishery Resources Division. It is the eighteenth worldwide species catalogue in the FAO Fisheries Synopsis series.

Several ophidiiform fishes are abundant in nature and play a significant role in the ecology of their habitats. Some species are of great importance to fisheries. Their identification, however, often presents such great difficulty that specimens are often referred to the family or genus level only. The purpose of this catalogue is to facilitate identification of these fishes. It also provides a much updated and extended version of the revision of the Order Ophidiiformes by Cohen and Nielsen (1978). The authors are internationally recognized experts in ophidiiform fishes and have been collaborating with FAO's Species Identification and Data Programme for many years.

The sections "Information on fisheries" were kindly provided by Sergi Tudela, CSIC, Barcelona.

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Digitization of distribution maps: E. Orlova (St. Petersburg), F. Carocci (FAO, Rome), and E. Luchetti (Rome).

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FAO species catalogue. Volume 18. Ophidiiform fishes of the world (Order Ophidiiformes). An annotated and illustrated catalogue of pearlfishes, cusk-eels, brotulas and other ophidiiform fishes known to date.

FAO Fisheries Synopsis. No. 125, Vol. 18. Rome, FAO. 1999. 178p., 136 figs.

ABSTRACT

This is the eighteenth issue in the FAO series of worldwide annotated and illustrated catalogues of the groups of marine organisms that enter marine fisheries. This volume covers all 93 genera currently recognized in the order Ophidiiformes (pearlfishes, cusk-eels, brotulas and allies). It includes a glossary of technical terms, general remarks on the order, identification keys from the suborder to the species level, detailed genera accounts, and a table of species by major fishing areas. In addition, 10 species of interest to fisheries are treated in illustrated accounts. The work is fully indexed and there is a comprehensive list of references to pertinent literature.

Distribution

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Selector SC

Acknowledgments

I thank numerous colleagues from all around the world who helped me. I remain grateful to many who were acknowledged in an earlier version of this review, and for the present work I particularly thank Dr. Anne Cohen for sharing her computer expertise, Dr. John Paxton for information on the distribution of Australian bythitids, Rick Feeney and Jeff Seigel for help at the Los Angeles County Museum of Natural History where much of this work was done, and the staff of the Ichthyological Department at the California Academy of Sciences, who helped in the final stages.

Daniel M. Cohen

I am thankful to many colleagues from all over the world for taking good care of me during visits and for sending specimens and data. In addition I am grateful to FAO for funding travels to Los Angeles and London.

Jørgen G. Nielsen

For assistance with the literature I thank G.H. Burgess, W.J. Richards, and C. Riva Rossi. R.N. Lea, K.A. Shaw, and E.O. Wiley commented on various versions of the manuscript. Other acknowledgments concerning acquisition of material, loans of material, and radiographs may be found in the author's papers cited in the bibliography.

C. Richard Robins

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1. INTRODUCTION

The purposes of this catalogue are to provide a convenient means for the identification of ophidiiform genera, and species to the extent possible, which are most likely to be encountered by fishery workers, ecologists and other marine biologists, to summarize fisheries, distributional and other biological information, to guide users to the most relevant literature, and to illustrate the wide diversity of this important group of fishes. Many ophidiiform species are abundant in nature and play a significant role in the ecology of their habitats, but their identification often presents such great difficulty that they are referred to family or genus level only.

This catalogue includes keys to and accounts of all genera of ophidiiform fishes as well as lists of referred species and keys to most of them. Because many ophidiiforms are fishes of the deep sea, are rare in collections and have a relatively small and often imprecise literature, keys to species of all genera are not possible.

Much of the information here included has been selectively compiled from the literature. Taxonomic descriptions have been verified to the extent possible, using both preserved museum and freshly caught specimens. This catalogue also constitutes an updating and enlargement of Cohen and Nielsen (1978). It does not purport to present a definitive phyletic classification of the order.

1.1 General Remarks on the Order Ophidiiformes

A hierarchical classification that differed in several respects from then current usage was presented by Cohen and Nielsen (1978). They wrote that the purpose of their classification was chiefly to distinguish genera from each other and that it was not intended as a phylogeny. Although the relationships of various taxa were suggested, the problem of aligning taxa on the basis of synapomorphies (the possession of shared special characters) received little explicit attention.

Although most of the research on ophidiiform fishes over the past 2 decades has been concerned with distinguishing species and other taxa from each other, several ichthyologists have attempted to discover a classification based on phyletic relationships for all or parts of the order. The order Ophidiiformes was identified by Cohen and Nielsen (1978) using a combination of characters. One or more specialized characters shared by all presumed ophidiiforms have yet to be discovered.

In a search for uniquely ophidiiform characters Rosen (1985) implied that the order is not monophyletic because of marked differences between, and absence of specialized similarities among, the 2 suborders: Ophidioidei and Bythitoidei. Patterson and Rosen (1989) placed the 2 groups as adjacent but separate clades or evolutionary lines. A survey of 36 genera (out of about 93) for a suite of osteological, myological, and cranial nerve characters failed to provide Howes (1992) with data that would establish the order as monophyletic. For present purposes, due to lack of anything better, we use the following definition of the order:

1. Pelvic fins with 1 or 2 soft rays in each or fin completely absent (in some species a basal spine-like splint may be present).
2. Pelvic fins inserted at about the level of the preopercle or farther anteriorly.
3. Pelvic fins bases close together (in all but *Tauredophidium*).
4. Dorsal and anal fins with long bases, extending to and often joined with the caudal fin.
5. Fin rays soft (except as noted above in no. 1).
6. Dorsal- and anal-fin pterygiophores more numerous than adjacent vertebrae.
7. Nostrils paired on each side of the head.

Our presently used classification of the order Ophidiiformes is shown in Fig. 1.

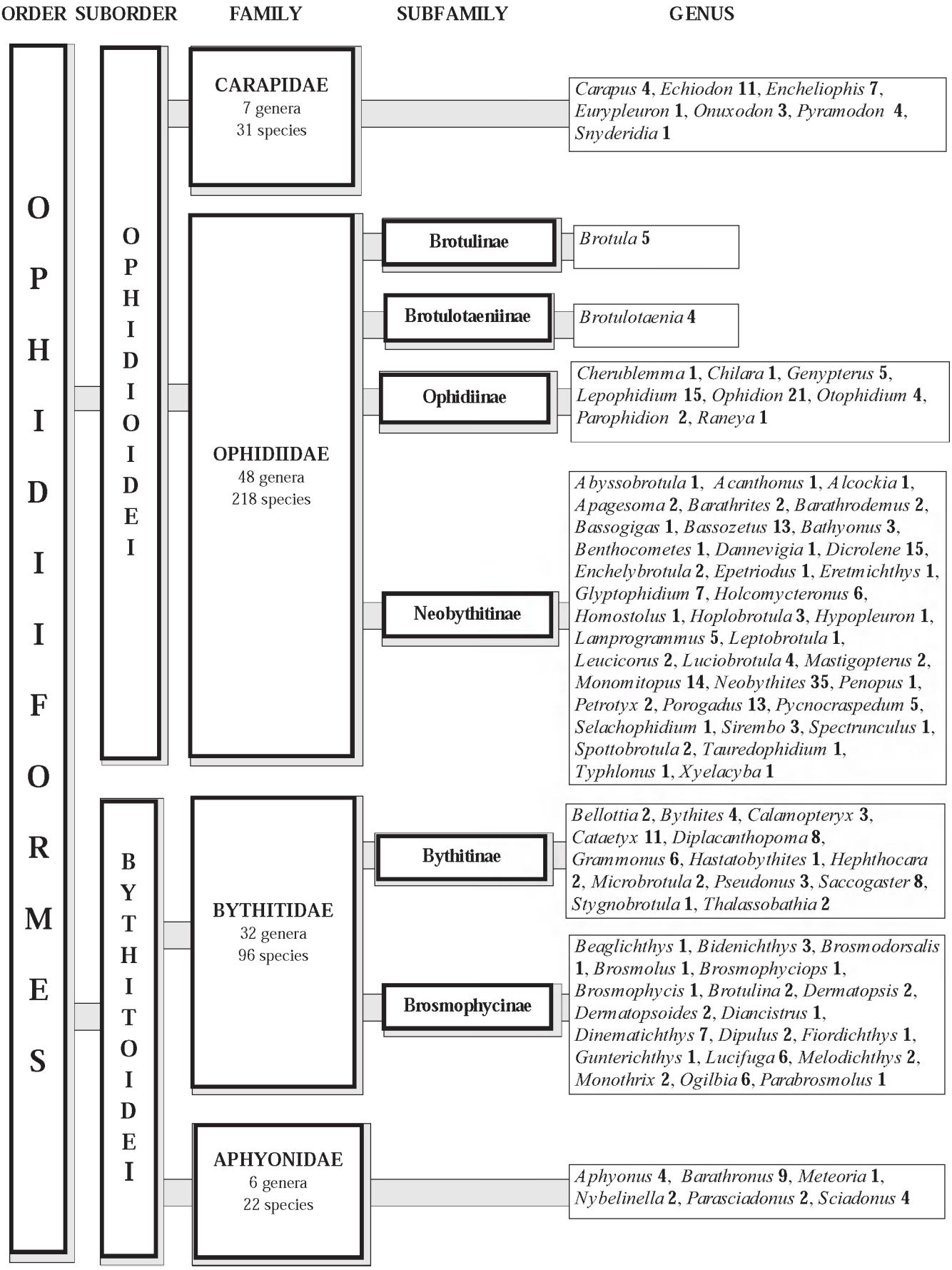


Fig. 1 Arrangement of Ophidiiformes followed in this catalogue. Entries under each taxonomic category are alphabetical. Figures in boldface refer to the number of species

1.2 General Remarks on Suborders and Families

The suborder **Ophidioidei**, as herein treated, was distinguished by Cohen and Nielsen (1978) with a suite of characters that Gordon et al. (1984), Rosen (1985), Patterson and Rosen (1989), and Howes (1992) found to be primitive, negative, or otherwise unsatisfactory for phylogenetic purposes. These authors noted that although some of the constituent taxa or un-named clusters of genera posses specialized characters, there is no presently known encompassing synapomorphy for the entire suborder.

The family **Carapidae** is a monophyletic group of elongate fishes that have pelagic larvae with a specialized first dorsal-fin ray called a vexillum. According to Howes (1992) the Carapidae is the closest relative of all other ophidiiform fishes. Carapids include 7 genera and about 30 species and are found around the world from tropical reefs and warm-temperate shallow water to the continental slope. Many species live as adults inside of sea cucumbers and other large bottom dwelling invertebrate animals.

The family **Ophidiidae** as herein treated has not been shown to be monophyletic. It contains about 50 genera that we here subdivide into 4 subfamilies.

The subfamily **Brotulinae**, the brotulas, consists of a single genus, ***Brotula***, which is most obviously characterized by the possession of barbels on the snout and chin. Similarities of ***Brotula*** to the gadiform genus ***Muraenolepis*** have been described by Markle (1989), and Howes (1992) found similarities between ***Brotula*** and several neobythitine genera (an expanded family Brotulidae once contained many genera now classified in other ophidiiform groups). There are at least 5 species of ***Brotula***, some of which are quite common, living at shallow to mid-depths in tropical and subtropical waters around the world.

The subfamily **Brotulotaeniinae** is most obviously characterized in having its scales modified into small prickles. Its closest relative is not known. There is a single genus, ***Brotulotaenia,*** with 4 uncommonly encountered species found in the meso- to bathypelagic of tropical and subtropical seas.

The subfamily **Ophidiinae**, containing the cusk-eels, is an apparently monophyletic group characterized in having the pelvic fins far forward and supported by an anterior extension of the pectoral girdle. The closest relative of the cusk-eels is not known, although Howes (1992) finds similarities with ***Brotula*** and several neobythitine genera. There are 8 genera and about 50 described and many undescribed species of cusk-eels which are found around the world in tropical, subtropical and temperate seas, mostly on the continental shelf. Some of the common species classified in the southern hemisphere genus ***Genypterus*** grow large enough to support fisheries.

The subfamily **Neobythitinae** contains 38 genera and about 170 described species (many of which were formerly classified in an expanded family **Brotulidae**) and numerous undescribed species. It does not at present meet the requirements for monophyly (Howes, 1992). Further research is required to define several clusters of genera and help decide whether they should remain in this subfamily. Although a single genus of neobythitines, ***Petrotyx***, lives on tropical reefs, most are found in deeper water, from the continental shelf to a depth of 8 370 m where ***Abyssobrotula galatheae***, the deepest known fish, has been caught.

The suborder **Bythitoidei** was distinguished by Cohen and Nielsen (1978) chiefly on the basis of viviparity and associated anatomical features, which Patterson and Rosen (1989) considered as specialized. Thus the mantle of monophyly was bestowed on bythitoids.

The family **Aphyonidae** is a monophyletic group of fragile, scaleless, and mostly rare fishes with a high number of precaudal vertebrae and many neotenous features. The closest relative of Aphyonidae is the **Bythitidae**. Aphyonids include 6 genera and 22 species and are found close to the bottom in all oceans at depths ranging from the continental shelf to the abyss. Nelson (1994) moved the Parabrotulidae from the Zoarciformes to the Ophidiiformes as it might be a derivative of the Aphyonidae. He based the reassignment on M.E. Anderson's remarks in Smith and Heemstra (1986) even though Smith and Heemstra kept the Parabrotulidae in the Zoarciformes. Until more research has shown the proper placement of the Parabrotulidae we exclude them from the Ophidiiformes.

The family **Bythitidae** is considered a monophyletic group which is here divided into 2 subfamilies. The structure of the male intromittent organ has proven useful for defining many of the genera.

The subfamily **Bythitinae** contains 13 genera and at least 50 species which have their dorsal, caudal and anal fins joined. Bythitines live in diverse habitats ranging from temperate to tropical reefs, to the deep sea where most are benthopelagic, although *Thalassobathia* and perhaps others are pelagic. One species, *Bythites fuscus*, is known from as far north as Greenland and *B. islandicus* has been taken at Iceland.

The subfamily **Brosmophycinae** has 19 genera and at least 43 and perhaps far more species. Brosmophycines have the caudal fin free from the dorsal and anal fins (this character is variable in some of the species of the genus *Lucifuga*). Most of the species are secretive, small-eyed, temperate to tropical reef dwellers, and species of *Lucifuga* are found in shallow fresh, brackish, and marine waters.

1.3 Developmental Stages

Larvae and juveniles of ophidiiform fishes are known only from relatively few species. Some are found in the epipelagic, others somewhat deeper in the pelagic, while still others remain near the bottom at great depths like adults.

From the oviparous suborder Ophidioidei, larvae of the family Carapidae are easily recognizable by their vexillifer stage (Fig. 2). The vexillum is of taxonomical importance. Carapid larvae are found near the surface in all oceans.

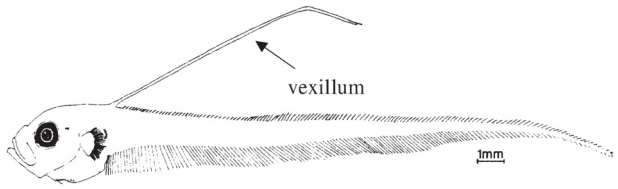


Fig. 2 Family Carapidae, vexillifer stage of *Pyramodon ventralis*
(from Markle and Olney, 1990)

Among the subfamilies of Ophidiidae the meso-and bathypelagic Brotulotaeniinae are known from a single 59 mm long pelagic larva. Small juveniles of the coastal-living Brotulinae are found in surface waters, often far from the shore. Larvae of the Ophidiinae, which occur on the continental shelf and upper slope are numerous in the epipelagic. They are easily recognized as ophidiins because of an elongate body and anteriorly placed pelvic fins (Fig. 3) but are

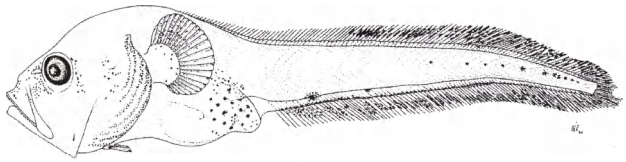


Fig. 3 Family Ophidiidae, subfamily Ophidiinae, larva of *Cherublemma emmelas*
(12.2 mm) (from Ambrose, 1996)

difficult to identify to genus. Most adult Neobythitinae are benthopelagic at great depths. Although larvae of this subfamily are rarely caught they are apparently pelagic at depths of 100 to 300 m and even deeper, judging from larval material in the DANA collections. Some of the larvae have the anterior dorsal-fin rays prolonged, as for instance *Benthocometes robustus* (Fig. 4).

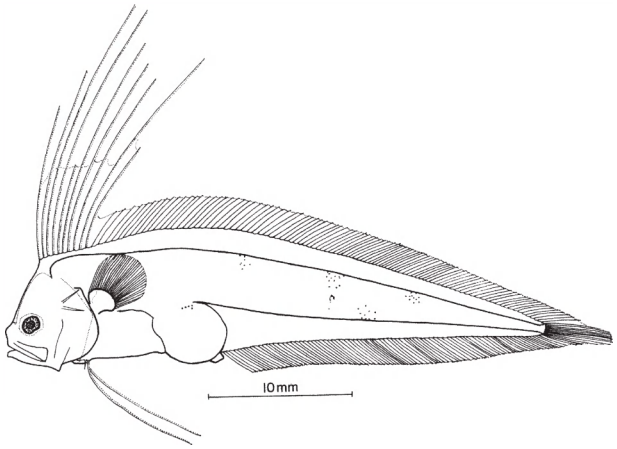


Fig. 4 Family Ophidiidae, subfamily Neobythitinae, larva of *Benthocometes robustus*
(from Nielsen and Evseenko, 1989)

In the viviparous suborder, Bythitoidei, newly born fish of the family Bythitidae are generally small. Most species live at shallow depths and the few identified larvae for example *Brosmo-*

phycis marginata (Fig. 5) and *Cataetyx rubrirostris* are caught in the epipelagic.

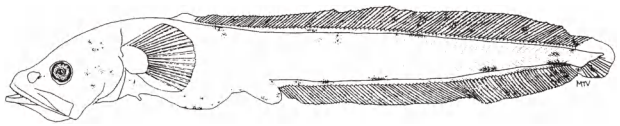


Fig. 5 Family Bythitidae, larva of *Brosmophycis marginata*
(17.2 mm) (from Ambrose, 1996)

The family Aphyonidae, is represented by very deepliving species, except for some species of *Barathronus*. Of the few larvae known, only 1 (Fig. 6) has been identified, *Barathronus pacificus*, caught in the epipelagic (Okiyama and Kato, 1997). Judging from the large size of embryos of deepliving species, newly born larvae might be expected to live near the bottom.

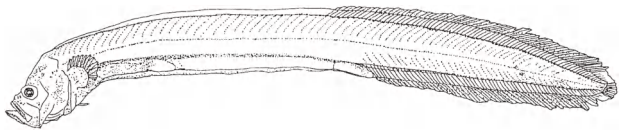


Fig. 6 Family Aphyonidae, larva of *Barathronus pacificus*
(42 mm) (from Okiyama and Kato, 1997)

1.4 Information on Fisheries

Among the ophidiiform fishes, only some species of the genus *Genypterus* are important targets of commercial fisheries, namely *G. blacodes, G. capensis, G. chilensis* and *G. maculatus*. The highest landings, approaching 30 000 t per year, are recorded for the former, mostly from the Southwest Atlantic fisheries. Catches of *Brotula barbata* by fleets from West African countries also have some commercial importance, probably improving local food security. Information on fisheries is included under the respective accounts of commercial species. Most species of the order have very limited or no fishing interest.

1.5 Plan of the Systematic Catalogue

Four families of ophidiiform fishes are presented; Carapidae, Ophidiidae, Bythitidae and Aphyonidae. For each family a description is given with the diagnostic characters in boldface, notes on habitat, distribution and biology and a key to subfamilies or genera. Within each of the categories the genera are arranged alphabetically. Within each genus, a key to species is given whenever possible, and an annotated list of species including synonyms. A full species account is given only for 10 species of interest to fisheries. Information is presented for each genus on the following subjects:

1. **Scientific name**. Reference is given to the type species, which is the species on which the genus is based.
2. **Synonyms**. Later or more recent names used for the genus in question with indication of the type species.
3. **Number of recognized genera/species**.
4. **Diagnosis and description**. This is a combination of descriptive and diagnostic characters with the latter ones appearing in bold face.
5. **Revision**. References to taxonomic revisions are cited.
6. **Geographical distribution**. A summary statement is presented of geographical distribution.
7. **Habitat and biology**. Although data are scant for most species, a summary is presented whenever possible.
8. **Interest to fisheries**. Data are presented for the few genera that are fished commercially.
9. **Size**. Unless otherwise indicated, standard length (a straight line from tip of snout to base of caudal fin) is given. Since many species are known from very few specimens the "size" will undoubtedly increase when more material is available.
10. **Key to species**. A key to the species is given whenever possible. For most genera the key is based on a revision of the genus.
11. **Remarks**. Various information is here included such as knowledge about undescribed species, need for a generic revision.

12. **List of (nominal) species**. The species are listed alphabetically. When only currently recognized species are listed the paragraph is titled "List of species". When junior synonyms also are included it is titled "List of nominal species". When more than 1 species is listed data on distribution and depth are added for each species. When a genus has only a single species, reference is made to distribution and depth for the genus. A species is noted as "rare" when less than 10 specimens are known, "uncommon" when 10-50 are known and "common" when more than 50 are known.

13. **Illustrations** are either original for this publication or have been copied from earlier publications with reference to the source.

1.6 Problems with Identification

Highly technical characters used in the keys or defined in the glossary are illustrated with diagrams. If in doubt refer to the relevant genus illustration.

1.7 Illustrated Glossary of Technical Terms

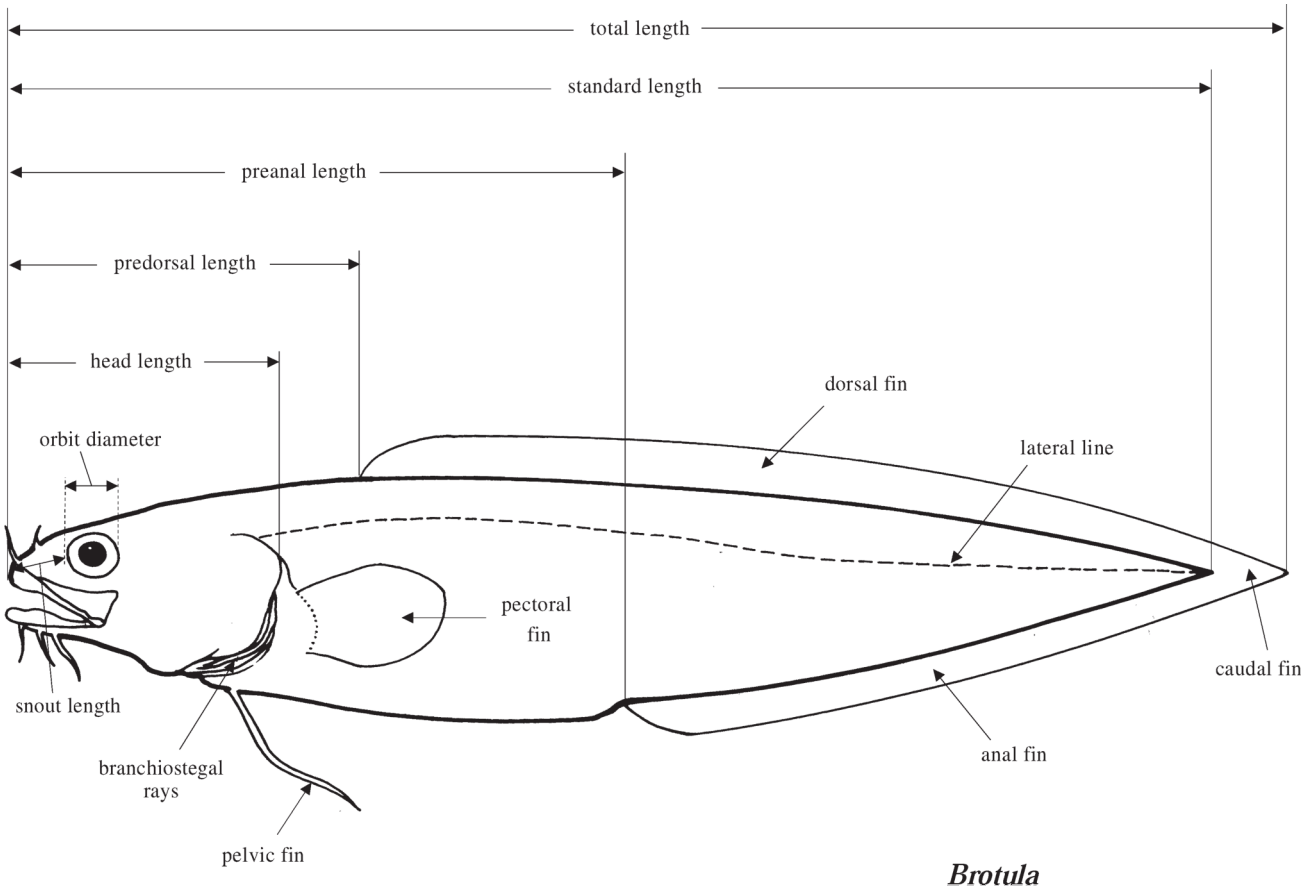


Fig. 7 External morphology and measurements

Adnate - Upper jaw bone (maxillary) attached to rather than free from side of head; like a snake's jaw.

Basibranchial tooth patch - Dentition of floor of mouth in ***Holcomycteronus***. Stippled areas include 2 median and 1 pair of basibranchial tooth patches and the dentaries. The dark areas are the bases of the fifth gill arches (Fig. 8).

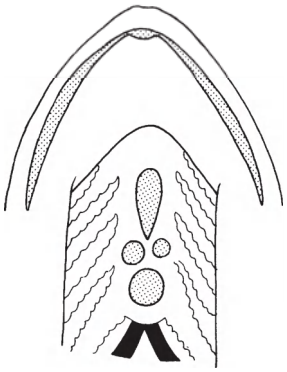


Fig. 8 Floor of mouth
(from Cohen and Nielsen, 1978)

Branchiostegal rays - Bony stays that support the membrane that seals the opening to the gill chamber (see Figs 7, 11).

Diastema - A gap in the dentition sometimes found between fangs and smaller teeth in the jaws.

Exterillium stage - Larval stage with a looped, trailing gut.

Fin rays - The flexible supporting struts of the fins. The pelvic fins of ophidiiform fishes consist each of 0 to 2 rays [see Fig. 9: diagrams of cross-sections through the pelvic fins of 3 kinds of ophidiiform fishes; the dotted line in each separates the 2 halves of a single ray; a) 1 ray in each fin; b) 2 separate rays in each fin; c) 2 joined rays in each fin].

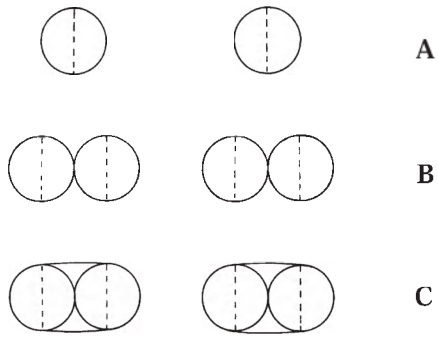


Fig. 9 Cross-section of pelvic fins
(from Cohen and Nielsen, 1978)

Gill rakers - Long bony protuberences along the anterior (inner) edges of the gill arches. [see Fig. 10: anterior gill arches of ophidiiform fishes; a) ***Saccogaster tuberculata***, lateral view of right side showing 3 developed rakers; b) ***Leucicorus atlanticus***, lateral view of left side showing 10 developed rakers].

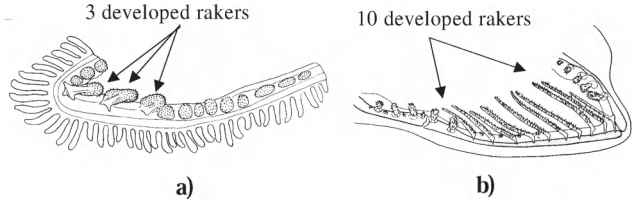


Fig. 10 Gill rakers
(from Cohen and Nielsen, 1978)

Head bones - See Fig. 11 for names of bones used in this work.

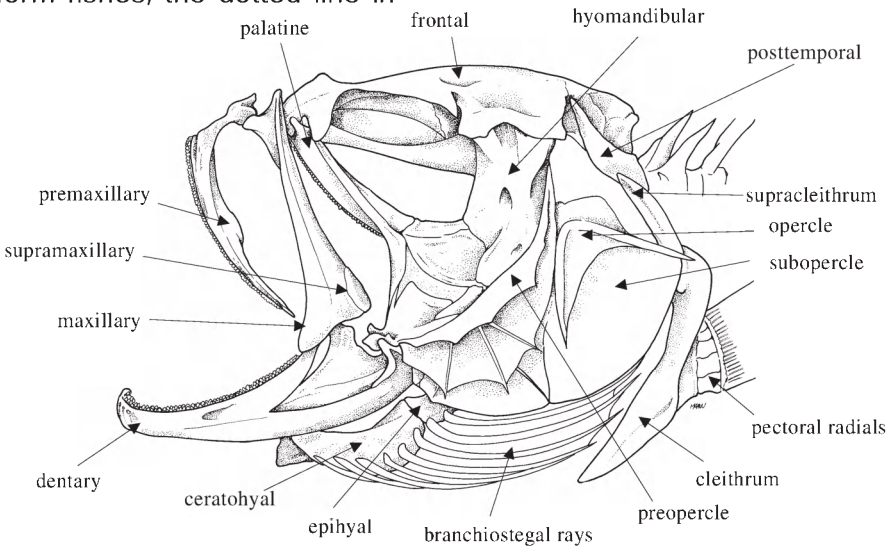


Fig. 11 Skull (after Gregory, 1959)

Intrinsic swimbladder - A constriction separating the swimbladder in 2 subequal parts.

Lateral line - A sensory system that runs in a line along the body (Fig. 7) and is also present on the head.

Male genital appendages - See Fig. 12, intromittent organ in ventral view in *Ogilbia* (note the 2 pairs of ossified pseudoclaspers).

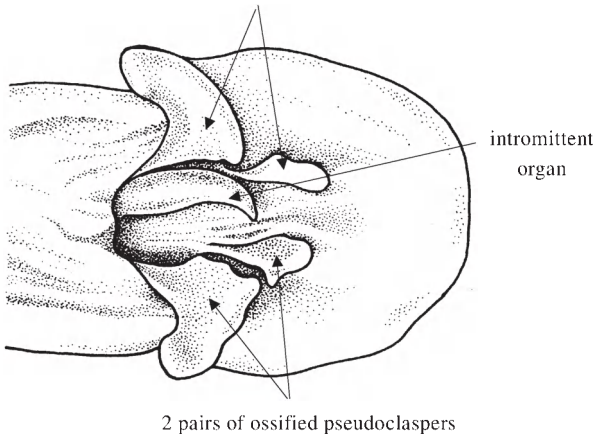


Fig. 12 Male genital appendages

Male intromittent organ - See **male genital appendages**.

Maxillary sheath - Skin fold covering the posterior, upper part of the maxillary bone.

Parapophyses - A pair of lateral processes on the precaudal vertebrae.

Pectoral-fin peduncle - A free, fleshy structure supporting the pectoral fin in some fishes.

Pectoral radials - A series of support bones at the base of the pectoral fin, buried in the pectoral-fin peduncle in some fishes.

Rocker bone - A hardened, modified anterior section of the swimbladder (see Fig. 13).

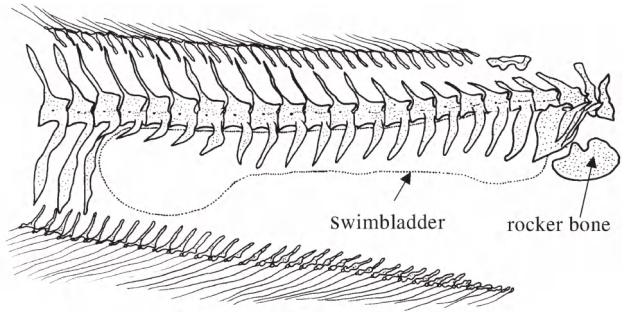


Fig. 13 Anterior axial skeleton of *Onuxodon fowleri*

Symphyseal fangs - Large, pointed teeth located at or close to the anterior junction of the upper or the lower jaws.

Teeth - Cardiform teeth (= heart-shaped teeth), premaxillary teeth (= teeth in upper jaw, see Fig. 11), dentary teeth (= teeth in lower jaw, see Fig. 11), palatine teeth and vomerine teeth (= teeth in roof of mouth, see Fig. 14)

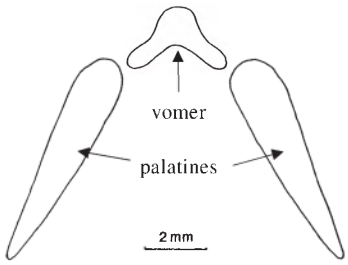


Fig. 14 Tooth patches on roof of mouth

Tenuis stage - Larval stage in Carapidae without enlarged anterior dorsal-fin ray often following vexillum stage.

Tunic ridges - Thickenings in the wall of the swimbladder of some Carapidae.

Vertebrae - Backbones often separated into precaudal (or abdominal) and caudal vertebrae; all caudal vertebrae bear a strong ventral spine. Total number of vertebrae does not include the ural centra.

Vexillum stage - Pelagic larval stage with anterior dorsal-fin ray much prolonged and often highly ornamented (see **vexillum**) found in the family Carapidae (Fig. 2).

Vexillum - Deciduous, elongate, highly vascularized, ornamented first dorsal-fin ray found in carapid larvae (Fig. 2).

2. SYSTEMATIC CATALOGUE

2.1 Order Ophidiiformes

Ordinal name: Ophidiodei Mead et al. (1964).

Number of recognized suborders: 2.

Diagnosis and description: Pelvic fins with 0 to 2 soft rays in each (in some species a basal spine-like splint may be present) **inserted at about level of opercle or farther anteriorly, placed close together** (except for *Tauredophidium*); **dorsal and anal fins with long bases, extended to and often joined with caudal fin, all rays soft; dorsal and anal fin pterygiophores more numerous than adjacent vertebrae**; nostril paired on each side of head.

Key to suborders

1a. Oviparous, males lacking a developed external intromittent organ; anterior nostril well above upper lip (Fig.15a) in most (variable in some cusk-eels); basibranchial tooth patches present or absent; pelvic fins at about level of preopercle or farther anterior in position, when present; caudal fin usually present and connected with dorsal and anal fins . . . . . **Ophidioidei**

1b. Viviparous, males with variously developed external intromittent organ; anterior nostril immediately above upper lip (Fig. 15b) in most (variable in Aphyonidae and a few bythitid genera); basibranchial tooth patches absent; pelvic fins at about level of opercle in position, when present; caudal fin connected with dorsal and anal fins or free . . . . . **Bythitoidei**

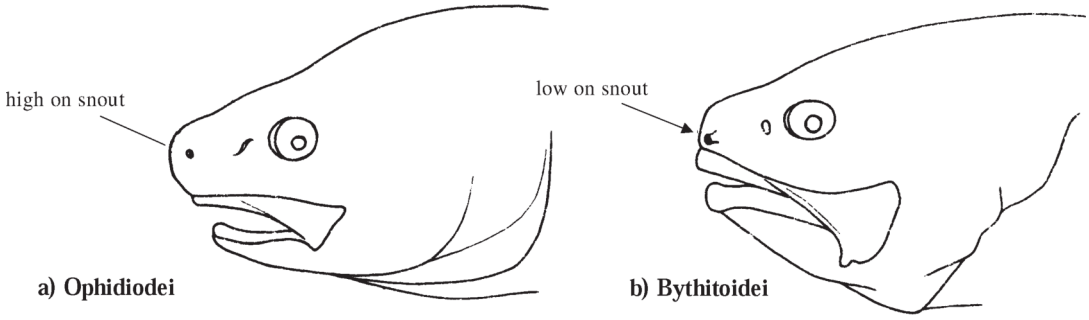


Fig. 15 Position of anterior nostril in 2 suborders of ophidiiform fishes (from Cohen and Nielsen, 1978)

2.2 Suborder Ophidioidei

Number of recognized families: 2.

Diagnosis and description: See above key to suborders.

Key to families

1a. Supramaxilla absent; anal-fin rays longer than opposing dorsal-fin rays . . . . . **Carapidae**

1b. Supramaxilla present; dorsal-fin rays usually equal to or longer than opposing anal-fin rays . . . . . **Ophidiidae**

2.3 Family Carapidae

Family: Carapidae Jordan and Fowler (1902).

FAO name: Pearlfishes.

Number of recognized genera: 7.

Diagnosis and description: Body elongate, compressed to rounded and eel-like; **supramaxilla absent; anal-fin origin advanced, under vertebrae 1 to 13**; scapula and coracoid fused; upper distal radial of pectoral fins enlarged; hyomandibula with large foramen; **larvae with highly modified first dorsal-fin ray (vexillum)**.

Habitat, distribution, and biology: Shallow to moderately deep dwelling benthic fishes of shelves and slopes with greatest diversity in shallow tropical waters of the Indo-West Pacific. A few species have free-living adults but most are commensals in the body cavity of invertebrates, primarily holothurians (sea cucumbers). Specialized biology of some sea cucumber commensals includes male-female pairing within a host, parasitism of the host's gonads and respiratory tree, and cannibalism. Larvae, called vexillifers, are highly specialized and apparently capable of long distance dispersal.

Interest to fisheries: A bycatch in some sea cucumber fisheries, but otherwise of no interest.

Key to genera

1a. Pelvic fins present . . . . . ***Pyramodon***

1b. Pelvic fins absent . . . . . → *2*

2a. Dorsal-fin origin anterior to anal-fin origin; 24 to 27 pectoral-fin rays; precaudal vertebrae 13 to 15 . . . . . ***Snyderidia***

2b. Dorsal-fin origin over or posterior to anal-fin origin; 0 to 26 pectoral-fin rays; precaudal vertebrae 15 to 35 . . . . . → *3*

3a. Upper and lower jaws with 1 to several large symphyseal fangs, no cardiform teeth . . . . → *4*

3b. Upper and lower jaws without enlarged fangs, cardiform teeth present . . . . . → *6*

4a. Tunic ridges ventrally or laterally on posterior part of swimbladder . . . . . ***Echiodon***

4b. No ridges on posterior part of swimbladder . . . . . → *5*

5a. Large median rocker bone in anterior part of swimbladder, posterior part of swimbladder embedded in hypaxial musculature; males lack expanded plate-like parapophyses on trunk vertebrae . . . . . ***Onuxodon***

5b. No median rocker bone in anterior part of swimbladder, posterior part of swimbladder not embedded in hypaxial musculature; males with expanded plate-like parapophyses on trunk vertebrae . . . . . ***Eurypleuron***

6a. Swimbladder constricted; maxilla not adnate; developed gill rakers present . . . . ***Carapus***

6b. Swimbladder with terminal membrane or bulb but no constriction; usually with adnate maxilla (except *E. boraborensis*); usually no developed gill rakers (except *E. boraborensis*) . . . . . ***Encheliophis***

List of nominal genera

Carapus Rafinesque, 1810

Cynophidium Regan, 1914 (junior synonym of ***Pyramodon***)

Diaphasia Lowe, 1843 (junior synonym of *Carapus*)
Disparichthys Herre, 1935 (junior synonym of *Carapus* or *Encheliophis*)
Echiodon Thompson, 1837
Encheliophiops Reid, 1940 (junior synonym of *Encheliophis*)
Encheliophis Müller, 1842
Eurypleuron Markle and Olney, 1990
Fierasfer Oken (ex Cuvier, 1817) (junior synonym of *Carapus*)
Helminthodes Gill, 1864 (junior synonym of *Carapus*)
Helminthostoma Günther (ex Cocco, 1870) (unavailable junior synonym of *Carapus*)
Jordanicus Gilbert, 1905 (junior synonym of *Encheliophis*)
Lefroyia Jones, 1874 (junior synonym of *Carapus*)
Leptofierasfer Meek and Hildebrand, 1928 (junior synonym of *Encheliophis*)
Onuxodon Smith, 1955
Oxybeles Richardson, 1846 (junior synonym of *Encheliophis*)
Pirellinus Whitley, 1928 (junior synonym of *Encheliophis*)
Porobronchus Kaup, 1860 (junior synonym of *Carapus*)
Pyramodon Smith and Radcliffe in Radcliffe, 1913
Rhizoiketicus Vaillant, 1893 (junior synonym of *Encheliophis*)
Snyderidia Gilbert, 1905
Vexillifer Gasco, 1870 (junior synonym of *Carapus*)

Carapus Rafinesque, 1810

Type species: *Gymnotus acus* Linneaus, without date, by Opinion 42, International Commission on Zoological Nomenclature.

Synonyms: *Diaphasia* Lowe, 1843, type species *Gymnotus acus* Brünnich, 1768; *Disparichthys* Herre, 1935 (?), type species *Disparichthys fluviatilis* Herre, 1935; *Fierasfer* Oken (ex Cuvier, 1817), type species *Ophidium imberbe* Cuvier, 1815; *Helminthodes* Gill, 1864, type species *Oxybeles lumbricoides* Bleeker, 1854; *Helminthostoma* Günther (ex Cocco, 1870) (unavailable); *Lefroyia* Jones, 1874, type species *Lefroyia bermudensis* Jones, 1874; *Porobronchus* Kaup, 1860, type species *Porobronchus linearis* Kaup, 1860; *Vexillifer* Gasco, 1870, type species *Vexillifer dephilippii* Gasco, 1870.

Number of recognized species: 4.

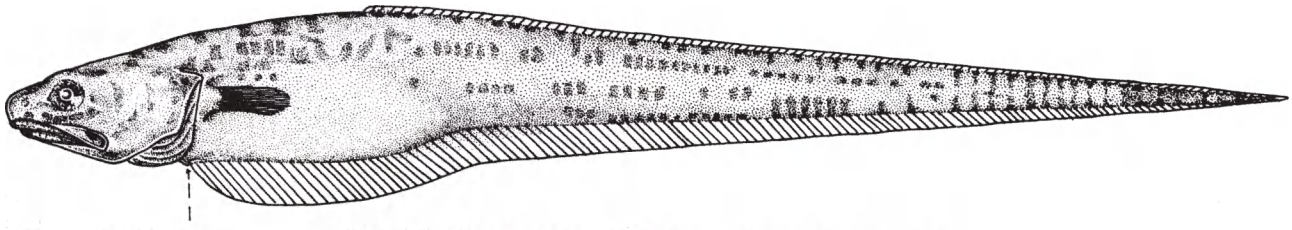


Fig. 16 *Carapus mourlani* (from Markle and Olney, 1990)

Diagnosis and description: Eel-like, moderate to shallow body depth; cardiform teeth present but restricted to upper jaw symphysis; swimbladder constricted forming 2 chambers; lacking enlarged dentary or premaxillary fangs, dentary diastema, pelvic fins and swimbladder rocker bone; juveniles and adults facultative or obligatory commensals with holothurians, asteroids or ascidians; **larvae extremely elongate with vexillum well anteriad of first dorsal-fin ray and first anal-fin ray; compensatory (shrinking) tenuis stage well developed.**

Revisions: Arnold (1956), Markle and Olney (1990).

Geographical distribution: Tropical and subtropical in the Atlantic, Indian and western Pacific.

Habitat and biology: Facultative or obligatory commensals in holothurians, asteroids and ascidians in waters of 1 to 150 m.

Interest to fisheries: None.

Size: At least 251 mm.

Remarks: *Carapus* is very similar to the specialized holothurian commensals, *Encheliophis*.

Key to species

1a. Distributed in Indo-West Pacific from Red Sea to Hawaii . . . . . → *2*

1b. Distributed in Atlantic and Mediterranean . . . . . → *3*

2a. Swimbladder constriction under vertebrae 9 or 10; precaudal vertebrae 15 to 17; primarily commensal in starfish . . . . . *C. mourlani*

2b. Swimbladder constriction under vertebra 13; precaudal vertebrae 19; primarily (?) commensal in tunicates (sea squirts) . . . . . *C. sluiteri*

3a. Pectoral-fin rays 17 to 20; found in western Atlantic, Bermuda and Caribbean Sea . . . . . *C. bermudensis*

3b. Pectoral-fin rays 20 to 24; found in eastern Atlantic and Mediterranean . . . . . *C. acus*

List of nominal species

Carapus acus (Brünnich, 1768). Eastern Atlantic and Mediterranean. Holothurian commensal. Common.

C. bermudensis (Jones, 1874). Western Atlantic and Caribbean. Holothurian commensal. Common.

C. birpex Arnold, 1956 (junior synonym of ***C. acus***).

C. chavesi Ancona-Lopez, 1956 (junior synonym of ***C. bermudensis***).

C. cuspis Arnold, 1956 (junior synonym of ***C. acus***).

C. mayottae Smith, 1955 (junior synonym of ***C. mourlani***).

C. mourlani (Petit, 1934). Indian and western Pacific. Asteroid (primarily) and holothurian commensal. Common.

C. pindae Smith, 1955 (junior synonym of ***C. mourlani***).

C. recifensis Ancona-Lopez, 1956 (junior synonym of ***C. bermudensis***).

C. sluiteri Weber, 1905. Indonesia. Ascidian commensal. Rare.

C. variegatus Fowler and Steinitz, 1956 (in part, junior synonym of ***C. acus*** and ***C. mourlani***).

Disparichthys fluviatilis Herre, 1935 (larval form, presumed junior synonym of a ***Carapus***).

D. herrei Schultz, 1938 (junior synonym of ***C. bermudensis***).

Encheliophis tenuis Putnam, 1874 (junior synonym of ***C. acus***).

Fierasfer dubius Putnam, 1874 (in part, junior synonym of ***C. bermudensis***).

F. maculata Swainson, 1839 (junior synonym of ***C. acus***).

Notopterus fontanesii Risso, 1810 (junior synonym of ***C. acus***).

Ophidium fierasfer Risso, 1826 (junior synonym of ***C. acus***).

O. imberbe Cuvier, 1815 (junior synonym of ***C. acus***).

Oxybeles lumbricoides Bleeker, 1854 (nomen dubium, probable synonym of ***C. mourlani***).

Porobronchus linearis Kaup, 1860 (junior synonym of *C. acus*).
Vexillifer dephilippii Gasco 1870 (junior synonym of *C. acus*).

Echiodon Thompson, 1837

Type species: *Echiodon drummondi* Thompson, 1837 by monotypy.

Synonyms: None.

Number of recognized species: 11.

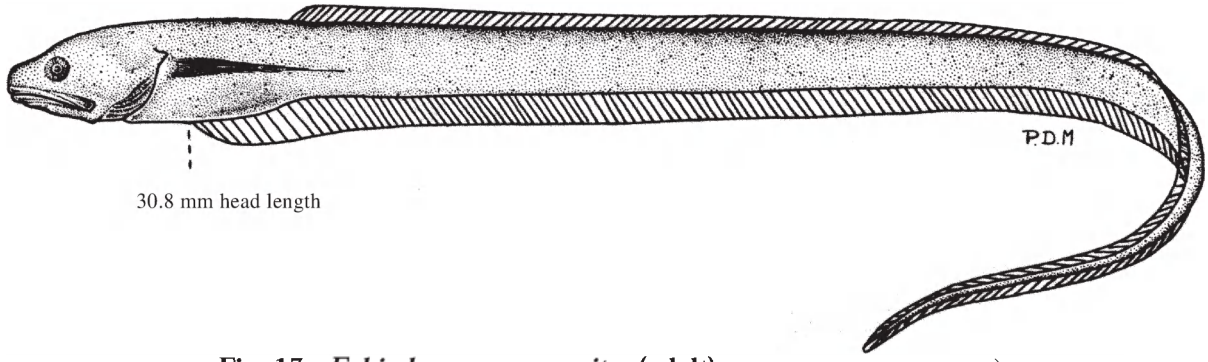


Fig. 17 *Echiodon cryomargarites* **(adult)** (from Markle and Olney, 1990)

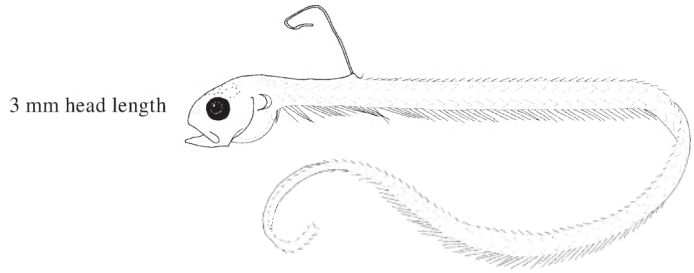


Fig. 18 *Echiodon coheni* **(larva)** (from Markle and Olney, 1990)

Diagnosis and description: Eel-like, shallow body depth; 1 to several large symphyseal fangs on dentary and premaxilla; lacking cardiform teeth, pelvic fins, and swimbladder rocker bone; **a patch of ridges posteriorly on the ventral surface of the swimbladder**; juveniles and adults free living or, possibly, facultative commensals with sponges or polychaete worm tubes; **larvae elongate with vexillum just anterior of first dorsal-fin ray and directly over to well posteriad of first anal-fin ray**; compensatory (shrinking) tenuis stage may be present or absent.

Revisions: Arnold (1956), Markle and Olney (1990).

Geographical distribution: Tropical to temperate in all oceans.

Habitat and biology: Free-living or possibly facultative commensals in shelf and slope waters of 18 to 2 000 m.

Interest to fisheries: None.

Size: At least 419 mm total length.

Remarks: One undescribed species known only from larvae; many rare forms in need of more study.

Key to species

1a. Dorsal-fin origin over or slightly behind anal-fin origin; 0 to 7 anal-fin rays anterior to dorsal-fin origin . . . . . → *2*

1b. Dorsal-fin origin distinctly behind anal-fin origin; 8 to 19 anal-fin rays anterior to dorsal-fin origin . . . . . → *6*

2a. More than 30 precaudal vertebrae . . . . . → *3*

2b. Less than 30 precaudal vertebrae . . . . . → *4*

3a. Vexillum present in adult; 19 or 20 pectoral-fin rays . . . . . *E. neotes*

3b. Vexillum absent in adult; 14 to 17 pectoral-fin rays . . . . . *E. rendahli*

4a. Tunic ridges left of ventral midline of swimbladder; western Pacific off New Zealand . . . . . *E. pegasus*

4b Tunic ridges on ventral midline of swimbladder; Atlantic and Mediterranean . . . . . → *5*

5a. Pigmented eye diameter greater than 16% head length; North Sea . . . . . *E. drummondi*

5b. Pigmented eye diameter less than 15% head length; Mediterranean and eastern Atlantic . . . . . *E. dentatus*

6a. Pectoral-fin rays 26; tunic ridges lateral to ventral midline of swimbladder . . . . . *E. pukaki*

6b. Pectoral-fin rays 15 to 21; tunic ridges on ventral midline of swimbladder . . . . . → *7*

7a. Twenty-eight to 35 dorsal-fin rays in front of vertical through back of 30th vertebra . . . → *8*

7b. Thirty-five to 45 dorsal-fin rays in front of vertical through back of 30th vertebra . . . . → *9*

8a. Forty-five to 47 anal-fin rays in front of vertical through back of 30th vertebra; 16 to 19 anal-fin rays in front of vertical through dorsal-fin origin; Indo-West Pacific . . . . . *Echiodon* **species**

8b. Thirty-nine to 43 anal-fin rays in front of vertical through back of 30th vertebra; 11 or 12 anal-fin rays in front of vertical through dorsal-fin origin; western Atlantic . *E. dawsoni*

9a. Fifty-two to 54 anal-fin rays in front of vertical through back of 30th vertebra; 18 to 20 precaudal vertebrae . . . . . *E. coheni*

9b. Forty-six to 50 anal-fin rays in front of vertical through back of 30th vertebra; 21 to 29 precaudal vertebrae . . . . . → *10*

10a. Precaudal vertebrae 21 to 25; eastern Pacific . . . . . *E. exsilium*

10b. Precaudal vertebrae 25 to 29; southern Ocean . . . . . *E. cryomargarites*

List of nominal species

Echiodon anchipterus Williams, 1984 (junior synonym of *E. coheni*).

E. coheni Williams, 1984. Tropical Indo-West Pacific. Benthic, 75 to 175 m, Rare.

E. cryomargarites Markle, Williams and Olney, 1983. Southern Ocean. Benthic. Uncommmon.

E. dawsoni Williams and Shipp, 1982. Tropical Atlantic. Benthic, 75 to 175 m. Uncommon.

E. dentatus (Cuvier, 1829). Mediterranean and eastern Atlantic. Benthic. Uncommon.

E. drummondi Thompson, 1837. Temperate eastern North Atlantic. Benthic. Common.

E. exsilium Rosenblatt, 1961. Tropical eastern Pacific. Benthic. Uncommon.

E. neotes Markle and Olney, 1990. Kermadec Trench, New Zealand. Pelagic? Rare.

E. pegasus Markle and Olney, 1990. New Zealand. Benthic, 117 to 239 m. Rare.

E. pukaki Markle and Olney, 1990. New Zealand. Benthic, 860 m. Rare.

E. rendahli (Whitley, 1941). Southern Australia. Benthic. Uncommon.

Echiodon **species**. Temperate western North Pacific. Rare.

Encheliophis Müller, 1842

Type species: ***Encheliophis vermicularis*** Müller, 1842 by monotypy.

Synonyms: ***Disparichthys*** Herre, 1935 (?), type species ***Disparichthys fluviatilis*** Herre, 1935; ***Encheliophiops*** Reid, 1940, type species ***Encheliophiops hancocki*** Reid, 1940; ***Jordanicus*** Gilbert, 1905, type species ***Fierasfer umbratilis*** Jordan and Evermann, 1903; ***Leptofierasfer*** Meek and Hildebrand, 1928, type species ***Leptofierasfer macrurus*** Meek and Hildebrand, 1928; ***Oxybeles*** Richardson, 1846, type species ***Oxybeles homei*** Richardson, 1846; ***Pirellinus*** Whitley, 1928, type species ***Oxybeles lumbricoides*** Bleeker, 1854; ***Rhizoiketicus*** Valliant, 1893, type species ***Rhizoiketicus carolinensis*** Valliant, 1893.

Number of recognized species: 7.

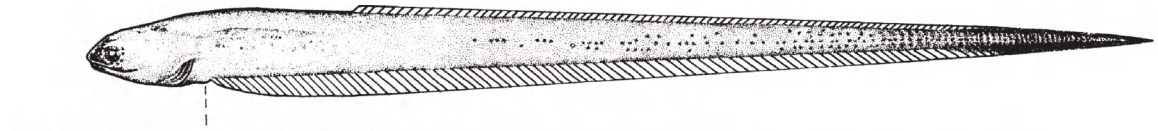


Fig. 19 ***Encheliophis vermicularis*** **(adult)** (from Markle and Olney, 1990)

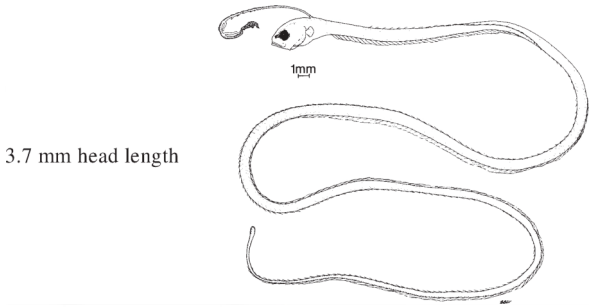


Fig. 20 ***Encheliophis/Carapus*** **sp. (larva)** (from Markle and Olney, 1990)

Diagnosis and description: Eel-like, moderate to shallow body depth; maxilla free to adnate; cardiform teeth present; gill rakers not developed in some species; **branchiostegal membranes partly or completely united; swimbladder with thin terminal membrane or bulb**; lacking enlarged dentary or premaxillary fangs, dentary diastema, pelvic fins, and swimbladder rocker bone; juveniles and adults obligatory commensals or parasites in holothurians or commensal in molluscs; **larvae extremely elongate with vexillum well anterior of first dorsal-fin ray and first anal-fin ray**; compensatory (shrinking) tenuis stage presumed well developed.

Revisions: Arnold (1956), Markle and Olney (1990).

Geographical distribution: Tropical to temperate Indo-Pacific.

Habitat and biology: One eastern Pacific molluscan commensal; others are holothurian commensals, some forming male-female pairs within a host, while others are cannibals or parasites on host's gonads and respiratory tree. In depths of 1 to 110 m.

Interest to fisheries: None.

Size: At least 334 mm total length.

Remarks: An additional deep-water dwarf form is under study.

Key to species

1a. Maxilla free and movable . . . . . → *2*

1b. Maxilla adnate or nearly so . . . . . → *4*

2a. Pectoral fins small, less than 29% head length; body thick, robust and highly pigmented; 15 to 17 precaudal vertebrae . . . . . ***E. boraborensis***

2b. Pectoral fins large, greater than 39% head length; body not robust and generally unpigmented; 16 to 21 precaudal vertebrae . . . . . → ***3***

3a. Molluscan commensal; 19 to 21 precaudal vertebrae . . . . . ***E. dubius***

3b. Holothurian commensal; 16 to 19 precaudal vertebrae . . . . . ***E. homei***

4a. Pectoral fins absent . . . . . ***E. vermicularis***

4b. Pectoral fins present . . . . . → ***5***

5a. Precaudal vertebrae 26 or more; swimbladder long, tubular, extending well beyond twelfth vertebra; 17 to 19 pectoral-fin rays . . . . . ***E. gracilis***

5b. Precaudal vertebrae less than 24; swimbladder short, not extending beyond twelfth vertebra; 15 or 16 pectoral-fin rays . . . . . → ***6***

6a. Dentary and palatine with tightly spaced triangular teeth; 16 vertebrae in front of dorsal-fin origin; probably a dwarf species . . . . . ***E. vermiops***

6b. Dentary and palatine with conical teeth; 11 to 14 vertebrae in front of dorsal-fin origin; attains 200 mm total length . . . . . ***E. sagamianus***

List of nominal species

Disparichthys fluviatilis Herre, 1935 (larval form of an ***Encheliophis***).

D. lucillae Fowler, 1938 (larval form of an ***Encheliophis***).

Encheliophis boraborensis (Kaup, 1856a, Eschmeyer uses Kaup 1856b). Tropical Indo-West Pacific. Holothurian commensal. Uncommon.

E. dubius (Putnam, 1874). Tropical eastern Pacific and Hawaii. Molluscan commensal. Uncommon.

E. gracilis (Bleeker, 1856). Tropical Indo-West Pacific. Holothurian commensal. Uncommon.

E. hancocki Reid, 1940 (junior synonym of ***E. vermicularis***).

E. homei (Richardson, 1846). Tropical Indo-West Pacific. Holothurian commensal. Uncommon.

E. jordani Heller and Snodgrass, 1903 (junior synonym of ***E. vermicularis***).

E. sagamianus Tanaka, 1908. Japan. Holothurian commensal. Rare

E. vermicularis (Müller, 1842). Indo-Pacific. Holothurian parasite with male-female pairs in each host. Uncommon.

E. vermiops Markle and Olney, 1990. South Africa and Australia. Perhaps a commensal in burrowing holothurians. Rare.

Fierasfer affinis Gunther, 1862 (junior synonym of ***E. homei***)

F. arenicola Jordan and Gilbert, 1882 (junior synonym of ***E. dubius***).

F. caninus Günther, 1862 (nomen dubium for ***E. dubius***).

F. frantii Popta, 1912 (larval form of an ***Encheliophis***).

F. houlti Ogilby, 1922 (junior synonym of ***E. gracilis***).

F. kagoshimanus Steindachner and Döderlein, 1887 (probable junior synonym of ***E. boraborensis)***.

F. microdon Gilbert, 1905 (junior synonym of ***E. dubius***).

F. neglectum Peters, 1855 (junior synonym of ***E. homei***).

F. parvipinnis (Kaup, 1856a. Eschmeyer uses Kaup 1856b) (junior synonym of ***E. boraborensis***).

F. punctatus Fischer, 1885 (possible larval form of ***Encheliophis***).

F. umbratilis Jordan and Evermann, 1902 (junior synonym of ***E. gracilis***).

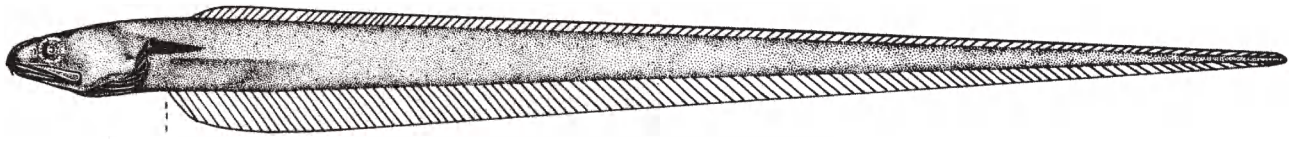
Leptofierasfer macrurus Meek and Hildebrand, 1928 (junior synonym of *E. dubius*).
Oxybeles brandesii Bleeker, 1851 (junior synonym of *E. homei*).
Rhizoiketicus carolinensis Vaillant, 1893 (junior synonym of *E. boraborensis*).

Eurypleuron Markle and Olney, 1990

Type species: *Carapus owasianus* Matsubara, 1953 by original designation.

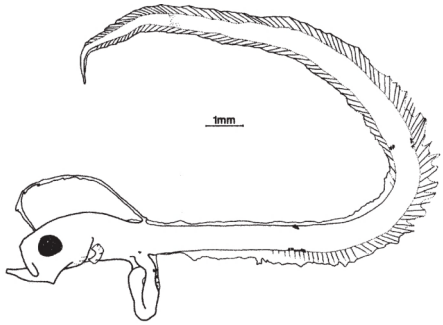
Synonyms: None.

Number of recognized species: 1.



13.1 mm head length

Fig. 21a *Eurypleuron owasianum* **(adult)** (from Markle and Olney, 1990)



2.0 mm head length

Fig. 21b *Eurypleuron owasianum* **(larva)**
(from Markle and Olney, 1990)

Diagnosis and description: Eel-like, shallow body depth; **dorsal-fin origin about opposite anal-fin origin; males with expanded parapophyses on vertebrae 5 to 18-20**; lacking cardiform premaxillary teeth, pelvic fins, swimbladder rocker bone, and ventral tunic ridges on posterior swimbladder; **larvae elongate with vexillum just anteriad of first dorsal-fin ray and with a looped, trailing gut (exterillium)**; unknown if compensatory (shrinking) tenuis stage present.

Revisions: Markle and Olney (1990).

Geographical distribution: Temperate Indo-Pacific off South Africa, Australia, New Zealand, Chile and Japan.

Habitat and biology: Presumably free-living in waters of 1 to 455 m. Uncommon.

Interest to fisheries: None.

Size: At least 236 mm total length.

Remarks: Although Markle and Olney (1990) synonymized the nominal Japanese and South African species, the widely separated populations suggest the need for further evaluation.

List of nominal species

Eurypleuron owasianum (Matsubara, 1953). Information see above.
Carapus cinereus Smith, 1955 (junior synonym of ***E. owasianum***).

Onuxodon Smith, 1955

Type species: ***Carapus parvibrachium*** Fowler, 1927 by original designation.

Synonyms: None.

Number of recognized species: 3.

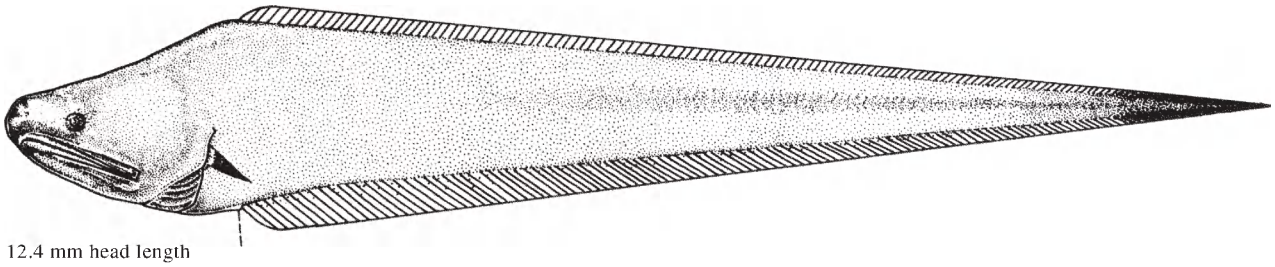


Fig. 22 ***Onuxodon parvibrachium*** **(adult)** (from Markle and Olney, 1990)

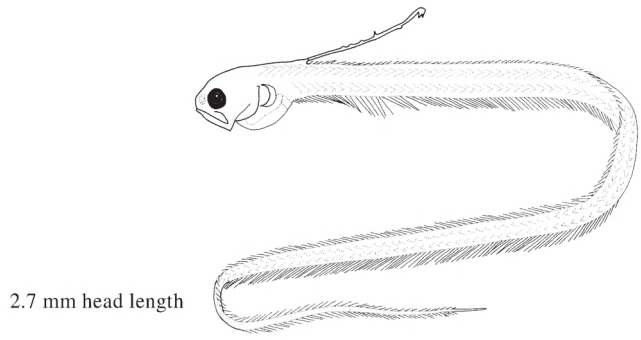


Fig. 23 ***Onuxodon fowleri*** **(larva)** (from Markle and Olney, 1990)

Diagnosis and description: Eel-like, shallow to moderate body depth; **adults small, less than 100 mm, trunk compressed; 1 to several large symphyseal fangs on premaxilla and dentary; anterior swimbladder modified into "rockerbone"**; predorsal bone present; pectoral-fin rays supported by numerous small distal radials; **juveniles and adults almost exclusively molluscan commensals; larvae elongate with vexillum adjacent to first dorsal-fin ray and just anteriad or directly over vertical through first anal-fin ray**; compensatory (shrinking) tenuis stage presumed present.

Revisions: Markle and Olney (1990).

Geographical distribution: Tropical and temperate Indo-West Pacific, including Hawaii.

Habitat and biology: Molluscan commensals at depths of 1 to 30 m.

Interest to fisheries: None.

Size: At least 99 mm total length.

Remarks: Tenuis stage must exist but none have been identified.

Key to species

1a. Pectoral fins short (16 to 29% head length); eyes small (diameter 8 to 16% head length); precaudal vertebrae 16 to 18; lateralis papillae not visible on head or anterior lateral line . . . . . *O. parvibrachium*

1b. Pectoral fins long (28 to 54% head length); eyes large (diameter 15 to 22% head length); precaudal vertebrae 18 to 22; lateralis papillae noticeable on ventral edge of interopercle, mandible and anterior lateral line . . . . . → *2*

2a. Precaudal vertebrae 18 to 20; relatively short and deep-bodied (body depth 11 to 16% total length); restricted to western Australia . . . . . *O. margaritiferae*

2b. Precaudal vertebrae 19 to 22; relatively long and slender (body depth 6 to 10% total length); Indo-West Pacific from South Africa to Hawaii . . . . . *O. fowleri*

List of nominal species

Onuxodon fowleri (Smith, 1955). Indo-West Pacific from South Africa to Hawaii. Uncommon.

O. parvibrachium (Fowler, 1927). Indo-West Pacific from South Africa to Hawaii. Uncommon.

O. margaritiferae (Rendahl, 1921). Tropical northwestern Australia in western Australian pearl oyster. Uncommon.

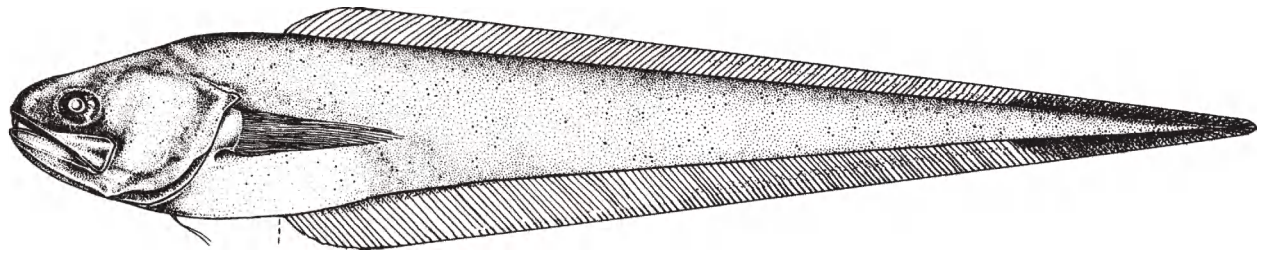
Carapus reedi Smith, 1955 (juvenile form of ***O. fowleri*** or ***O. parvibrachium***).

Pyramodon Smith and Radcliffe in Radcliffe, 1913

Type species: ***Pyramodon ventralis*** Smith and Radcliffe in Radcliffe, 1913 by original designation.

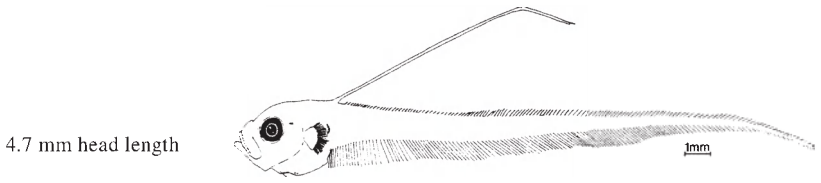
Synonyms: ***Cynophidium*** Regan, 1914, type species ***Cynophidium punctatum*** Regan, 1914.

Number of recognized species: 4.



38.3 mm head length

Fig. 24a ***Pyramodon ventralis*** **(adult)** (from Markle and Olney, 1990)



4.7 mm head length

Fig. 24b ***Pyramodon ventralis*** **(larva)** (from Markle and Olney, 1990)

Diagnosis and description: Eel-like, moderate to relatively deep body depth**; a large single vomerine fang; pelvic-fin rays present**; 3 developed gill rakers; swimbladder large, filling visceral cavity and extending past anus; dorsal and anal fin radials robust and elongate; **dorsal-fin origin anteriad or directly over anal-fin origin**; lacking rockerbone, cardiform teeth, and intrinsic swimbladder constrictions or tunic ridges**; larvae not extremely elongate, with vexillum adjacent to first dorsal-fin ray, with large head and deep body (36 to 106% head length), and enlarged premaxillary cartilage**.

Revisions: Markle and Olney (1990).

Geographical distribution: Tropical and temperate Indo-Pacific.

Habitat and biology: Apparently free living at depths of 120 to 731 m.

Interest to fisheries: None.

Size: At least 360 mm total length.

Remarks: Two species, ***Pyramodon ventralis*** and ***P. lindas,*** occur sympatrically off Japan (Machida and Okamura, 1993).

Key to species

1a. Margins of dorsal and anal fins edged in black over entire length; head and body generally unpigmented; 21 to 25 pectoral-fin rays . . . . . ***P. lindas***

1b. Margins of dorsal and anal fins edged in black over posterior quarter or not at all; head and body lightly to darkly pigmented, especially cheek and pectoral-fin base; 24 to 30 pectoral-fin rays . . . . . → ***2***

2a. Body darkly pigmented but dorsal- and anal-fin margins unpigmented; 28 to 30 pectoral-fin rays . . . . . ***P. parini***

2b. Body lightly pigmented with dorsal- and anal-fin margins pigmented over posterior quarter; 24 to 28 pectoral-fin rays . . . . . → ***3***

3a. Pectoral fins with 24 to 26 rays; 14 or 15 precaudal vertebrae; anus anterior, distance from snout to anus 99 to 133% head length . . . . . ***P. ventralis***

3b. Pectoral fins with 26 to 28 rays; 17 to 19 precaudal vertebrae; anus more posterior with distance from snout to anus 130 to 151% head length . . . . . ***P. punctatus***

List of species

Pyramodon lindas Markle and Olney, 1990. Northern Australia to Japan. Benthopelagic in 250 to 385 m. Uncommon.

P. parini Markle and Olney, 1990. Tropical South Pacific. Benthopelagic in 185 to 443 m. Rare.

P. punctatus (Regan, 1914). South temperate Indo-West Pacific. Benthopelagic in 120 to 731 m. Rare.

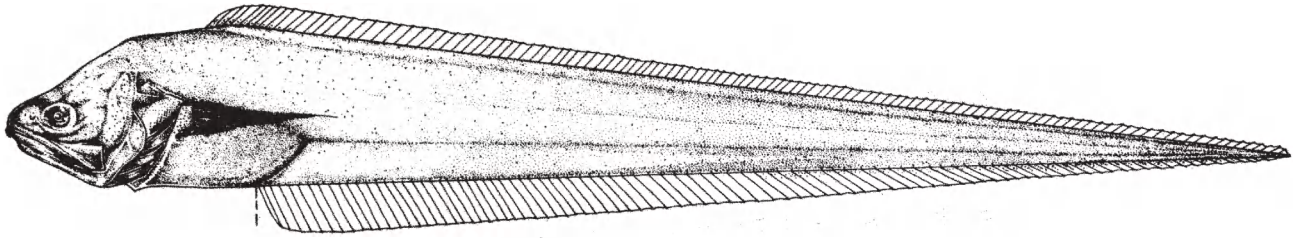
P. ventralis Smith and Radcliffe in Radcliffe, 1913. Tropical and north temperate Indo-West Pacific, including Japan. Benthopelagic in 184 to 364 m. Uncommon.

Snyderidia Gilbert, 1905

Type species: *Snyderidia canina* Gilbert, 1905 by original designation.

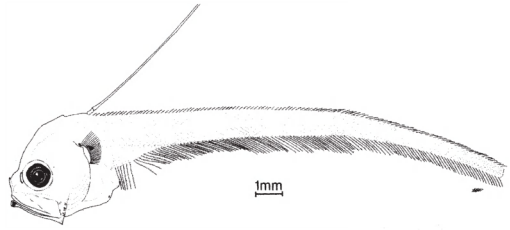
Synonyms: None.

Number of recognized species: 1.



26.4 mm head length

Fig. 25a *Snyderidia canina* **(adult)** (from Markle and Olney, 1990)



5.8 mm head length

Fig. 25b *Snyderidia canina* **(larva)** (from Markle and Olney, 1990)

Diagnosis and description: Eel-like, moderate to relatively deep body depth; **dorsal-fin origin anterior to anal-fin origin**; dorsal- and anal-fin radials elongate and frail; swimbladder small, not filling visceral cavity and not reaching past anus; lacking pelvic-fin rays, rockerbone, cardiform teeth, and intrinsic swimbladder constrictions or tunic ridges; **larvae not extremely elongate, with vexillum adjacent to first dorsal-fin ray, with large head and deep body (34 to 95% head length), and with prominent concentration of melanophores at symphysis of lower jaw**.

Revisions: Markle and Olney (1990).

Geographical distribution: Atlantic and Indo-West Pacific.

Habitat and biology: Apparently free-living at 110 to 1 500 m. Uncommon.

Interest to fisheries: None.

Size: At least 268 mm total length.

List of nominal species

Snyderidia canina Gilbert, 1905. Information see above.
S. bothrops Robins and Nielsen, 1970 (junior synonym of *S. canina*).

2.4 Family Ophidiidae

Family name: Ophidiidae Rafinesque (1810).

FAO name: Cusk-eels (in part).

Number of recognized genera: 48.

Diagnosis and description: Dorsal, caudal and anal fins confluent; **supramaxilla present**; dorsal-fin origin anterior to anal-fin origin; **dorsal-fin rays usually longer than opposing anal-fin rays**; body with scales; so far as known no vexillifer larval stage.

Key to subfamilies

1a. Barbels present on snout and chin . . . . . **Brotulinae**

1b. No barbels on snout and chin . . . . . → *2*

2a. Scales in form of small, non-imbricate prickles . . . . . **Brotulotaeniinae**

2b. Scales cycloid . . . . . → *3*

3a. Main body of ventral arm of cleithrum meeting its mate at about level of preopercle, but a slender, elongate filament of bone extends anteriorly to pelvic fins (Fig. 26a) inserted beneath eye; median basibranchial tooth patches present or absent . . **Ophidiinae**

3b. Ventral arm of cleithrum meeting its mate and terminating at about level of preopercle or farther anteriorly, but the anteriorly directed bony filament is absent (Fig. 26b); pelvic-fin insertion variable in position but most often well posterior to eye, fin absent in a few species; 1 or more median basibranchial tooth patches (except absent in *Apagesoma* spp., 1 species of *Barathrites*, 2 species of *Bassozetus*, and 2 species of *Lamprogrammus*) . . . . . **Neobythitinae**

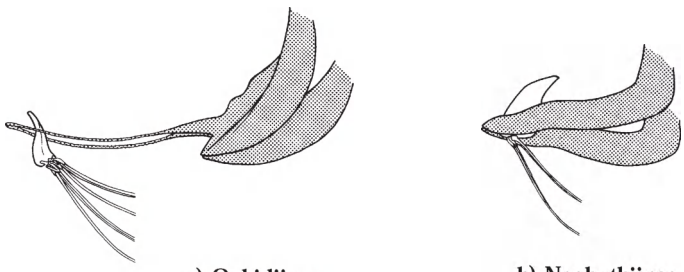


Fig. 26 Pelvic-fin support in 2 subfamilies of ophidiid fishes

2.4.1 Subfamily Brotulinae

Subfamily name: Brotulinae Swainson (1839).

Number of recognized genera: 1.

Diagnosis and description: See genus.

Brotula Cuvier, 1829

Type species: *Enchelyopus barbatus* Bloch in Bloch and Schneider, 1801 by monotypy.

Synonyms: *Nematobrotula* Gill, 1863a, type species *Brotula ensiformis* Günther, 1862; *Geneiates* Tickell in Day, 1888, type species *Geneiates ferruginosus* Tickell in Day, 1888.

Number of recognized species: About 5.

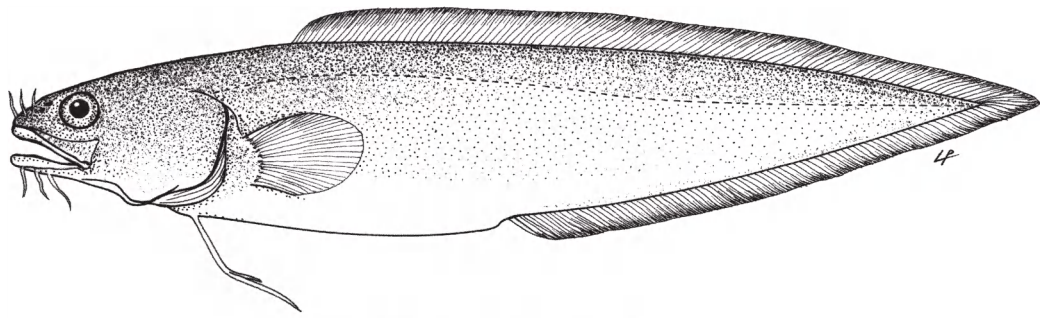


Fig. 27 *Brotula barbata*

Diagnosis and description: Body completely covered with small, imbricate, cycloid scales; **barbels present on snout (6) and chin (6)**; branchiostegal rays 8; median basibranchial tooth patch absent; developed gill rakers on first arch 4 or fewer; pelvic fin with 2 rays in each inserted at about level of preopercle, well behind eye.

Revisions: Hubbs (1944).

Geographical distribution: Around the world in tropical and subtropical seas.

Habitat and biology: Adults benthopelagic to 650 m and juveniles common on reefs. Smaller silvery specimens taken far out at sea in the epipelagic.

Interest to fisheries: Occasionally seen in markets, fresh, dried or salted.

Size: At least 750 mm.

Remarks: Additional research required to determine number of valid species. The descriptions of each of the many nominal species are based on very few specimens so both the inter-and intraspecific variation is poorly known.

Key to species: Not possible at present.

List of nominal species

Brotula barbata (Bloch in Bloch and Schneider, 1801). Tropical and subtropical Atlantic. Habits as for genus. Common.

B. burbonensis Kaup, 1858 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. clarkae Hubbs, 1944. Tropical eastern Pacific, Gulf of California to Peru. Habits as for genus. Occasionally caught.

B. ensiformis Günther, 1862 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. ferruginosus (Tickell, 1888) in Day, 1888 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. formosae Jordan and Evermann, 1902 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. japonica Steindachner and Döderlein, 1887 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. jayakari Günther, 1909 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. marginalis Jenkins, 1901 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. mülleri Günther, 1909 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. multibarbata Temminck and Schlegel, 1846. Red Sea and East Africa to Japan and Australia to Central Pacific. Habits as for genus. Common.

B. multicirrata Vaillant and Sauvage, 1875 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. ordwayi Hildebrand and Barton, 1949. Peru and Galapagos. Locally abundant.

B. palmietensis Smith, 1935 (listed in synonymy of *B. multibarbata* by Hubbs, 1944).

B. townsendi Fowler, 1900 (listed in synonymy of *B. multibarbata* by Hubbs, 1944; recognized by Gosline, 1953). Hawaii and Johnston Island. Uncommon. Matures at 46 cm.

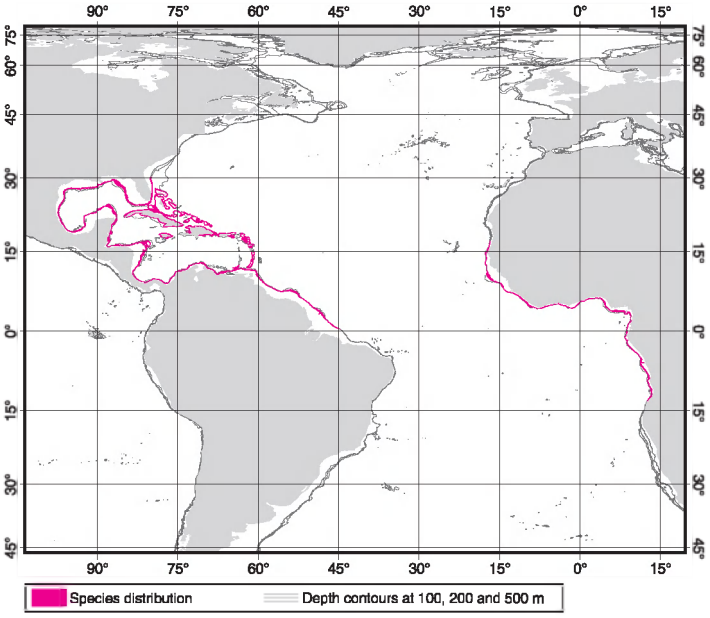
Brotula barbata (Bloch in Bloch and Schneider, 1801)

Synonyms: None.

FAO names: En - Bearded brotula; **Fr** - Brotule barbé; **Sp** - Brótula de barbas.

Diagnosis and description: See generic diagnosis and description. All Atlantic *Brotula* specimens are referred to this species.

Geographical distribution: In tropical parts of both the West and the East Atlantic.



Habitat and biology: Benthopelagic on shelf and upper slope down to 600 m. Larvae found in the epipelagic far off shore.

Interest to fisheries: Of some commercial importance in several Central African countries, mainly Congo Rep., Côte d'Ivoire, Liberia and Mauritania. Landings by the latter countries' fleets in 1996 amounted to 368 t (total world catch). Catches principally occur on the continental shelf by means of trawling gears.

Local names: Not available.

Size: At least 75 cm and 4 kg.

Brotula multibarbata Temminck and Schlegel, 1846

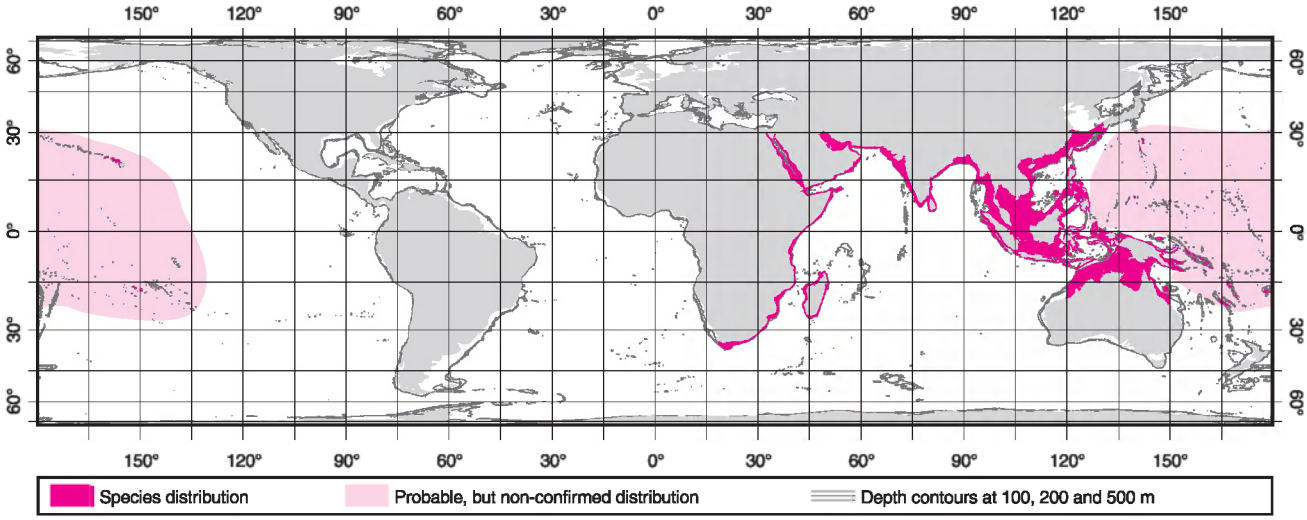
Synonyms: See **List of nominal species** in generic section.

FAO names: En - Goatsbeard brotula; **Fr** - Brotule barbe-de-boue; **Sp** - Brótula barba de carnero.

Diagnosis and description: See generic diagnosis and description. All specimens from the Indian Ocean and the West Pacific are referred to this species.

click for next page

Geographical distribution: From East Africa to Hawaii.



Habitat and biology: Benthopelagic on shelf and upper slope down to 650 m. Larvae found in the epipelagic far off shore.

Interest to fisheries: Of only minor commercial importance. Fishing involves the use of traps, trawls and hooks. Catches are usually consummed fresh.

Local names: Not available.

Size: At least 75 cm.

2.4.2 Subfamily Brotulotaeniinae

Subfamily name: Brotulotaeniinae Cohen and Nielsen (1978).

Number of recognized genera: 1.

Diagnosis and description: See genus.

Brotulotaenia Parr, 1933

Type species: ***Brotulotaenia nigra*** Parr, 1933 by original designation.

Synonyms: None.

Number of recognized species: 4.

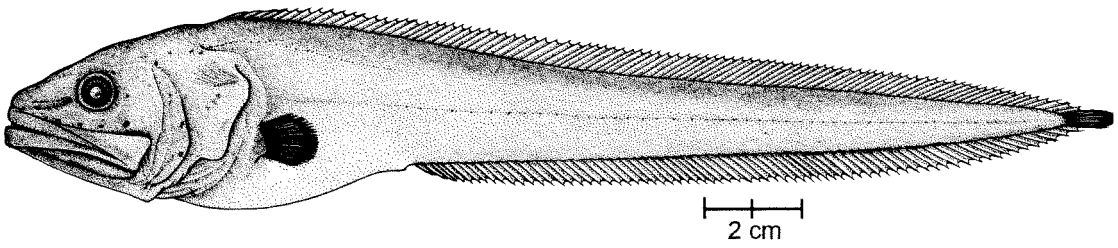


Fig. 28 ***Brotulotaenia nigra*** (from Cohen, 1974)

Diagnosis and description: Scales small non-imbricate prickles (Fig. 29); opercle with no spine; median basibranchial tooth patch absent; **gill rakers are tooth-bearing tubercles**; **otolith very small and rounded**; **pelvic fins absent**; precaudal vertebrae 12 to 15.

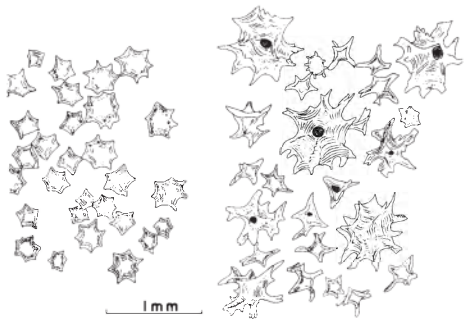


Fig. 29 ***Brotulotaenia*** **body scales**
(from Cohen and Nielsen, 1978)

Revisions: Cohen (1974), Shcherbachev (1980) and Machida et al. (1997).

Geographical distribution: Tropical and subtropical seas.

Habitat and biology: Meso- to bathy- and perhaps benthopelagic; caught in midwater and bottom trawls. The largest known example was caught on an espada longline at Madeira. Aboussouan (1980) described and illustrated a larva of 59 mm standard length caught pelagically between the surface and 165 m.

Interest to fisheries: None.

Size: ***Brotulotaenia crassa*** reaches at least 860 cm.

Key to species

1a. Head length 5.3 to 9.9 in standard length; dorsal-fin rays 113 to 134; anal-fin rays 91 to 108; total vertebrae 88 to 96 . . . . . → *2*

1b. Head length 3.2 to 4.5 in standard length; dorsal-fin rays 79 to 91; anal-fin rays 58 to 72; total vertebrae 67 to 72 . . . . . → *3*

2a. Head length 9.2 to 9.9 in standard length; dorsal-fin rays 113 to 115; anal-fin rays 91 to 94 . . . . . ***B. nigra***

2b. Head length 5.3 to 8.5 in standard length; dorsal-fin rays 119 to 134; anal-fin rays 98 to 108 . . . . . ***B. crassa***

3a. Dorsal-fin rays 85 to 91; anal-fin rays 62 to 72; total vertebrae 68 to 72 . . . . . ***B. nielseni***

3b. Dorsal-fin rays 79 to 84; anal-fin rays 58 to 64; total vertebrae 63 to 66 . . . ***B. brevicauda***

List of species

Brotulotaenia brevicauda Cohen, 1974. Tropical Atlantic and Indian Oceans. Uncommon.

B. crassa Parr, 1934. Atlantic and Indian Oceans. Uncommon.

B. nielseni Cohen, 1974. Pacific and Indian Oceans. Uncommon.

B. nigra Parr, 1933. Tropical Atlantic Ocean. Uncommon.

2.4.3 Subfamily Ophidiinae

Subfamily name: Ophidiinae Rafinesque (1810).

FAO names: En - Cusk-eels.

Number of recognized genera: 8.

Diagnosis and description: Caudal fin always with 9 (4+5) rays; no barbels on head although nasal region may be fringed in some species of *Lepophidium* and subnasal dermal lobes present in *Ophidion lagocheila* and to a lesser extent in *Parophidion* spp.; body covered with cycloid scales arranged in regular, overlapping rows or imbedded, arranged in a basketweave fashion (anguilloid). **pelvic-fin rays with 2 rays each**, of unequal length except in *Parophidion*; **branchiostegal rays 7**, 4 attached laterally to epihyal and posterior part of ceratohyal, 3 attached anteriorly to ventral edge of ceratohyal; **ventral arms of the 2 cleithra approximate each other anteriorly under level of preopercle from which point a slender element extends forward below orbital region**; pelvic fins supported between anterior ends of these 2 filamentous bones; lateral line on body incomplete, failing to reach caudal fin by an amount that varies among various genera and species.

Habitat, distribution, and biology: Benthic fishes of shelf and slope waters although the prejuveniles of *Cherublemma* and perhaps *Chilara* are mesopelagic. Known from all oceans.

Interest to fisheries: See species accounts.

Key to tribes (modified from Cohen and Nielsen, 1978)

1a. All body scales in regular overlapping rows; posterior part of head extensively scaled . . . . . **Lepophidiini**

1b. At least some body scales (frequently all) non-overlapping, arranged in a basket-weave or anguilloid fashion (Fig. 30); head entirely or mostly naked (except in *Raneya*) . . . . . **Ophidiini**

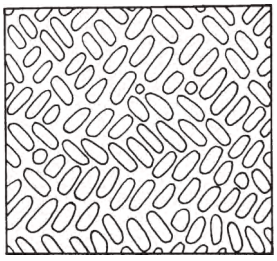


Fig. 30 Ophidiini body scales (from Cohen and Nielsen, 1978)

List of nominal genera

Tribe LEPOPHIDIINI

Brotuloides Robins, 1961 (junior synonym of *Cherublemma*)
Cherublemma Trotter, 1926
Genypterus Philippi, 1857
Hoplophycis Kaup, 1858 (junior synonym of *Genypterus*)
Lepophidium Gill, 1895
Leptophidium Gill, 1863b (name preoccupied)
Xiphiurus Smith, 1847 (name suppressed)

Tribe OPHIDIINI

Chilara Jordan and Evermann, 1896
Ophidion Linnaeus, 1758
Otophidium Gill in Jordan, 1885

Parophidion Tortonese, 1954
Raneya Robins, 1961
Rissola Jordan and Evermann, 1896 (junior synonym of *Ophidion*)

Tribe Lepophidiini Robins, 1961

Number of recognized genera: 3.

Diagnosis and description: Squamation of body in regular, overlapping rows, posterior part of head completely scaled; swimbladder an elongate simple sac in both sexes, without posterior opening or projection and without associated vertebral modifications except in a few species of *Lepophidium* (notably *L. brevibarbe* and *L. prorates*); **pyloric caeca present**.

Key to genera (modified from Cohen and Nielsen, 1978)

1a. No well-developed rostral (ethmoid) spine; postorbital part of head long, twice the length of the snout plus eye length . . . . . *Genypterus*

1b. A well-developed rostral (ethmoid) spine projecting forward to tip of snout . . . . . → *2*

2a. Peritoneum and guts black; rostral spine straight with a vertical basal component; a narrow row of weak basibranchial teeth . . . . . *Cherublemma*

2b. Peritoneum pale; rostral spine curved, without basal vertical component; no median basibranchial teeth . . . . . *Lepophidium*

Cherublemma Trotter, 1926

Type species: *Cherublemma lelepris* Trotter, 1926 by monotypy.

Synonyms: *Brotuloides* Robins, 1961, type species *Leptophidium emmelas* Gilbert, 1890.

Number of recognized species: 1

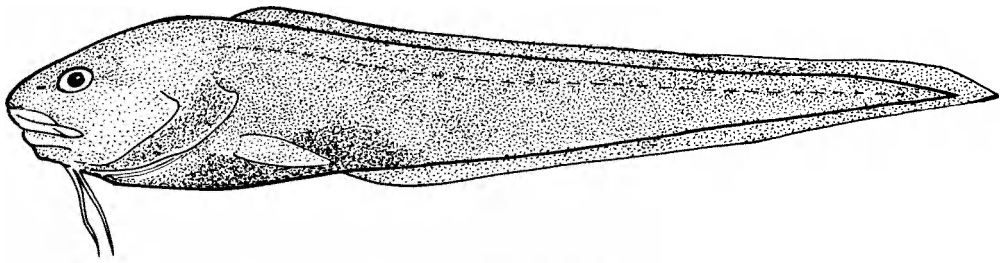


Fig. 31 *Cherublemma emmelas* (from Lea, 1995)

Diagnosis and description: Rostral spine well developed with **vertical basal component which projects dorsally,** and a long forward projecting straight component; **peritoneum and guts black; narrow, weak band of basibranchial teeth;** bones thin, weakly developed.

Revisions: Robins (1961).

Geographical distribution: Tropical eastern Pacific from Baja California to northern Chile.

Habitat and biology: Slope bottoms between 500 and 750 m. Prejuveniles with large liver, mesopelagic.

Interest to fisheries: None.

Size: To 25 cm.

List of nominal species

Cherublemma emmelas (Gilbert, 1890). Information see above. Common.
C. lelepris Trotter, 1926 (junior synonym of ***C. emmelas***).

Genypterus Philippi, 1857

Type species: ***Genypterus nigricans*** Philippi, 1857 by monotypy.

Synonyms: ***Xiphiurus*** Smith, 1847, type species ***Xiphiurus capensis*** Smith, suppressed by Opinion 1200 of the International Commission on Zoological Nomenclature (1982); ***Hoplophycis*** Kaup, 1858, type species ***Hoplophycis lalandi*** Kaup, 1858.

Number of recognized species: 5.

Diagnosis and description: No well-developed rostral spine; **postorbital length of head at least twice length of snout plus eye length**; peritoneum pale; basibranchial tooth patches present or absent; **top and sides of head extensively scaled**; **basal quarter to third of pectoral fins scaled on both surfaces**.

Revisions: None.

Geographical distribution: South temperate waters of southern Africa, South America, Australia, New Zealand, and the Chatham Islands.

Habitat and biology: Temperate waters of the deep shelf and upper slope, the adults preferring rocky habitat, the young shallower weedy areas.

Interest to fisheries: All species are of real or potential commercial importance.

Size: At least 2 m.

Key to species: Not possible at present.

List of nominal species

Genypterus blacodes (Schneider in Bloch and Schneider, 1801). See species account.
G. brasiliensis Regan, 1903b (junior synonym of ***G. blacodes***).
G. capensis (Smith, 1847). See species account.
G. chilensis (Guichenot, 1848). See species account.
G. maculatus (Tschudi, 1846) (junior homonym, see comments on species account).
G. microstomus Regan, 1903a (junior synonym of ***G. blacodes***).
G. nigricans Philippi, 1857 (junior synonym of ***G. chilensis***).
G. reedi Reed, 1962 (nomen nudum).
G. tigerinus Klunzinger, 1872. See species account.
Hoplophysis lalandi Kaup, 1858 (junior synonym of ***G. capensis***).

Genypterus blacodes (Forster in Bloch and Schneider, 1801) CUS

Synonyms: ***Genypterus microstomus*** Regan, 1903a; ***Genypterus brasiliensis*** Regan, 1903b.

FAO names: En - Pink cusk-eel; **Fr** - Abadèche rosé; **Sp** - Congribadejo rosé.

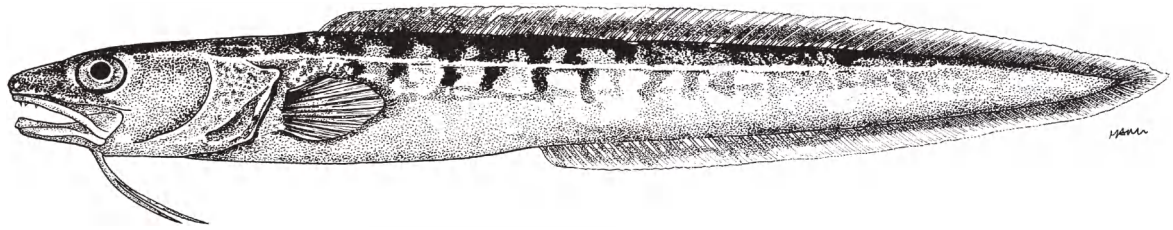
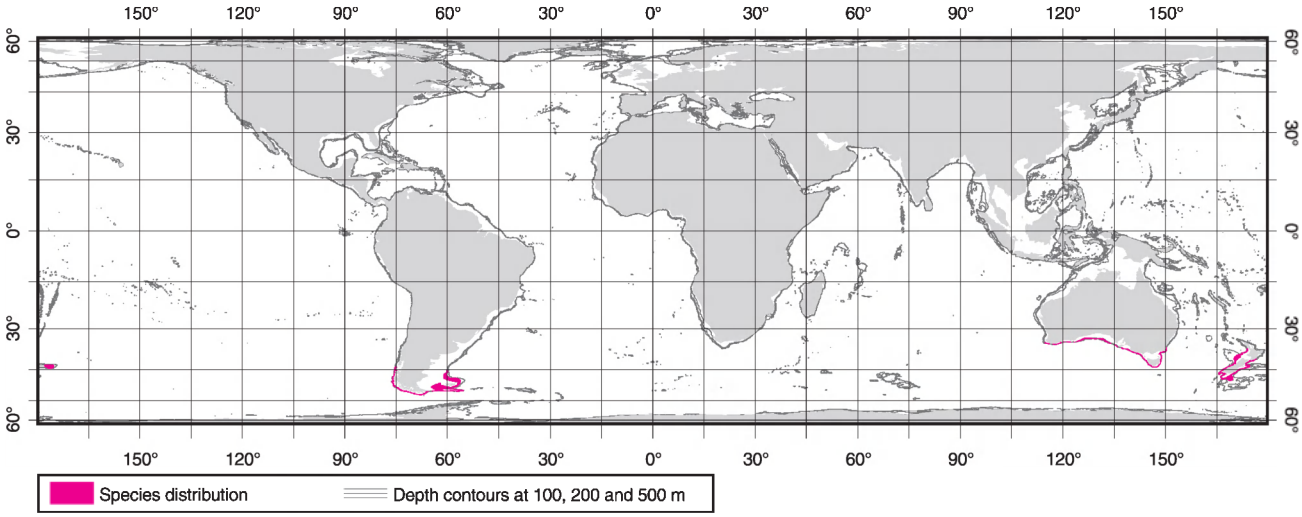


Fig. 32 ***Genypterus blacodes*** (after Last et al., 1983)

Diagnosis: Head and body with pinkish or orangish cast, with dark irregular blotches; dorsal-fin rays 141 to 164; anal-fin rays 101 to 126; pyloric caeca 6 (2+4).

Geographical distribution: New Zealand (including Chatham Islands), southern coast of Australia from New South Wales to Western Australia, and southern South America from southern Chile to Argentina.



Habitat and biology: Benthic in 200 to 650 m, juveniles more common in the shallower part of range, adults below 200 m. Common.

Interest to fisheries: Highly commercial species throughout its geographical range. FAO reports that landings in recent years fluctuate around 30 000 t, the bulk of this amount being caught by the Argentinian fleet in the southwest Atlantic and by Chilean vessels in the southeast Pacific – which landed, respectively, 23 443 t and 5 780 t in 1996. A significant share of the remaining landings comes from the activity of foreign fishing fleets in the southwest Atlantic, mainly Spanish and Korean. Fishing gears involved in the fishery are long lines and trawls. This production is most frequently utilized fresh and frozen as well as smoked. In Japan the meat can even be eaten raw as sashimi. New Zealand catches of ***Genypterus*** spp., reported by FAO to be 12 882 t in 1996, should probably be considered as belonging to this species, which is exploited in New Zealand waters by bottom long lines and bottom trawls. 80% of this harvest is frozen exported to eastern Asia markets. In spite of its high market value only one-third of the limited Australian pink ling catch - not reported at specific level by FAO - is a target fish; most is taken as bycatch of other fisheries such as those of gemfish, blue grenadier and shark. Australian catches in the South East Fishery are locally marketed.

Local names: AUSTRALIA: Pink ling; NEW ZEALAND: Ling, Kingclip, Hokarai; SOUTH AMERICA: Congrio.

Size: At least 2 m and 25 kg.

Remarks: The systematic status of the various populations is unclear. Two species may exist in southern Australia and in Argentina under this name and the distinctness of ***blacodes*** vs ***capensis*** has yet to be demonstrated. Literature reports of the distribution of South American species are confused and the exact distributions of each needs clarification. For recent discussions of this problem see Lay-son (1984) and de Astarola and Figueroa (1993). ***G. brasiliensis*** (Regan, 1903b) from northern Argentina appears to be an unpatterned form of ***blacodes***. It has been recognized as a distinct species (Nakamura, 1986) but its status is unclear.

Genypterus capensis (Smith, 1847) KCP

Synonyms: *Hoplophycis lalandi* Kaup, 1858.

FAO names: En - Kingklip; **Fr** - Abadèche du Cap; **Sp** - Congribadejo (= Rosada) del Cabo.

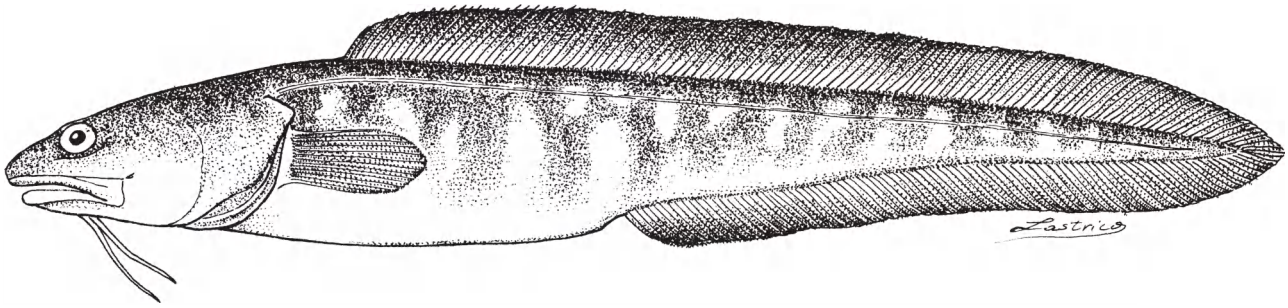


Fig. 33 *Genypterus capensis*

Diagnosis: Head and body usually pinkish to orangish with dark spots and blotches especially dorsally; dorsal-fin rays about 150; anal-fin rays about 110.

Geographical distribution: Southern Africa from Walvis Bay, Namibia, to Algoa Bay, southeastern Cape Province, South Africa.

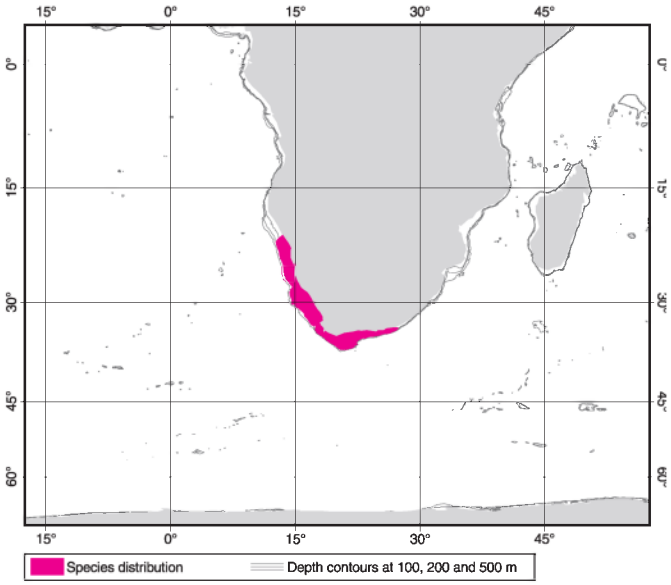
Habitat and biology: Benthic at depths of 50 to 500 m. Common.

Interest to fisheries: An important commercial species. Landings amounted to 6 281 t in 1996. Catches are almost equally distributed between Namibian and South African trawling fleets. Some minor catches are also landed by a foreign Spanish fleet. Harvests are consummed fresh and frozen.

Local names: NAMIBIA: Kingclip.

Size: At least 1.6 m.

Remarks: The distinctiveness of this species and ***Genypterus blacodes*** is unclear.



Genypterus chilensis (Guichenot, 1848) CUC

Synonyms: ***Genypterus nigricans*** Philippi, 1857; ***Genypterus reedi*** Reed, 1962 (a nomen nudum).

FAO names: En - Red cusk-eel; **Fr** - Abadèche rouge; **Sp** - Congribadejo colorado.

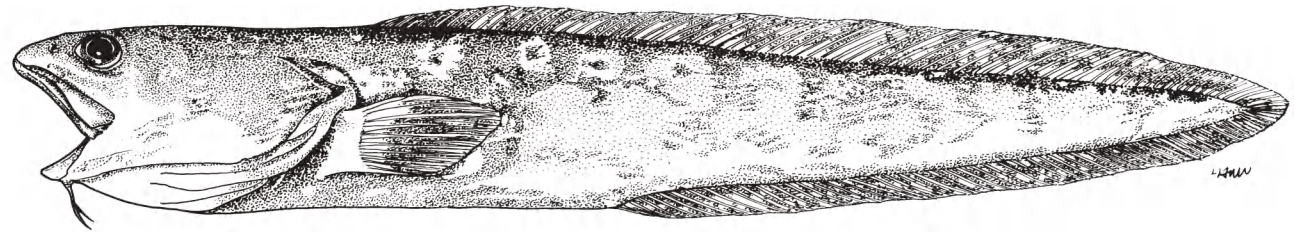


Fig. 34 ***Genypterus chilensis*** (after Mann, 1954)

Diagnosis: Head and body dark with large, irregular pale markings; head more than 4.5 times in standard length; dorsal-fin rays more than 135; anal-fin rays more than 105.

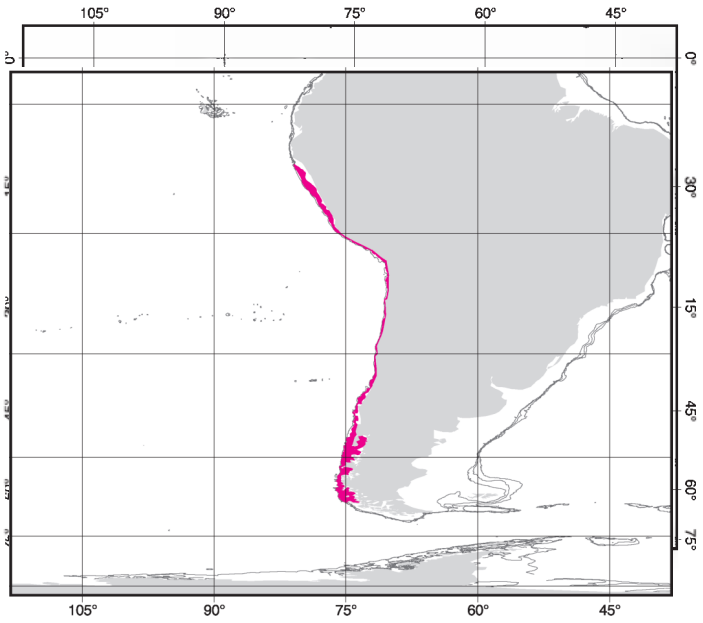
Geographical distribution: Southern Peru to southern Chile.

Habitat and biology: Benthic on rocky bottom in deep shelf and upper slope waters. Common.

Interest to fisheries: An important commercial species. FAO reported landings in 1996 were 982 t, all of them resulting from the activity of the Chilean fleet. Catch data from Peru are reported together with those for ***Genypterus maculatus***; for 1996, a total catch of 1 121 t of ***Genypterus*** spp. was reported from Peru.

Local names: Chilean kingclip, Congrio colorado, Congrio rosado.

Size: At least 1.5 m.



Genypterus maculatus (Tschudi, 1846) CUB

Synonyms: None.

FAO names: En - Black cusk-eel; **Fr** - Abadèche noir; **Sp** - Congribadejo negro.

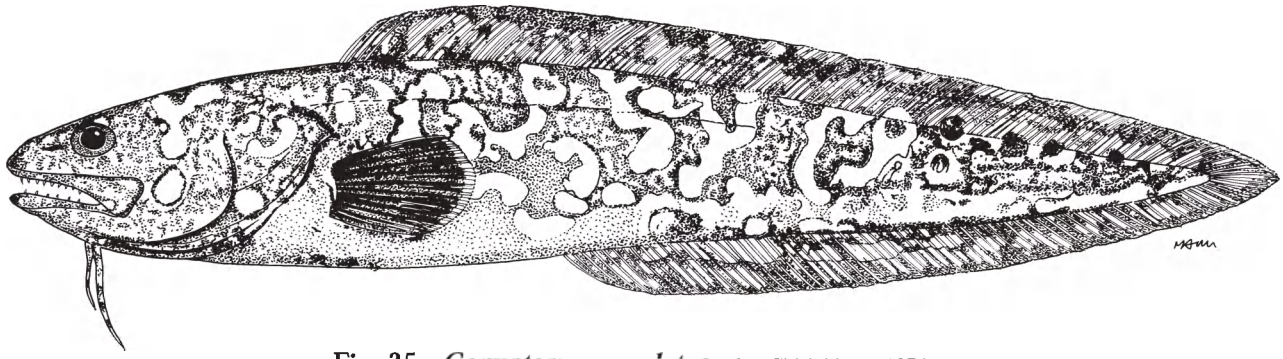
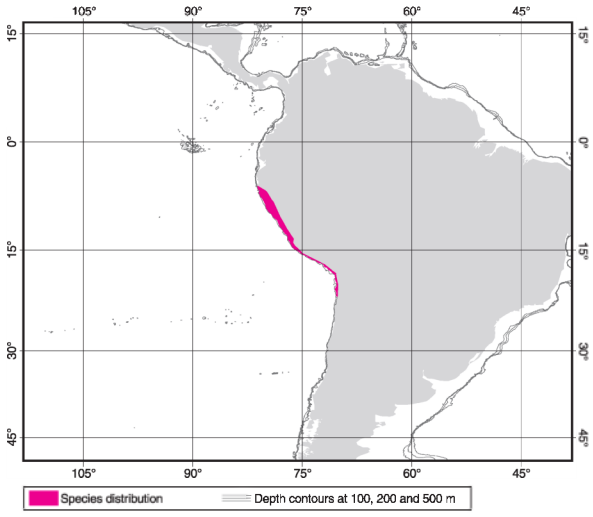


Fig. 35 ***Genypterus maculatus*** (after Chirichigno, 1974)

Diagnosis: Head and body dark with large pale markings; body short, head less than 4.5 times in standard length; dorsal-fin rays 118 to 135; anal-fin rays 92 to 105; pyloric caeca 6 to 9.

Geographical distribution: Peru to northern Chile.



Habitat and biology: Benthic in rocky shelf and upper slope waters. Common.

Interest to fisheries: Of commercial importance. Landings from the Chilean fleet amounted to 1 343 t in 1996.

Local names: Congrio negro, Congrio moreno.

Size: At least 600 mm.

Remarks: ***Ophidium maculatum*** Tschudi is permanently unavailable because it is a junior homonym of ***Ophidium maculatum*** Rafinesque (***O. barbatum***). A petition to conserve the Tschudi name in ***Genypterus*** has been submitted to the International Commission on Zoological Nomenclature by Melvyn H. Wilson. Pending the outcome of this petition, it is recommended here to use the name ***Genypterus maculatus*** (Tschudi) for this species.

Genypterus tigerinus Klunzinger, 1872

Synonyms: None.

FAO names: En - Rock ling.

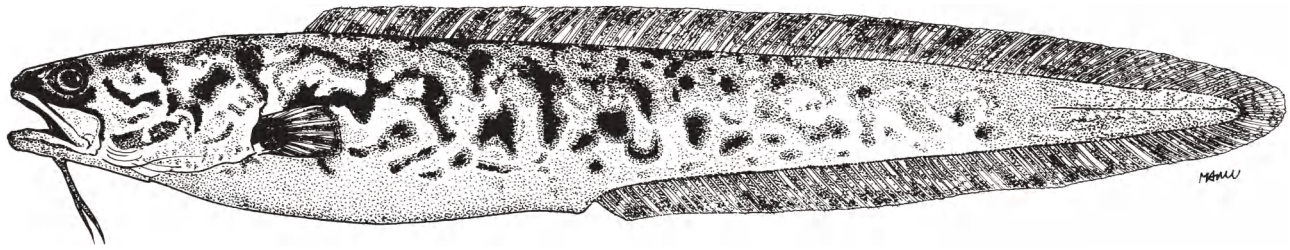


Fig. 36 *Genypterus tigerinus* (after Last et al., 1983)

Diagnosis: Head and body grey or whitish with large irregular dark blotches; large adults darker, almost black; dorsal-fin rays 144 to 157; anal-fin rays 107 to 117; pyloric caeca 8 (3+5).

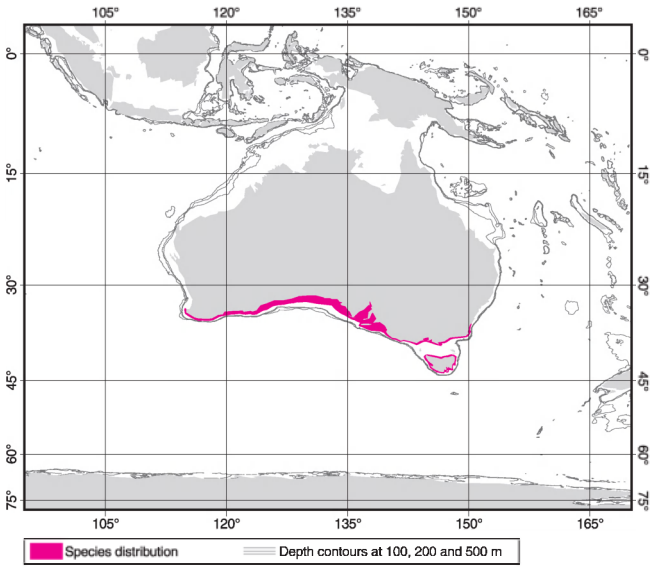
Geographical distribution: Southern coast of Australia from New South Wales to Western Australia.

Habitat and biology: Benthic in rocky habitat from shallows to 60 m, juveniles more common in shallow water in grass beds. Uncommon.

Interest to fisheries: Less common in the commercial trade than other species but of equal value.

Local names: AUSTRALIA: Rock ling.

Size: At least 1.2 m.



Lepophidium Gill, 1895

Type species: *Leptophidium profundorum* Gill, 1863b, preoccupied by *Leptophidium* Hallowell, 1860 (in snakes); *Lepophidium* Gill, 1895 (replacement name for *Leptophidium* preoccupied).

Synonyms: None.

Number of recognized species: 15.

Diagnosis and description: Rostral spine long and curved, reaching tip of snout, without vertical basal component; peritoneum pale; no median basibrachial tooth patch; **head extensively covered with imbricate rows of cycloid scales** except for snout and throat; body tapering to point, dagger-shaped.

Revisions: Robins (1962), Robins and Lea (1978) both dealing with Pacific species.

Geographical distribution: Western Atlantic from southeastern Canada to southern Brazil, eastern Pacific from Baja California to Peru.

Habitat and biology: From shallow coastal waters to the upper slope.

Interest to fisheries: Little. ***Lepophidium brevibarbe*** enters the shrimp bycatch fishery in Colombia as "perla". ***L. negropinna***, the largest species, is sufficiently large to be of commercial value but is currently not harvested, except, perhaps locally.

Size: 150 to about 500 mm.

Key to species (only available for Pacific species)

1a. Body with numerous large dark brown blotches; esophagus dark; gill chamber pale; pharynx dusky; mouth pale . . . . . ***L. pardale***

1b. Body rather uniformly pigmented, slightly paler below or with only a series of dark dashes along lateral line or markings confined to vertical fins; esophagus, gill chamber, oral cavity variously pigmented but not as above . . . . . → ***2***

2a. Esophagus, gill chamber (sometimes with scattered melanophores dorsally) and oral cavity pale . . . . . → ***3***

2b. Esophagus or gill chamber dark (almost black), oral cavity pale . . . . . → ***4***

3a. Lateral line with dark dash between each pore anteriorly; vertical fins with dark margins (particularly anal fin), basal section of dorsal fin not spotted. . . . . ***L. prorates***

3b. Lateral line unmarked; vertical fins dark, the margins especially so; basal section of dorsal fin spotted or mottled (sometimes difficult to see in heavily pigmented individuals) . . . . . ***L. negropinna***

4a. Gill chamber black; esophagus dusky; dorsal fin with dark spot between rays no. 4 to 14; pectoral-fin rays 19 to 21 . . . . . ***L. stigmatistium***

4b. Gill chamber pale; esophagus black; dorsal fin unspotted; pectoral-fin rays 23 or 24 . . . . . ***L. microlepis***

List of nominal species

Note: for convenience the species are divided between western Atlantic and eastern Pacific.

Western Atlantic species

Lepophidium aporrhox Robins, 1961. From Honduras to Suriname. Benthic from 50 to 125 m. Uncommon.

L. brevibarbe (Cuvier, 1829). See species account.

L. cervinum (Goode and Bean, 1885a) (junior synonym of ***L. profundorum***).

L. graellsi (Poey, 1861) (junior synonym of ***L. brevibarbe***).

L. jeannae Fowler, 1941. From southeastern United States to southern Florida and the Gulf of Mexico. Benthic from 25 to 100 m. Uncommon.

L. kallion Robins, 1959b. From Bahamas and Greater Antilles to Barbados. Benthic from 350 to 520 m. Uncommon.

L. marmoratum (Goode and Bean, 1885a). From Bahamas, Cuba, and Yucatan to Nicaragua and the Virgin Islands. Benthic from 155 to 525 m. Uncommon.

L. pheromystax Robins, 1960. From Puerto Rico and Colombia to northeastern Brazil. Benthic from 50 to 125 m. Common.

L. profundorum (Gill, 1863b). From Georges Bank, Canada to northern Florida and Gulf of Mexico. Benthic from 55 to 365 m. A report of this species from the Tyrennian Sea (Nielsen and Bini, 1972) is based on a specimen from a fish-monger and is regarded as spurious. It was most likely included in a shipment of cod from the western Atlantic. Uncommon.

L. staurophor Robins, 1959a. From southern Gulf of Mexico (off Yucatan) to western Caribbean Sea. Benthic from 180 to 485 m. Rare.

Remarks: In addition there are 8 undescribed species from the western Atlantic. Their descriptions are being prepared by C. Richard Robins.

Eastern Pacific species

Lepophidium microlepis (Gilbert, 1890). From western coast of Baja California and Gulf of California to Peru. Divided into 3 north to south subspecies from Robins and Lea (1978): *L. microlepis microlepis* (Gilbert, 1890), *L. m. hubbsi* Robins and Lea, 1978, and *L. m. inca* Robins and Lea, 1978. Benthic from 70 to 320 m (shallower records from off Peru are based on composite collection over a wide range of depths and are likely in error). Uncommon.

L. negropinna Hildebrand and Barton, 1949. See species account.

L. pardale (Gilbert, 1890). From Gulf of California to Peru. Benthic in 6 to 90 m. Uncommon.

L. prorates (Jordan and Bollman, 1890). From northern Gulf of California to southern Colombia. Benthic from 7 to 90 m. Common.

L. stigmatistium (Gilbert, 1890). From Gulf of California and outer coast of Baja California. Benthic from 55 to 205 m. Rare.

Lepophidium brevibarbe (Cuvier, 1829)

Synonyms: *Lepophidium graellsi* (Poey, 1861).

FAO names: En - Shortbeard cusk-eel; **Fr** - Brotule barbiche; **Sp** - Perla barbarcorta.

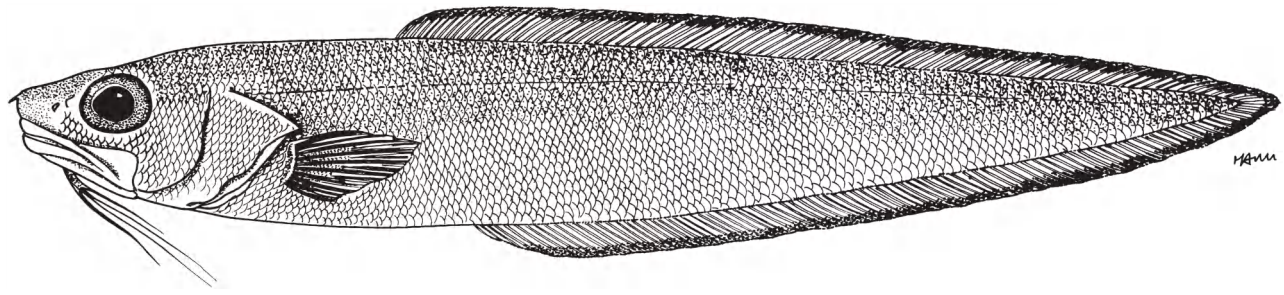


Fig. 37 *Lepophidium brevibarbe* (from Cervigón, 1991)

Diagnosis and description: Head and body tan, unmarked except for dark margin to dorsal fin and, to a lesser extent, **anal fin**; dorsal-fin rays 124 to 134; anal-fin rays 99 to 110; precaudal vertebrae 15 (occasionally 14), caudal vertebrae 54 to 56 (57), total vertebrae 69 to 72(73); gill rakers usually 3 (2 to 4) rudiments on upper limb of first arch, **4** (very rarely 5) **developed rakers on lower limb**.

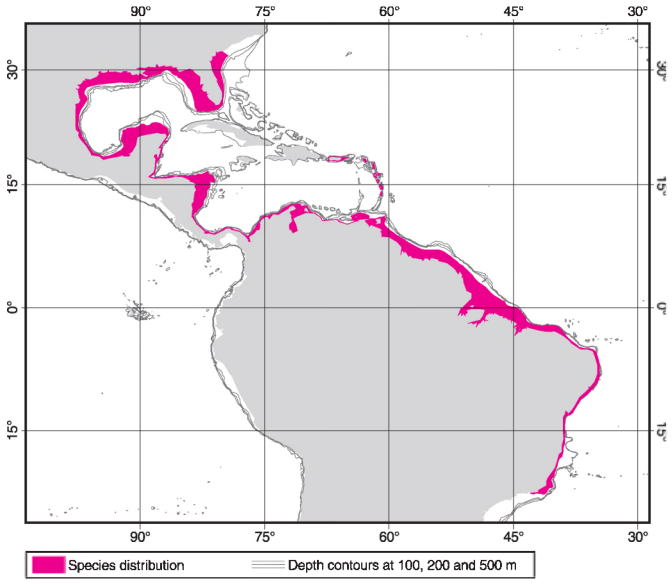
Geographical distribution: Southeastern United States and northern Gulf of Mexico to southern Brazil.

Habitat and biology: Benthic from waters edge to 75 m. Common.

Interest to fisheries: Of minor economic importance. Sometimes harvested as by-catch of the shrimp trawling fishery. In Colombia it is marketed under the local name of "perla". Landings by the Cuban fleet are less than 100 t/year.

Local names: Blackedge cusk-eel.

Size: At least 260 mm.



Lepophidium negropinna Hildebrand and Barton, 1949

Synonyms: None.

FAO names: En - Specklefin cusk-eel; **Fr** - Congriperle tacheté; **Sp** - Congriperla pintada.

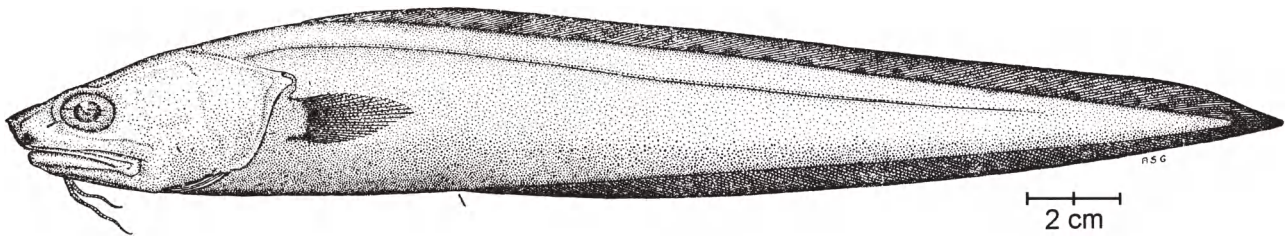


Fig. 38 ***Lepophidium negropinna*** (from Hildebrand and Barton, 1949)

Diagnosis and description: Dorsal fin with dark margin and dark mottling or spots throughout the fin; dorsal-fin rays 134 to 148; anal-fin rays 111 to 123; precaudal vertebrae 16 (15 to 17), caudal vertebrae 60 to 63 (59 to 64), total vertebrae 75 to 77.

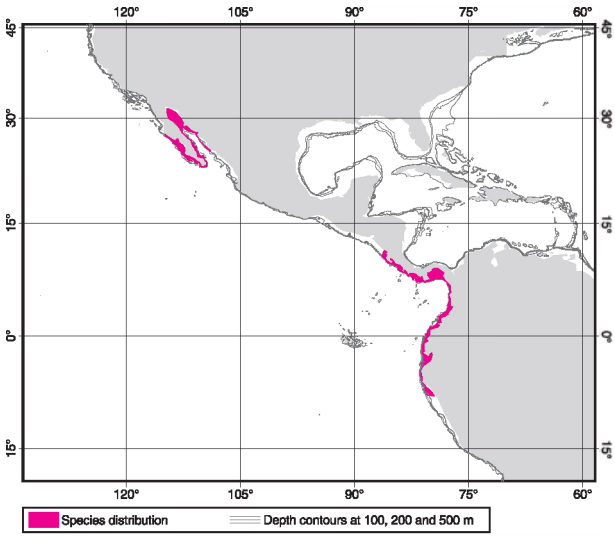
Geographical distribution: Gulf of California, outer coast of Baja California, and off northwestern South America.

Habitat and biology: Benthic from 40 to 390 m. Common.

Interest to fisheries: This is potentially a marketable species but is currently not the subject of any fishery.

Local names: Specklefin cusk-eel, Congriperla, Pintada, Congriperla tachété.

Size: The largest species of *Lepophidium*, to 475 mm.



Tribe Ophidiini Rafinesque, 1810

Diagnosis and description: Some to all of the **scales on body elongate and arranged in basketweave (anguilloid) fashion;** except for *Raneya*, **cheeks, opercle and lower part of head entirely naked;** swimbladder stiffened, short, males often with a posterior opening or long tubular projection and with anterior vertebrae modified to support the swimbladder, anterior end of swimbladder in males may have a rocker bone (see Rose, 1961) or be enclosed in a bony casque; **pyloric caeca absent.**

Number of recognized genera: 5.

Remarks: The definition and relationships of the genera remain unknown. See comments under each genus.

Key to genera (modified after Cohen and Nielsen, 1978)

1a. Scales present on top of head . . . . . → *2*

1b. Head naked except for 1 undescribed species of *Ophidion* which has a small patch of scales in front of the eye . . . . . → *3*

2a. The 2 pelvic-fin rays equal in length; scales on head restricted to dorsal area, scales on body anguilloid . . . . . *Parophidion*

2b. The 2 pelvic-fin rays unequal in length; scales on top and sides of head and opercle, scales on body anguilloid anteriorly and below, otherwise in regular rows . . *Raneya*

3a. Dorsal-fin rays 187 to 229; anal-fin rays 150 or more; precaudal vertebrae 18 or 19, total vertebrae 86 to 91 . . . . . *Chilara*

3b. Dorsal-fin rays rarely if ever more than 150; anal-fin rays rarely more than 125; precaudal vertebrae usually fewer than 18 . . . . . → *4*

4a. Ethmoid spine stout, blunt, projecting anterodorsally . . . . . *Otophidium*

4b. Ethmoid spine absent, weakly developed, or long, sharp and projecting forward to or toward snout tip . . . . . *Ophidion*

Chilara Jordan and Evermann, 1896

Type species: *Ophidium taylori* Girard, 1858a by monotypy.

Synonyms: None.

Number of recognized species: 1.

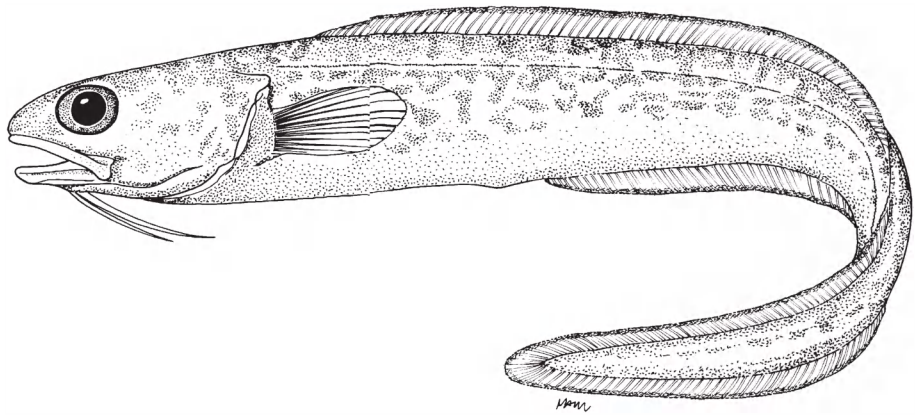


Fig. 39 *Chilara taylori* (after Fitch and Larvenberg, 1968)

Diagnosis and description: Head naked; scales on body in basketweave pattern; **dorsal-fin rays 187 to 229; anal-fin rays 150 to 181; precaudal vertebrae 18 or 19, total vertebrae 86 to 91;** swimbladder in males with posterior opening; body and head with numerous dark spots and blotches.

Revisions: Lea (1980).

Geographical distribution: Eastern Pacific from Washington to Baja California and Ecuador (Lea and Béarez, 1999). A record from the Gulf of California is very doubtful.

Habitat and biology: Benthic on sandy bottom from shore to 280 m. Uncommon.

Interest to fisheries: None.

Size: At least 370 mm.

List of nominal species

Ophidion novaculum Harry, 1951 (junior synonym of *C. taylori*).
Chilara taylori (Girard, 1858a). Information see above.

Ophidion Linnaeus, 1758

Type species: *Ophidion barbatum* Linnaeus, 1758 by subsequent designation by Gill (1863b).

Synonyms: *Ophidium* Linnaeus, 1766 is an unjustified emendation; *Rissola* Jordan and Evermann, 1896, type species *Ophidium marginatum* DeKay, 1842.

Number of recognized species: 21.

Diagnosis and description: Head entirely naked (1 undescribed species has a small patch of scales in front of the eye); scales on body elongated, arranged in basketweave or anguilloid pattern; dorsal-fin rays fewer than 150.

Revisions: None.

Geographical distribution: Nearly worldwide in warm-temperate and tropical coastal and shelf waters.

Habitat and biology: Benthic from coastal bays and inlets to 350 m.

Interest to fisheries: Little. ***Ophidion holbrooki***, the largest Atlantic species enters the shrimp bycatch fishery in Colombia as "perla".

Size: 90 to 300 mm.

Remarks: Within this genus the relations of the various species groups to each other and to ***Otophidium*** and ***Parophidion*** are unclear.

Key to species: Not possible at present.

List of nominal species

About 30 species are known, 11 of them undescribed at present. For convenience they are grouped below by region.

Mediterranean and eastern Atlantic species

Ophidion barbatum Linnaeus, 1758. Southern England to Senegal and the northern Mediterranean Sea from Gibraltar to Israel. Benthic from shallows to 150 m. Uncommon.

O. broussoneti Müller, 1845 (junior synonym of ***O. rochei***).

O. lagocheila (Böhlke and Robins, 1959). From Bermuda and Bahamas to Venezuela. Shallow coastal waters. Rare.

O. lozanoi Matallanas, 1990. From Spain to Senegal. Benthic in 60 to 80 m. Uncommon.

O. maculatum Rafinesque, 1810 (unneeded new name for ***O. barbatum***).

O. rochei Müller, 1845. Western and northern Mediterranean Sea and Black Sea. Benthic from shallows to 150 m. Uncommon.

Remarks: One undescribed species occurs in the eastern Atlantic.

Indian Ocean and western and central Pacific species

Ophidion asiro (Jordan and Fowler, 1902) (junior synonym of ***O. muraenolepis***).

O. genyopus (Ogilby, 1897). Coastal waters of New South Wales, Australia. Benthic. Uncommon.

O. smithi (Fowler, 1934). From Red Sea to Natal, Seychelles and northwestern coast of Australia. Benthic in shallow coastal waters. This species is questionably distinct from ***O. genyopus***. Uncommon.

O. muraenolepis (Günther, 1880). Wideranging in central and western Pacific from Hawaii to Taiwan Province of China and Arafura Sea. Benthic in deep shelf and upper slope waters in 80 to 250 m. This is a little sampled habitat across the region and a wide distribution of this species is anticipated. Uncommon.

Remarks: At least 2 undescribed species occur in this region.

Eastern Pacific species

Ophidion exul Robins, 1991. Easter Island and the Marquesas Islands. Benthic from shore to 20 m. Uncommon.

O. fulvum (Hildebrand and Barton, 1949). From Costa Rica to Peru. Benthic from shore to 20 m. Uncommon.

O. galeoides (Gilbert, 1890). From outer coast of Baja California and northern Gulf of California to Gulf of Panama. Benthic from near shore to 75 m. Uncommon.

O. imitator Lea, 1997. From tip of Baja California to Gulf of Panama. Benthic in 18 to 112 m. Uncommon.

O. iris Breder, 1936. Entire Gulf of California and adjacent coast of Mexico to Banderas Bay. Benthic from shore to 86 m. Uncommon.

O. metoecus Robins, 1991. Juan Fernandez Islands (Isla Juan Fernandez), and Isla San Felix. Benthic from shore to 31 m. Uncommon.

O. nigricauda Breder, 1936 (junior synonym of *O. iris*).

O. scrippsae (Hubbs, 1916). From northern California to Baja California. The single record from the Gulf of California is regarded as erroneous. Benthic from shore to 110 m. Uncommon.

Remarks: Three undescribed species occur in eastern Pacific waters.

Western Atlantic

Ophidion beani Jordan and Gilbert, 1883 (junior synonym of *O. holbrooki*).

O. grayi Fowler, 1948. From South Carolina and northern Gulf of Mexico to Mexico. Benthic in 10 to 60 m. Uncommon.

O. holbrooki (Putnam, 1874). See species account.

O. josephi Girard, 1858b. From Georgia to northeastern Florida and entire northern Gulf of Mexico. Benthic in shallow coastal waters. Common.

O. marginatum (DeKay, 1842). From New York to northeastern Florida, but needs clarification. Benthic in shallow coastal waters. Common.

O. nocomis Robins and Böhlke, 1959. From Bahamas to Puerto Rico. Benthic in shallow sandy bays. Uncommon.

O. robinsi Fahay, 1992. From New Jersey to South Carolina. Benthic in 12 to 45 m. Rare.

O. selenops Robins and Böhlke, 1959. From South Carolina to the Florida Keys including the southeastern Gulf of Mexico. Benthic in 12 to 45 m. Uncommon.

O. welshi (Nichols and Breder, 1922). Its ranges along the southeastern United States needs clarification. Probably a junior synonym of *O. josephi*. Common.

Remarks: A manuscript by Lea and Robins describing 4 new species from the western Atlantic has been completed.

Ophidion holbrooki (Putnam, 1874)

Synonyms: *Ophidion beani* Jordan and Gilbert, 1883.

FAO names: En - Band cusk-eel.

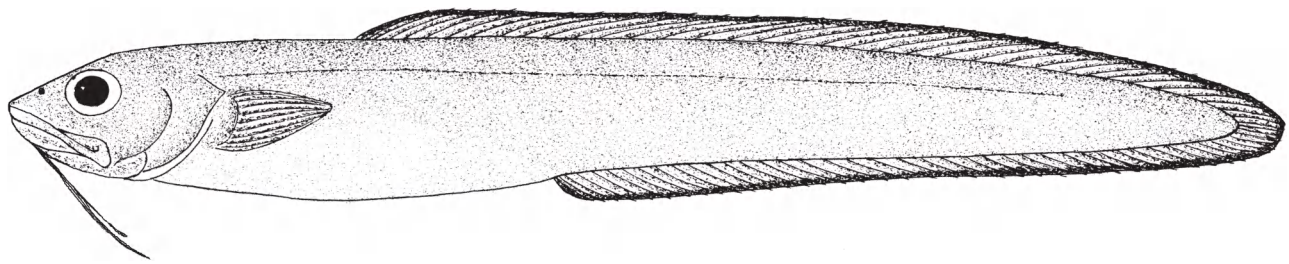


Fig. 40 *Ophidion holbrooki*

Diagnosis and description: Head and body tan, unmarked except for dark margin to dorsal fin and, occasionally, anal fin; gill raker on first arch with 2 rudiments on upper limb and 4 developed rakers on lower limb; **mouth subterminal; dorsal profile nearly straight from snout to dorsal-fin origin (not arched); body distinctly deepest at dorsal-fin origin; body slab-sided.**

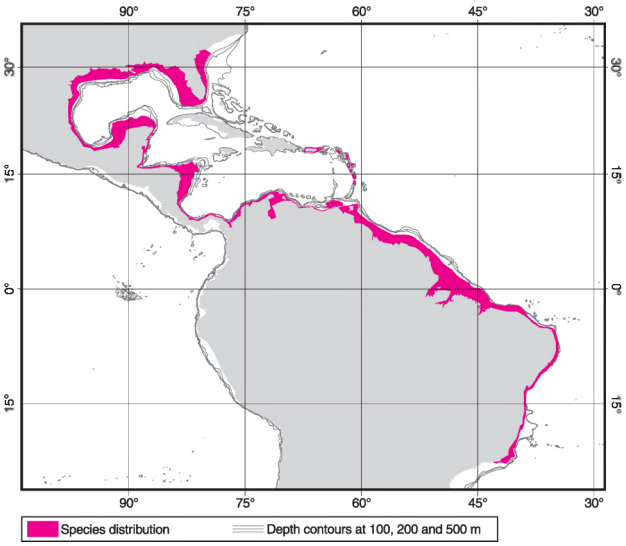
Geographical distribution: North Carolina and northern Gulf of Mexico to southeastern Brazil. Absent from the Bahamas.

Habitat and biology: Benthic from coastal bays to 75 m. Common.

Interest to fisheries: Little. Sometimes landed as a bycatch of the shrimp trawling fishery. In Colombia is marketed under the local name of "perla". Its flesh is appreciated.

Local names: Band cusk-eel.

Size: At least 300 mm.



Otophidium Gill in Jordan, 1885

Type species: ***Genypterus omostigma*** Jordan and Gilbert, 1882b by original designation.

Synonyms: None.

Number of recognized species: 4.

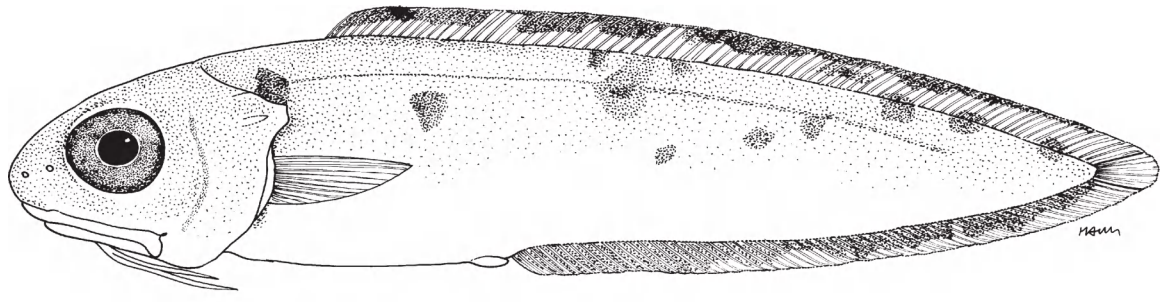


Fig. 41 ***Otophidium omostigma*** (after Robins, 1959)

Diagnosis and description: Ethmoid spine stout, blunt, projecting anterodorsally; swimbladder stout, short, with posterior opening in males; dorsal-fin rays 97 to 117; anal-fin rays 84 to 102.

Revisions: None.

Geographical distribution: Western Atlantic from North Carolina, Bermuda, and northern Gulf of Mexico to Lesser Antilles. Eastern Pacific from Gulf of California to Panama and Galapagos Islands.

Habitat and biology: Benthic from sandy shores to 100 m.

Interest to fisheries: None.

Size: At least 130 mm.

Key to species: Not possible at present.

List of species

Otophidium chickcharney Böhlke and Robins, 1959. The Bahamas. Benthic from shore to 15 m. Rare.

O. dormitator Böhlke and Robins, 1959. From southern Florida and the Bahamas to Yucatan, Mexico and the Lesser Antilles. Benthic from shore to 15 m. Rare.

O. indefatigabile Jordan and Bollman, 1890. From outer coast of Baja California and Gulf of California to Panama and the Galapagos Islands. Uncommon.

O. omostigma (Jordan and Gilbert, 1882b). From North Carolina and northern Gulf of Mexico to Florida and Lesser Antilles. Benthic in 16 to 50 m. Uncommon.

Remarks: Four species are currently assigned to this genus. The relationship of this group relative to the diverse species groups currently assigned to ***Ophidion*** is unclear.

Parophidion Tortonese, 1954

Type species: ***Ophidion vassali*** Risso, 1810 by original designation.

Synonyms: None.

Number of recognized species: 2.

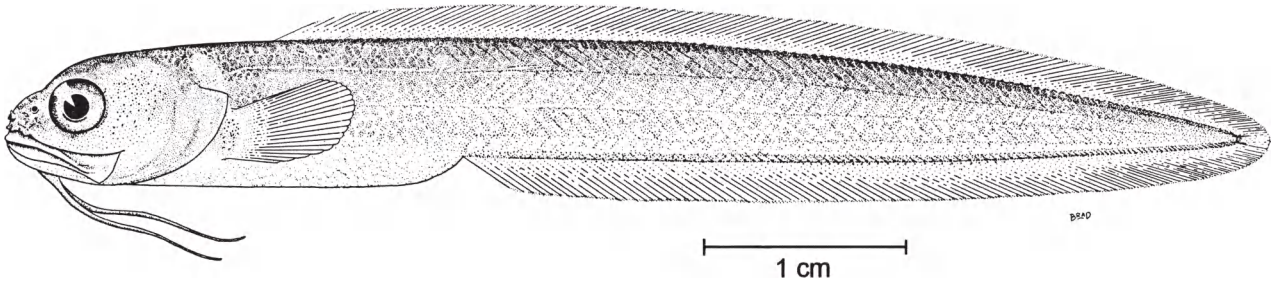


Fig. 42 ***Parophidion schmidti*** (from Woods and Kanazawa, 1951)

Diagnosis and description: Scales on body in anguilloid pattern, somewhat overlapping, interorbital region scaled, opercle naked, **cheeks, top of head forward to centre of interorbital region scaled;** ethmoid spine reduced to a low bump; gill chamber and guts pale; no pyloric caeca; males with posterior opening on swimbladder; the **2 pelvic-fin rays equally long** or very nearly so.

Revisions: Böhlke and Robins (1959).

Geographical distribution: Tropical western Atlantic and the Mediterranean Sea and adjacent northeastern Atlantic.

Habitat and biology: Shallow coastal waters.

Interest to fisheries: None.

Size: At least 10 cm.

Key to species: The 2 species are separated geographically (see below).

List of species

Parophidion schmidti (Woods and Kanazawa, 1951). Bermuda, the Bahamas and southern Florida to northern South America. Uncommon.

P. vassali (Risso, 1810). Mediterranean Sea and adjacent northeastern Atlantic. Uncommon.

Raneya Robins, 1961

Type species: *Lepophidium fluminense* Miranda-Ribeiro, 1903 by original designation.

Synonyms: None.

Number of recognized species: 1.

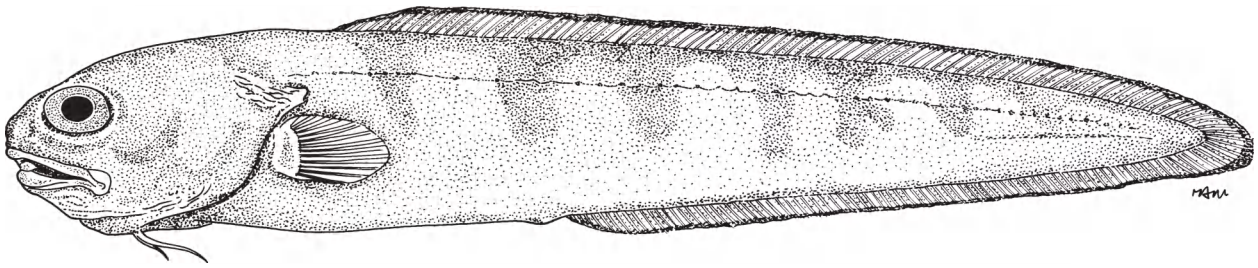


Fig. 43 *Raneya brasiliensis* (after Menni and López, 1974)

Diagnosis and description: Scales on body in regular but non-overlapping rows, some anguilloid, becoming anguilloid in pattern on belly and flanks in front of anus, **top of head from interorbit to nape and sides of head with non-imbricate scales, snout, subocular area and chin and throat naked;** ethmoid spine short but strong; **gill chamber dark; esophagus dark** and intestines and stomach pale; no pyloric caeca; males with posterior opening on swimbladder; dorsal-fin rays 111 to 135; anal-fin rays 93 to 105; pectoral-fin rays 19 to 23; gill rakers 2 or 3 rudiments above, 4 or 5 developed rakers below on first arch (total 6 to 8); vertebrae 14 or 15 precaudal, 48 to 51 caudal, 62 to 66 total.

Revisions: Robins (1985).

Geographical distribution: Southern Brazil (near Ilha Rasa) to northern Argentina (Puerto Quequén).

Habitat and biology: Benthic in coastal waters. Uncommon.

Interest to fisheries: Of minor commercial importance.

Size: At least 310 mm.

List of nominal species

Raneya brasiliensis (Kaup, 1856a). Information see above.

R. fluminense (Miranda-Ribeiro, 1903) (junior synonym of *R. brasiliensis*).

2.4.4 Subfamily Neobythitinae

Subfamily name: Neobythitinae Radcliffe (1913).

Number of recognized genera: 38.

Diagnosis and description: No barbels on snout and chin; body covered with small cycloid scales; **ventral arm of cleithrum meeting its mate and terminating at about level of preopercle or farther**

forward but no slender elongate anteriorly extending filament of bone (Fig. 26), pelvic fin present in most genera at about level of preopercle or further forward with 1 or 2 rays in each fin; 1 or 2 (rarely 3 or 4) median basibranchial tooth patches except for a few species with none (see key to subfamilies p. 22); caudal-fin rays 6 to 12; developed gill rakers 0 to 42.

Key to genera (the following genera are entered in the key more than once: ***Bassozetus, Dicrolene, Porogadus, Pycnocraspedum, Spectrunculus,*** and ***Spottobrotula***):

1a. Pelvic fins placed below or slightly behind eyes . . . . . → *2*

1b. Pelvic fins placed below preopercle or absent . . . . . → *6*

2a. Each pelvic fin with a single ray; no spines on preopercle . . . . . ***Sirembo***

2b. Each pelvic fin with 2 rays; spines variously developed on preopercle . . . . . → *3*

3a. Spine on opercle short, hardly extending beyond rear margin of head . . . . . → *4*

3b. Spine on opercle long, extending well beyond rear margin of head . . . . . → *5*

4a. Several weak, skin-covered spines at angle of preopercle; pelvic fins inserted below rear margin of eye . . . . . ***Dannevigia***

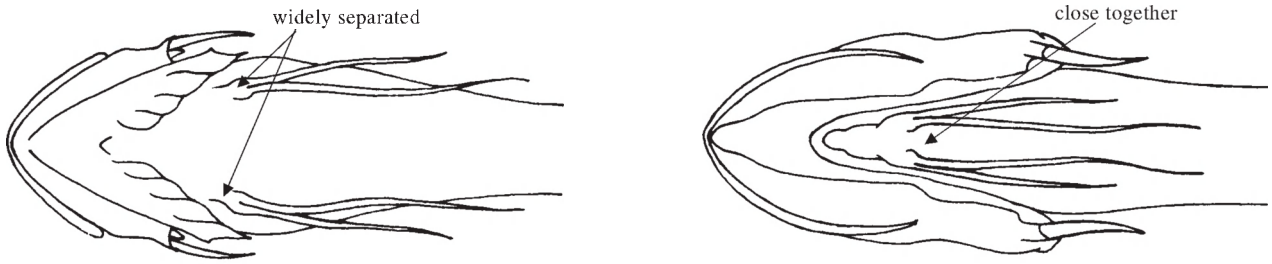
4b. Angle of preopercle with 3 strong spines; pelvic fins inserted below middle of eye . . . . . ***Hoplobrotula***

5a. Prominent, protruding bifid spine on tip of snout; body slender . . . . . ***Acanthonus***

5b. No spine on snout; body robust . . . . . ***Xyelacyba***

6a. Pelvic fins widely separated on isthmus (Fig. 44a) . . . . . ***Tauredophidium***

6b. Pelvic fins, if present, close together (Fig. 44b) . . . . . → *7*



a) *Tauredophidium* b) *Xyelacyba*

Fig. 44 Pelvic-fin insertion (from Cohen and Nielsen, 1978)

7a. Pelvic fins absent or rudimentary, rays shorter than orbit . . . . . → *8*

7b. Pelvic fins present, each with 1 or 2 well-developed rays . . . . . → *10*

8a. One median and a pair of basibranchial tooth patches; body short and high . . ***Leptobrotula***

8b. Basibranchial tooth patches absent or 1 median present; body elongate . . . . . → *9*

9a. Preopercle posteriorly expanded almost reaching hind margin of opercle (*B. multispinis*) . . . . . ***Bassozetus***

9b. Preopercle not expanded posteriorly . . . . . ***Lamprogrammus***

10a. Orbit large, eye lens rudimentary or absent . . . . . ***Leucicorus***

10b. Orbit large to small, developed lens present or eyes buried and not externally visible . . . . . → *11*

11a. Head massively inflated; mouth much inferior; eyes not externally developed or very small . . . . . ***Typhlonus***

11b. Head more or less inflated; mouth subterminal or terminal; eyes large to small externally visible . . . . . → *12*

12a. Head length much less than 1/2 preanal length . . . . . → *13*

12b. Head length about 1/2 preanal length . . . . . → *15*

13a. Developed gill rakers 3 or fewer; vomerine teeth in a narrow row . . . . . ***Enchelybrotula***

13b. Developed gill rakers 5 or more; vomerine teeth in a diamond-shaped patch . . . . . → *14*

14a. Median basibranchial tooth patch 0 or 1; pectoral fins as long as head . . . . . ***Barathrites***

14b. Median basibranchial tooth patches 2; pectoral fins 1/2 as long as head . . ***Spectrunculus***

15a. Long gill rakers 4 or fewer . . . . . → *16*

15b. Long gill rakers 5 or more . . . . . → *20*

16a. Median basibranchial tooth patches 2; preopercle with 2 or 3 spines at lower angle . . . . . ***Pycnocraspedum***

16b. Median basibranchial tooth patches 1; preopercle with 0 or 1 spine at lower angle . . → *17*

17a. Opercular spine present . . . . . → *18*

17b. Opercular spine absent . . . . . → *19*

18a. Head depressed; eye much smaller than snout . . . . . ***Luciobrotula***

18b. Head rounded; eye diameter almost as long as snout (***S. amaculata***) . . . . . ***Spottobrotula***

19a. Mouth terminal or lower jaw slightly longer; some teeth enlarged . . . . . ***Hypopleuron***

19b. Mouth inferior; no teeth enlarged . . . . . ***Petrotyx***

20a Opercular spine absent or weak, if present rather broad, flattened and flap-like incorporated in opercular bone . . . . . → *21*

20b. Opercular spine strong and narrow, sometimes hidden, usually rounded in cross-section . . . . . → *29*

21a. Pectoral fins narrow and constricted proximally, originating on only part of peduncle, some of the rays greatly elongated . . . . . ***Mastigopterus***

21b. Pectoral fins originating on the entire peduncle, fin short or only lower rays prolonged . . . . . → *22*

22a. Pectoral-fin rays 10 or 11 . . . . . ***Abyssobrotula***

22b. Pectoral-fin rays 15 or more . . . . . → *23*

23a. Eye diameter equal to or greater then snout . . . . . ***Glyptophidium***

23b. Eye diameter less than snout . . . . . → *24*

24a. Head depressed; upper jaw ends below posterior margin of eye . . . . . ***Alcockia***

24b. Head not depressed; upper jaw ends well behind eye . . . . . → *25*

25a. Depth of body at anus at least 10 times in standard length; caudal fin with 5 or 6 rays . . . . . ***Porogadus***

25b. Depth of body less than 10 times in standard length (in 2 ***Bassozetus*** spp. depth of body more than 10 times in standard length, but with 8 caudal-fin rays) . . . . . → *26*

26a. Lower pectoral-fin rays free, prolonged or fin divided . . . . . → *27*

26b. Lower pectoral-fin rays normal and fin not divided . . . . . → *28*

27a. Pelvic-fin rays 2; median basibranchial tooth patches 2; lower pectoral-fin rays free . . . . . ***Bathyonus***

27b. Pelvic-fin rays 1; median basibranchial tooth patches 1; lower pectoral-fin rays prolonged (ripe males) or middle fin rays shorter than upper and lower rays (females and unripe males) . . . . . ***Eretmichthys***

28a. Soft watery body; anterior nostril swollen . . . . . ***Apagesoma***

28b. Body not soft; anterior nostril not swollen . . . . . ***Bassozetus***

29a. Opercular spine curved . . . . . → *30*

29b. Opercular spine straight . . . . . → *31*

30a. Snout long, broad and strongly depressed . . . . . ***Penopus***

30b. Snout short and blunt (***D. kanazawai***) . . . . . ***Dicrolene***

31a. Pectoral fins with lower rays free; pelvic fins with 2 rays in each . . . . . → *32*

31b. Pectoral fins entire; pelvic fins with 1 or 2 rays in each . . . . . → *33*

32a. Eye diameter much less than 1/2 snout length; pelvic-fin rays flattened . . ***Holcomycteronus***

32b. Eye diameter equal to 1/2 or more of snout length; pelvic-fin rays filamentous . . ***Dicrolene***

33a. Body depth at anus 10 times or more in standard length; caudal fin with 5 or 6 rays . . . . . ***Porogadus***

33b. Body depth at anus 8.5 times or less in standard length; caudal fin with 8 or more rays . . . . . → *34*

34a. Median basibranchial tooth patch 1 . . . . . → *35*

34b. Median basibranchial tooth patches 2 . . . . . → *38*

35a. Pelvic fins longer than head; pectoral fins placed closer to ventral edge than to midline . . . . . ***Homostolus***

35b. Pelvic fins not longer than head; pectoral fins placed closer to midline than to ventral edge . . . . . → *36*

36a. Opercular spines 2; teeth longer near symphysis . . . . . ***Benthocometes***

36b. Opercular spine 1; jaw teeth granular, small and close-set . . . . . → *37*

37a. Pelvic fin with 2 fleshy rays; prominent dark spots or lines on body and fins . ***Spottobrotula***

37b. Pelvic fin with 1 filamentous ray; no spots on body and fins . . . . . ***Monomitopus***

38a. Teeth large, needle-like and separate from each other . . . . . ***Epetriodus***

38b. Teeth small, granular (a few ***Neobythites*** spp. with needle-like teeth) and close set . . . → *39*

39a. Pelvic-fin rays 1 . . . . . ***Selachophidium***

39b. Pelvic-fin rays 2 . . . . . → *40*

40a. Eye diameter about equal to or greater than snout length; many species with spots, blotches or bands . . . . . ***Neobythites***

40b. Eye diameter less than snout; no spots, blotches or bands . . . . . → *41*

41a. Anterior nostril with a thick, fleshy, raised rim . . . . . ***Spectrunculus***

41b. Anterior nostril a simple pore or with a thin tube . . . . . → *42*

42a. Snout notably inflated; long gill rakers 12 or more; pectoral fins almost reaching anus . . . . . ***Barathrodemus***

42b. Snout not inflated; long gill rakers 5 to 9; pectoral fins far from reaching anus . . . . . → *43*

43a. Preopercle with 3 spines; long rakers on anterior gill arch 5 or 6; precaudal vertebrae 12 or 13 . . . . . ***Pycnocraspedum***

43b. Preopercle without spines; long rakers on anterior gill arch 7 to 9; precaudal vertebrae 15 or 16 . . . . . ***Bassogigas***

List of nominal genera

Abyssobrotula Nielsen, 1977
Acanthonus Günther, 1878
Alcockia Goode and Bean, 1896
Apagesoma Carter, 1983
Barathrites Zugmayer, 1911
Barathrodemus Goode and Bean, 1883
Bassobythites Brauer, 1906 (junior synonym of ***Lamprogrammus***)
Bassogigas Goode and Bean, 1896
Bassozetus Gill, 1884
Bathynectes Günther, 1877 (preoccupied - substituted by ***Bathyonus***)
Bathyonus Goode and Bean, 1878
Benthocometes Goode and Bean, 1896
Brachydicrolene Norman, 1939 (junior synonym of ***Dicrolene***)
Brotella Kaup, 1858 (junior synonym of ***Sirembo***)
Celema Goode and Bean, 1896 (junior synonym of ***Porogadus***)
Dannevigia Whitley, 1941

Dermatorus Alcock, 1890b (junior synonym of ***Porogadus***)
Dicrolene Goode and Bean, 1883
Dicromita Goode and Bean, 1896 (junior synonym of ***Monomitopus***)
Enchelybrotula Smith and Radcliffe in Radcliffe, 1913
Epetriodus Cohen and Nielsen, 1978
Eretmichthys Garman, 1899
Glyptophidium Alcock, 1889
Grimaldichthys Roule, 1913 (junior synonym of ***Holcomycteronus***)
Holcomycteronus Garman, 1899
Homostolus Smith and Radcliffe in Radcliffe, 1913
Hoplobrotula Gill, 1863a
Hypopleuron Smith and Radcliffe in Radcliffe, 1913
Itatius Matsubara, 1943 (junior synonym of ***Pycnocraspedum***)
Lamprogrammus Alcock, 1891
Leptobrotula Nielsen, 1986
Leucicorus Garman, 1899
Luciobrotula Smith and Radcliffe in Radcliffe, 1913
Mastigopterus Smith and Radcliffe in Radcliffe, 1913
Mixonus Günther, 1887 (junior synonym of ***Bathyonus***)
Moebia Goode and Bean, 1896 (junior synonym of ***Porogadus***)
Monomeropus Garman, 1899 (junior synonym of ***Monomitopus***)
Monomitopus Alcock, 1890b
Nematonus Günther, 1887 (junior synonym of ***Bathyonus***)
Neobythites Goode and Bean, 1885b
Parabassogigas Nybelin, 1957 (junior synonym of ***Spectrunculus***)
Paradicrolene Alcock, 1889 (junior synonym of ***Dicrolene***)
Penopus Goode and Bean, 1896
Petrotyx Heller and Snodgrass, 1903
Porogadus Goode and Bean, 1886
Pseudobythites Meek and Hildebrand, 1928 (junior synonym of ***Petrotyx***)
Pterodicromita Fowler, 1925 (junior synonym of ***Bassozetus***)
Pteroidonus Günther, 1887 (junior synonym of ***Dicrolene***)
Pycnocraspedum Alcock, 1889
Selachophidium Gilchrist, 1903
Sirembo Bleeker, 1858
Spectrunculus Jordan and Thompson, 1914
Spottobrotula Cohen and Nielsen, 1978
Tauredophidium Alcock, 1890a
Tetranematopus Günther, 1887 (junior synonym of ***Neobythites***)
Typhlonus Günther, 1878
Umalius Herre and Herald, 1951 (junior synonym of ***Sirembo***)
Volcanus Gosline, 1954 (junior synonym of ***Luciobrotula***)
Watasea Jordan and Snyder, 1901 (junior synonym of ***Neobythites***)
Xyelacyba Cohen, 1961

Abyssobrotula Nielsen, 1977

Type species: ***Abyssobrotula galatheae*** Nielsen, 1977 by monotypy.

Synonyms: None.

Number of recognized species: 1.

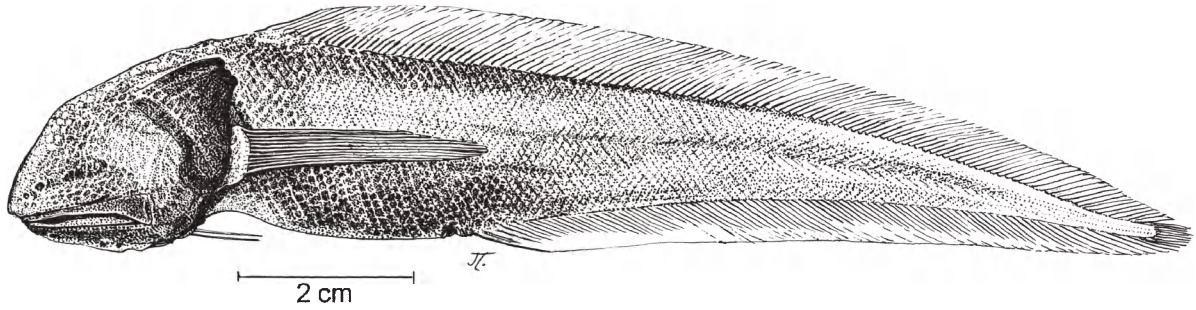


Fig. 45 ***Abyssobrotula galatheae*** (from Nielsen, 1977)

Diagnosis and description: Head short with downward inflection, with inferior mouth and swollen snout; eyes small; **poorly developed opercular spine, 2 median and a pair of basibranchial tooth patches**; 8 to 11 developed rakers on anterior gill arch; **pectoral fin with 10 or 11 rays**; 2 pelvic-fin rays; precaudal vertebrae 18 to 21.

Revisions: None.

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthopelagic at abyssal and hadal depths (3 110 to 8 370 m).

Interest to fisheries: None.

Size: At least 165 mm.

List of species

Abyssobrotula galatheae Nielsen, 1977. Information see above. Uncommon.

Acanthonus Günther, 1878

Type species: ***Acanthonus armatus*** Günther, 1878 by monotypy.

Synonyms: None.

Number of recognized species: 1

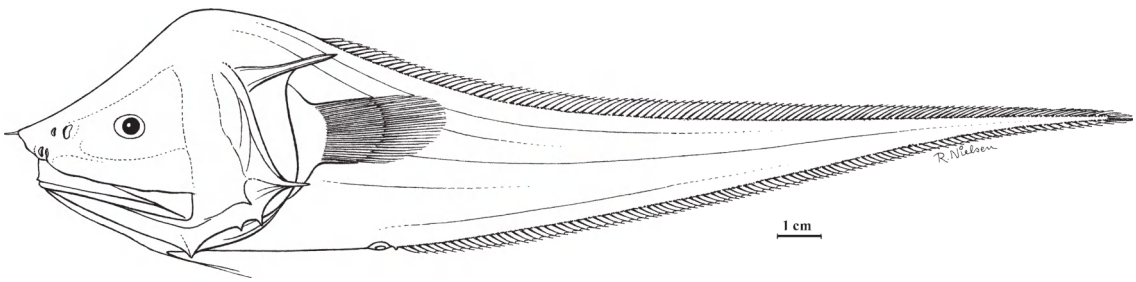


Fig. 46 ***Acanthonus armatus*** (from Nielsen, 1977)

Diagnosis and description: Head large and body tapering; **snout with prominent, bifid spine; opercular spine long and slender extending well beyond rear margin of head, well developed spines at lower angle of preopercle**; eye small; 1 to 4 median basibranchial tooth patches; 16 to 22 developed rakers on anterior gill arch; pectoral-fin rays 16 to 19; pelvic-fin rays 2; precaudal vertebrae 9 or 10.

Revisions: Nielsen (1965), Howes (1992).

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and distribution: Benthopelagic at bathyal and abyssal depths (1 500 to 4 415 m).

Interest to fisheries: None.

Size: At least 375 mm.

List of nominal species

Acanthonus armatus Günther, 1878. Information see above. Common.
A. spinifer Garman, 1899 (junior synonym of *A. armatus*).

Alcockia Goode and Bean, 1896

Type species: *Porogadus rostratus* Günther, 1878 by monotypy.

Synonyms: None.

Number of recognized species: 1.

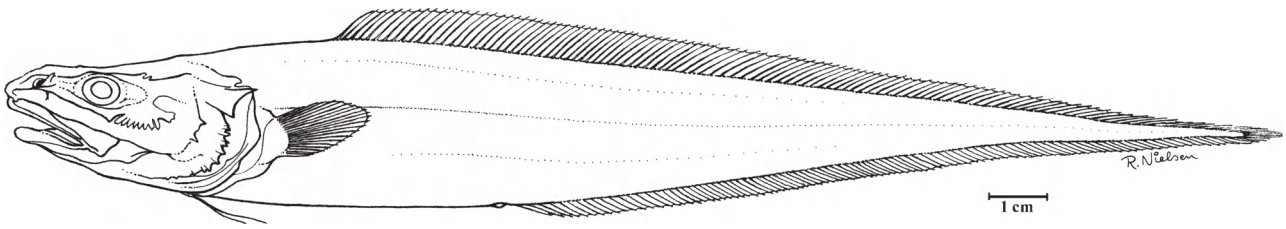


Fig. 47 *Alcockia rostrata* (from Nielsen, 1977)

Diagnosis and description: Elongate body with depressed head bearing sharp spines; eye diameter much shorter than snout; suborbital bones membraneous; maxillary sheathed posterodorsally; **opercular spine flat and weak**; 2 median basibranchial tooth patches; **7 developed rakers on anterior gill arch**, pectoral-fin rays 23; 2 pelvic-fin rays.

Revisions: None.

Geographical distribution: From East Africa to New Caledonia and Japan.

Habitat and biology: Benthopelagic at abyssal depths (3 300 to 4 040 m).

Interest to fisheries: None.

Size: At least 350 mm.

List of species

Alcockia rostrata Günther, 1887. Information see above. Rare.

Apagesoma Carter, 1983

Type species: *Apagesoma edentatum* Carter, 1983 by original designation.

Synonyms: None.

Number of recognized species: 2.

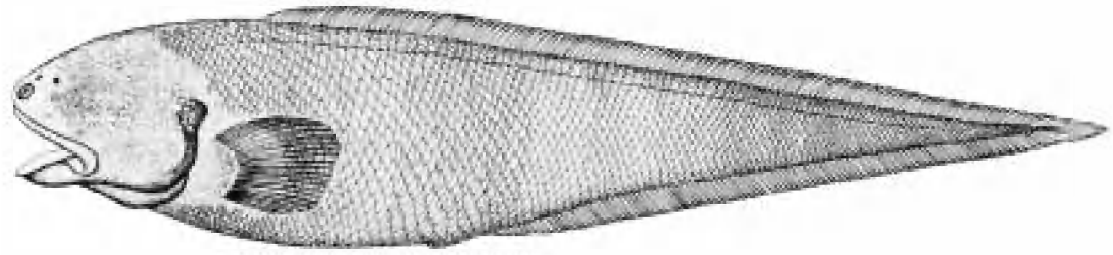


Fig. 48 *Apagesoma edentatum* (from Carter, 1983)

Diagnosis and description: Soft, watery body; eyes small; anterior nostril swollen; no spines on opercle and preopercle; preopercle posteriorly expanded; basibranchial tooth patches absent; 10 to 12 developed rakers on anterior gill arch; pectoral-fin rays 25 to 28; a single ray in each pelvic fin.

Revisions: None.

Geographical distribution: Tropical East and West Atlantic.

Habitat and biology: Benthopelagic at abyssal depths (2 560 to 5 082 m).

Interest to fisheries: None.

Size: At least 750 mm.

Key to species

1a. Dorsal-fin rays 116; anal-fin rays 98 . . . . . ***A. edentatum***

1b. Dorsal-fin rays 129 to 131; anal-fin rays 111 . . . . . ***A. delosommatus***

List of species

Apagesoma delosommatus (Hureau, Staiger and Nielsen, 1979). From the Bahamas and off the Canary Islands and Angola at 2 560 to 3 431 m. Rare.

A. edentatum Carter, 1983. Off the Bahamas at 5 082 m. Rare.

Barathrites Zugmayer, 1911

Type species: *Barathrites iris* Zugmayer, 1911 by monotypy.

Synonyms: None.

Number of recognized species: 2.

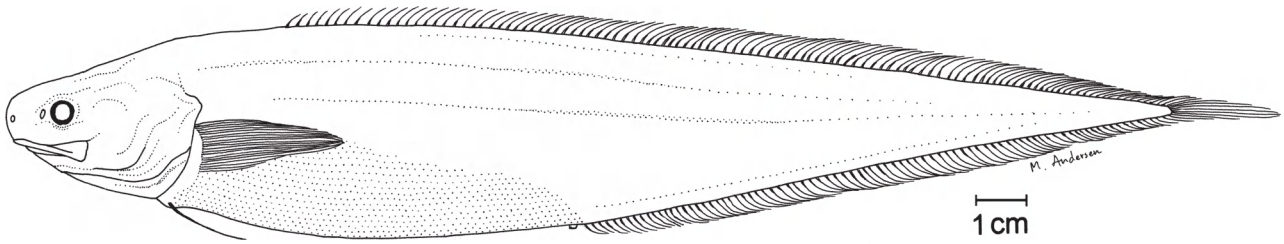


Fig. 49 *Barathrites parri*

Diagnosis and description: Head small, about 3 times in preanal distance; eye small; **anterior nostril without thick, fleshy raised rim**; median basibranchial tooth patch 0 or 1; **vomerine teeth in a diamond-shaped patch**; developed gill rakers 5 to 7; pelvic fins with 2 rays in each; **precaudal vertebrae 18.**

Revisions: Nybelin (1957).

Geographical distribution: Possibly worldwide beneath tropical and subtropical seas.

Habitat and biology: Benthopelagic at depths ranging from 1 270 to 5 200 m.

Interest to fisheries: None.

Size: At least 625 mm.

Remarks: Large specimens of *Barathrites iris* have been taken in deep traps as well as by bottom trawls.

Key to species

1a. Branchiostegal rays 6; median basibranchial tooth patches 0; reaches a known size of 625 mm standard length . . . . . *B. iris*

1b. Branchiostegal rays 7; median basibranchial tooth patch 1; sexually mature at 233 mm standard length . . . . . *B. parri*

List of nominal species

Barathrites abyssorum Roule, 1916 (junior synonym of *B. iris*).

B. iris Zugmayer, 1911. Benthopelagic at abyssal depths in the Atlantic; specimens from the Indian Ocean and Central Pacific may also be this species. Rare.

B. parri Nybelin, 1957. Benthopelagic on the western North Atlantic continental slope at 1 270 to 3 000 m. Locally abundant.

Barathrodemus Goode and Bean, 1883

Type species: ***Barathrodemus manatinus*** Goode and Bean, 1883 by monotypy.

Synonyms: None.

Number of recognized species: 2.

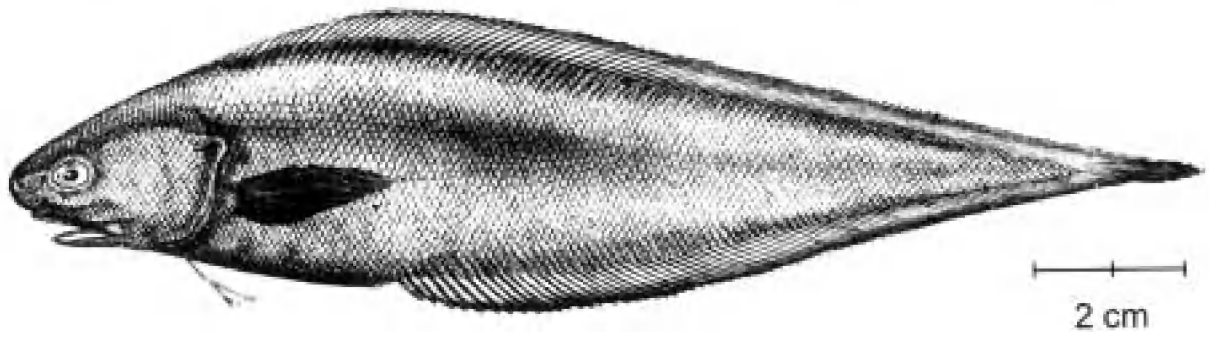


Fig. 50 ***Barathrodemus nasutus*** (from Radcliffe, 1913)

Diagnosis and description: Head relatively large, about 2 times in preanal distance; jaws inferior; **snout inflated; maxillary strongly sheathed; median basibranchial tooth patches 2**; **vomerine tooth patch triangular**; branchiostegal rays 8; developed rakers on first arch 12 to 15; opercular spine short and sharp; **pectoral fin reaches to anus or beyond**; pelvic fins with 2 rays in each; caudal-fin rays 8; pectoral-fin rays 19 to 25; precaudal vertebrae 12 to 14.

Revisions: None.

Geographical distribution: Continental slopes of the tropical western Atlantic and several localities in the western Pacific and Indian Ocean.

Habitat and biology: Benthopelagic at 850 to 2 340 m.

Interest to fisheries: None.

Size: At least 170 mm.

Remarks: Sexual dimorphism has been described in ***Barathrodemus manatinus*** in both body shape and probable sound producing mechanisms (Carter and Musick, 1985).

Key to species

1a. Dorsal-fin rays 106 to 107; anal-fin rays 85 to 87 . . . . . ***B. manatinus***

1b. Dorsal-fin rays 99 or 100; anal-fin rays 79 to 82 . . . . . ***B. nasutus***

List of nominal species

Barathrodemus manatinus Goode and Bean, 1883. Benthopelagic at bathyal depths in the tropical western North Atlantic. Locally abundant.

B. microps Parr, 1933 (junior synonym of ***B. manatinus***).

B. nasutus Smith and Radcliffe in Radcliffe, 1913. Benthopelagic in the Gulf of Tomini, Celebes, and the eastern Indian Ocean. Rare.

Bassogigas Goode and Bean, 1896

Type species: ***Bassogigas gilli*** Goode and Bean, 1896 by monotypy.

Synonyms: None.

Number of recognized species: 1.

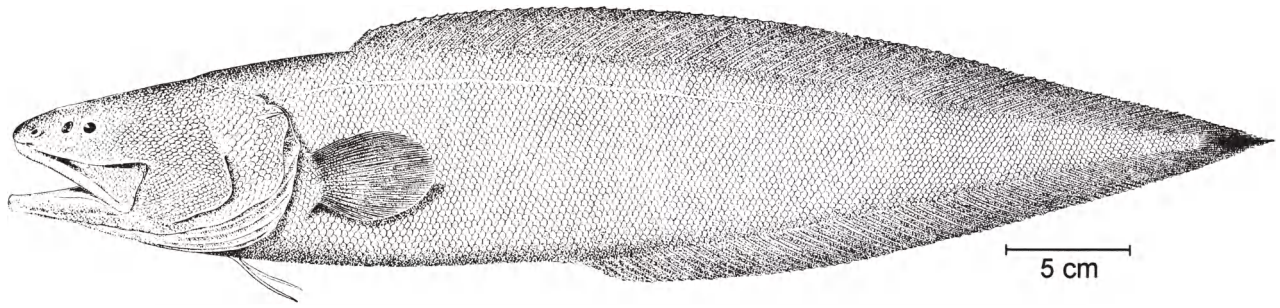


Fig. 51 ***Bassogigas gilli*** (from Goode and Bean, 1896)

Diagnosis and description: Head flat; snout much longer than eye, opercular spine strong; 2 median and most often a pair of basibranchial tooth patches; **7 to 9 developed rakers on anterior gill arch; pectoral fin short and rounded and with 27 to 31 rays**; lateral line distinct; 2 pelvic-fin rays; precaudal vertebrae 15 or 16.

Revisions: Nielsen (1980).

Geographical distribution: In the western Atlantic from 40°N to 23°S, between Madagascar and Cape Town and off New Caledonia.

Habitat and biology: Benthopelagic at bathyal depths (1 060 to 2 150 m).

Interest to fisheries: None.

Size: At least 830 mm.

List of species

Bassogigas gilli Goode and Bean, 1896. Information see above. Uncommon.

Bassozetus Gill, 1884

Type species: ***Bassozetus normalis*** Gill, 1884 by monotypy.

Synonyms: ***Pterodicromita*** Fowler, 1925, type species ***Sirembo oncerocephalus*** Vaillant, 1888.

Number of recognized species: 13.

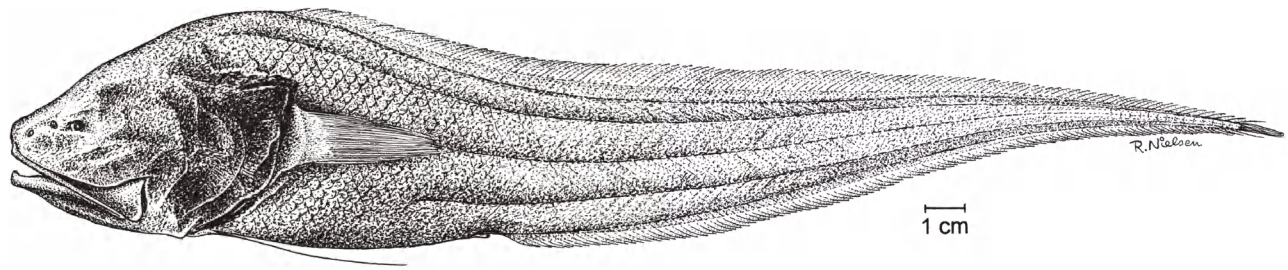


Fig. 52 ***Bassozetus robustus***

Diagnosis and description: Mouth terminal; snout inflated; eyes much smaller than snout; **opercular spine weak or absent; preopercle without spines and posteriorly expanded almost reaching posterior margin of opercle**, median basibranchial tooth patch 1 except for ***B. levistomatus***, ***werneri*** and ***zenkevitchi*** with 0; pseudobranchial filaments 2; 9 to 22 developed rakers on anterior gill arch; pectoral fin with 21 to 29 rays; pelvic fins with 1 ray in each; precaudal vertebrae 11 to 17.

Revisions: Nielsen and Merrett (in press).

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthopelagic and pelagic (***Bassozetus zenkevitchi***) at depths between 1 000 and 5 500 m.

Interest to fisheries: None.

Size: At least 800 mm.

Remarks: The revision in press will describe 2 new species.

Key to species

1a. Basibranchial tooth plates 0 . . . . . → *2*

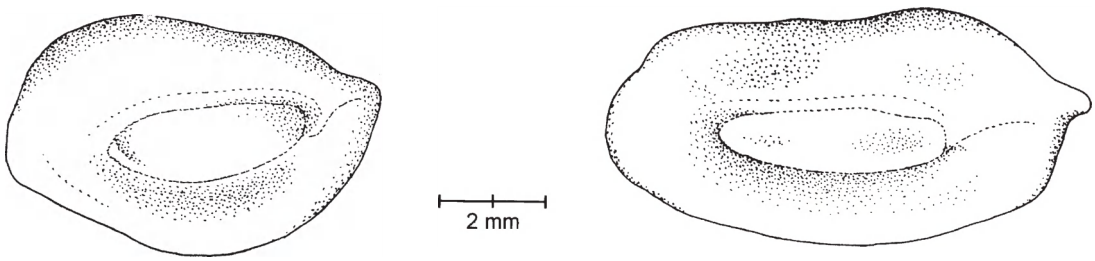
1b. One well-developed basibranchial tooth plate . . . . . → *4*

2a. Long gill rakers 15 to 18; vomer dentigerous and V-shaped . . . . . ***B. zenkevitchi***

2b. Long gill rakers 9 to 11; vomer edentate or with small circular plate . . . . . → *3*

3a. Pelvic fins 8 to 12% standard length; vomer usually edentate (a 735 mm specimen with a proportionally small, 3.5 mm tooth plate); otolith (Fig. 53a) . . . . . ***B. levistomatus***

3b. Pelvic fins 17.5% standard length, vomer with a 3 mm tooth plate in the 375 mm known specimen; otolith (Fig. 53b) . . . . . ***B. n. sp. 2***



a) ***Bassozetus levistomatus*** (standard length 735 mm) b) ***Bassozetus*** **n.sp. 2** (standard length 365 mm)

Fig. 53 Sagittal otolith

4a. Pelvic-fin rays less than about 3.0% standard length; long gill rakers 16 to 22 . . . . . ***B. multispinis***

4b. Pelvic-fin rays more than 5% standard length; long gill rakers 11 to 21 . . . . . → *5*

5a. Dorsal-fin rays 132 to 142; anal-fin rays 108 to 115; long gill rakers 14 to 18; precaudal vertebrae 13 to 17 . . . . . ***B. n. sp. 1***

5b. Dorsal-fin rays 98 to 133; anal-fin rays 90 to 111; long gill rakers 9 to 22; precaudal vertebrae 11 to 16 . . . . . → *6*

6a. Length of pelvic fins 18 to 25% standard length reaching beyond anus; depth at anus 8.2 to 11.0% standard length; precaudal vertebrae 11 to 13; transverse scale-rows between anus and dorsal fin 15 to 20 (Fig. 54) . . . . . *B. elongatus*

6b. Length of pelvic fins rarely more than 19% standard length rarely reaching beyond anus; depth at anus 6.4 to 16.5% standard length; precaudal vertebrae 11 to 19; transversal scale-rows between anus and dorsal fin 15 to 35 . . . . . → *7*

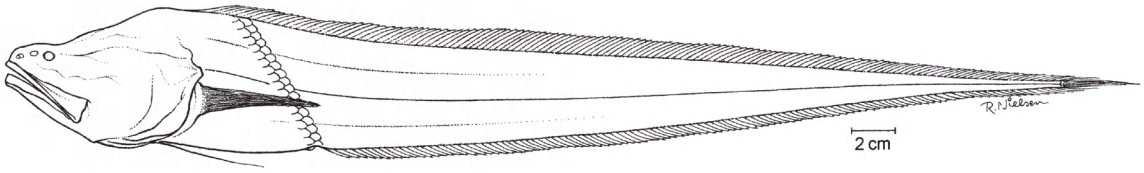


Fig. 54 *Bassozetus elongatus*

7a. Sagittal otolith large (8 mm in a 250 mm standard length specimen); long gill rakers 12 to 16; scale rows between anus and dorsal fin 25 to 35; depth at anus 10 to 19% standard length . . . . . *B. robustus*

7b. Sagittal otolith small (4 mm in a 250 mm standard length specimen); long gill rakers 11 to 21; scale rows between anus and dorsal fin 15 to 35; depth at anus 8.7 to 14% standard length . . . . . → *8*

8a. Scales small (more than 25 transverse rows). This couplet holds 3 closely related species the diagnostic characters of which are slightly overlapping; a coming revision will clarify the differences; until then the distribution of the species should be used:

Indian and western (to 169°E) Pacific Oceans . . . . . *B. glutinosus*

East (to 117°W) Pacific Ocean . . . . . *B. nasus*

Atlantic Ocean . . . . . *B. normalis*

8b. Scales large (less than 25 transverse rows) . . . . . → *9*

9a. Long rakers on anterior gill arch 11 to 14; depth at anus 8 to 14% standard length; preanal 34 to 40% standard length . . . . . *B. compressus*

9b. Long rakers on anterior gill arch 15 to 20; depth at anus 7 to 10% standard length; preanal 28 to 34% standard length . . . . . → *12*

10a. Distance between bases of ventral fins and anal fin 15.0 to 19.0% of standard length, 12 to 14 precaudal vertebrae . . . . . *B. taenia*

10b. Distance between bases of ventral fins and anal fin 23.5% of standard length, 16 precaudal vertebrae . . . . . *B. oncerocephalus*

List of species

Bassozetus compressus (Günther, 1878). Philippines and Atlantic Ocean. Benthopelagic at 1 920 to 2 750 m. Uncommon.

B. elongatus Smith and Radcliffe in Radcliffe, 1913. Indian Ocean and West Pacific. Benthopelagic at 1 990 to 4 970 m. Uncommon.

B. glutinosus (Alcock, 1890a). Indian Ocean and West Pacific. Benthopelagic at 1 530 to 2 040 m. Uncommon.

B. levistomatus Machida, 1989a. In all oceans. Benthopelagic at 4 125 to 5 200 m. Rare.

B. multispinis Shcherbachev, 1980. Indian Ocean. Benthopelagic at 1 500 to 1 880 m. Rare.

B. nasus Garman, 1899. East Pacific. Benthopelagic at 3 060 to 3 570 m. Common.

B. normalis Gill, 1884. Northwest Atlantic. Benthopelagic at 2 850 m. Uncommon.

B. oncerocephalus (Vaillant, 1888). East Atlantic. Benthopelagic 3 200 m. Rare.

B. robustus Smith and Radcliffe in Radcliffe, 1913. In all oceans. Benthopelagic at 1 035 to 2 750 m. Common.

B. taenia (Günther, 1887). North Atlantic. Benthopelagic at 4 375 m. Rare.

B. zenkevitchi Rass, 1955. North Pacific. Deep pelagic. Rare.

B. **n. sp. 1**. Indian Ocean and West Pacific. Benthopelagic at 1 280 to 3 960 m. Uncommon.

B. **n. sp. 2**. Off Vanuatu. Benthopelagic at 1 850 m. Rare.

Bathyonus Goode and Bean, 1886

Type species: Replacement name for *Bathynectes* Günther, 1877; takes same type species, *Bathynectes laticeps* Günther.

Synonyms: *Bathynectes* Günther, 1878, type species *Bathynectes laticeps* Günther; preoccupied by *Bathynectes* Stimpson, 1870 in Crustacea. *Mixonus* Günther, 1887, type species *Bathynectes laticeps* Günther. *Nematonus* Günther, 1887, type species *Bathyonus pectoralis* Goode and Bean.

Number of recognized species: 3.

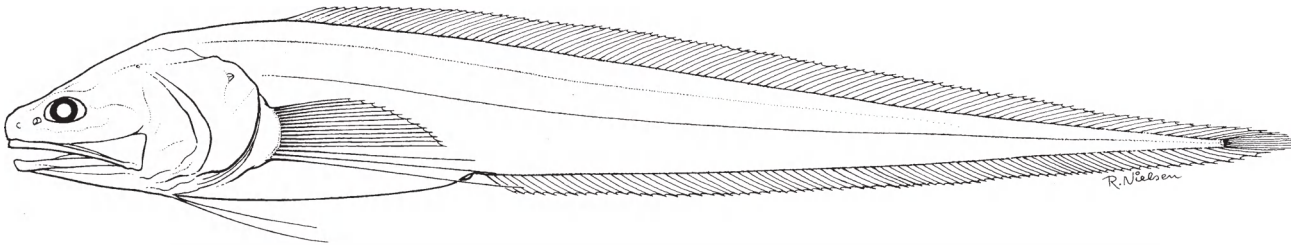


Fig. 55 *Bathyonus caudalis* (from Nielsen, 1997)

Diagnosis and description: Body depth 9.5 or less in standard length; head length about 1/2 preanal length; branchiostegal rays 8 or 9; **no prominent spines on top or side of head**; median basibranchial tooth patches 2; developed rakers on first arch 10 or more; **pectoral-fin rays 16 to 19, lower rays free and stronger than upper ones,** pelvic fin with 2 rays in each; caudal-fin rays 6; precaudal vertebrae 17 to 19.

Revisions: None.

Geographical distribution: Probably circumtropical.

Habitat and biology: Benthopelagic at bathyal and abyssal depths.

Interest to fisheries: None.

Size: Reaches at least 780 mm.

Remarks: Taxonomic revision is needed in order to verify species distributions.

Key to species: Not possible at present.

List of nominal species

Bathyonus caudalis (Garman, 1899). Eastern tropical Pacific at 1 524 to 2 417 m; also recorded from the Indian Ocean at 1 840 to 4 040 m. Uncommon.

B. guentheri (Vaillant, 1888) (junior synonym of ***B. laticeps***).

B. laticeps (Günther, 1878). Bathyal to abyssal in the Atlantic; juvenile caught in midwater off Bermuda at 1 280 m. Locally abundant.

B. pectoralis Goode and Bean, 1886. Tropical western Atlantic at 604 to 2 615 m and eastern Indian ocean at 4 600 m. Uncommon.

Benthocometes Goode and Bean, 1896

Type species: ***Neobythites robustus*** Goode and Bean, 1886 by subsequent selection.

Synonyms: None.

Number of recognized species: 1.

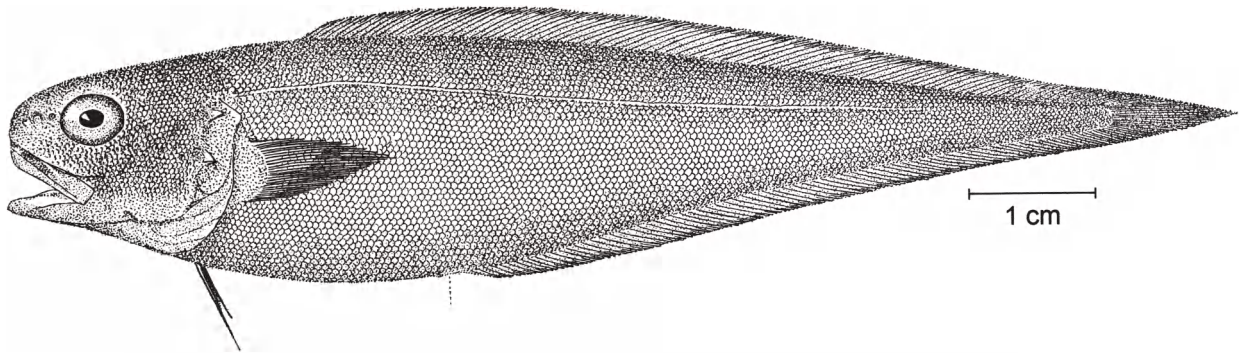


Fig. 56 ***Benthocometes robustus*** (from Goode and Bean, 1896)

Diagnosis and description: Head short and stubby, mouth terminal; eyes equal to or greater than length of snout; **opercle with 2 posteriorly directed spines**, 1 basibranchial tooth patch; vomerine tooth patch without arms; **developed rakers on anterior gill arch 7 to 10; pseudobranchial filaments 5 to 7**; pectoral-fin rays 27 to 33; pelvic fins with 2 rays in each.

Revisions: Bougis and Ruivo (1954).

Geographical distribution: Tropical West Atlantic, off Northwest Africa and the Mediterranean.

Habitat and biology: Benthopelagic at 500 to 1 000 m. Larvae epipelagic (see Fig. 4).

Interest to fisheries: None.

Size: At least 122 mm.

List of nominal species

Benthocometes robustus (Goode and Bean, 1886). Information see above. Uncommon.

Pteridium armatum Doederlein, 1886 (junior synonym of ***B. robustus***).

Sirembo muraenolepis Vaillant, 1888 (junior synonym of ***B. robustus***).

Dannevigia Whitley, 1941

Type species: ***Dannevigia tusca*** Whitley, 1941 by original designation.

Synonyms: None.

Number of recognized species: 1.

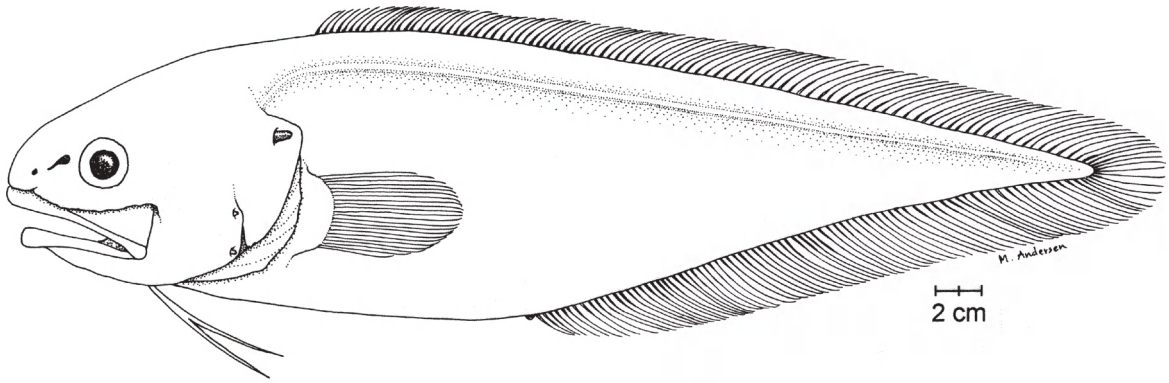


Fig. 57 ***Dannevigia tusca***

Diagnosis and description: Body robust, deepest over pectoral fins; **several short, weak, concealed spines at lower angle of preopercle**; spine on opercle barely if at all reaching beyond rear margin of head; eyes well developed; **median basibranchial tooth patches 2**; developed gill rakers on first arch 4; **no dark spots on body or fins of adults**; **pelvic fins with 2 rays in each, fin bases close together, inserting under rear margin of eye.** Small specimens with 4 rather diffuse broad vertical brown bands on body, adults uniformly brown.

Revisions: None.

Geographical distribution: Great Australian Bight, straying to Bass Straits.

Habitat and biology: Benthopelagic along the outer shelf at 115 to 365 m.

Interest to fisheries: Occasionally landed but not taken in abundance.

Size: Reaching at least 56 cm.

List of species

Dannevigia tusca Whitley, 1941. Information see above. Common.

Dicrolene Goode and Bean, 1883

Type species: ***Dicrolene intronigra*** Goode and Bean, 1883 by monotypy.

Synonyms: ***Pteroidonus*** Günther, 1887, type species ***Pteroidonus quinquarius*** Günther; ***Paradicrolene*** Alcock, 1889, type species ***Paradicrolene multifilis*** Alcock; ***Brachydicrolene*** Norman, 1939, type species ***Dicrolene nigricaudis*** Alcock.

Number of recognized species: 15.

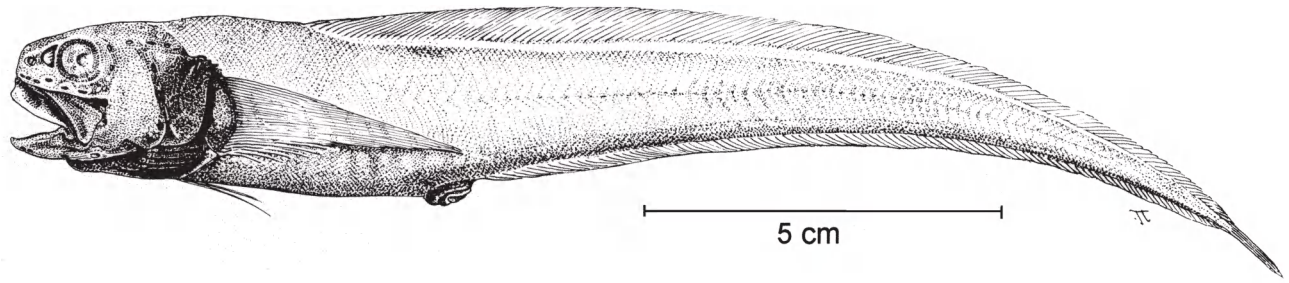


Fig. 58 ***Dicrolene pallidus*** (from Hureau and Nielsen, 1981)

Diagnosis and description: Snout rather blunt; eye diameter almost as long as snout; opercular spine strong and straight (except curved in ***D. kanazawai***); **hind margin of preopercle usualy with 3 sharp spines**; 1 or 2 median basibranchial tooth patches and a pair (except ***D. kanazawai*** with 0); pseudobranchial filaments 2 or 3; 7 to 15 developed rakers on anterior arch; **pectoral-fin rays 22 to 33 of which lower 5 to 11 are free and longer than upper ones**; pelvic-fin rays 2; precaudal vertebrae 13 to 16.

Revisions: None.

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthopelagic at bathyal and abyssal depths (350 to 3 200 m).

Interest to fisheries: None.

Size: At least 580 mm.

Remarks: A much needed revision may show that more than 1 genus should be recognized. Various collections hold much untreated material.

Key to species

Note: Shcherbachev (1980) published a tentative key to ***Dicrolene*** spp. mainly based on meristic characters, but due to insufficient knowledge of the intraspecific variation his key is difficult to use. A key to species and species groups from Hureau and Nielsen (1981) is provided below.

1a. No paired and 1 median basibranchial tooth patch; opercular spine curved . . ***D. kanazawai***

1b. One or 2 median and 1 pair of basibranchial tooth patches; opercular spine straight . . . → *2*

2a. Two median basibranchial tooth patches (Fig. 59a) . . . . . ***D. longimana, D. nigricaudis, D. tristis, D. vaillanti***

2b. One median basibranchial tooth patch . . . . . → *3*

3a. Median basibranchial tooth patch long and narrow (Fig. 59b) . . . . . ***D. filamentosa, D. gregoryi, D. nigra, D. pullata***

3b. Median basibranchial tooth patch broad . . . . . → *4*

4a. Caudal fin and posterior part of dorsal and anal fins black . . . . . *D. hubrechti, D. mesogramma, D. quinquarius*

4b. No black fin rays . . . . . → *5*

5a. One supraorbital and 3 preopercular spines all strong . . . . . *D. intronigra*

5b. Spines in supraorbital absent and on preopercle absent or weak . . . . . → *6*

6a. Paired basibranchial tooth patches larger and overlapping the median one (Fig. 59c) . . . . . *D. pallidus*

6b. Paired basibranchial tooth patches small and placed behind median one (Fig. 59d) *D. multifilis*

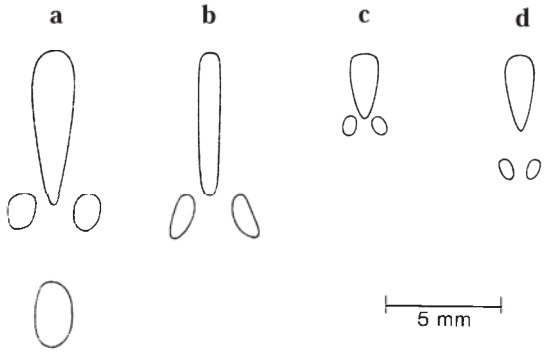


Fig. 59 Basibranchial tooth patches

List of species

Dicrolene filamentosa Garman, 1899. East Pacific. Benthopelagic at 935 to 1 855 m. Rare.

D. gregoryi Trotter, 1926. East Pacific. Benthopelagic at 1 545 m. Rare.

D. hubrechti Weber, 1913. Eastern Indian Ocean, Timor Sea and off Hawaii (Iwai 1976) at 920 to 1 700 m. Rare.

D. intronigra Goode and Bean, 1883. From both sides of the Atlantic at 700 to 1 785 m. Common.

D. kanazawai Grey, 1958. Western Atlantic at 1 375 to 2 342 m. Common.

D. longimana Smith and Radcliffe in Radcliffe, 1913. From off East Africa to New Caledonia at 410 to 1 410 m. Uncommon. A report from the Peru-Chile Trench (Nalbant and Mayer, 1971) is based on an incorrectly identified specimen.

D. mesogramma Shcherbachev, 1980. Eastern Indian Ocean at 1 340 to 1 640 m. Rare.

D. multifilis (Alcock, 1889). Indian Ocean at 350 to 1 700 m. Uncommon. *D. nigra* Garman, 1899. Eastern Pacific at 770 to 1865 m. Uncommon.

D. nigricaudis (Alcock in Wood-Mason and Alcock, 1891). Indian Ocean at 345 to 730 m. Uncommon.

D. pallidus Hureau and Nielsen, 1981. Off Southwest Africa at 2 772 to 2 992 m. Rare.

D. pullata Garman, 1899. Eastern Pacific at 1 335 m. Rare.

D. quinquarius (Günther, 1887). From off Mozambique to Japan at 1 030 to 1 300 m. Rare.

D. tristis Smith and Radcliffe in Radcliffe, 1913. Off the Philippines at 880 m. Uncommon.

D. vaillanti (Alcock, 1890b). Indian Ocean at 1 355 m. Rare.

Enchelybrotula Smith and Radcliffe in Radcliffe, 1913

Type species: ***Enchelybrotula paucidens*** Smith and Radcliffe in Radcliffe, 1913 by original designation.

Synonyms: None.

Number of recognized species: 2.

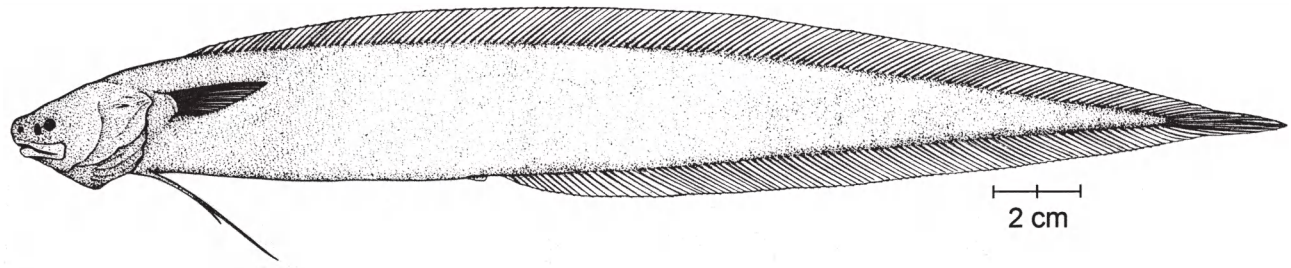


Fig. 60 ***Enchelybrotula gomoni*** (from Cohen, 1982)

Diagnosis and description: Body long and compressed; **head short, 3 or more times in preanal**; eyes small; branchiostegal rays 7; **jaw teeth sharp-pointed, compressed, in a single row**; median basibranchial tooth patches 2; **gill rakers short, spiny tubercles or pads**; pelvic fins with 2 rays in each; caudal-fin rays 8; **precaudal vertebrae 22 or 23**.

Revisions: Cohen (1982).

Geographical distribution: Gulf of Panama, Celebes and Bay of Bengal.

Habitat and biology: Benthopelagic at 2 000 to 3 200 m. Massive lower jaw skeleton, unique dentition, and the high oblique placement of pectoral fins suggest that *Enchelybrotula* may hover and nip at prey items.

Interest to fisheries: None.

Size: At least 491 mm.

Key to species

1a. Body depth at anus greater than head length; dorsal-fin rays 130 . . . . . *E. paucidens*

1b. Body depth at anus less than head length; dorsal-fin rays 135 to 136 . . . . . *E. gomoni*

List of species

Enchelybrotula gomoni Cohen, 1982. Gulf of Panama. Benthopelagic at 2 000 to 3 208 m. Rare.

E. paucidens Smith and Radcliffe in Radcliffe, 1913. Gulf of Tomini, Celebes and Bay of Bengal. Benthopelagic at 2 000 to 2 820 m. Rare.

Epetriodus Cohen and Nielsen, 1978

Type species: ***Epetriodus freddyi*** Cohen and Nielsen, 1978 by original designation.

Synonyms: None.

Number of recognized species: 1.

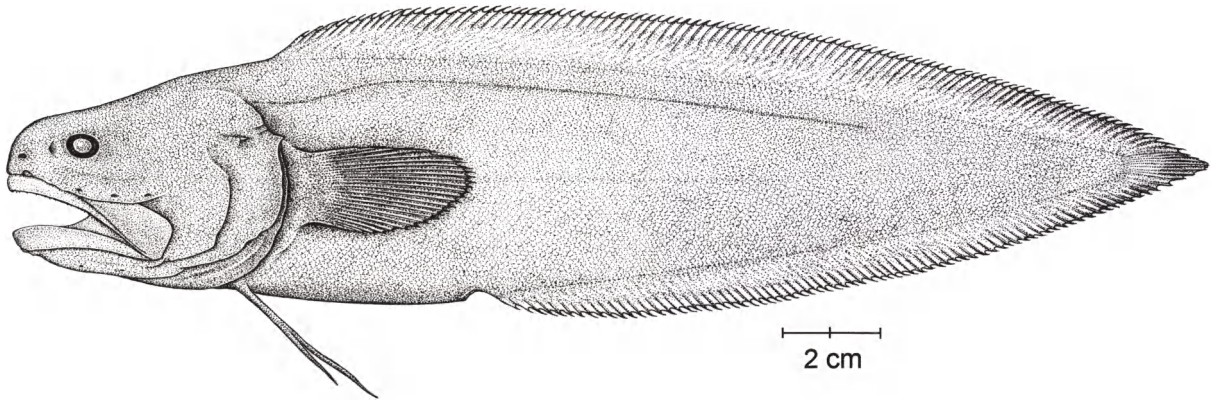


Fig. 61 ***Epetriodus freddyi*** (from Cohen and Nielsen, 1978)

Diagnosis and description: **Body relatively short**; **eye diameter much shorter than snout**, mouth ends well posterior to eye; **many needle-like teeth**; a short, sharp opercular spine, preopercular unarmed; 2 median basibranchial tooth patches; **20 to 24 developed rakers on anterior gill arch**; 23 to 29 pectoral- and 2 pelvic-fin rays.

Revisions: None.

Geographical distribution: From off East Africa to New Caledonia.

Habitat and biology: Benthopelagic at bathyal depths (1 000 to 1 750 m).

Interest to fisheries: None.

Size: At least 215 mm.

List of species

Epetriodus freddyi Cohen and Nielsen, 1978. Information see above. Uncommon.

Eretmichthys Garman, 1899

Type species: ***Eretmichthys pinnatus*** Garman, 1899 by subsequent designation.

Synonyms: None.

Number of recognized species: 1.

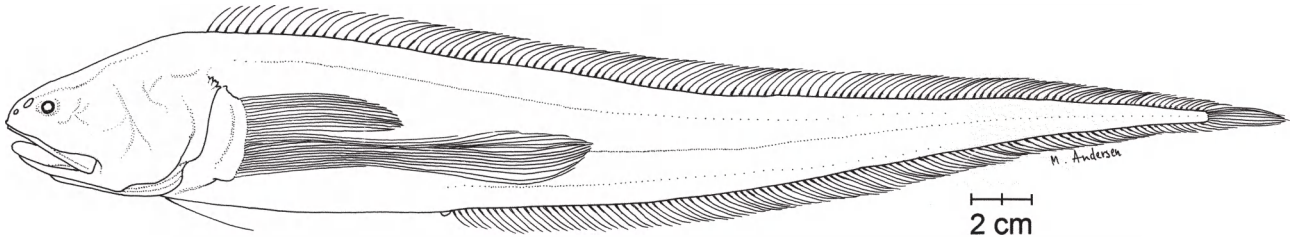


Fig. 62 *Eretmichthys pinnatus*

Diagnosis and description: Mouth terminal, snout inflated; **eyes much smaller than snout; opercular spine absent; preopercular without spines and posteriorly expanded almost reaching posterior margin of opercle; lower pectoral radial with ventral process, lower pectoral-fin rays extended well beyond anus in ripe males but not in unripe males and females**, median basibranchial tooth patch 1; pseudobranchial filaments 2; 15 to 20 developed rakers on anterior gill arch; pectoral-fin rays 25 to 29; pelvic-fin rays 1.

Revisions: Shcherbachev (1980).

Geographical distribution: Found below tropical areas of all oceans.

Habitat and biology: Benthopelagic at 1 490 to 2 820 m.

Interest to fisheries: None.

Size: At least 410 mm.

Remarks: Many unidentified specimens from the tropical West Atlantic. An undescribed species from off Madagascar.

List of nominal species

Eretmichthys ocellata Garman, 1899 (junior synonym of *E. pinnatus*).

E. pinnatus Garman, 1899. From off East Africa to the Gulf of Panama at 1 355 to 2 820 m. Uncommon.

E. remifer Smith and Radcliffe in Radcliffe, 1913 (junior synonym of *E. pinnatus*).

Glyptophidium Alcock, 1889

Type species: *Glyptophidium argenteum* Alcock, 1889 by monotypy.

Synonyms: None.

Number of recognized species: 7.

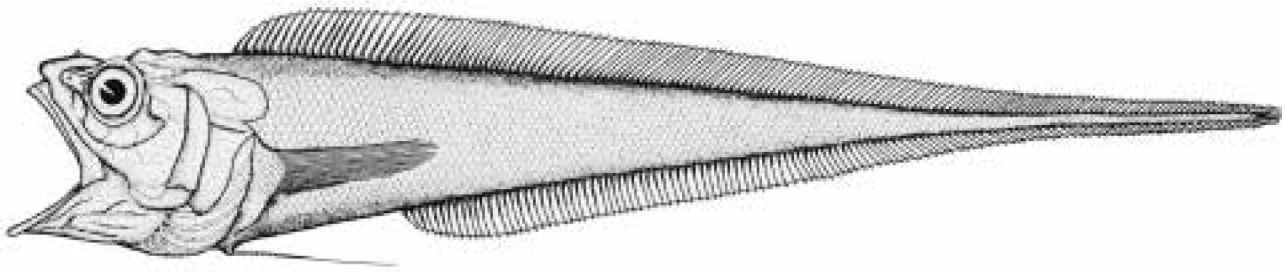


Fig. 63 *Glyptophidium argenteum* (from Nielsen and Machida, 1988)

Diagnosis and description: Prominent head and body with an attenuate caudal part; head bones with large, thin crests; eye equal to or greater then length of snout; opercular spine broad, flat and weak, basibranchial with 1 or 2 median and a pair of tooth patches; developed rakers on anterior gill arch 14 to 41; pectoral-fin rays 20 to 26; pelvic fins with 1 or 2 rays in each.

Revisions: Nielsen and Machida (1988).

Geographical distribution: From off East Africa to Japan and Australia.

Habitat and biology: Benthopelagic at 40 to 823 m.

Interest to fisheries: Found in fish markets in Japan but not taken in abundance.

Size: At least 285 mm.

Key to species (from Nielsen and Machida, 1988)

1a. Pelvic-fin rays 1; median basibranchial tooth patches 1; long gill rakers on anterior arch 14 to 23 (***argenteum*** species group) . . . . . → *2*

1b. Pelvic-fin rays 2; median basibranchial tooth patches 2; long gill rakers on anterior arch 21 to 41 (***macropus*** species group) . . . . . → *4*

2a. Horizontal diameter of orbit 31.5 to 40.5% of head length; pseudobranchial filaments 11 to 15; pectoral-fin rays 23 to 26 . . . . . *G. lucidum*

2b. Horizontal diameter of orbit 21.5 to 31% of head length; pseudobranchial filaments 7 to 12; pectoral-fin rays 20 to 24. . . . . → *3*

3a. Horizontal diameter of orbit 21.5 to 28.5% of head length; sagitta most often thick with flat dorsal rim . . . . . *G. argenteum*

3b. Horizontal diameter of orbit 29 to 31% of head length; sagitta large and thin with depression in dorsal rim . . . . . *G. effulgens*

4a. Pelvic-fin length 180 to 200% of head length (fin rays often broken); pectoral-fin rays 20 to 22; caudal-fin rays 7 or 8; stem of pseudobranchial filaments dark . . *G. longipes*

4b. Pelvic-fin length 60 to 125% of head length; pectoral-fin rays 22 to 26; caudal-fin rays 8 to 10; stem of pseudobranchial filament pale . . . . . → *5*

5a. Long gill rakers on anterior arch 36 to 41; pelvic-fin length 90 to 125% of head length; pseudobranchial filaments 7 to 11 . . . . . *G. macropus*

5b. Long gill rakers on anterior arch 21 to 33; pelvic-fin length 57 to 81% of head length; pseudobranchial filaments 10 to 15 . . . . . → *6*

6a. Long rakers 30 to 33 and total rakers on anterior gill arch 35 to 38; anterior anal-fin ray below 31st to 34th dorsal-fin rays; diameter of horizontal orbit 32.5 to 34.5% of head length . . . . . *G. oceanium*

6b. Long rakers 21 to 26 and total rakers on anterior gill arch 28 to 33; anterior anal-fin ray below 28th to 31st dorsal-fin rays; diameter of horizontal orbit 28.5 to 33% of head length . . . . . *G. japonicum*

List of species

Glyptophidium argenteum Alcock, 1889. From Bay of Bengal to the Philippines at 295 to 815 m. Common.

G. effulgens Nielsen and Machida, 1988. Off the Philippines at 705 m. Rare.

G. japonicum Kamohara, 1936. From Japan to off Northwest Australia at 145 to 595 m. Common.

G. longipes Norman, 1939. Western Indian Ocean at 360 to 825 m. Common.

G. lucidum Smith and Radcliffe in Radcliffe, 1913. From the northern Philippines to off Northwest Australia at 395 to 685 m. Common.

G. macropus Alcock, 1894. From Gulf of Aden to off Lombok at 40 to 550 m. Common.

G. oceanium Smith and Radcliffe in Radcliffe, 1913. From Japan to the northern Philippines and probably a specimen from off Madagascar at 200 to 565 m (430 to 700 m off Madagascar). Common.

Holcomycteronus Garman, 1899

Type species: *Holcomycteronus digittatus* Garman, 1899 by monotypy.

Synonyms: *Grimaldichthys* Roule, 1913, type species *Grimaldichthys profundissimus* Roule.

Number of recognized species: 6.

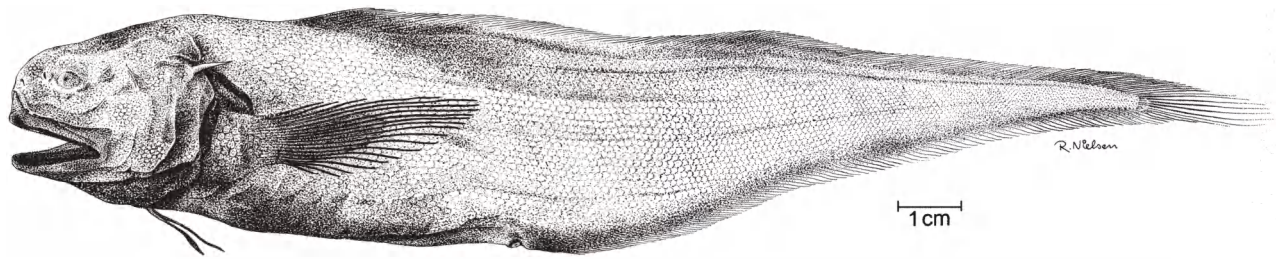


Fig. 64 *Holcomycteronus aequatoris*

Diagnosis and description: Robust body with rounded snout; eye diameter much shorter than snout; opercular spine strong; 2 median and a pair of basibranchial tooth patches; **7 to 11 developed rakers on anterior gill arch**; pectoral-fin rays 15 to 21; **pelvic fins with 2 rays in each flattened distally and somewhat thicker in males.**

Revisions: Nybelin (1957).

Geographical distribution: Below tropical and subtropical areas of all oceans. Also 1 specimen from the Antarctic area.

Habitat and biology: Benthopelagic at bathyal, abyssal and hadal depths (1 570 to 7 160 m).

Interest to fisheries: None.

Size: At least 310 mm.

Remarks: A revision is needed.

Key to species: Not possible at present.

List of nominal species

Holcomycteronus aequatoris (Smith and Radcliffe in Radcliffe, 1913). From off East Africa to the Philippines at 1 995 to 4 030 m. Rare.

H. brucei (Dollo, 1906). Weddell Sea at 4 575 m. Rare.

H. digittatus Garman, 1899. East Pacific at 1 570 to 4 080 m. Uncommon.

H. koefoedi Nybelin, 1957 (junior synonym of ***H. squamosus***).

H. profundissimus (Roule, 1913). Northeast Pacific, Atlantic and East Indian Ocean at 5 600 to 7 160 m. Rare. Staiger (1972) referred the deepest recorded fish, from the Puerto Rico Trench (8 370 m), to this species. Nielsen (1977) transferred it to ***Abyssobrotula galatheae***.

H. pterotus (Alcock, 1890a). Indian Ocean at 1 830 to 3 195 m. Rare.

H. squamosus (Roule, 1916). Atlantic Ocean at 2 605 to 5 055 m. Rare.

Homostolus Smith and Radcliffe in Radcliffe, 1913

Type species: ***Homostolus acer*** Smith and Radcliffe in Radcliffe, 1913 by original designation.

Synonyms: None.

Number of recognized species: 1.

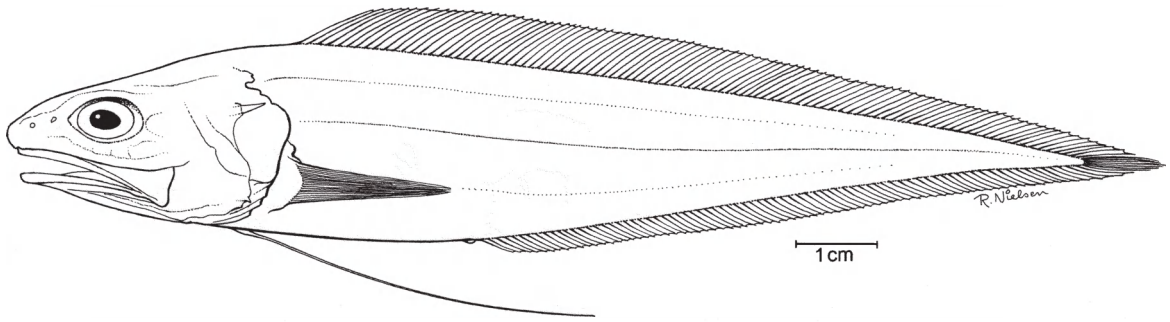


Fig. 65 ***Homostolus acer*** (from Nielsen, 1997)

Diagnosis and description: Rather elongate body with pointed head; eye diameter equal to or longer than snout; jaw teeth granular in narrow bands; opercular spine sharp and straight; **1 to 3 sharp spines on lower margin of preopercle**; median basibranchial tooth patch 1; **developed rakers on anterior gill arch 27 to 42**; pectoral fins placed low on body with 21 to 23 rays; **each pelvic fin with 1 ray longer than head**; precaudal vertebrae 13.

Revisions: Machida and Okamura (1992).

Geographical distribution: Known from off Japan, the Philippines, Australia and New Caledonia.

Habitat and biology: Benthopelagic at bathyal depths (300 to 1 000 m).

Interest to fisheries: Occasionally on markets in Japan.

Size: At least 180 mm.

List of nominal species

Homostolus acer Smith and Radcliffe in Radcliffe, 1913. Information see above. Common.

H. japonicus Matsubara, 1943 (junior synonym of ***H. acer***).

Hoplobrotula Gill, 1863a

Type species: *Brotula armata* Temminck and Schlegel, 1846 by original designation.

Synonyms: None.

Number of recognized species: 3.

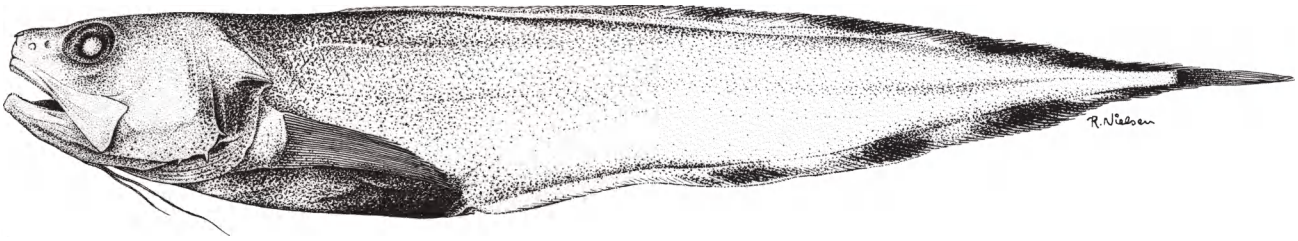


Fig. 66 *Hoplobrotula armata*

Diagnosis and description: Rather elongate body with **blunt head; eye almost as long as snout**; upper jaw ends well behind eye; **3 sharp spines on preopercle and 1 strong opercular spine;** 1 median and a pair of basibranchial tooth patches; **5 or 6 developed rakers on anterior gill arch**; pectoral-fin rays 19 to 23; **pelvic fins inserted beneath eye** with 2 rays in each; precaudal vertebrae 13 to 15. Body of juveniles with several black, vertical bars continuing onto dorsal and anal fins as blotches. Fig. 66 shows rests of juvenile coloration.

Revisions: Machida (1990).

Geographical distribution: From off Southeast Africa to Japan and East Australia.

Habitat and biology: Benthopelagic at bathyal depths (180 to 550 m).

Interest to fisheries: Often marketed in Japan.

Size: At least 360 mm.

Key to species (from Machida, 1990)

1a. Snout spine absent; dorsal-fin rays 99 to 103; precaudal vertebrae 15 . . . . *H. gnathopus*

1b. Snout spine present; dorsal-fin rays less than 95; precaudal vertebrae 13 . . . . . → *2*

2a. Snout spine long, sharp and strong; sensory pore just above anterior nostril present; dorsal-fin rays 85 to 90; pelvic fin not extending beyond head . . . . . *H. armata*

2b. Snout spine extremely short and blunt; no sensory pore above anterior nostril; dorsal-fin rays 94; pelvic fin extending well beyond head . . . . . *H. badia*

List of species

Hoplobrotula armata (Temminck and Schlegel, 1846). From off Australia to Japan at 220 to 330 m. Common.

H. badia Machida, 1990. Sagami Bay, Japan. Rare.

H. gnathopus Regan, 1921. Off Southeast Africa at 180 to 550. Uncommon.

Hypopleuron Smith and Radcliffe in Radcliffe 1913

Type species: ***Hypopleuron caninum*** Smith and Radcliffe in Radcliffe, 1913 by original designation.

Synonyms: None.

Number of recognized species: 1.

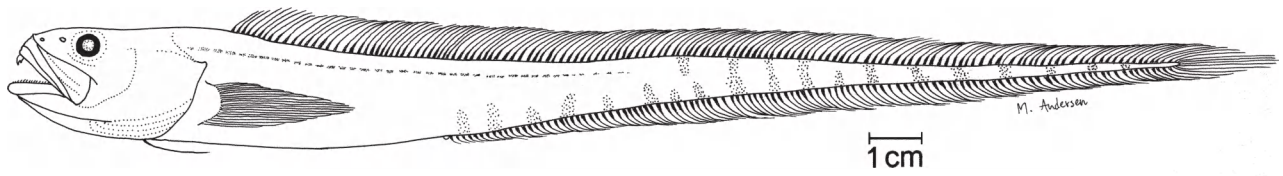


Fig. 67 *Hypopleuron caninum*

Diagnosis and description: Jaws equal in length or lower jaw slightly protruding; no spines on opercle or subopercle; a canine tooth at the front of each upper jaw bone; median basibranchial tooth patch 1; branchiostegal rays 8; **lateral line with small scales that overlie an inner series of larger scales that bear neuromasts**; pelvic fins with 1 ray in each; pectoral-fin rays 26; **precaudal centra 22, parapophyses broad and inflated, inclosing the swimbladder.**

Revisions: None.

Geographical distribution: Arabian Sea, Andaman Sea and the Philippines.

Habitat and biology: Trawled on the continental shelf at depths of 300 to 575 m.

Interest to fisheries: None.

Size: At least 570 mm.

List of species

Hypopleuron caninum Smith and Radcliffe in Radcliffe, 1913. Information see above. Common.

Lamprogrammus Alcock in Wood-Mason and Alcock, 1891

Type species: ***Lamprogrammus niger*** Alcock in Wood-Mason and Alcock, 1891 by monotypy.

Synonyms: ***Bassobythites*** Brauer, 1906. Type species ***Bassobythites brunswigi*** Brauer.

Number of recognized species: 5 or 6.

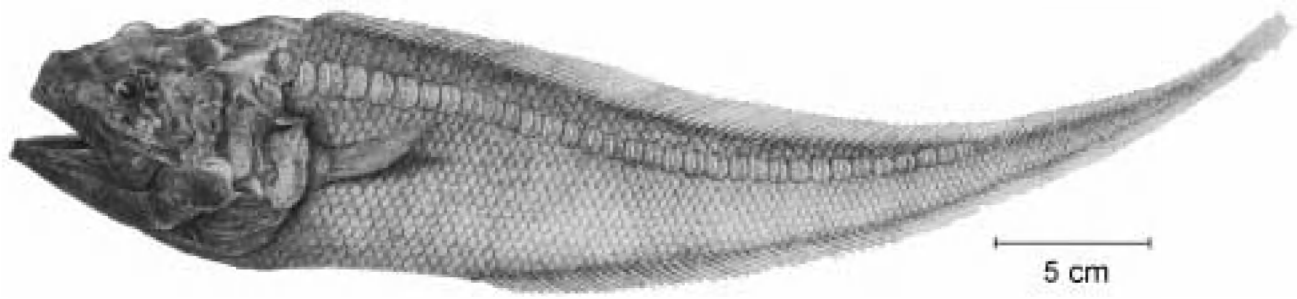


Fig. 68 ***Lamprogrammus niger*** (from Alcock, 1892a)

Diagnosis and description: **Mouth terminal**; branchiostegal rays 8; median basibranchial tooth patches 0 or 1; teeth granular, none enlarged; **lateral line covered with small scales, beneath which lie vertically oriented, spindle-shaped neuromasts, each of which is mounted on a large, vertically elongate scale (Fig. 69); pelvic fins absent in adults**; caudal-fin rays 8 or 9; precaudal vertebrae 11 to 14.

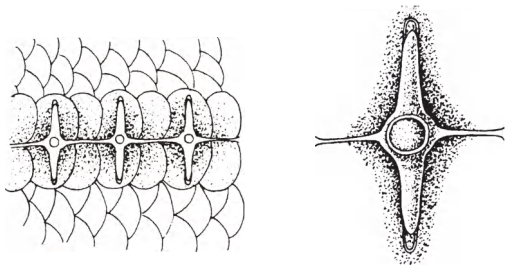


Fig. 69
Lateral-line scales of *Lamprogrammus illustris*
(after Garman, 1899)

Revisions: Nybelin (1957), Cohen et al. (1991), Cohen and Rohr (1993).

Geographical distribution: Circumtropical, with some species caught occasionally in subtropical waters.

Habitat and biology: Small specimens apparently live in the meso- to bathypelagic; larger fish are most often taken with bottom trawls fished at bathyal depths, although largest specimen known, the holotype of *Lamprogrammus shcherbachevi*, was taken in a midwater trawl.

Interest to fisheries: None.

Size: *L. shcherbachevi* reaches 193 cm in standard length, *L. brunswigi* 103 cm length. Other species are smaller.

Key to species

1a. Maxilla free, not sheathed posteriodorsally . . . . . *L. brunswigi*

1b. Maxilla sheathed posteriodorsally . . . . . → *2*

2a. Median basibranchial tooth patch absent . . . . . *L. niger, L. illustris*

2b. Median basibranchial tooth patch 1 . . . . . → *3*

3a. Body elongate, depth at anus 10.0 to 11.7 in standard length . . . . . *L. shcherbachevi*

3b. Body shorter, depth at anus 5.2 to 8.0 in standard length . . . . . → *4*

4a. Depth at anus 5.2 to 6.3 in standard length; developed gill rakers on lower arm of first arch 14 to 17; posterior margin of opercle smooth . . . . . *L. fragilis*

4b. Depth at anus 6.2 to 8.0 in standard length; developed gill rakers on lower arm of first arch 9 to 12; posterior margin of opercle weakly fimbriate . . . . . *L. exutus*

List of nominal species

Lamprogrammus brunswigi (Brauer, 1906). Circumtropical except for eastern Pacific, trawled from 800 to 1 600 m; 4 out of 7 specimens larger than 90 cm were collected floating at the surface in the Marshall and Hawaiian islands and at Puerto Rico. Rare.

L. exutus Nybelin and Poll, 1958. Tropical eastern Atlantic, caught with bottom trawls at depths of 260 to 700 m. Uncommon.

L. fragilis Alcock, 1892b. Tropical Indian Ocean at depths 745 to 1240 m. Uncommon.

L. illustris Garman, 1899 (probably junior synonym of *L. niger*).

L. macropterus Smith and Radcliffe in Radcliffe, 1913 (junior synonym of *L. brunswigi*).

L. niger Alcock in Wood-Mason and Alcock, 1891. Circumtropical and sometimes into subtropical waters as well; small specimens are occasionally caught in midwater trawls fishing in the mesopelagic. Adults may reach 610 mm and are locally abundant to 1 500 m.

L. shcherbachevi Cohen and Rohr, 1993. Caught off Chile, northwest coast of Australia, Angola, northeastern coast of South America and off the Faroe Islands in midwater and bottom trawls to about 1 000 m. Rare.

Leptobrotula Nielsen, 1986

Type species: *Leptobrotula breviventralis* Nielsen, 1986 by original designation.

Synonyms: None.

Number of recognized species: 1.

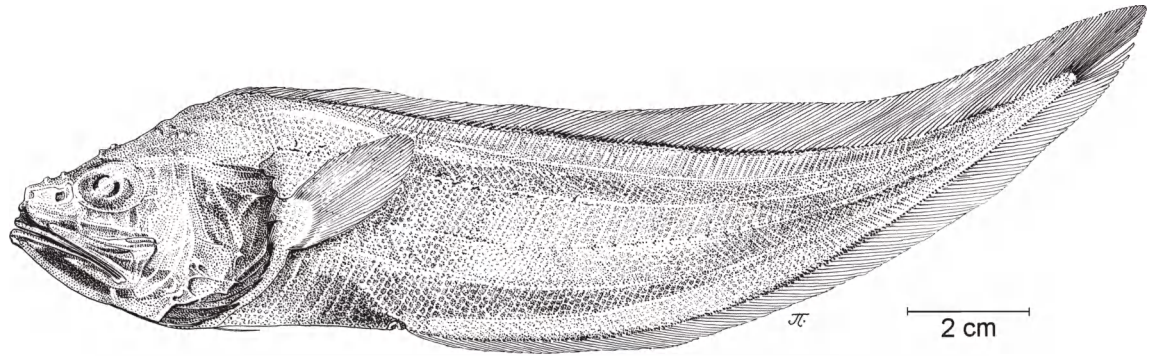


Fig. 70 *Leptobrotula breviventralis* (from Nielsen, 1986)

Diagnosis and description: Body short, high and compressed; origin of dorsal fin in front of first vertebra; orbit slightly shorter than snout; **head bones with thin crests; opercular spine thin and narrow**; 1 median and a pair of basibranchial tooth patches; 15 to 17 developed rakers on anterior gill arch; **pelvic fins each with 1 ray, shorter than diameter of orbit**; pectoral fins with 26 to 28 rays each; precaudal vertebrae 12.

Revisions: None.

Geographical distribution: Known from off Hawaii and South Africa.

Habitat and biology: Benthopelagic at bathyal depths (220 to 780 m).

Interest to fisheries: None.

Size: At least 320 mm.

List of species

Leptobrotula breviventralis Nielsen, 1986. Information see above. Rare.

Leucicorus Garman, 1899

Type species: *Leucicorus lusciosus* Garman, 1899 by monotypy.

Synonyms: None.

Number of recognized species: 2.

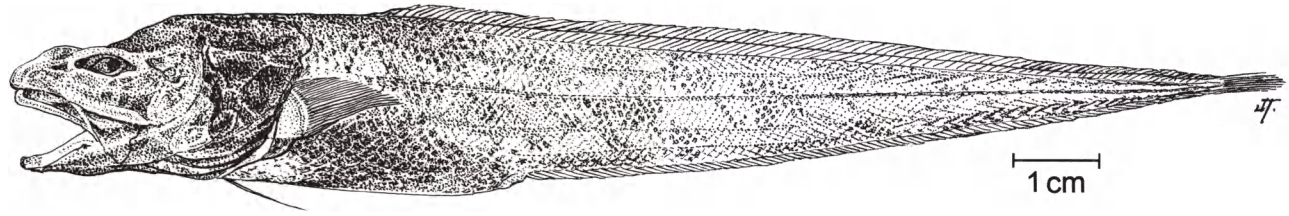


Fig. 71 ***Leucicorus atlanticus*** (from Nielsen, 1975a)

Diagnosis and description: Body elongate; **orbit large with rudimentary or lacking lens; head with prominent mucous cavities and distinct rows of pores**, opercular spine weak; basibranchial tooth patch single; 8 to 12 developed rakers on anterior gill arch; pectoral-fin rays 22 to 25; pelvic fins with 2 rays in each; precaudal vertebrae 13 or 14.

Revisions: Nielsen (1975a).

Geographical distribution: East Pacific and Atlantic Ocean.

Habitat and biology: Benthopelagic at abyssal and hadal depths (2 710 to 6 800 m).

Interest to fisheries: None.

Size: At least 245 mm.

Remarks: 1 or 2 undescribed species are being studied.

Key to species

1a. Head scales present; pectoral-fin rays 25 or 26; dorsal-and anal-fin rays 110 to 114 and 96 to 100, respectively . . . . . ***L. lusciosus***

1b. Head scales strongly reduced; pectoral-fin rays 22 to 24; dorsal- and anal-fin rays 82 to 98 and 68 to 80, respectively . . . . . ***L. atlanticus***

List of species

Leucicorus atlanticus Nielsen, 1975a. West Atlantic. Benthopelagic at 4 580 to 6 800 m. Rare.

L. lusciosus Garman, 1899. East Pacific. Benthopelagic at 2 710 to 3 435 m. Rare.

Luciobrotula Smith and Radcliffe in Radcliffe, 1913

Type species: ***Luciobrotula bartschi*** Smith and Radcliffe in Radcliffe, 1913 by original designation.

Synonyms: ***Volcanus*** Gosline, 1954, type species ***Volcanus lineatus*** Gosline.

Number of recognized species: 4.

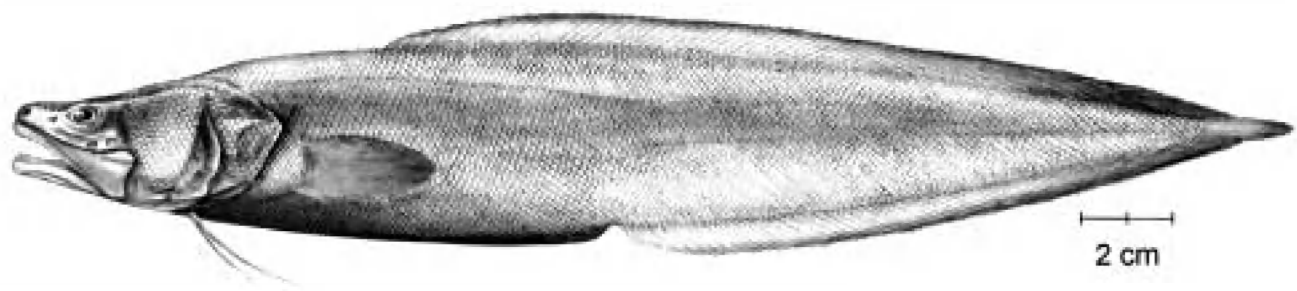


Fig. 72 *Luciobrotula bartschi* (from Smith and Radcliffe in Radcliffe, 1913)

Diagnosis and description: Head large, equal to about 1/2 preanal length; snout depressed, naked, bearing fleshy flaps and ridges at the tip; rear margin of preopercle free, lacking spines; opercle with spine at upper angle; **developed gill rakers 3; teeth granular; median basibranchial tooth patches 1**; branchiostegal rays 8; caudal-fin rays 10 to 12; pelvic fins with 2 rays in each; precaudal vertebrae 14 to 16.

Revisions: Cohen (1981a).

Geographical distribution: Circumtropical; occasionally taken in the subtropics.

Habitat and biology: Benthopelagic at depths to about 1 000 m.

Interest to fisheries: None.

Size: At least 610 mm.

Remarks: Unidentified specimens of *Luciobrotula* have been trawled off the Pacific coast of Panama.

Key to species

1a. Tubular lateral line ends near level of dorsal-fin origin . . . . . *L. lineata*

1b. Tubular lateral line ends near level of anal-fin origin . . . . . → *2*

2a. Body and fins dark; head pale in specimens larger than about 200 mm . . . . . *L. nolfi*

2b. Body usually pale; lighter than fins, head variable . . . . . → *3*

3a. Pronounced concavity in dorsal rim of otolith in larger specimens (Fig. 73a) . . . . . *L. corethromycter*

3b. No pronounced concavity in dorsal rim of otolith (Fig. 73b) . . . . . *L. bartschi*

a) *Luciobrotula corethromycter*

b) *Luciobrotula bartschi*

Fig. 73 Inner surface of left otolith

List of species

Luciobrotula bartschi Smith and Radcliffe, 1913. Widely distributed at depths to 1 000 m in the Indo-Pacific, from the Gulf of Aden and Natal to the Philippines, Japan and Hawaii. Rare.

L. corethromycter Cohen, 1964a. Tropical Atlantic at depths from 260 to 1 200 m. Not often encountered but may be locally abundant.

L. lineata (Gosline, 1954). Hawaii. Type taken where lava flow entered ocean. Rare.

L. nolfi Cohen, 1981a. Tropical eastern Atlantic. Trawled at depths to 980 m. Rare.

Mastigopterus Smith and Radcliffe in Radcliffe, 1913

Type species: ***Mastigopterus imperator*** Smith and Radcliffe in Radcliffe, 1913 by original designation.

Synonyms: None.

Number of recognized species: 2.

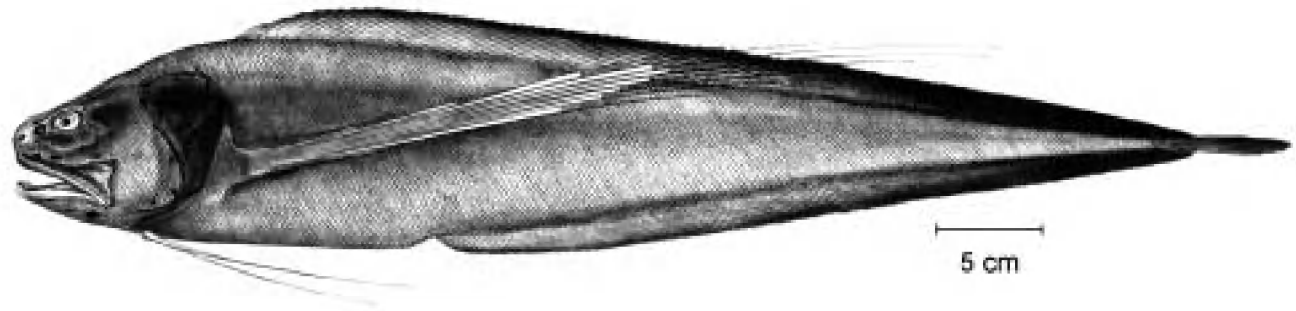


Fig. 74 ***Mastigopterus imperator*** (from Smith and Radcliffe in Radcliffe, 1913)

Diagnosis and description: Head large with subterminal mouth; **eye diameter much shorter than snout; large mucous cavities on head; opercular spine broad and weak**; 2 median basibranchial tooth patches; 10 developed rakers on anterior gill arch; **pectoral fin with narrow base and 12 to 14 rays at least as long as 1/2 of standard length**, pelvic fins with 2 joined rays in each; precaudal vertebrae 15.

Revisions: None.

Geographical distribution: From off Madagascar to the Philippines.

Habitat and biology: Benthopelagic at bathyal depths (1 500 to 2 365 m).

Interest to fisheries: None.

Size: At least 510 mm.

Remarks: More material will probably show that the 2 species are conspecific.

Key to species

1a. Dorsal-fin rays 133 to 146; anal-fin rays 116 to 125 . . . . . ***M. praetor***

1b. Dorsal-fin rays 144; anal-fin rays 132 . . . . . ***M. imperator***

List of species

Mastigopterus imperator Smith and Radcliffe in Radcliffe, 1913. The Philippines. Benthopelagic at 1 785 m. Rare.

M. praetor Smith and Radcliffe in Radcliffe, 1913. From off New Guinea and the Philippines to Madagascar. Benthopelagic at 1 500 to 2 365 m. Rare.

Monomitopus Alcock, 1890b

Type species: ***Sirembo nigripinnis*** Alcock, 1889 by monotypy.

Synonyms: ***Dicromita*** Goode and Bean, 1896, type species ***Dicromita agassizi*** Goode and Bean; ***Monomeropus*** Garman, 1899, type species ***Monomeropus malispinosus*** Garman.

Number of recognized species: 14.

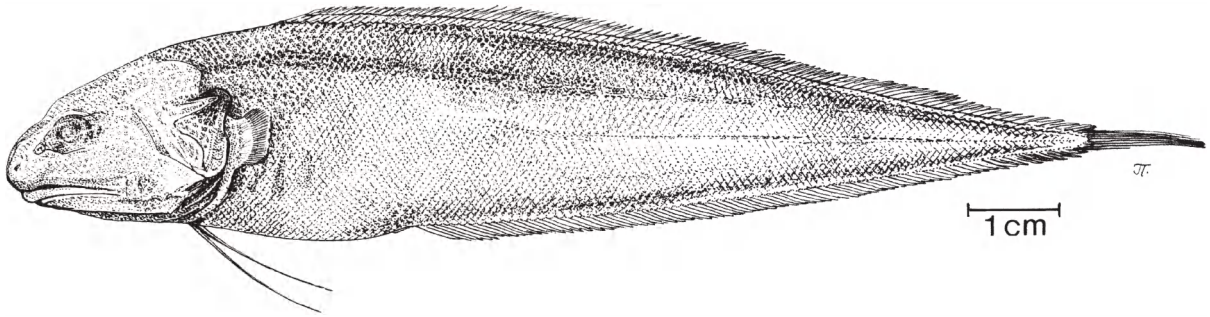


Fig. 75 ***Monomitopus vityazi*** **(*M. nigripinnis* species group)** (from Nielsen, 1971)

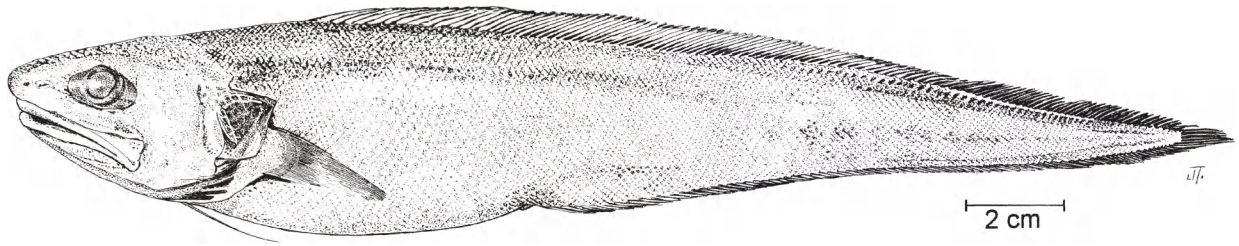


Fig. 76 ***Monomitopus americanus*** **(*M. pallidus* species group)** (from Nielsen, 1971)

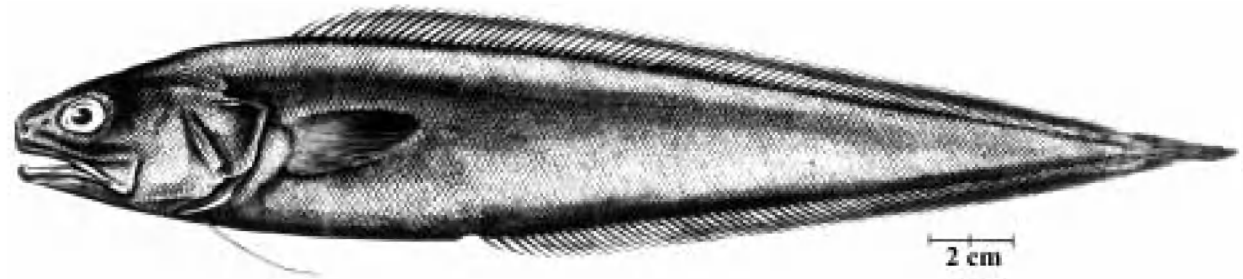


Fig. 77 ***Monomitopus microlepis*** **(*M. torvus* species group)** (from Smith and Radcliffe in Radcliffe, 1913)

Diagnosis and description: Robust body; **eye diameter equal to or slightly shorter than snout; opercular spine strong; preopercle with 2 or 3 more or less distinct spines at lower angle; 1 median basibranchial tooth patch**, 10 to 27 developed rakers on anterior gill arch; pectoral-fin rays 26 to 34; pelvic-fin rays 1; precaudal vertebrae 13 to 15.

Revisions: Carter and Cohen (1985) suggested 3 species groups.

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthopelagic at upper continental slope and bathyal depths (150 to 1 570 m).

Interest to fisheries: None.

Size: At least 535 mm.

Remarks: This genus is much in need of a revision. Large, unstudied collections are kept in many museums. According to Carter and Cohen (1985) there are several undescribed species.

Key to species (based on literature and material at the U.S. National Museum)

1a. Developed gill rakers on lower arm of anterior arch 7 to 10 (including angle) . . . . . → *2*

1b. Developed gill rakers on lower arm of anterior arch 12 to 19 (including angle) . . . . . → *4*

2a. Horizontal diameter of eye 3.7 in head length . . . . . *M. pallidus*

2b. Horizontal diameter of eye 4.9 to 5.6 in head length . . . . . → *3*

3a. Dorsal-fin rays 104 to 108; anal-fin rays 85 to 92; total vertebrae 61 to 65 . . . . *M. magnus*

3b. Dorsal-fin rays 99; anal-fin rays 82; total vertebrae 59 . . . . . *M. microlepis*

4a. Oblique scale rows between origin of dorsal fin and lateral line 12 to 19 . . . . . → *5*

4b. Oblique scale rows between origin of dorsal fin and lateral line 7 to 10 . . . . . → *8*

5a. Horizontal diameter of eye 3.8 to 4.7 in head length . . . . . → *6*

5b. Horizontal diameter of eye 5.7 to 6.0 in head length . . . . . → *7*

6a. Horizontal diameter of eye 3.8 in head length; dorsal-fin rays 100 to 108; anal-fin rays 95 . . . . . *M. americanus*

6b. Horizontal diameter of eye 4.3 to 4.7 in head length; dorsal-fin rays 95; anal-fin rays 78 . . . . . *M. conjugator*

7a. Dorsal-fin rays 100; anal-fin rays 83 . . . . . *M. kunae*

7b. Dorsal-fin rays 109; anal-fin rays 78 . . . . . *M. torvus*

8a. Head length 3.8 in standard length . . . . . *M. longiceps*

8b. Head length 4.2 to 5.0 in standard length . . . . . → *9*

9a. Dorsal fin with 93 rays; total vertebrae 55 . . . . . *M. vityazi*

9b. Dorsal fin with 95 to 104 rays; total vertebrae 58 to 62 . . . . . → *10*

10a. Dorsal-fin rays 104; anal-fin rays 88; total vertebrae 62. . . . . *M. agassizi*

10b. Dorsal-fin rays 95 to 102; anal-fin rays 78 to 85; total vertebrae 58 or 59 . . . . . → *11*

11a. Posteroventral margin of preopercle with 2 or 3 broad, strong points . . . . . → *12*

11b. Posteroventral margin of preopercle rounded or with weak flaps, no sharp points . . . → *14*

12a. Head length 4.2 to 4.3 in standard length . . . . . *M. conjugator*

12b. Head length 4.5 to 5.0 in standard length. . . . . → *13*

13a. Horizontal diameter of eye 4.1 to 4.2 in head length (Atlantic) . . . . . ***M. metriostoma***

13b. Horizontal diameter of eye 4.2 to 5.3 in head length (Pacific) . . . . . ***M. malispinosus***

14a. Horizontal diameter of eye 3.9 to 4.7 in head length . . . . . ***M. nigripinnis***

14b. Horizontal diameter of eye 5.0 in head length . . . . . ***M. garmani***

List of species

Carter and Cohen (1985) proposed the following 3 species groups:

Species group 1

Monomitopus nigripinnis species group (head relatively deep and downward inflected, poorly ossified opercular bones, flaps rather than spines on hind margin of preopercle).

M. agassizi (Goode and Bean, 1896). West Atlantic at 530 to 1 010 m. Common.

M. conjugator (Alcock, 1896). Bay of Bengal at 540 to 760 m. Common.

M. garmani Smith and Radcliffe in Radcliffe, 1913. From Celebes to New Caledonia at 825 to 1 220 m. Common.

M. malispinosus (Garman, 1899). Eastern Pacific at 1865 m. Rare.

M. metriostoma (Vaillant, 1888). Off West Africa from 40°N to 10°S at 235 to 1 570 m. Common.

M. nigripinnis (Alcock, 1889). From off East Africa to the Andaman Sea at 700 to 1 510 m. Common.

M. vityazi (Nielsen, 1971). Off Western Australia at 835 m. Rare.

Species group 2

M. pallidus species group (head relatively slender with an almost straight dorsal profile, well ossified opercular bones, strong spines on hind margin of preopercle):

M. americanus (Nielsen, 1971). Southwestern Atlantic at 600 to 800 m. Uncommon.

M. magnus Carter and Cohen, 1985. Off southeastern North America at 730 to 930 m. Uncommon.

M. pallidus Smith and Radcliffe in Radcliffe, 1913. From off the Philippines and East China Sea at 200 to 600 m. Common.

Species group 3

M. torvus species group (relatively straight dorsal profile, intermediate development of head spines compared to the other 2 species groups):

M. kumae Jordan and Hubbs, 1925. From off southern Japan to East China Sea at 600 to 800 m. Common.

M. longiceps Smith and Radcliffe in Radcliffe, 1913. From off Indonesia and the Philippines at 150 to 960 m. Common.

M. microlepis Smith and Radcliffe in Radcliffe, 1913. Off the Philippines at 705 m. Rare.

M. torvus Garman, 1899. Eastern Pacific at 820 to 1 015 m. Rare.

Neobythites Goode and Bean, 1885

Type species: ***Neobythites gilli*** Goode and Bean, 1885 by monotypy.

Synonyms: ***Tetranematopus*** Günther, 1887 (nomem nudum); ***Watasea*** Jordan and Snyder, 1901, type species ***Watasea sivicola*** Jordan and Snyder.

Number of recognized species: 35.

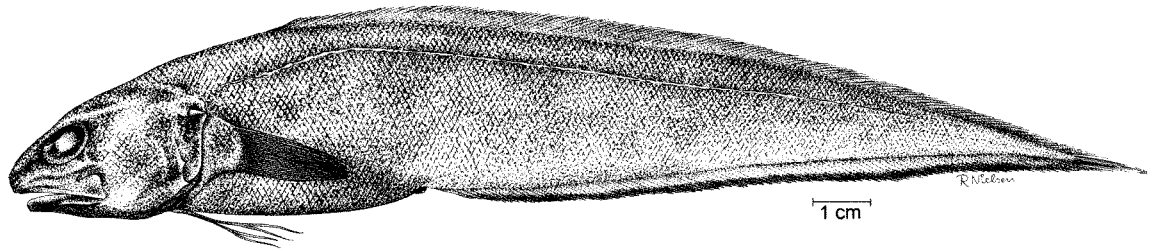


Fig. 78 ***Neobythites analis*** (from Nielsen, 1995)

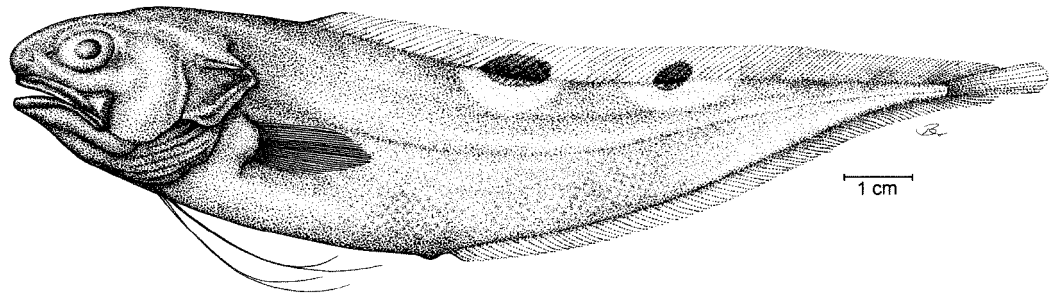


Fig. 79 ***Neobythites gilli*** (from Nielsen, 1999)

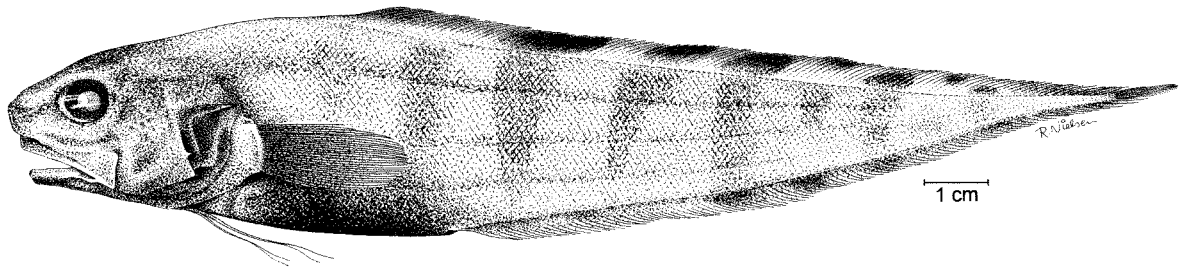


Fig. 80 ***Neobythites multistriatus*** (from Nielsen and Quero, 1991)

Diagnosis and description: Snout most often blunt, rarely pointed; mouth terminal or subterminal; **horizontal diameter of eye window equal to or slightly shorter than snout; opercular spine strong and straight**, hind margin of preopercle with 0 to 2 (rarely 3) spines; **median basibranchial tooth patches 2**, pseudobranchial filaments 1 to 8; developed rakers on anterior gill arch 6 to 34; pectoral-fin rays 22 to 34; large variation in colour patterns with some species unmarked, some with 1 to many ocelli on dorsal and anal fins and/or horizontal or vertical, dark bands on body and fins; **pelvic-fin rays 2 in each fin**; precaudal vertebrae 11 to 14.

Revisions: No revision includes all ***Neobythites*** spp. but the species from the following geographical areas have been revised: western Indian Ocean (Nielsen, 1995), New Caledonia (Nielsen, 1997) and western Atlantic (Nielsen,1999).

Geographical distribution: Below tropical and subtropical areas of all oceans except for the eastern Atlantic.

Habitat and biology: Benthopelagic at lower continental shelf and at bathyal depths ((25?) 100 to 1 830 m).

Interest to fisheries: A few species known from fish markets in Japan.

Size: At least 350 mm.

Remarks: When the species from the eastern Indian and the western Pacific Ocean have been revised (Nielsen in prep.) at least 10 additional species can be expected.

Keys to species

A. West Atlantic Ocean (from Nielsen, 1999)

1a. Preopercular spines 0 or 1 . . . . . → *2*

1b. Preopercular spines 2 . . . . . → *5*

2a. No ocelli in dorsal fin; preopercular spine strong . . . . . *N. unicolor*

2b. Dorsal fin with 1 to 6 ocelli; preopercular spine absent or broad and thin . . . . . → *3*

3a. Dorsal fin with 1 ocellus . . . . . *N. monocellatus*

3b. Dorsal fin with 2 to 6 ocelli . . . . . → *4*

4a. Dorsal fin with 2 (rarely 3 or 4) ocelli; body and jaws dark brown . . . . . *N. gilli*

4b. Dorsal fin with 4 (rarely 5 to 8) ocelli; body and jaws light brown . . . . . *N. ocellatus*

5a. Dorsal fin without markings . . . . . → *6*

5b. Dorsal fin with black markings or horizontal stripes . . . . . → *7*

6a. Two broad spines on preopercle; pectoral-fin rays 32 . . . . . *N. multidigitatus*

6b. Two strong, pointed spines on preopercle; pectoral-fin rays 23 to 26 . . . . . *N. elongatus*

7a. Dorsal fin and body with horizontal, dark band . . . . . *N. marginatus*

7b. Body with 5 to 7 diffuse, dark brown, vertical bands ending in black spots on dorsal and anal fins . . . . . *N. braziliensis*

B. Western Indian Ocean (from Nielsen, 1995)

1a. Preopercular spines 0 or 1 (weak) . . . . . → *2*

1b. Preopercular spines 2 (rarely 1 or 3) . . . . . → *6*

2a. Dorsal fin with 2 ocelli . . . . . *N. kenyaensis*

2b. Dorsal fin with 1 ocellus . . . . . → *3*

3a. Vertical bar below ocellus; origin of dorsal fin above opercle . . . . . *N. malhaensis*

3b. No vertical bar; origin af dorsal fin above pectoral fins . . . . . → *4*

4a. Dorsal-fin ocellus above anus; long gill rakers 6 . . . . . *N. meteori*

4b. Dorsal-fin ocellus above anterior part of anal fin; long gill rakers 10 to 14 . . . . . → *5*

5a. Edge of anal fin transparent; body with 4 ill-defined, brown, vertical bars; longest gill filaments 15 to 19% head length . . . . . *N. steatiticus*

5b. Edge of anal fin black; no dark, vertical bars; longest gill filaments 9 to 16% head length . . . . . *N. stefanovi*

6a. Teeth needle-like; black area behind eyes . . . . . *N. trifilis*

6b. Teeth granular; no black area behind eyes . . . . . → *7*

7a. Dorsal fin with ocelli or large, dark blotches . . . . . → *8*

7b. Dorsal fin without ocelli or large, dark blotches . . . . . → *10*

8a. Dorsal fin with 7 or 8 and anal fin with 3 or 4 dark blotches; 4 to 10 dark, vertical bars on body; developed gill rakers 12 to 15 . . . . . *N. multistriatus*

8b. Dorsal fin with 2 distinct or about 6 indistinct ocelli; no bars on body; long gill rakers 8 to 10 . . . . . → *9*

9a. Dorsal fin with 2 distinct ocelli . . . . . *N. crosnieri*

9b. Dorsal fin with about 6 indistinct ocelli . . . . . *N. natalensis*

10a. Distal part of dorsal and anal fins black; longest gill filaments 10.5 to 14% head length . . . . . *N. somaliaensis*

10b. Distal part of dorsal fin not black, anal fin black or not; longest gill filaments 4.4 to 7.7% head length . . . . . → *11*

11a. Distal part of anal fin black; posterior margin of vomer tooth patch concave or straight . . . . . *N. analis*

11b. Anal fin not black; posterior margin of vomer tooth patch convex . . . . . *N. vityazi*

C. **New Caledonian waters** (from Nielsen, 1997)

1a. Pelvic-fin rays reaching beyond anus; dorsal part of body mottled; 2 ocelli in dorsal fin with the anterior placed at origin of fin . . . . . *N. longiventralis*

1b. Pelvic-fin rays not reaching anus; body not mottled; 0 to 2 ocelli in dorsal fin with the anterior placed posterior to anus . . . . . → *2*

2a. No spines on hind margin of preopercle; pectoral-fin rays 33 to 34; 7 or 8 developed gill rakers . . . . . *N. bimarginatus*

2b. Two spines on hind margin of preopercle; pectoral-fin rays 25 to 29; 10 to 16 developed gill rakers . . . . . → *3*

3a. Dorsal fin with about 4 dark blotches or ocelli continuing on body as dark, vertical bars . . . . . *N. zonatus*

3b. No dark, vertical bars on body . . . . . → *4*

4a. One or 2 ocelli on dorsal fin . . . . . → *5*

4b. No ocelli on dorsal fin . . . . . → *6*

5a. One ocellus on dorsal fin . . . . . *N. unimaculatus*

5b. Two ocelli on dorsal fin . . . . . *N. bimaculatus*

6a. Developed rakers on anterior gill arch 14 to 16; longest gill filaments on anterior arch 2.8 to 4.8% head length . . . . . ***N. pallidus***

6b. Developed rakers on anterior gill arch 11; longest gill filaments on anterior arch 6.1 to 7.6% head length . . . . . ***N. neocaledoniensis***

List of nominal species

Neobythites analis Barnard, 1927. From Mozambique to off Cape Town at 100 to 365 m in the Indian Ocean and at 1 830 m in the Atlantic. Common.

N. bimaculatus Nielsen, 1997. Off New Caledonia at 435 to 480 m. Rare.

N. bimarginatus Fourmanoir and Rivaton, 1979. Off New Caledonia and nearby islands at 295 to 530 m. Common.

N. braziliensis Nielsen, 1999. Off northern Brazil at 320 to 410 m. Common.

N. crosnieri Nielsen, 1995. Off western Madagascar at 125 to 350 m. Rare.

N. elongatus Nielsen and Retzer, 1994. Caribbean Sea at 230 to 1 270 m. Common.

N. fasciatus Smith and Radcliffe in Radcliffe, 1913. The Philippines at 220 to 460 m. Uncommon.

N. gilli Goode and Bean, 1885. Gulf of Mexico at 60 to 230 m. Common.

N. kenyaensis Nielsen, 1995. Off Kenya and Tanzania at 240 to 300 m. Rare.

N. longipes Smith and Radcliffe in Radcliffe, 1913. From the Philippines to off Northwest Australia at 300 to 480 m. Uncommon.

N. longiventralis Nielsen, 1997. From the Philippines to New Caledonia at 205 to 330 m. Rare.

N. macrops Günther, 1887. From Bay of Bengal to the Philippines and Northwest Australia at 350 to 505 m. Common.

N. malayanus Weber, 1913. From the Philippines to Indonesia and Vanuatu at 124 to 550 m. Common.

N. malhaensis Nielsen, 1995. Saya de Malha Bank north of Mauritius at 235 to 250 m. Rare.

N. marginatus Goode and Bean, 1886. From off North Carolina to northern South America including the Gulf of Mexico at 75 to 935 m. Common.

N. meteori Nielsen, 1995. Off Socotra Island at 175 to 335 m. Rare.

N. monocellatus Nielsen, 1999. Off northern South America at 115 to 440 m. Common.

N. multidigitatus Nielsen, 1999. Off the Bahamas. Rare.

N. multistriatus Nielsen and Quero, 1991. Off Reunion and Rodriques at 300 to 490 m. Rare.

N. natalensis Nielsen, 1995. Off Natal and western Madagascar at 310 to 590 m. Rare.

N. neocaledoniensis Nielsen, 1997. Off New Caledonia and on Norfolk Ridge at 470 to 670 m. Rare.

N. nigromaculatus Kamohara, 1938 (junior synonym of ***N. unimaculatus***).

N. ocellatus Günther, 1887. From Strait of Florida to off Recife, Brazil (excluding the Gulf of Mexico) at 45 to 640 m. Common.

N. pallidus Nielsen, 1997. Off New Caledonia at 500 to 620 m. Uncommon.

N. purus Smith and Radcliffe in Radcliffe, 1913. From the Philippines to Indonesia at 175 to 700 m. Common.

N. sivicola (Jordan and Snyder, 1901). From Japan to Taiwan Province of China at 75 to 100 m. Common. Marketed.

N. somaliaensis Nielsen, 1995. Gulf of Aden at 300 to 490 m. Uncommon.

N. steatiticus Alcock, 1893. From Bay of Bengal to Arabian Gulf at 195 to 460 m. Rare.

N. stefanovi Nielsen and Uiblein, 1993. From the Red Sea to the Gulf of Oman at 435 to 805 m. Uncommon.

N. stelliferoides Gilbert, 1890. From the northern part of the Gulf of California to off northern Peru at 90 to 310 m. Common.

N. stigmosus Machida, 1984. From Japan to Taiwan Province of China at 160 to 300 m. Common. Marketed.

N. trifilis Kotthaus, 1979. From Socotra Island to Andaman Sea at 175 to 420 m. Common.

N. unicolor Nielsen and Retzer, 1994. Caribbean Sea at 185 to 935 m. Common.

N. unimaculatus Smith and Radcliffe in Radcliffe, 1913. Off Japan, the Philippines and New Caledonia at 110 to 565 m. Uncommon.

N. vityazi Nielsen, 1995. Mozambique Channel at 280 to 760 m. Uncommon.

N. zonatus Nielsen, 1997. From Caroline Islands to New Caledonia and a few nearby islands at 275 to 950 m. Uncommon.

Penopus Goode and Bean, 1896

Type species: *Penopus macdonaldi* Goode and Bean, 1896 by monotypy.

Synonyms: None.

Number of recognized species: 1.

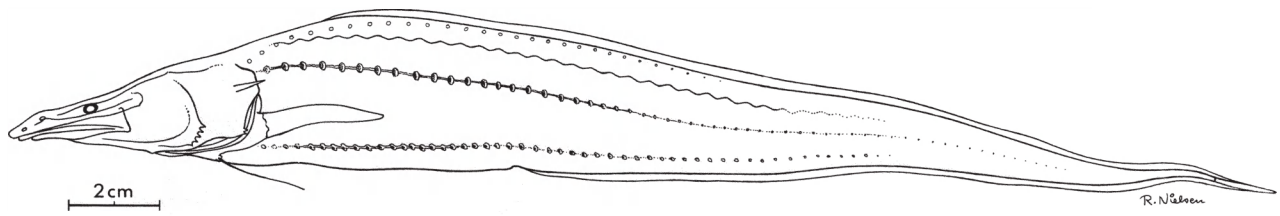


Fig. 81 *Penopus microcephalus*

Diagnosis and description: Head depressed anteriorly; snout long and projecting over mouth, body long and slender; **depth at anus about 10 times in standard length; eyes very small**, preopercle with 4 or 5 spines at lower angle, **opercle with 1 strong, curved spine**, median basibranchial tooth patches 2 and rarely with an additional pair; 8 to 10 developed rakers on anterior gill arch; **3 lateral lines with circular organs**; pectoral-fin rays 17 to 19; pelvic-fin rays 2 in each; precaudal vertebrae 18 or 19.

Revisions: Séret (1988).

Geographical distribution: Tropical Atlantic Ocean and off Cape Town.

Habitat and biology: Benthopelagic at bathyal depths (1 320 to 3 535 m).

Interest to fisheries: None.

Size: At least 315 mm.

List of nominal species

Penopus macdonaldi Goode and Bean, 1896 (junior synonym of ***P. microcephalus***).

P. microcephalus (Vaillant, 1888). Information see above. Rare.

Petrotyx Heller and Snodgrass, 1903

Type species: ***Petrotyx hopkinsi*** Heller and Snodgrass, 1903 by monotypy.

Synonyms: ***Pseudobythites*** Meek and Hildebrand, 1928. Type species ***Pseudobythites sanguineus*** Meek and Hildebrand.

Number of recognized species: 2.

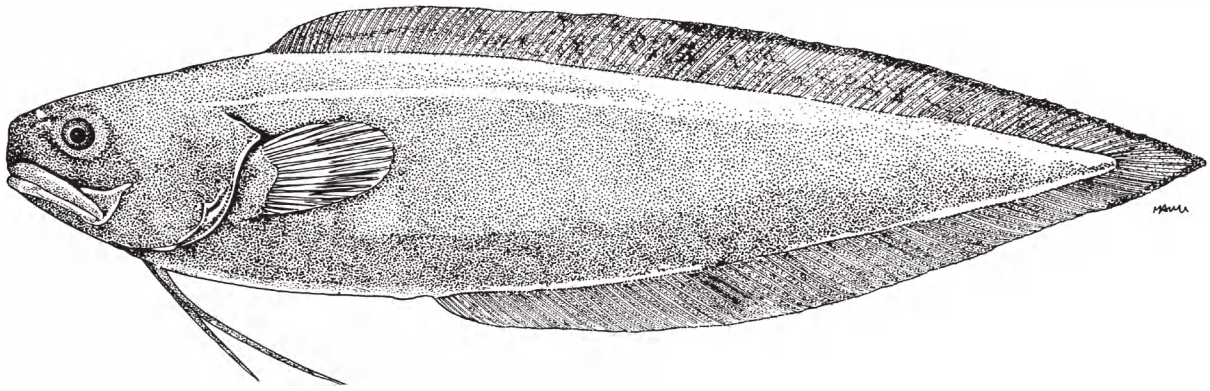


Fig. 82 ***Petrotyx sanguineus*** (after Böhlke and Chaplin, 1968)

Diagnosis and description: Snout with numerous small, fleshy papillae, lips bearing series of dermal fringes; eye small; **posterior margin of preopercle skin-covered; spines absent from opercle and preopercle**; **upper margin of maxilla sheathed**; developed gill rakers 3; **single lateral line on body, apparently no pores on head**; median basibranchial tooth patch 1; branchiostegal rays 8; pelvic fins with 2 rays in each; precaudal vertebrae 12.

Revisions: Böhlke (1955).

Geographical distribution: Tropical American reefs.

Habitat and biology: Taken at depths from 4 to 21 m on reefs; apparently secretive in habit.

Interest to fisheries: None.

Size: At least 200 mm.

Key to species

1a. Length of head 4.0 to 4.6 and length of pelvic fin 5.0 to 5.5 in total length . . ***P. sanguineus***

1b. Length of head 4.9 to 5.9 and length of pelvic fin 6.1 to 7.1 in total length . . . . ***P. hopkinsi***

List of species

Petrotyx hopkinsi Heller and Snodgrass, 1903. Tropical eastern Pacific including Galapagos Islands. Lives in rocky crevices on reef. Uncommon.

P. sanguineus (Meek and Hildebrand, 1928). Tropical western Atlantic from Florida Keys and Bahamas to northern South America. In the Bahamas on patch reefs at 3 to 15 m. Common.

Porogadus Goode and Bean, 1885

Type species: ***Porogadus miles*** Goode and Bean, 1885 by monotypy.

Synonyms: ***Dermatorus*** Alcock, 1890b, type species ***Dermatorus trichiurus*** Alcock; ***Celema*** Goode and Bean, 1896, type species ***Porogadus nudus*** Vaillant, 1888; ***Moebia*** Goode and Bean, 1896, type species ***Bathynectes gracilis*** Günther, 1887.

Number of recognized species: 13.

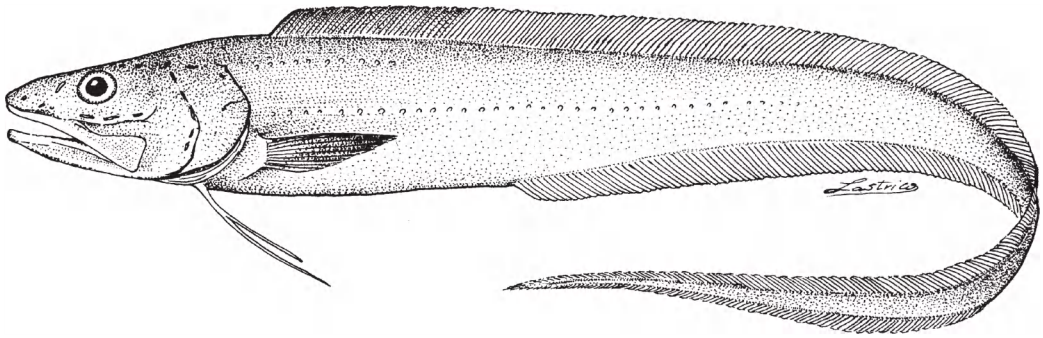


Fig. 83 ***Porogadus miles*** (after Goode and Bean, 1896)

Diagnosis and description: Body long and slender; depth at anus more than 10 times in standard length; prominent mucous cavities beneath orbital region and on posterior margin of preopercle, upper jaw ends well behind eye; spines on head variously developed in different species; **opercular spine flat and weak**, 0 to 2 small median basibranchial tooth patches; developed rakers on anterior gill arch 12 to 22; **lateral line represented by 3 rows of circular organs variously developed from one species to another and by a row of easily shed modified scales**, pectoral-fin rays 14 to 20; pelvic-fin rays 1(?) to 2; precaudal vertebrae 15 to 18.

Revisions: Nybelin (1957) divided the genus into 3 species groups according to the development of the head spines (see list of nominal species below). Carter and Sulak (1984) reviewed the western Atlantic species.

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthopelagic at bathyal and abyssal depths (805 to 5 300 m).

Interest to fisheries: None.

Size: At least 390 mm.

Remarks: A general revision of ***Porogadus*** is much needed. Available material is present in many collections.

Key to species (only available for West Atlantic species; from Carter and Sulak, 1984)

1a. Head depth 60 to 75% of head length; frontal spine above eye absent; margins of preopercle smooth; lateral-line scales to level of anus 14 to 20 . . . . . ***P. silus***

1b. Head depth less than 60% of head length; frontal spine above eye present; margins of preopercle with scalloped edges or spines; lateral-line scales to level of anus 20 or more . . . . . → *2*

2a. Spines on top and sides of head well developed; lateral-line scales to level of anus 40 or more; 3 prominent lateral lines . . . . . ***P. miles***

2b. Spines on top and sides of head poorly developed; lateral-line scales to level of anus 28 to 36; lateral line absent . . . . . ***P. catena***

List of nominal species

Species group 1 (with strong head spines)

Porogadus miles Goode and Bean, 1886. Cosmopolitan at 1 000 to 5 055 m. Common.

P. melanocephalus (Alcock, 1891). Bay of Bengal at 3 010 to 3 200 m. Rare.

P. nudus Vaillant, 1888. East Atlantic at 2 325 to 3 200 m. Rare.

P. trichiurus (Alcock, 1890b). Western Indian Ocean at 1 335 to 2 310 m. Uncommon.

Species group 2 (with moderate head spines)

P. guentheri Jordan and Fowler, 1902. Off Japan at 805 to 1 530 m. Uncommon.

P. melampeplus (Alcock, 1896). Western Indian Ocean at 1 500 to 2 000 m. Uncommon.

P. subarmatus Vaillant, 1888. Eastern Atlantic at 3 200 m. Rare.

Species group 3 (with very weak head spines)

P. abyssalis Nybelin, 1957. Central Atlantic at 5 250 to 5 300 m. Rare.

P. atripectus Garman, 1899. Gulf of Panama at 1 950 to 3 220 m. Rare.

P. breviceps Garman, 1899 (junior synonym of ***P. catena***).

P. catena (Goode and Bean, 1886). Western Atlantic and Gulf of Panama at 1 180 to 3 500 m. Uncommon.

P. gracilis (Günther, 1878). Western Pacific at 2 560 m. Rare.

P. longiceps Garman, 1899. Eastern Pacific at 1 865 to 3 280 m. Rare.

P. promelas Gilbert, 1891 (junior synonym of ***P. catena***).

P. silus Carter and Sulak, 1984. Off the Bahamas and in the Caribbean Sea at 1 500 to 3 510 m. Uncommon.

Pycnocraspedum Alcock, 1889

Type species: ***Pycnocraspedum squamipinne*** Alcock, 1889 by monotypy.

Synonyms: ***Itatius*** Matsubara, 1943, type species ***Itatius microlepis*** Matsubara.

Number of recognized species: 5.

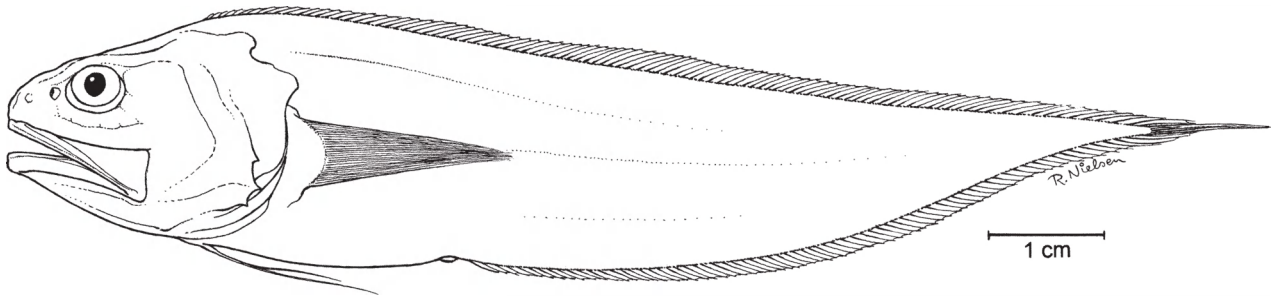


Fig. 84 *Pycnocraspedum squamipinne* (from Nielsen, 1997)

Diagnosis and description: Body short with large head; upper jaw ends behind eye; opercular spine strong but not always visible; **hind margin of preopercle with 2 to 4 spines**; eye equal to or slightly shorter than snout; 2 median basibranchial tooth patches and in *P. fulvum* additionally a pair of small patches; **4 to 6 developed rakers on anterior gill arch**, pectoral-fin rays 24 to 28; pelvic-fin rays 2; precaudal vertebrae 12 or 13.

Revisions: Revisionary notes in Machida (1984) and remarks in Nielsen (1997).

Geographical distribution: From off East Africa to Hawaii and in the western Atlantic.

Habitat and biology: Benthopelagic at bathyal depths (145 to 500 m). The 100 mm deep-bodied, juvenile holotype and only known specimen of *Pycnocraspedum phyllosoma* was caught pelagically indicating the possibility of a wide species distribution.

Interest to fisheries: None.

Size: At least 340 mm.

Remarks: A full revision is needed.

Key to species: Not possible at present.

List of species

Pycnocraspedum armatum Gosline, 1954. Off Hawaii, no depth as killed by lava flow. Rare.
P. fulvum Machida, 1984. Okinawa Trough at 143 m. Rare.
P. microlepis (Matsubara, 1943). From off Japan to East China Sea at 300 to 500 m. Uncommon.
P. phyllosoma (Parr, 1933). Off the Bahamas, caught pelagically. Rare.
P. squamipinne Alcock, 1889. From East Africa to New Caledonia at 200 to 500 m. Uncommon.

Selachophidium Gilchrist, 1903

Type species: ***Selachophidium guentheri*** Gilchrist, 1903 by monotypy.

Synonyms: None.

Number of recognized species: 1.

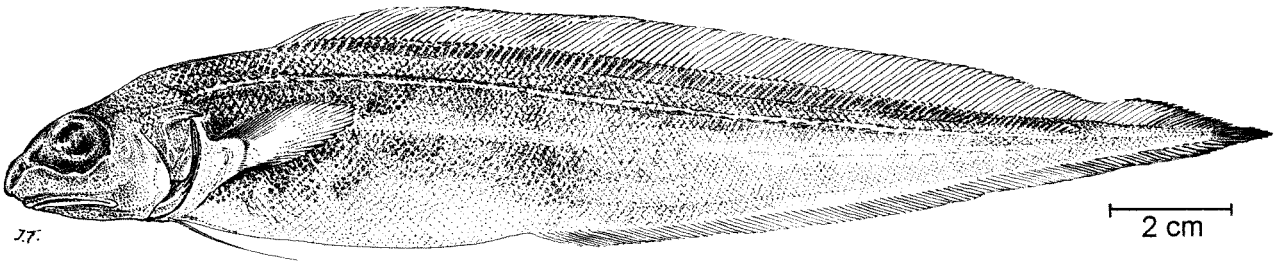


Fig. 85 ***Selachophidium guentheri*** (from Nielsen, 1971)

Diagnosis and description: Elongate body with pointed head; snout inflated and mouth inferior; eye diameter greater than snout; opercular spine distinct but not very strong; **lateral line distinct,** median basibranchial tooth patches 2; 15 to 21 developed rakers on anterior gill arch; pseudobranchial filaments 3 to 6; pectoral-fin rays 26 to 29; pelvic-fin rays 2; precaudal vertebrae 17 or 18.

Revisions: Nielsen (1971).

Geographical distribution: Off southern Africa from Angola to Mozambique.

Habitat and biology: Benthopelagic at bathyal depths (275 to 980 m). A 50 mm juvenile was caught epipelagically off Cape Town.

Interest to fisheries: None.

Size: At least 285 mm.

Remarks: Two ***Selachophidium*** spp. described by Nielsen (1971) were later transferred to ***Monomitopus*** by Cohen and Nielsen (1978).

List of species

Selachophidium guentheri Gilchrist, 1903. Information see above. Common.

Sirembo Bleeker, 1858

Type species: ***Brotula imberbis*** Temminck and Schlegel, 1846 by subsequent designation of Vaillant, 1888.

Synonyms: ***Brotella*** Kaup, 1858, type species ***Brotula imberbis*** Temminck and Schlegel, 1846; ***Umalius*** Herre and Herald, 1951, type species ***Umalius philippinus*** Herre and Herald.

Number of recognized species: 3.

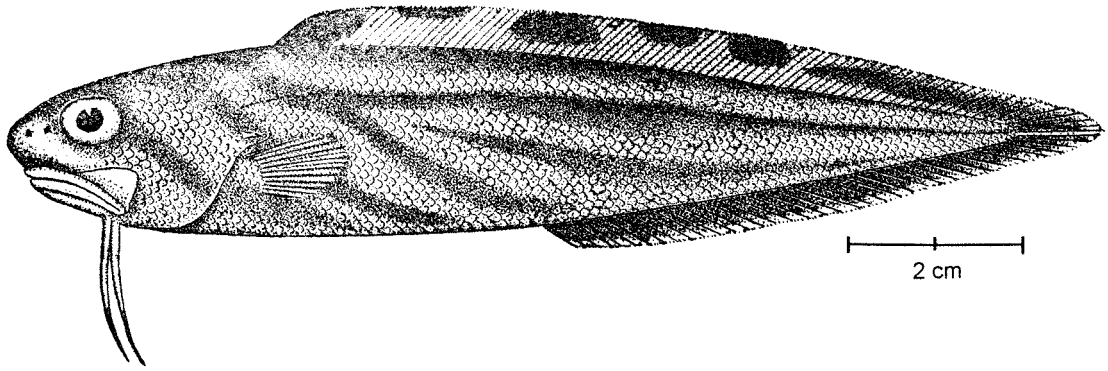


Fig. 86 *Sirembo jerdoni* (from Herre and Herald, 1951)

Diagnosis and discription: Deepest part of fish well behind head; **no spines on preopercle, spine on opercle short, not reaching rear margin of head**; **eyes well developed**; developed gill rakers on first arch 4; **pseudobranch large, with 15 to 28 filaments**; single median basibranchial tooth patch; **pelvic fins immediately adjacent to each other, each with a single ray inserted beneath or immediately behind the eye.**

Revisions: Cohen and Robins (1986).

Geographical distribution: Red Sea, tropical Indian Ocean, Australia, and the Philippines to Japan.

Habitat and biology: Continental shelf, probably benthic or benthopelagic.

Interest to fisheries: Rarely seen in fish markets.

Size: At least 317 mm.

Key to species

1a. Three or 4 broad, oblique bands on head and anterior body, which connect over the predorsal and head to the other side . . . . . ***S. jerdoni***

1b. No oblique bands on forepart of body . . . . . → *2*

2a. Lateral line marked by a bold to faint brown line over a light brown or yellow brown ground colour . . . . . ***S. metachroma***

2b. Body usually with 1 or more horizontal stripes or rows of blotches . . . . . ***S. imberbis***

List of nominal species

Sirembo everriculi Whitley, 1936 (junior synonym of ***S. imberbis***).

S. heraldi (Herre, 1953) (apparently a replacement name for ***Umalius philippinus***, a junior synonym of ***S. jerdoni***).

S. imberbis (Temminck and Schlegel, 1846). Tropical western Pacific from Japan, East China Sea, the Philippines, Queensland; also Western Australia. Caught occasionally, rare in markets.

S. jerdoni (Day, 1888). Red Sea, Bay of Bengal, Western Australia, Gulf of Thailand, the Philippines, East China Sea. Caught occasionally, rare in markets.

S. maculata (Kaup, 1858) (new name for ***Brotula imberbis***).

S. metachroma Cohen and Robins, 1986. Queensland and Western Australia (which may represent an undescribed species). Probably benthopelagic. Rare.

S. philippinus (Herre and Herald, 1951) (junior synonym of ***S. jerdoni***).

Spectrunculus Jordan and Thompson, 1914

Type species: ***Spectrunculus radcliffei*** Jordan and Thompson, 1914 by monotypy.

Synonyms: ***Parabassogigas*** Nybelin, 1957, type species ***Sirembo grandis*** Günther, 1877.

Number of recognized species: 1.

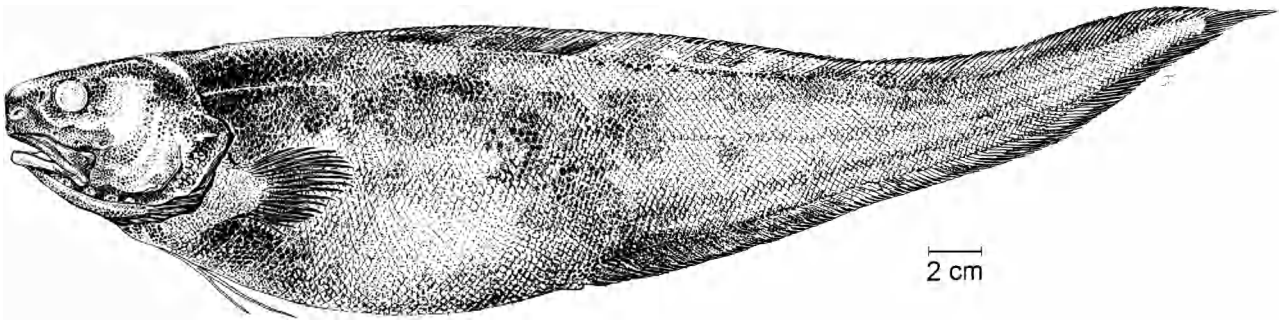


Fig. 87 ***Spectrunculus grandis*** (from Nielsen and Hureau, 1980)

Diagnosis and description: Head short, more than twice in preanal length, eye shorter than snout; **anterior nostril with a thick, fleshy raised rim; opercular spine strong**; 2 median basibranchial tooth patches; **5 to 10 developed rakers on anterior gill arch**; pectoral-fin rays 23 to 33; pelvic-fin rays 2; precaudal vertebrae 18 to 25.

Revisions: Nielsen and Hureau (1980).

Geographical distribution: Below tropical and temperate areas of all oceans.

Habitat and biology: Benthopelagic at bathyal and abyssal depths (800 to 4 255 m). Epipelagic larva.

Interest to fisheries: None.

Size: At least 1 270 mm.

List of nominal species

Bythites crassus Vaillant, 1888 (junior synonym of ***Spectrunculus grandis***).
Bassogigas coheni Mayer and Nalbant, 1972 (junior synonym of ***S. grandis***).
Spectrunculus grandis (Günther, 1877). Information see above. Common.
S. radcliffei Jordan and Thompson, 1914 (junior synonym of ***S. grandis***).

Spottobrotula Cohen and Nielsen, 1978

Type species: ***Spottobrotula mahodadi*** Cohen and Nielsen, 1978 by original designation.

Synonyms: None.

Number of recognized species: 2.

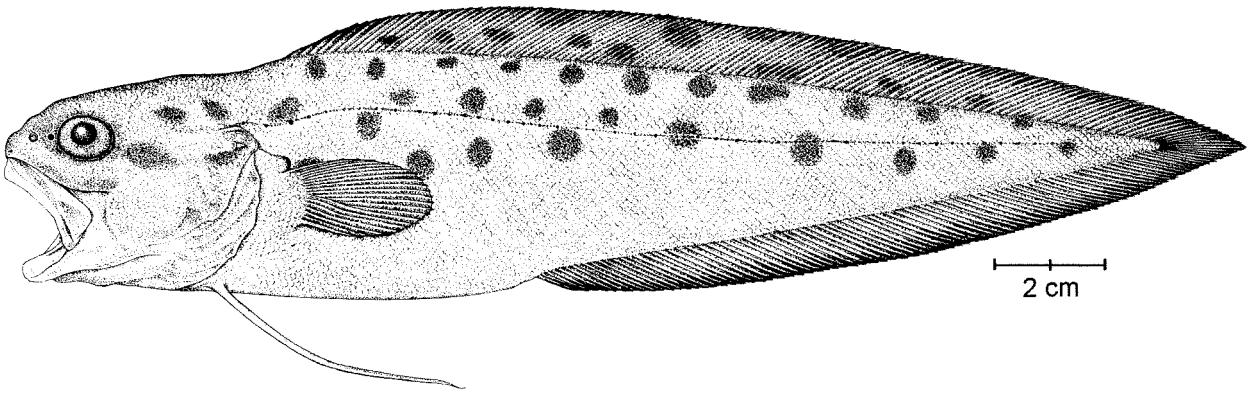


Fig. 88 ***Spottobrotula mahodadi*** (from Cohen and Nielsen, 1978)

Diagnosis and description: Body relatively short; depth at anus about 5 times in standard length; preanal about 2 times or more in standard length; head about 2 times or more in preanal length; **a prominent skin flap above base of pectoral fins**; opercle with a strong pointed spine; **pseudobranch large, with 25 or more filaments**; teeth granular; developed gill rakers 3 to 10; **colour pattern present**, which varies with size and species; **a single median basibranchial tooth patch**; **pelvic fins fleshy, with 2 rays in each, bound together with tough skin**, equal to or somewhat shorter than head and extending beyond rear margin of pectoral fins but falling short of anus; abdominal vertebrae 14 or 15.

Revisions: Cohen and Nielsen (1982).

Geographical distribution: Arabian Sea, Andaman Islands, west coast of Australia and the Philippines.

Habitat and biology: Benthopelagic at 40 to 90 m.

Interest to fisheries: None.

Key to species

1a. Developed gill rakers 10; vertebrae 54 or 55; dorsal-fin rays 101 to 103; anal-fin rays 75 to 77 . . . . . ***S. mahodadi***

1b. Developed gill rakers 3 or 4; vertebrae 51 or 52; dorsal-fin rays 94 to 96; anal-fin rays 71 to 73 . . . . . ***S. amaculata***

List of species

Spottobrotula amaculata Cohen and Nielsen, 1982. The Philippines, west coast of Australia. Benthopelagic at 52 to 90 m. Uncommon.

S. mahodadi Cohen and Nielsen, 1978. Arabian Sea, Andaman Islands. Benthopelagic at 40 to 75 m. Rare.

Tauredophidium Alcock, 1890a

Type species: ***Tauredophidium hextii*** Alcock, 1890a by monotypy.

Synonyms: None.

Number of recognized species: 1.

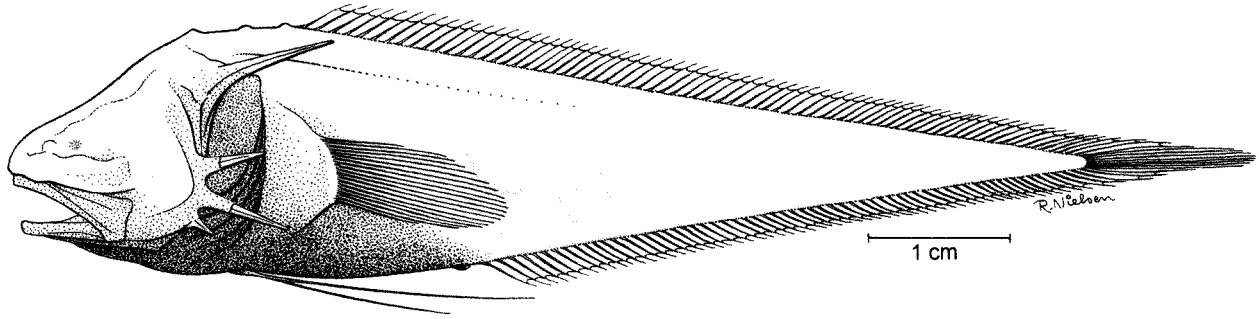


Fig. 89 ***Tauredophidium hextii*** (from Nielsen, 1997)

Diagnosis and description: Head high and body tapering; **eyes not visible at surface of head; preopercle with 3 strong spines and opercle with 1 even longer spine; a short spine on tip of snout**, one median and a pair of basibranchial tooth patches; 11 or 12 developed rakers on anterior gill arch; pectoral-fin rays 18 to 20; **pelvic fins widely separated and with 2 rays in each** (Fig. 44a); precaudal vertebrae 11.

Revisions: None.

Geographical distribution: From off East Africa to New Caledonia.

Habitat and biology: Benthopelagic at bathyal and abyssal depths (1 500 to 2 660 m).

Interest to fisheries: None.

Size: At least 105 mm.

List of species

Tauredophidium hextii Alcock, 1890a. Information see above. Rare.

Typhlonus Günther, 1878

Type species: ***Typhlonus nasus*** Günther, 1878 by monotypy.

Synonyms: None.

Number of recognized species: 1.

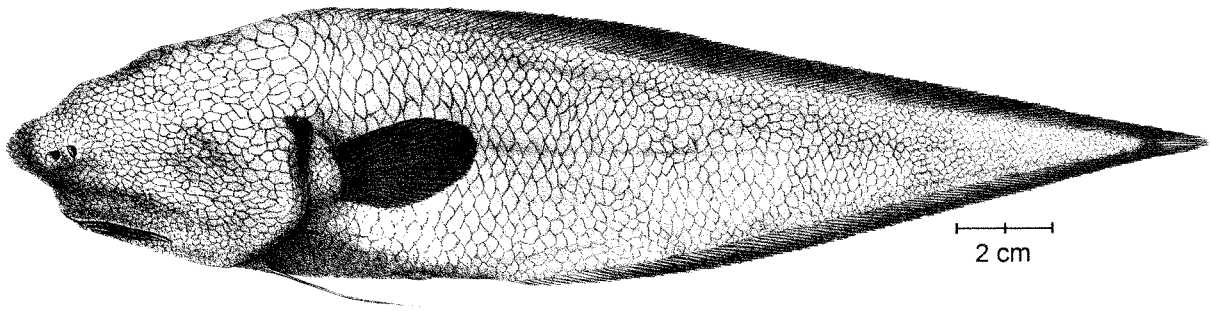


Fig. 90 ***Typhlonus nasus*** (from Günther, 1878)

Diagnosis and description: Head and body soft; head massively inflated and without spines; mouth inferior with protrusible jaws; eyes small or not at all visible at surface of head; median basibranchial tooth patch 0 or 1; 10 to 13 developed rakers on anterior gill arch; pectoral-fin rays 24 to 28; pelvic-fin rays 1; precaudal vertebrae 13 or 14.

Revisions: Nielsen (1965), Howes (1997).

Geographical distribution: Below tropical areas of the Indian and Pacific Oceans.

Habitat and biology: Benthopelagic at abyssal depths (3 935 to 4 940 m).

Interest to fisheries: None.

Size: At least 285 mm.

List of nominal species

Typhlonus delosomatus Hureau, Staiger and Nielsen, 1979. Transferred to the genus ***Apagesoma*** by Carter (1983).

T. nasus Günther, 1878. Information see above. Rare.

Xyelacyba Cohen, 1961

Type species: ***Xyelacyba myersi*** Cohen, 1961 by original designation.

Synonyms: None.

Number of recognized species: 1.

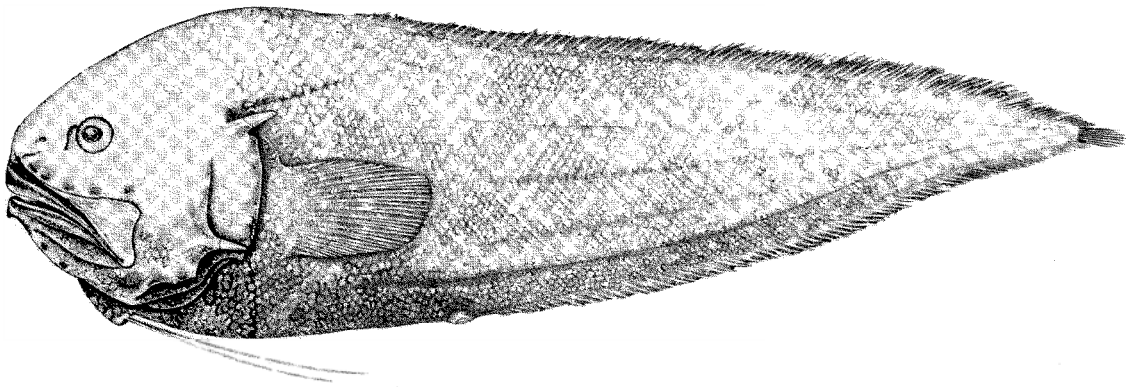


Fig. 91 ***Xyelacyba myersi*** (from Cohen, 1961)

Diagnosis and description: Body relatively short, depth at anus 26 to 29% of standard length; head massive and short, less than 25% of standard length; prominent spine at upper angle of opercle, extending well beyond head, another long spine at lower angle of opercle preceded by several along lower margin of preopercle; no spine on snout; branchiostegal rays 8; eye small; basibranchial tooth patches 2 to 4; developed gill rakers 14 to 18; 2 rays in each pelvic fin, inserted far forward, close to level of rear margin of maxilla; **precaudal vertebrae 11 or 12**, total vertebrae 49 to 52.

Revisions: Machida (1989b).

Geographical distribution: Possibly around the world in tropical and subtropical seas. But not yet caught in the eastern Pacific.

Habitat and biology: Benthopelagic at bathyal depths; caught by bottom trawling at depths of 1 075 to 2 500 m.

Interest to fisheries: None.

Size: At least 464 mm.

List of species

Xyelacyba myersi Cohen, 1961. Information see above. Rare.

2.5 Suborder Bythitoidei

Number of recognized families: 2.

Diagnosis and description: See key to suborders (page 9).

Key to families

1a. Most species with scales; skin firm; precaudal vertebrae 9 to 22; swimbladder present . . . . . **Bythitidae**

1b. Scales absent; skin loose and transparent; precaudal vertebrae 26 to 50; swimbladder absent . . . . . **Aphyonidae**

2.6 Family Bythitidae

Family name: Bythitidae Gill (1861a).

Number of recognized genera: 32.

Diagnosis and description: Developed rakers on anterior arch fewer than 6 in most species but in some as many as 18; scales present in all but a few species; no median basibranchial tooth patch; pelvic fin with a single ray or absent in a few, except 2 in *Thalassobathia*; swimbladder present; precaudal vertebrae 9 to 22; anterior neural spine shorter than those following.

Key to subfamilies

1a. Caudal fin broadly joined to dorsal and anal fins . . . . . **Bythitinae**

1b. Caudal fin free from dorsal and anal fins (sometimes partly connected in *Dermatopsis*, *Dipulus*, and *Lucifuga*) . . . . . **Brosmophycinae**

2.6.1 Subfamily Bythitinae

Subfamily name: Bythitinae Gill (1861a).

Number of recognized genera: 13.

Diagnosis and description: Squamation on body and head variable, present and imbricate in most genera but absent in a few; **caudal fin broadly joined to dorsal and anal fins; male intromittant organ lacking ossified parts.**

Key to genera

1a. Pelvic fin with 2 short, fleshy rays in each (Fig. 92) . . . . . *Thalassobathia*

1b. Pelvic fins absent or with a single filamentous ray in each . . . . . → *2*

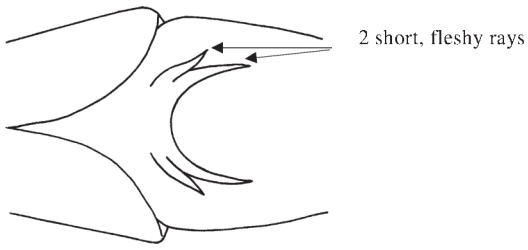


Fig. 92 Pelvic fins of *Thalassobathia* (from Cohen and Nielsen, 1978)

2a. Pectoral fins supported by elongate radials . . . . . → *3*

2b. Pectoral fins radials not elongate . . . . . → *5*

3a. Two anteriorly directed, median spines on head, 1 on frontal, the other buried on mesethmoid . . . . . ***Hastatobythites***

3b. No anteriorly directed spines on head . . . . . → *4*

4a. Scales present on head; preopercle with a curved spine at lower angle; branchiostegal rays 7 . . . . . ***Calamopteryx***

4b. Scales absent from head; no spines at lower angle of preopercle; branchiostegal rays 8 . . . . . ***Saccogaster***

5a. Palatine teeth absent . . . . . → *6*

5b. Palatine teeth present . . . . . → *7*

6a. Rear of maxilla rounded, not expanded (Fig. 93a) . . . . . ***Stygnobrotula***

6b. Rear of maxilla vertically expanded (Fig. 93b) . . . . . ***Grammonus***

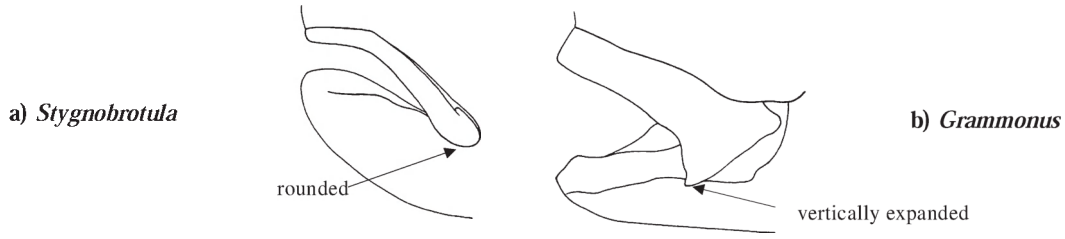


Fig. 93 (from Cohen and Nielsen, 1978)

7a. Prominent skin flap bearing large pore above opercle (Fig. 94) . . . . . → *8*

7b. No prominent skin flap with pore above opercle . . . . . → *9*

8a. Pelvic fin absent . . . . . ***Hephthocara***

8b. Pelvic fin present . . . . . ***Diplacanthopoma***

9a. Circumorbital head pores large, a prominent median interorbital pore (Fig. 95) . ***Pseudonus***

9b. Circumorbital pores variously developed, no prominent median interorbital pore. . . . → *10*

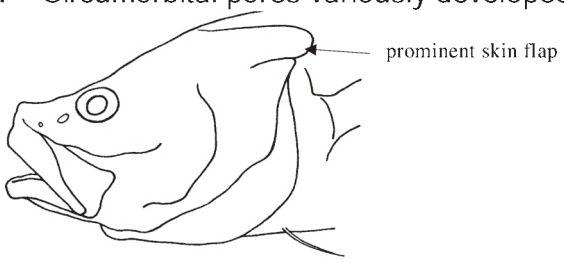


Fig. 94 Head of *Diplacanthopoma* (from Cohen and Nielsen, 1978)

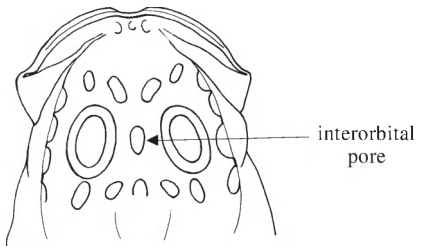


Fig. 95 Dorsal view of head (*Pseudonus*) (from Cohen and Nielsen, 1978)

10a. Pelvic fins absent; preopercle with several sharp, pointed spines at lower angle . . ***Bellottia***

10b. Pelvic fins present; no sharp spines on preopercle . . . . . → *11*

11a. Scales absent on head . . . . . ***Bythites***

11b. Scales present on head . . . . . → *12*

12a. Pectoral-fin rays 11 to 14; precaudal vertebrae 11 or 12 . . . . . ***Microbrotula***

12b. Pectoral-fin rays 22 to 32; precaudal vertebrae 13 to 16 . . . . . ***Cataetyx***

List of nominal genera

Abythites Nielsen and Cohen, 1973 (here treated as a junior synonym of ***Cataetyx***)
Barbuliceps Chan, 1966 (junior synonym of ***Saccogaster***)
Bathystorreus Howell Rivero, 1934 (junior synonym of ***Grammonus***)
Bellottia Giglioli, 1883
Bythites Reinhardt, 1835
Calamopteryx Böhlke and Cohen, 1966
Cataetyx Günther, 1887
Diplacanthopoma Günther, 1887
Eutyx Heller and Snodgrass, 1903 (junior synonym of ***Grammonus***)
Grammonoides Smith, 1934 (here treated as a junior synonym of ***Grammonus***)
Grammonus Gill in Goode and Bean, 1896
Hastatobythites Machida, 1997
Hephthocara Alcock, 1892b
Microbrotula Gosline, 1953
Myxocephalus Steindachner and Doderlein, 1887 (junior synonym of ***Diplacanthopoma***)
Oculospinus Koefoed, 1927 (junior synonym of ***Cataetyx***)
Oligopus Risso, 1810 (incorrectly used in Bythitidae as senior synonym of ***Grammonus***)
Propteridium Arambourg, 1967 (Oligocene fossil, apparently valid; not included in key)
Pseudonus Garman, 1899
Saccogaster Alcock, 1889
Stygnobrotula Böhlke, 1952
Thalassobathia Cohen, 1963
Xenobythites Smith and Radcliffe in Radcliffe, 1913 (junior synonym of ***Bellottia***)

Bellottia Giglioli, 1883

Type species: ***Bellottia apoda*** Giglioli, 1883 by monotypy.

Synonyms: ***Xenobythites*** Smith and Radcliffe in Radcliffe, 1913. Type species ***Xenobythites armiger*** Smith and Radcliffe in Radcliffe, 1913.

Number of recognized species: 2.

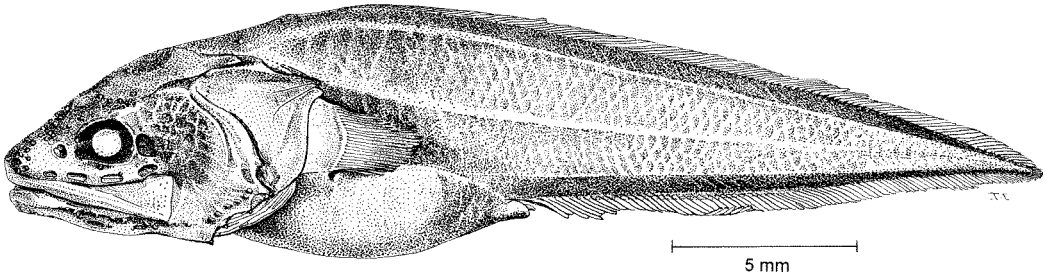


Fig. 96 ***Bellottia apoda*** (from Nielsen and Cohen, 1968)

Diagnosis and description: Body short, depth at anus 26.2 to 31.2% of standard length; **several sharp spines present at lower angle of preopercle**, a single spine near upper angle of opercle; palatine teeth present; developed rakers on first arch 3 to 6; pectoral-fin rays 22 to 25; **pelvic fins absent**; precaudal vertebrae 10 to 12.

Revisions: None.

Geographical distribution: Subtropical eastern and western North Atlantic, Mediterranean, off the Galapagos Archipelago and off the Philippines.

Habitat and biology: Mostly caught with bottom trawls fishing between 30 m and 527 m. Two specimens have been caught in midwater trawls: the first by a closing net fishing at 990 to 1 010 m, the other by an open net fishing from 0 to 1 000 m.

Interest to fisheries: None.

Size: At least 71 mm.

Key to species: Additional research required.

List of nominal species

Bellottia apoda Giglioli, 1883. Mediterranean and subtropical eastern Atlantic. Specimens from subtropical western Atlantic may also be this species. Uncommon.

B. armiger (Smith and Radcliffe in Radcliffe, 1913). The Philippines. Rare.

Remarks: The 2 pelagic specimens mentioned above, 1 from off Portugal, the other from the Galapagos Islands, may represent 1 or more undescribed species.

Bythites Reinhardt, 1835

Type species: ***Bythites fuscus*** Reinhardt, 1837 by monotypy.

Synonyms: None.

Number of recognized species: 4.

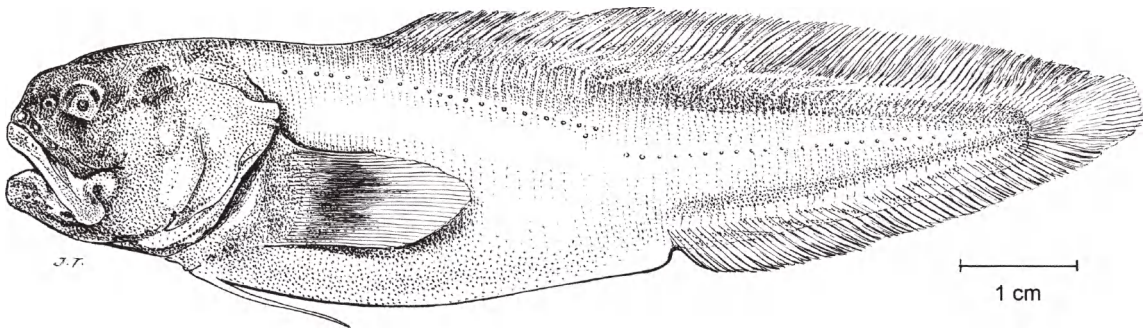


Fig. 97 ***Bythites islandicus*** (from Nielsen and Cohen, 1973)

Diagnosis and description: Body short with blunt snout, caudal fin not attenuate; **body with scales**, **head without scales**, mouth terminal, **upper jaw ends well behind eye**; snout longer than eye diameter; **opercular spine strong**; **palatines with teeth**; developed rakers on anterior gill arch 0 to 3; male with stalked intromittent organ; pectoral-fin rays 22 to 37; **pectoral-fin peduncle not prolonged; pelvic-fin rays 1** in each fin; precaudal vertebrae 14 to 20.

Revisions: Nielsen and Cohen (1973), Cohen et al. (1990).

Geographical distribution: Greenland, Iceland, Straits of Florida and off the Galapagos Archipelago.

Habitat and biology: Benthopelagic at 100 to 2 500 m.

Interest to fisheries: None.

Size: At least 304 mm.

Key to species

1a. Pectoral-fin rays 37; dorsal-fin rays 122; total vertebrae 76 . . . . . ***B. hollisi***

1b. Pectoral-fin rays 22 to 30; dorsal-fin rays 75 to 88; total vertebrae 40 to 53 . . . . . → *2*

2a. Lower jaw with 5 pairs of large pores . . . . . ***B. gerdae***

2b. Lower jaw with 2 pairs of large pores . . . . . → *3*

3a. Dorsal-fin rays 88; anal-fin rays 70 . . . . . ***B. fuscus***

3b. Dorsal-fin rays 76 to 79; anal-fin rays 46 to 50 . . . . . ***B. islandicus***

List of species

Bythites fuscus Reinhardt, 1837. West Greenland from "great depths". Rare.

B. gerdae Nielsen and Cohen, 1973. Straits of Florida at 86 to 832 m. Rare.

B. hollisi Cohen et al, 1990. Galapagos Rift Zone at 2 500 m. Living in thermal vent effluent. Rare.

B. islandicus Nielsen and Cohen, 1973. Off southeastern Iceland at 223 to 285 m. Rare.

Remarks: As all ***Bythites*** spp. are rare both inter- and intraspecific variation is poorly known and the genus may be paraphyletic (Cohen et al. 1990). In the latter paper the genus ***Abythites*** was considered a junior synonym of ***Bythites*** but we here place it in the synonymy of the genus ***Cataetyx*** due to the shape of the snout and the naked head.

Calamopteryx Böhlke and Cohen, 1966

Type species: ***Calamopteryx goslinei*** Böhlke and Cohen, 1966 by original designation.

Synonyms: None.

Number of recognized species: 3.

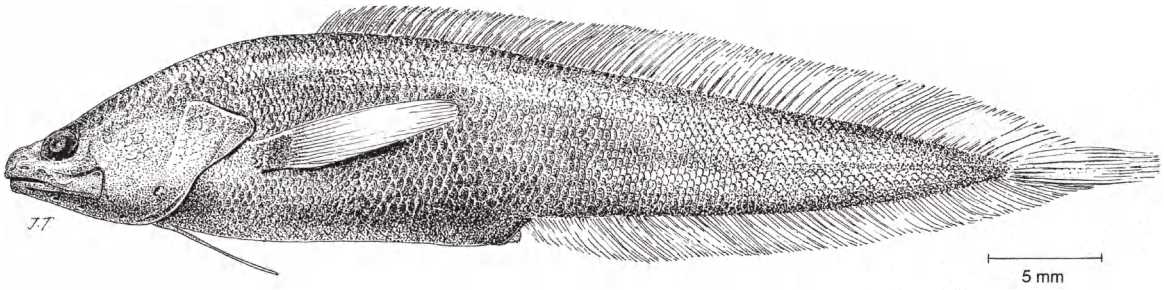


Fig. 98 ***Calamopteryx goslinei*** (from Nielsen et al., 1968)

Diagnosis and description: Preopercle with a curved spine at the lower angle; opercular spine flattened and flap-like; **scales present on body and head**; branchiostegal rays 7; palatine teeth present; developed rakers on first gill arch 2 or 3; **pectoral fins supported by an elongated peduncle that contains elongated pectoral radials**; pectoral-fin rays 13 to 19; precaudal vertebrae 10 or 11.

Revisions: Cohen (1973).

Geographical distribution: Tropical western North Atlantic and Galapagos Archipelago.

Habitat and biology: Intertidal to 210 m.

Interest to fisheries: None.

Size: At least 58 mm.

Key to species

1a. Papillae on head small and sparse; caudal-fin rays 8; preanal length 1.6 to 1.7 in standard length . . . . . *C. robinsorum*

1b. Papillae on head prominent; caudal-fin rays 10; preanal length 1.8 to 2 in standard length . . . . . → *2*

2a. Anal-fin rays 46 to 50; eye 7.7 to 10.9 in head length . . . . . *C. jeb*

2b. Anal-fin rays 51 to 57; eye 6.1 to 7.6 in head length . . . . . *C. goslinei*

List of species

Calamopteryx goslinei Böhlke and Cohen, 1966. Coral reefs in the tropical western North Atlantic to 55 m. Uncommon.

C. jeb Cohen, 1973. Rocky areas and reefs in the Galapagos Archipelago to 25 m. Uncommon.

C. robinsorum Cohen, 1973. Most specimens trawled in the tropical western North Atlantic at depths of 64 to 210 m. Rare.

Cataetyx Günther, 1887

Type species: ***Sirembo messieri*** Günther, 1887 by monotypy.

Synonyms: ***Oculospinus*** Koefoed, 1927, type species ***Oculospinus brevis*** Koefoed, 1927; ***Abythites*** Nielsen and Cohen, 1973, type species ***Bythites lepidogenys*** Smith and Radcliffe in Radcliffe, 1913.

Number of recognized species: 11.

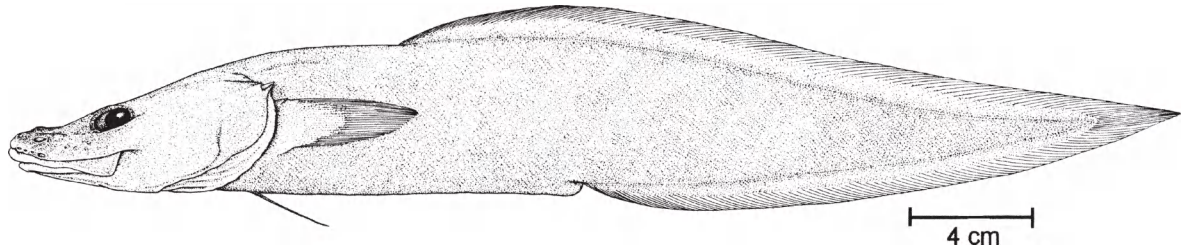


Fig. 99 ***Cataetyx chthamalorhynchus*** (from Cohen, 1981)

Diagnosis and description: Scales present on body and head; eye diameter less than snout length; prominent opercular spine present; **lateral ethmoid bone variously developed in front of or below eye, ranging from a sharp, retrorse, emergent spine to a buried cartilaginous knob; palatine teeth present**; developed rakers on first arch 3; **male intromittent organ on a broad, fleshy pad or stalk**; pelvic fins with 1 short ray in each; pectoral-fin rays 22 to 32; caudal-fin rays 8 to 11; precaudal vertebrae 13 to 18.

Revisions: Meyer-Rochow (1970), but see Cohen (1981) for comments.

Geographical distribution: Circumglobal in temperate to tropical seas.

Habitat and biology: Bottom trawled on continental slopes; however, the young of ***Cataetyx rubrirostris*** are taken from the mesopelagic off the Pacific coast of the U.S. at closing net depths of 300 to 900 m (Gibbs, 1991; Ambrose, 1996).

Interest to fisheries: None.

Size: The largest known species, ***C. laticeps***, reaches at least 765 mm; however, other species, for example ***C. alleni, C. messieri*** and ***C. rubrirostris*** mature at sizes of 250 mm or less.

Key to species

1a. Some or all jaw teeth separate and sharp-pointed (but granular in the small species ***C. lepidogenys***); adults small (to about 250 mm) and usually pale, with a less depressed snout . . . . . → *2*

1b. Jaw teeth granular (but in ***C. platyrhynchus*** inner teeth on lower jaw somewhat enlarged); adults large (to 765 mm), usually dark brown with a moderately to strongly depressed snout . . . . . → *7*

2a. Dorsal-fin rays 75 to 89; anal-fin rays 49 to 70; vertebrae 45 to 49. . . . . → *3*

2b. Dorsal-fin rays 109 to 121; anal-fin rays 76 to 93; vertebrae 56 to 65 . . . . . → *4*

3a. Dorsal-fin rays 89; anal-fin rays 70; vertebrae 49 . . . . . ***C. hawaiiensis***

3b. Dorsal-fin rays 75 to 81; anal-fin rays 49 to 56; vertebrae 44 or 45 . . . . . ***C. lepidogenys***

4a. Pectoral-fin rays 30 to 32. . . . . ***C. alleni***

4b. Pectoral-fin rays 25 to 28 . . . . . → *5*

5a. Dorsal-fin rays 114 to 121; anal-fin rays 86 to 93 . . . . . ***C. bruuni***

5b. Dorsal-fin rays 100 to 116; anal-fin rays 76 to 86 . . . . . → *6*

6a. Vertebrae 62 to 64; snout 3.5 to 4.2 in head length; no sharp retrorse suborbital spine . . . . . ***C. messieri***

6b. Vertebrae 59 to 63; snout 5 in head length; sharp retrorse suborbital spine present . . . . . ***C. rubrirostris***

7a. Dorsal-fin rays 139; anal-fin rays 100; vertebrae 77; snout 3 in head length . . . . . ***C. chthamalorhynchus***

7b. Dorsal-fin rays 84 to 107; anal-fin rays 57 to 83; vertebrae 56 to 63; snout 4.2 to 5 in head length . . . . . → *8*

8a. Dorsal-fin rays 84; anal-fin rays 57 . . . . . ***C. platyrhynchus***

8b. Dorsal-fin rays 93 to 107; anal-fin rays 69 to 83 . . . . . → ***9***

9a. Eyes directed more laterally than dorsally; body depth at anus 5.1 to 5.6 in standard length . . . . . ***C. niki***

9b. Eyes directed more dorsally than laterally; body depth at anus 6.3 to 8.8 in standard length . . . . . ***C. simus, C. laticeps***

List of nominal species

Cataetyx alleni (Byrne, 1906). Temperate eastern North Atlantic and western Mediterranean at depths from 480 to 1 000 m. Feeding in Mediterranean on polychaetes and benthic crustaceans (Carrasson and Matallanas, 1990). Locally abundant.

C. brevis (Koefoed, 1927) (junior synonym of ***C. alleni***).

C. bruuni (Nielsen and Nybelin, 1963). Tropical eastern Atlantic on the lower shelf and upper slope; caught in bottom trawls. Rare.

C. chthamalorhynchus Cohen, 1981. Temperate eastern South Atlantic; caught in a bottom trawl at 1 000 m. Rare.

C. hawaiiensis Gosline, 1954. Collected at surface after 1950 Mauna Loa, Hawaii lava flow into sea. Rare.

C. laticeps Koefoed, 1927 (possibly a junior synonym of ***C. simus***). Temperate and subtropical North Atlantic, Mediterranean and eastern South Atlantic. Benthic or benthopelagic at depths ranging from 500 to 2 400 m. Uncommon.

C. leucos (Osorio, 1917) (possibly a junior synonym of ***C. alleni***).

C. lepidogenys (Smith and Radcliffe in Radcliffe, 1913). The Philippines and Japan. Bottom trawled from the lower shelf and upper slope. Rare.

C. matsubarai (Arai, 1969) (junior synonym of ***C. lepidogenys***).

C. memoriabilis Meyer-Rochow, 1970 (junior synonym of ***C. laticeps***).

C. messieri (Günther, 1887). Off southern South America in both Atlantic and Pacific oceans. Incorrectly recorded from South Africa and New Zealand. Uncommon.

C. niki Cohen, 1981. Off southern coast of South Africa. Also recorded from Australia. Taken in a bottom trawl at 1 000 to 1 100 m. Rare.

C. platyrhynchus Machida, 1984. Okinawa Trough. Trawled at 910 to 990 m. Rare.

C. rubrirostris Gilbert, 1890. Northern Oregon coast to Pacific coast of Baja California and Gulf of California. Juveniles are mesopelagic, larger specimens apparently live on the bottom at depths of 600 to 1 000 m. Locally abundant. Specimens from the Gulf of Panama and Chile may be this species or an undescribed one.

C. simus Garman, 1899 (possibly a senior synonym of ***C. laticeps***). Gulf of Panama to Peru. Benthopelagic or benthic at 1 200 m. Rare.

Remarks: ***Cataetyx*** needs revision. In addition to the taxonomic problems noted above, several species remain to be described. Also, it may be necessary to recognize 2 genera, 1 for the larger dark coloured species, another for the smaller light coloured ones, although the type species of the genus, ***C. messieri*** is somewhat intermediate. ***C. lepidogenys***, which was first described in the genus ***Bythites***, was latter made the type species of the genus ***Abythites***. It is here included in ***Cataetyx*** on a provisional basis.

Diplacanthopoma Günther, 1887

Type species: *Diplacanthopoma brachysoma* Günther, 1887 by monotypy.

Synonyms: *Myxocephalus* Steindachner and Döderlein, 1887, type species *Myxocephalus japonicus* Steindachner and Döderlein, 1887; *Sarcocara* Smith and Radcliffe in Radcliffe, 1913, type species *Diplacanthopoma (Sarcocara) brunnea* Smith and Radcliffe in Radcliffe, l913.

Number of recognized species: 8.

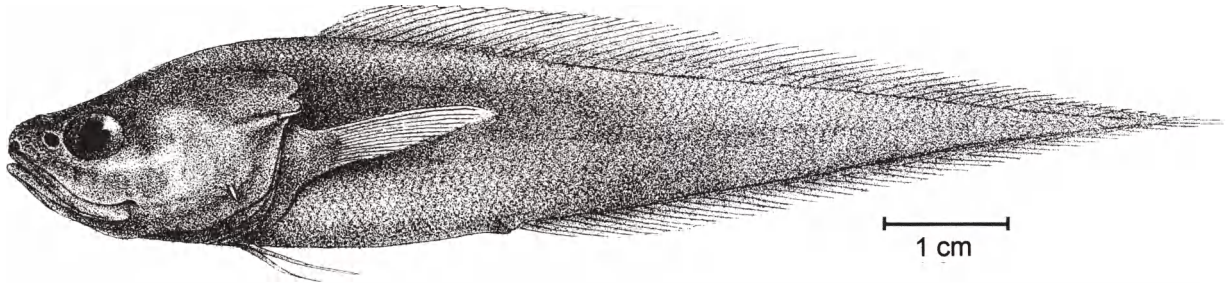


Fig. 100 *Diplacanthopoma brachysoma* (from Günther, 1887)

Diagnosis and description: Body tapers to a slender tail (regenerated in many specimens); **imbricate scales present on body, absent from head and bases of dorsal and anal fins**; opercular spine strong; **a prominent skin flap ending in a large pore above the upper angle of the opercle**; palatine teeth present; developed rakers on the first arch 3 or 4; branchiostegal rays 8; **male intromittent organ on a broad fleshy pad or stalk**; pectoral fins mounted on a broad lobe; pectoral-fin rays 21 to 28; precaudal vertebrae 14 to 20.

Revisions: Although not a revision, Gosline (1954) discusses the taxonomy of many of the species referred to this genus.

Geographical distribution: Circumglobal in tropical and subtropical seas.

Habitat and biology: Benthopelagic fishes of the upper continental slope.

Interest to fisheries: None.

Size: At least 434 mm.

Key to species: Additional research is required.

List of nominal species

Diplacanthopoma alcockii Goode and Bean, 1896. Andaman Sea at 900 m. Rare.

D. brachysoma Günther, 1887. Benthopelagic in the tropical western Atlantic at 460 to 1 670 m. Locally abundant.

D. brunnea Smith and Radcliffe in Radcliffe, 1913. The Philippines at 685 m. Possibly Arabian Sea as well. Rare.

D. japonicus (Steindachner and Döderlein, 1887). Japan. Rare.

D. jordani Garman, 1899. Equatorial eastern Pacific at 705 m. Rare.

D. nigripinnis Gilchrist and von Bonde, 1924. Western Indian Ocean off Natal at 410 to 1 210 m. Rare.

D. raniceps Alcock, 1898. Gulf of Aden and Andaman Sea at 550 to 1 080 m. Rare.

D. rivers-andersoni Alcock, 1895. Arabian Sea at 1640 m; perhaps Hawaii as well. Rare.

Remarks: Several undescribed species remain to be named.

Grammonus Gill in Goode and Bean, 1896

Type species: ***Oligopus ater*** Risso, 1810 by monotypy.

Synonyms: ***Bathystorreus*** Howell Rivero, 1934. Type species ***Benthocometes claudei*** Torre, 1930. ***Eutyx*** Heller and Snodgrass, 1903. Type species ***Eutyx diagrammus*** Heller and Snodgrass, 1903. ***Gadopsis*** (not of Agassiz, 1845 or Richardson, 1848) Filippi and Kolliker, 1856. Type species ***Oligopus ater*** Risso, 1810. ***Grammonoides*** Smith, 1934. Type species ***Grammonoides opisthodon*** Smith, 1934. ***Verater*** Jordan, 1919. Type species ***Oligopus ater*** Risso, 1810.

Number of recognized species: 6.

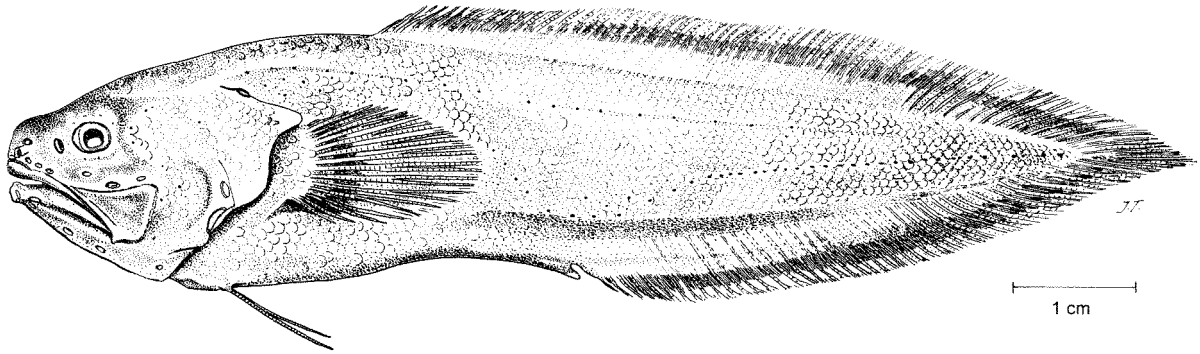


Fig. 101 ***Grammonus ater*** **(adult)** (from Nielsen et al., 1968)

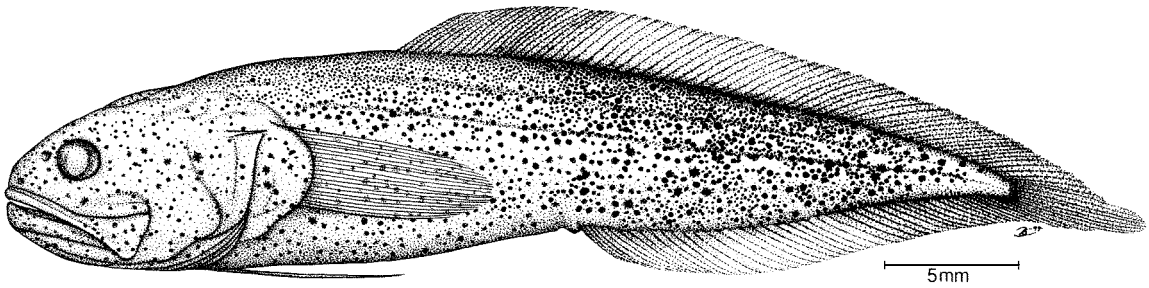


Fig. 102 ***Grammonus opisthodon*** **(juvenile)**

Diagnosis and description: Body relatively short and stubby; **head not depressed**; eyes well developed; **body completely covered with imbricate scales; head partly naked**; posterior part of maxilla expanded, usually with a pointed projection at the posterioventral angle; **palatine lacking teeth**; tongue massive, with an anterior prow-like projection; developed rakers on first arch 2 or 3; branchiostegal rays 8; lateral line consisting of 2 or more series of papillae on the body; pelvic fins with a single ray in each; **precaudal vertebrae usually 12, with many of the neural spines truncate**.

Revisions: Cohen (1964b).

Geographical distribution: Circumtropical to subtropical seas.

Habitat and biology: Mostly found in sea caves or on reef areas, but ***Grammonus longhursti*** was taken with a beach seine and ***G. robustus*** has been caught with bottom trawls. The reproductive biology of ***G. longhursti*** has been studied by Wourms and Cohen (1975).

Interest to fisheries: None.

Size: ***G. diagrammus*** reaches 185 mm; other species are smaller.

Key to species

1a. Preopercle margin with several small but distinct spines; lateral head canal with 3 or 4 pores . . . . . *G. claudei*

1b. Preopercle margin with no or small and weak spines; lateral head canal with 0 or 1 pore . . . . . → *2*

2a. Dorsal-fin rays 93 to 115; anal-fin rays 71 to 91; total vertebrae 48 to 53 . . . . . → *3*

2b. Dorsal-fin rays 68 to 87; anal-fin rays 51 to 62; total vertebrae 40 to 46 . . . . . → *4*

3a. Lateral-line scale rows about 80; anal-fin rays 71 . . . . . *G. waikiki*

3b. Lateral-line scale rows 97 to 115; anal-fin rays 76 to 91 . . . . . *G. diagrammus*

4a. Dorsal-fin rays 69 to 74; anal-fin rays 51 or 52; vertebrae 40 to 42 . . . . . *G. ater*

4b. Dorsal-fin rays 83 to 87; anal-fin rays 57 to 62; vertebrae 44 to 46 . . . . . → *5*

5a. Lateral scale rows about 120 . . . . . *G. longhursti*

5b. Lateral scale rows about 75 to 85 . . . . . *G. robustus*

List of nominal species

Grammonus ater (Risso, 1810). Northwest Mediterranean and Adriatic. Lives in marine caves and rocky areas at fairly shallow depths. Uncommon. In the literature sometimes confused with ***Benthocometes robustus*** (= ***B. armatum***).

G. claudei (Torre, 1930). Widely distributed in the tropical western North Atlantic. Marine caves and reef areas at 6 to 70 m. Uncommon.

G. diagrammus (Heller and Snodgrass, 1903). Tropical and subtropical eastern Pacific, from the Channel Islands of southern California to the Galapagos Archipelago, including peninsular Baja California, the Gulf of California and Panama. Rocky and reef areas at relatively shallow depths. Uncommon.

G. longhursti (Cohen, 1964b). Tropical eastern Atlantic. Apparently a soft bottom species, collected with a beach seine and by bottom trawling at 5 to 11 m. Rare.

G. mowbrayi Grey, 1951 (junior synonym of ***G. claudei***).

G. niger (Risso, 1826) (new name for ***Oligopus ater*** Risso).

G. niger (Gosline, 1953) (junior homonym of ***Oligopus niger*** Risso, 1826).

G. opisthodon Smith, 1934 (possibly a junior synonym of ***G. robustus***).

G. robustus Smith and Radcliffe in Radcliffe, 1913. Widely distributed in the Indian Ocean and western Pacific from the Red Sea and perhaps South Africa, the Philippines, East China Sea, and Japan. Taken with trawls fishing on soft bottom at depths from 45 to 345 m. Uncommon.

G. waikiki (Cohen, 1964b) (new name for ***Microbrotula niger*** Gosline, a secondary junior homonym of ***Oligopus niger*** Risso, 1826). Oahu in the Hawaiian Islands. Rare.

Remarks: The generic name ***Oligopus*** as used by Cohen (1964b) in **Bythitidae** is incorrect (Eschmeyer, 1996). The generic name ***Grammonoides*** Smith, 1934 is here treated as a junior synonym of ***Grammonus*** Gill in Goode and Bean, 1896 as the type species of these 2 nominal genera are congeneric.

Hastatobythites Machida, 1997

Type species: ***Hastatobythites arafurensis*** Machida, 1997 by original designation.

Synonyms: None.

Number of recognized species: 1.

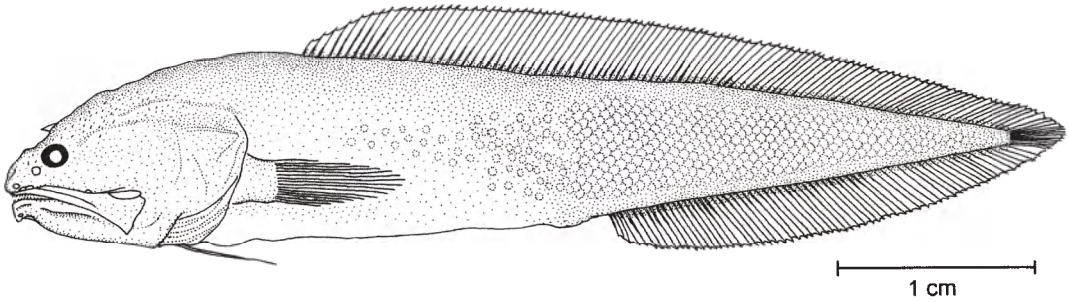


Fig. 103 ***Hastatobythites arafurensis*** (from Machida, 1997)

Diagnosis and description: Scales absent from head and anterior part of body; eye diameter less than snout length; 2 anteriorly directed, median spines on head, 1 on frontal and another buried on mesethmoid; weak opercular spine and none on hindmargin of preopercle; maxilla expanded posteriorly; **pectoral radials elongate**; vomer and palatines with teeth; developed rakers on anterior gill arch 3; pelvic fins with 1 ray in each; 15 or 16 pectoral-fin rays; caudal-fin rays 11 or 12; precaudal vertebrae 15.

Revisions: None.

Geographical distribution: From Arafura Sea to off New South Wales.

Habitat and biology: Benthopelagic at 146 to 850 m. A 57 mm female with full developed embryos.

Interest to fisheries: None.

Size: At least 90 mm.

List of species

Hastatobythites arafurensis Machida, 1997. Information see above. Rare.

Remarks: Apparently closely related to if not identical with ***Saccogaster***.

Hephthocara Alcock, 1892b

Type species: ***Hephthocara simum*** Alcock, 1892b by monotypy.

Synonyms: None.

Number of recognized species: 2.

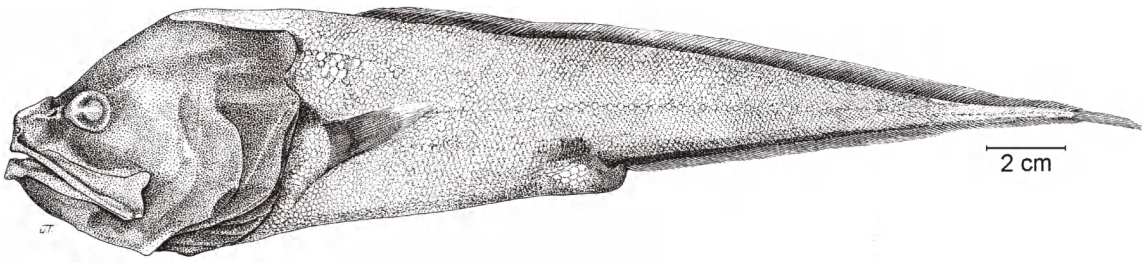


Fig. 104 ***Hephthocara*** **(undescribed species)**

Diagnosis and description: Head large and deep with tapering body, no scales on head; snout longer than diameter of eye; **head bones weak and soft**; **a large, pore-bearing flap above opercle**, **narrow bands of teeth on vomer and palatines**, anterior gill arch with 3 or 4 developed rakers; pectoral-fin rays 16 to 19; **no pelvic-fin rays**; caudal-fin rays 6 or 7; precaudal vertebrae 18 to 21.

Revisions: None.

Geographical distribution: From Bay of Bengal to South America.

Habitat and biology: Benthopelagic at bathyal to abyssal depths (760 to 5 540 m).

Interest to fisheries: None.

Size: At least 317 mm.

Key to species

1a. Preanal length 39 to 42% standard length; vertebral count 90 to 93 . . . . . ***H. crassiceps* and *H. simum***

1b. Preanal length 44 to 50% standard length, vertebral count 78 to 81 . . . . . ***Hephthocara* sp. (undescribed species)**

List of species

Hephthocara crassiceps Smith and Radcliffe in Radcliffe, 1913. Off the Philippines at 760 to 1 510 m. Rare.

H. simum Alcock, 1892b. Bay of Bengal at 1 110 to 1 650 m. Rare.

***Hephthocara* sp.** Nalbant and Mayer (1971). Peru-Chile Trench at 4 330 to 5 540 m. Rare. Undescribed species.

Remarks: ***Hephthocara crassiceps*** and ***H. simum*** are very closely related. More material may show that they are conspecific.

Microbrotula Gosline, 1953

Type species: ***Microbrotula rubra*** Gosline, 1953 by original designation.

Synonyms: None.

Number of recognized species: 2.

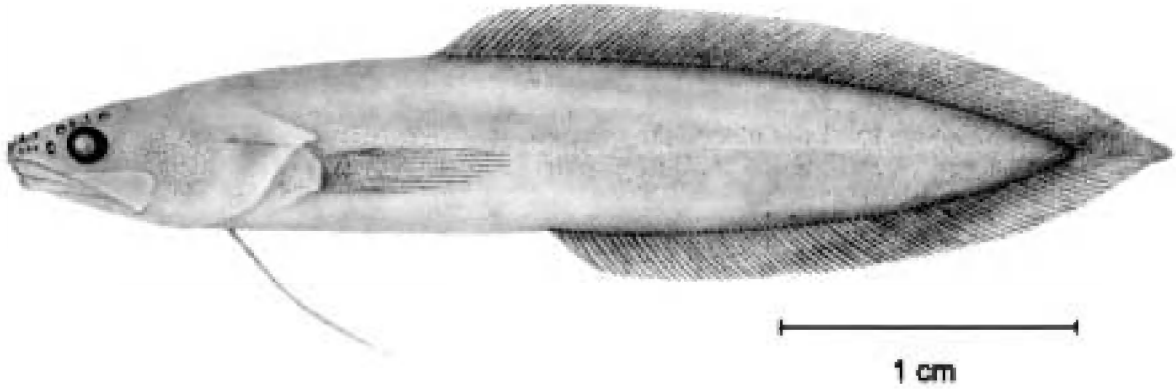


Fig. 105 ***Microbrotula rubra*** (from Cohen and Wourms, 1976)

Diagnosis and description: Body completely covered with small imbricate scales; head partly naked; snout depressed; eyes small, more than 6 times in head length; spine on opercle sharp and needle-like; **maxilla expanded posteriorly, not sheathed, with a ventrally directed pointed process near the posterioventral angle; both granular and needle-like teeth**; palatine teeth present; tongue with an anterior prow-like extension; developed gill rakers on first arch 3 or 4; branchiostegal rays 7; lateral line marked by free papillae; male intromittent organ lacking ossified parts; pelvic fin with a single ray in each; **pectoral-fin rays 11 to 14, fin mounted on a peduncle that is broader than long; caudal-fin rays 4 to 6**; precaudal vertebrae 11 or 12.

Revisions: Cohen and Wourms (1976).

Geographical distribution: Widely distributed throughout the tropical Indo-Pacific from the Gulf of Aden to Hawaii, but apparently absent from the eastern Pacific.

Habitat and biology: Tiny secretive reef fishes collected at 1 to 38 m. Nowhere very abundant.

Interest to fisheries: None.

Size: Largest known specimen is the holotype of *Microbrotula randalli* at 42 mm. A female specimen of *M. randalli* is gravid at 38 mm.

Key to species

1a. Eye diameter 6.4 to 8.4 in head length; interorbital width 10.7 to 13.7 in head length . . . . . *M. randalli*

1b. Eye diameter 11.0 to 15.4 in head length; interorbital width 3.6 to 4.2 in head length . . . . . *M. rubra*

List of species

Microbrotula randalli Cohen and Wourms, 1976. Samoa and Vanuatu at 30 to 38 m near reef-sand interface. Rare.

M. rubra Gosline, 1953. Oahu, Hawaii at 1 m over mixed coral and sand. Rare.

Remarks: There are several undescribed species in the Indo-Pacific region.

Pseudonus Garman, 1899

Type species: *Pseudonus acutus* Garman, 1899 by monotypy.

Synonyms: None.

Number of recognized species: 3.

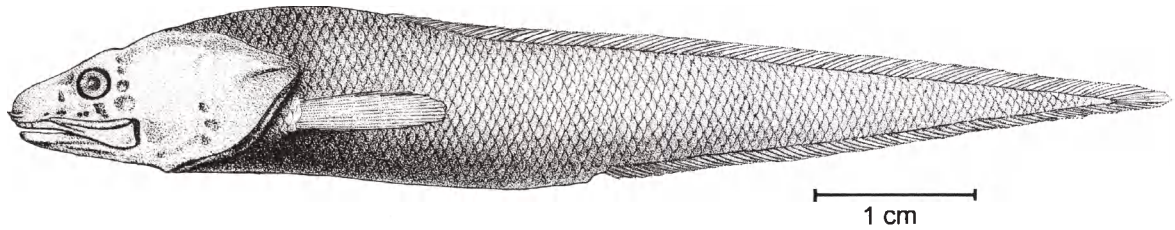


Fig. 106 *Pseudonus acutus* (from Garman, 1899)

Diagnosis and description: Head depressed, partly naked; eyes dorsolaterally directed; opercular spine strong; teeth present on palatines; developed rakers on first arch 3; branchiostegal rays 8 or 9; **head pores large and prominent, a large elliptical median interorbital pore; cleithrum with a sharp-pointed spine projecting posteriorly dorsal to the upper pectoral-fin ray; pelvic fins absent or with a single ray in each**; pectoral-fin rays 18 to 22; caudal-fin rays 7 to 9; pectoral fins on a fleshy lobe that is broader than long; precaudal vertebrae 15 or 16.

Revisions: None.

Geographical distribution: Gulf of Aden, Arabian Sea, the Philippines, and Gulf of Panama.

Habitat and biology: The few known specimens have been caught on the continental slope with bottom trawls fishing a soft bottom.

Interest to fisheries: None.

Size: At least 130 mm.

Key to species

1a. Pelvic fins absent . . . . . ***P. acutus***

1b. Pelvic fins present . . . . . → *2*

2a. Interorbital width 8.4 to 10.4 in head length . . . . . ***P. squamiceps***

2b. Interorbital width 7.2 in head length . . . . . ***P. platycephalus***

List of nominal species

Pseudonus acutus Garman, 1899. Gulf of Panama; caught in bottom trawls at 915 to 1 620 m. Rare.

P. platycephalus (Smith and Radcliffe in Radcliffe, 1913) (possibly a junior synonym of ***P. squamiceps***). Philippines; caught in bottom trawls fishing at 763 m and 1281 m on soft bottom. Rare.

P. squamiceps (Lloyd, 1909) (possibly a senior synonym of ***P. platycephalus***). Gulf of Aden and Arabian Sea; caught in bottom trawls at 915 to 990 m on a soft bottom. Rare.

Saccogaster Alcock, 1889

Type species: ***Saccogaster maculata*** Alcock, 1889 by monotypy.

Synonyms: ***Barbuliceps*** Chan, 1966. Type species ***Barbuliceps tuberculatis*** Chan, 1966 (apparently an error for ***tuberculatus***).

Number of recognized species: 8.

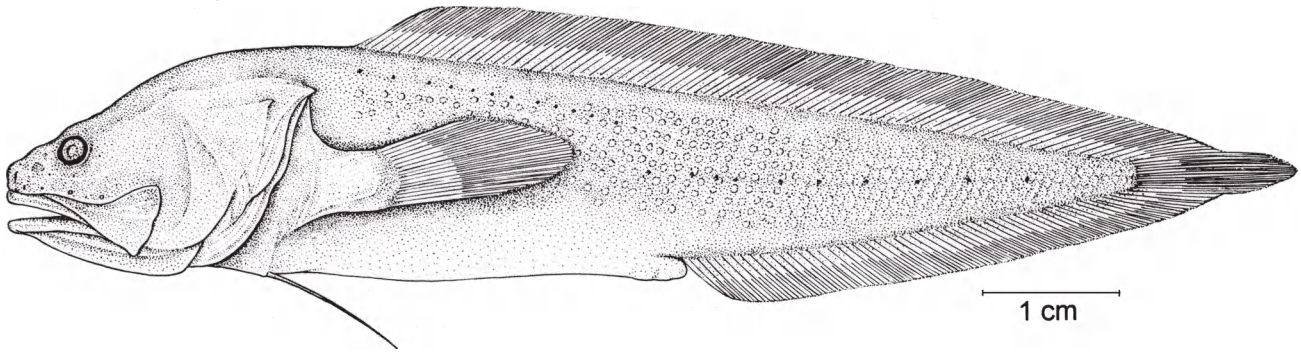


Fig. 107 ***Saccogaster maculata*** (from Cohen and Nielsen, 1972)

Diagnosis and description: Tail section of body not attenuate; **scales absent from head and reduced or absent on body**; eye size variable but small 6.8 to 14 in head length; maxilla vertically expanded posteriorly; opercular spine present; palatine teeth present; branchiostegal rays 7 to 9; developed rakers on first gill arch 0 to 6; **males with a stalked intromittent organ; anal fin originating on posterior half of body; pectoral fins supported by elongated radials** (inclosed in a free peduncle in some, adnate in others); pectoral-fin rays 12 to 23; pelvic fins with 1 ray in each; precaudal vertebrae 12 to 20.

Revisions: Cohen and Nielsen (1972), Cohen (1987).

Geographical distribution: Indian Ocean off East Africa, off New South Wales, Australia, South China Sea, Hawaii, northern Peru, and western Atlantic from Florida, Gulf of Mexico, and off Brazil. Unknown so far from the eastern Atlantic.

Habitat and biology: Apparently benthic or benthopelagic on soft bottom at depths of 100 to 834 m, although, 1 species, *Saccogaster melanomycter*, was caught at 7.5 m in a coral reef habitat.

Interest to fisheries: None.

Size: The largest known specimen, a male *S. tuberculata*, is 160 mm, but most specimens of most species are less than 100 mm. A 134 mm female specimen of *S. tuberculata* contains eyed embryos and the 58 mm holotype of *S. parva* contains developing eggs.

Key to species

1a. Scales present on body . . . . . → *2*

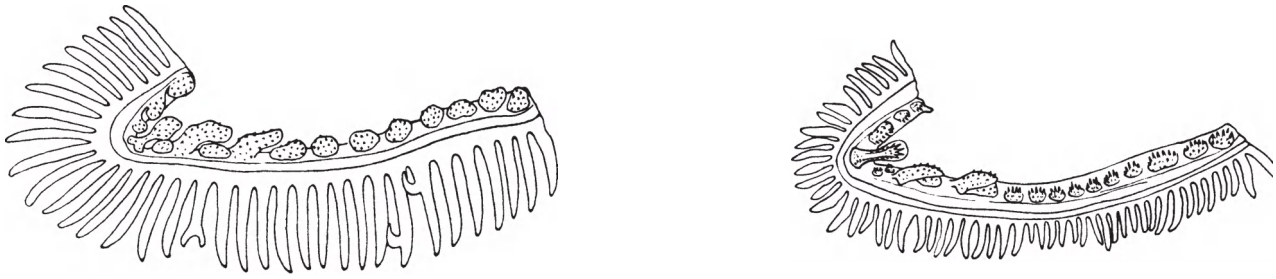
1b. Scales absent from body . . . . . → *4*

2a. Spine on opercle with 3 points; pectoral-fin rays 22; dorsal-fin rays 92 . . . . . *S. hawaii*

2b. Spine on opercle with a single point; pectoral-fin rays 16 to 18; dorsal-fin rays 75 to 88 . . . . . → *3*

3a. Gill filaments on first arch not notably reduced in size (Fig. 108a); palatine tooth row several teeth wide; dorsal-fin rays 75 to 83 . . . . . *S. maculata*

3b. Gill filaments on first arch notably reduced in size (Fig. 108b); palatine teeth in a single row; dorsal-fin rays 87 or 88 . . . . . *S. staigeri*



a) *Saccogaster maculata* b) *Saccogaster staigeri*

Fig. 108 First gill arch (from Cohen and Nielsen, 1972)

4a. Antrorse hook-like projection at posterioventral angle of maxilla; pectoral-fin rays 12; branchiostegal rays 7 . . . . . *S. rhamphidognatha*

4b. No hook-like projection at posterioventral angle of maxilla; pectoral-fin rays 14 to 23; branchiostegal rays 8 or 9 . . . . . → *5*

5a. Pectoral fins borne on a free fleshy peduncle; gill opening extending above level of top pectoral-fin ray . . . . . → *6*

5b. Pectoral fins without a free fleshy peduncle; gill opening restricted, not extending above level of top pectoral-fin ray . . . . . → *7*

6a. Pectoral-fin rays 20 to 23; anal-fin rays 56 to 61; developed rakers on first arch 3 . . . . . *S. tuberculata*

6b. Pectoral-fin rays 14; anal-fin rays 64; developed rakers on first arch 6 . . . . . *S. parva*

7a. Posterior end of maxilla sheathed dorsally; anal-fin rays 53 or 54; nasal chambers not sooty black . . . . . *S. normae*

7b. Posterior end of maxilla not sheathed dorsally; anal-fin rays 37; nasal chambers sooty black . . . . . *S. melanomycter*

List of species

Saccogaster hawaii Cohen and Nielsen, 1972. Off Maui, Hawaii. Known from a single specimen caught by a bottom trawl at 234 m. Rare.

S. maculata Alcock, 1889. Tropical Indian Ocean; caught with bottom trawls fishing at 265 to 600 m. Rare.

S. melanomycter Cohen, 1987. Caribbean Sea near Santa Marta, Colombia. Known from a single specimen caught in a coral reef environment at 7.6 m. Rare.

S. normae Cohen and Nielsen, 1972. Off the southern end of Peru. Known from 2 specimens caught by bottom trawls at 118 to 133 m and 150 m. Rare.

S. parva Cohen and Nielsen, 1972. Off the coast of Brazil south of Rio de Janeiro (corrected type locality: 24°1'S, 43°54'W). Known from a single specimen caught by a bottom trawl fishing at 500 m (corrected depth). Rare.

S. rhamphidognatha Cohen, 1987. Northern Gulf of Mexico off the Mississippi delta. Known from a single specimen caught at 210 m. Rare.

S. staigeri Cohen and Nielsen, 1972. East coast of Florida and Gulf of Mexico. Caught with bottom trawls fishing at 200 to 350 m. Rare.

S. tuberculata (Chan, 1966). South China Sea, east and west coasts of Australia and Hawaii. Caught at 585 to 834 m. Rare.

Stygnobrotula Böhlke, 1957

Type species: ***Stygnobrotula latebricola*** Böhlke, 1957 by original designation.

Synonyms: None.

Number of recognized species: 1.

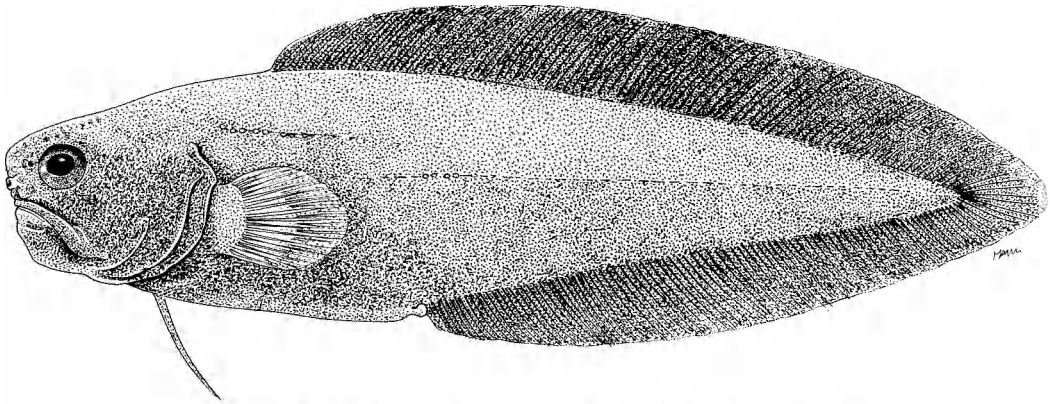


Fig. 109 ***Stygnobrotula latebricola*** (after Böhlke, 1957)

Diagnosis and description: Head and body notably compressed; snout blunt; maxilla narrow posteriorly; scales present on head; **snout equals diameter of eye**; upper jaw ends just behind eye; no opercular spine; some jaw teeth enlarged, **palatines edentate**; developed rakers on anterior gill arch 3 or 4; pectoral-fin rays 21 to 23; pelvic fins with 1 ray in each; precaudal vertebrae 14 with pointed neural spines.

Revisions: None.

Geographical distribution: Tropical western North Atlantic from the Bahamas to Curaçao.

Habitat and biology: Reef-dwelling.

Interest to fisheries: None.

Size: At least 70 mm.

List of nominal species

Stygnobrotula latebricola Böhlke, 1957. Information see above. Common.
Eutyx tumidirostris Boesemann, 1960 (junior synonym of ***S. latebricola***).

Thalassobathia Cohen, 1963

Type species: ***Thalassobathia pelagica*** Cohen, 1963 by original designation.

Synonyms: None.

Number of recognized species: 2.

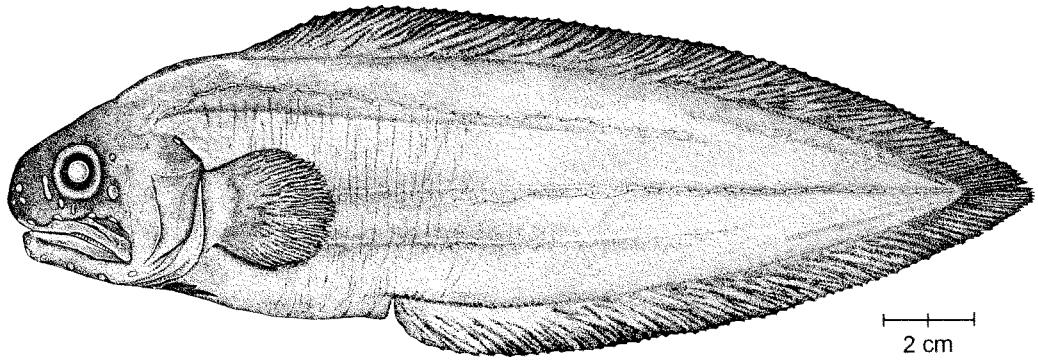


Fig. 110 ***Thalassobathia pelagica*** (from Cohen, 1963)

Diagnosis and description: Body relatively short; head and body compressed; **skin thick; scales absent from head and absent or scattered on body**; anterior profile of head blunt; **anterior nostril non-tubular and placed high on snout**; **maxilla narrow posteriorly**; jaw teeth needle-like; palatine teeth present; tongue massive, no anterior prow-like extension; **gill rakers on first arch reduced to a few small fleshy flaps and protuberances; prominent pseudobranch present**; 2 lateral-line series on body; branchiostegal rays 7; prominent pores on head; ossification weak; a broad fleshy hood over the genital area in females (no information for males); **pelvic fins with 2 rays in each, the fins diverging from each other and covered with thick fleshy skin** (Fig. 92); pectoral fin short, fan-shaped, with 19 to 29 rays; anal fin originating on anterior half of body; caudal-fin rays 10; precaudal vertebrae 12, with pointed neural spines.

Revisions: Lee (1974).

Geographical distribution: Eastern Atlantic from 60°N to 5°S; western Atlantic off Georges Bank; eastern South Pacific off northern Chile.

Habitat and biology: Mesopelagic; in the Atlantic at least, it apparently lives in close association with the large scyphomedusan jellyfish ***Stygiomedusa* sp.** (Harbison et al, 1973).

Interest to fisheries: None.

Size: At least 260 mm.

Key to species

1a. Pectoral-fin rays 22 to 27; eye diameter in head length 3.1 to 4.0 . . . . . ***T. pelagica***

1b. Pectoral-fin rays 19 to 20; eye diameter in head length 2.8 to 3.0 . . . . . ***T. nelsoni***

List of species

Thalassobathia nelsoni Lee, 1974. Caught at 0 to 1 000 m in an open midwater trawl off the coast of northern Chile. Rare.

T. pelagica Cohen, 1963. Mesopelagic; in the eastern Atlantic from 60°N to the Gulf of Guinea; in the western Atlantic off Georges Bank. Balanov and Fedorov (1996) reported a 157 mm specimen from the Bering Sea; the specific identification is uncertain. Uncommon.

Remarks: ***Thalassobathia*** is the only known bythitid with 2 pelvic-fin rays in each fin (although there are many records in the literature for other bythitids with 2 pelvic rays, all of those that we have been able to check have only 1, with each of the ray halves counted as a ray; see Fig. 9). Its weak ossification and other adaptations to a pelagic life are also unique in the family, as are its apparent association with a jellyfish.

2.6.2 Subfamily Brosmophycinae

Subfamily name: Brosmophycinae Gill (1862).

Number of recognized genera: 19.

Diagnosis and description: Squamation on body and head variable, present and imbricate or non-imbricate or absent in a few; **caudal fin free in most** but sometimes partly joined to dorsal and anal fins or strongly exserted (***Dermatopsis, Dipulus*** and ***Lucifuga***).

Key to tribes

1a. Male intromittent organ without ossified parts . . . . . **Brosmophycini**

1b. Male intromittent organ with 1 or more pairs of ossified pseudoclaspers . **Dinematichthyini**

Remarks: Two genera, ***Beaglichthys*** and ***Melodichthys*** are known from female specimens only; hence a tribal assignment is impossible. Consequently 2 keys to the Brosmophycinae are presented. In the first, to males, each of the 2 genera is entered twice: once under Brosmophycini and once under Dermatichthyini. In a second key, which makes no assignment to tribe, each genus is entered only once.

Key to genera of Brosmophycinae including referral to tribe. Based on males

1a. Male intromittent organ without ossified pseudoclaspers . . . . . **(tribe Brosmophycini) 13**

1b. Male intromittent organ with ossified pseudoclaspers . . . . . **(tribe Dinematichthyini) 2**

2a. Developed gill rakers on anterior arch 11 to 15 . . . . . ***Melodichthys***

2b. Developed gill rakers on anterior arch 0 to 7 . . . . . → *3*

3a. Gill membranes free from each other and from isthmus; branchiostegal rays 8 . . . . . → *7*

3b. Gill membranes joined to each other and to isthmus anteriorly; branchiostegal rays fewer than 8 . . . . . → *4*

4a. Opercle lacking spine . . . . . ***Dermatopsoides***

4b. Opercle with sharp-pointed spine, sometimes skin-covered . . . . . → *5*

5a. Pelvic fins long, reaching anus . . . . . ***Diancistrus***

5b. Pelvic fins short, not reaching anus . . . . . → *6*

6a. Branchiostegal rays 6; scales absent from body . . . . . ***Dipulus***

6b. Branchiostegal rays 7; non-imbricate scales present on body, sometimes imbedded . . . . . ***Dermatopsis***

7a. Anterior nostril rather high above upper lip (Fig. 111), about midway between lip and posterior nostril . . . . . ***Dinematichthys***

7b. Anterior nostril closer to upper lip . . . . . → *8*

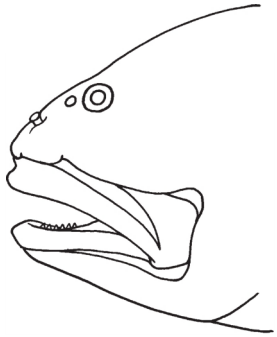


Fig. 111 ***Dinematichthys*** (from Cohen and Nielsen, 1978)

8a. Eye diameter greater than snout length . . . . . ***Beaglichthys***

8b. Eye diameter less than snout length . . . . . → *9*

9a. Branchiostegal rays 8; scales on body barely imbricate . . . . . ***Gunterichthys***
9b. Branchiostegal rays fewer than 8 (rarely 8 on one side); scales imbricate . . . . . → ***10***

10a. Male intromittent organ with 1 pair of pseudoclaspers . . . . . → ***11***
10b. Male intromittent organ with 2 or more pairs of pseudoclaspers . . . . . → ***12***

11a. Head deep, greatest height about equal to length; teeth large, some fang-like . ***Fiordichthys***
11b. Head long and slender; teeth needle-like . . . . . ***Monothrix***

12a. Largest pseudoclasper a compressed lobe . . . . . ***Ogilbia***
12b. Largest pseudoclasper a rather rounded prong . . . . . ***Brotulina***

13a. Developed gill rakers on anterior arch 0 to 7 . . . . . → ***16***
13b. Developed gill rakers on anterior arch 11 to 18 . . . . . → ***14***

14a. Dorsal-fin origin far forward on head, anterior fin rays free . . . . . ***Brosmodorsalis***
14b. Dorsal-fin origin above posterior margin of opercle or farther back, no fin rays free . . . → ***15***

15a. Eye diameter about equal to or greater than snout . . . . . ***Melodichthys***
15b. Eye diameter less than snout . . . . . ***Bidenichthys***

16a. Eye diameter greater than snout . . . . . → ***17***
16b. Eye diameter less than snout . . . . . → ***18***

17a. Branchiostegal rays 7: head naked; anal-fin rays 54 to 62 . . . . . ***Brosmophyciops***
17b. Branchiostegal rays 8; head with patch of scales behind eye; anal-fin rays 83 . ***Beaglichthys***

18a Anal-fin origin well in advance of midpoint of body . . . . . ***Brosmolus***
18b. Anal-fin origin close to midpoint of fish or farther posteriorly . . . . . → ***19***

19a. Branchiostegal rays 6; precaudal vertebrae 10 . . . . . ***Parabrosmolus***
19b. Branchiostegal rays 7; precaudal vertebrae 11 to 17 . . . . . → ***20***

20a Caudal-fin rays 16; precaudal vertebrae 16 or 17 . . . . . ***Brosmophycis***
20b. Caudal-fin rays 8 to 11; precaudal vertebrae 11 to 16 . . . . . ***Lucifuga***

Key to genera of Brosmophycinae without referral to tribe. Based on males and females

1a. Anterior dorsal-fin rays free, origin of dorsal fin above opercle . . . . . ***Brosmodorsalis***
1b. Anterior dorsal-fin rays not free, origin of dorsal fin posterior to opercle . . . . . → ***2***

2a. Maximum body depth 25 to 30% standard length . . . . . ***Fiordichthys***
2b. Maximum body depth less than 25% standard length . . . . . → ***3***

3a. Preanal length 60 to 65% standard length . . . . . → ***4***
3b. Preanal length less than 60% standard length . . . . . → ***5***

4a. Eye diameter shorter than length of snout . . . . . ***Bidenichthys***
4b. Eye diameter longer or equal to length of snout . . . . . ***Melodichthys***

5a. Opercular spine absent or weak . . . . . → ***6***
5b. Opercular spine strong and usually distinct . . . . . → ***8***

6a. Opercular spine absent . . . . . ***Dermatopsoides***
6b. Opercular spine weak and usually hidden . . . . . → ***7***

7a. All or part of head canals inflated . . . . . ***Lucifuga***
7b. None of head canals inflated . . . . . ***Gunterichthys***

8a. Anterior nostril placed midway between posterior nostril and upper lip . . . ***Dinematichthys***
8b. Anterior nostril placed closer to upper lip . . . . . → ***9***

9a. Eye diameter longer than length of snout . . . . . → ***10***
9b. Eye diameter shorter than length of snout . . . . . → ***11***

10a. Head naked . . . . . ***Brosmophyciops***
10b. Patches of scales behind eye . . . . . ***Beaglichthys***

11a. Head and body naked; body depth at origin of anal fin 6 to 9% standard length . . ***Dipulus***
11b. Head naked or not, body scaled; body depth at origin of anal fin 9 to 22% standard length . . . . . → ***12***

12a. Head naked . . . . . → ***13***
12b. Head with scales . . . . . → ***14***

13a. Maxilla greatly expanded vertically at posterior end; body scales imbricate . . . ***Monothrix***
13b. Maxilla not greatly expanded vertically at posterior end; body scales non-imbricate . . . . . ***Dermatopsis***

14a. Preanal length 40 to 45% standard length . . . . . → ***15***
14b. Preanal length 50 to 55% standard length . . . . . → ***16***

15a. Body depth at origin of dorsal fin 13.5% standard length . . . . . ***Brosmolus***
15b. Body depth at origin of dorsal fin 21.5% standard length . . . . . ***Parabrosmolus***

16a. Pelvic fins reaching anus . . . . . ***Diancistrus***
16b. Pelvic fins not reaching anus . . . . . → ***17***

17a. Fin bases covered with thick skin, fin rays obscured; skin over head, especially anteriorly, thick . . . . . ***Brosmophycis***
17b. Fin bases and head covered with thin skin . . . . . ***Brotulina/Ogilbia***

List of nominal genera

Tribe BROSMOPHYCINI

?*Beaglichthys* Machida, 1993b
Bidenichthys Barnard, 1934
Brosmodorsalis Paulin and Roberts, 1989
Brosmolus Machida, 1993b
Brosmophyciops Schultz, 1960
Brosmophycis Gill, 1861b
Lucifuga Poey, 1858
?*Melodichthys* Nielsen and Cohen, 1986
Parabrosmolus Machida, 1996
Stygicola Gill, 1863a (junior synonym of *Lucifuga*)

Tribe DINEMATICHTHYINI

?*Beaglichthys* Machida, 1993b
Brotulina Fowler, 1946
Caecogilbia Poll and Leleup, 1965 (junior synonym of *Ogilbia*)
Calcarbrotula Fowler, 1946 (junior synonym of *Brotulina*)
Dermatopsis Ogilby, 1896
Dermatopsoides Smith, 1947
Diancistrus Ogilby, 1898
Dinematichthys Bleeker, 1855
Dipulus Waite, 1905
Fiordichthys Paulin, 1995
Gunterichthys Dawson, 1966
Halias Ayres, 1860 (junior synonym of *Brosmophycis*)
?*Melodichthys* Nielsen and Cohen, 1986
Monothrix Ogilby, 1897
Ogilbia Jordan and Evermann, 1898
Typhlias Hubbs, 1938 (preoccupied)
Typhliasina Whitley, 1951 (replacement name for *Typhlias* - unior synonym of *Ogilbia*)

Tribe Brosmophycini Cohen and Nielsen, 1978

Number of recognized genera: 7 + 2?.

Diagnosis: Male intromittent organ without ossified parts.

Beaglichthys Machida, 1993b

Type species: ***Beaglichthys macrophthalmus*** Machida, 1993b by original designation.

Synonyms: None.

Number of recognized species: 1.

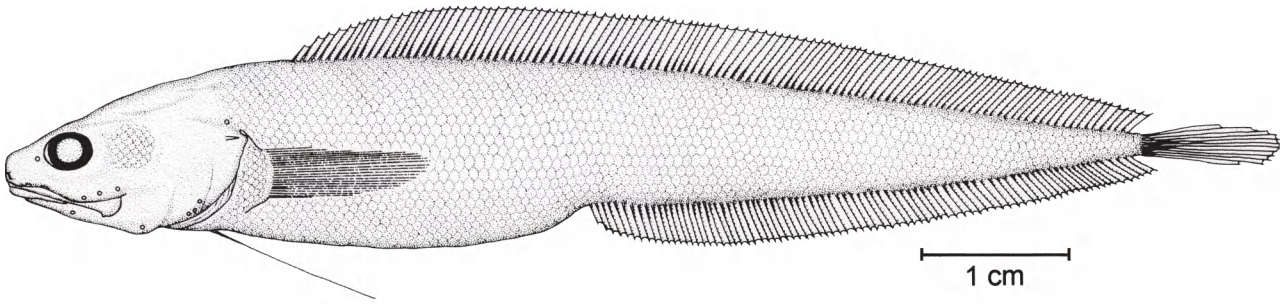


Fig. 112 ***Beaglichthys macrophthalmus*** (from Machida, 1993b)

Diagnosis and description: Body covered with imbricate scales; **eye relatively large, 5.4 in head length, longer than snout length, maxilla expanded posteriorly, with a pointed process at the posterioventral corner: a patch of scales present behind the eye**; both granular and enlarged teeth present; tongue broad, with a blunt tip; developed gill rakers 3; pores present on head; **branchiostegal rays 8**; dorsal-fin rays 111; **anal-fin origin at midpoint of body**, anal-fin rays 83; pectoral-fin rays 22; pelvic fins each with a single ray; caudal-fin rays 12; **vertebrae 14+36=50**.

Revisions: None.

Geographical distribution: Known only from the type locality, Shoal Bay, Northern Territory, Australia.

Habitat and biology: Probably shallow water. Holotype and only known adult specimen a gravid female.

Interest to fisheries: None.

Size: The holotype is 78 mm; a newly born embryo is 23.3 mm in total length.

List of species

Beaglichthys macrophthalmus Machida,1993b. Information see above. Rare.

Remarks: ***Beaglichthys*** is presently known only from the female holotype. Until males are caught the genus can not be allocated to either of the 2 brosmophycine tribes.

Bidenichthys Barnard, 1934

Type species: ***Bidenichthys capensis*** Barnard, 1934 by monotypy.

Synonyms: None.

Number of recognized species: 3.

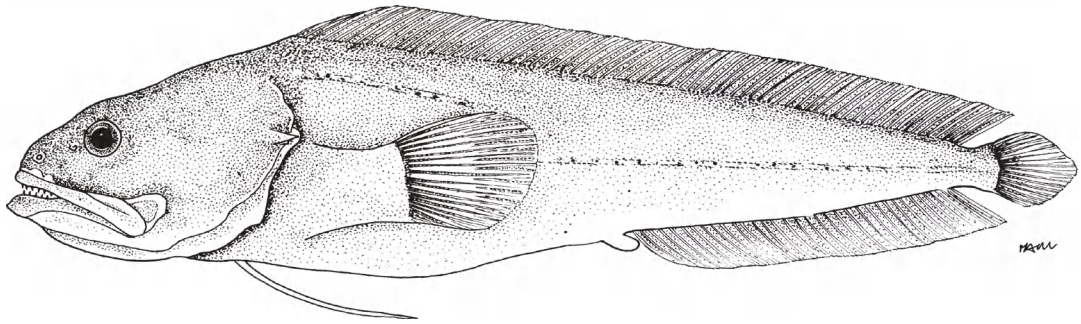


Fig. 113 ***Bidenichthys capensis*** (after Cohen, 1986)

Diagnosis and description: body covered with imbricate scales; head naked; eye diameter less than snout length; maxilla expanded and free posteriorly; branchiostegal rays 7 or 8; **anal-fin origin far posterior to midpoint of body**; precaudal vertebrae 15 to 19.

Revisions: Paulin (1995).

Geographical distribution: South Africa and New Zealand.

Habitat and biology: Rocky areas ranging from the intertidal to a depth of 178 m.

Interest to fisheries: None.

Size: At least 148 mm.

Key to species

1a. Pectoral-fin peduncle longer than broad . . . . . ***B. capensis***

1b. Pectoral-fin peduncle broader than long . . . . . → *2*

2a. Body colour a uniform grey-brown; dorsal-fin rays 79 to 87 . . . . . ***B. beeblebroxi***

2b. Body colour with irregular mottled brown bands; dorsal-fin rays 71 to 77 . . ***B. consobrinus***

List of species

Bidenichthys beeblebroxi Paulin, 1995. Found in holes beneath rocks and boulders from the surface to 30 m around the North Island and northern part of South Island, New Zealand. Common.

B. capensis Barnard, 1934. Intertidal in rocky tidepools from East London to the Cape of Good Hope, South Africa. Uncommon.

B. consobrinus (Hutton, 1876). Rocky areas at depths of 30 to 178 m off northern New Zealand. Rare.

Remarks: Further study may show that South African and New Zealand species should be classified in different genera.

Brosmodorsalis Paulin and Roberts, 1989

Type species: ***Brosmodorsalis persicinus*** Paulin and Roberts, 1989 by original designation.

Synonyms: None.

Number of species: 1.

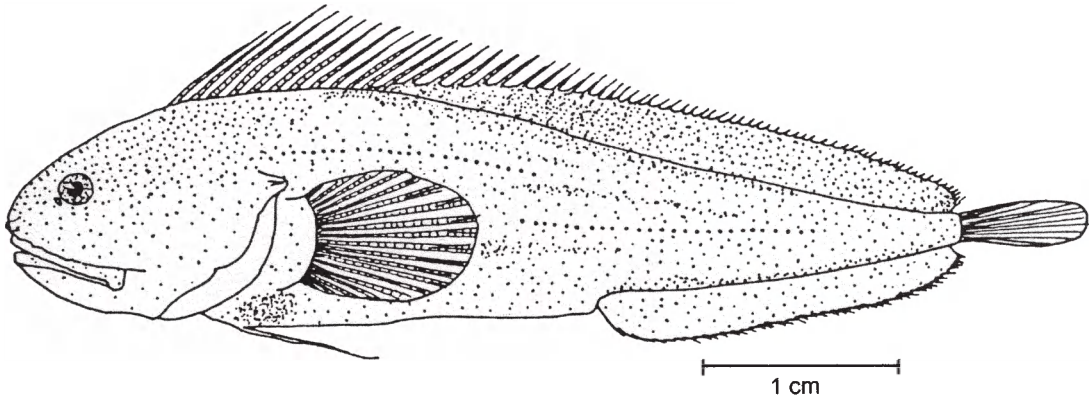


Fig. 114 ***Brosmodorsalis persicinus*** (from Paulin and Roberts, 1989)

Diagnosis and description: Body covered with small imbricate scales; head naked, 3.4 to 3.9 in standard length; dorsal profile of head rounded; teeth separate, sharp and needle-like; **developed gill rakers 13 to 16; fresh specimens peach-pink in colour; dorsal-fin rays 71 to 80, fin originates far forward on top of head, anterior rays free**; caudal-fin rays 14; **preanal long, 57.3 to 62.5% of standard length; anal-fin rays 35 to 41**; precaudal vertebrae 16 or 17.

Revisions: None.

Geographical distribution: Northeastern New Zealand.

Habitat and biology: Lives in areas of dense algal growth at depths of 0 to 17 m. Cryptic in behavior.

Interest to fisheries: None.

Size: At least 53 mm.

List of species

Brosmodorsalis persicinus Paulin and Roberts, 1989. Information see above. Uncommon to locally abundant.

Brosmolus Machida, 1993b

Type species: ***Brosmolus longicaudis*** Machida, 1993b by original designation.

Synonyms: None.

Number of recognized species: 1.

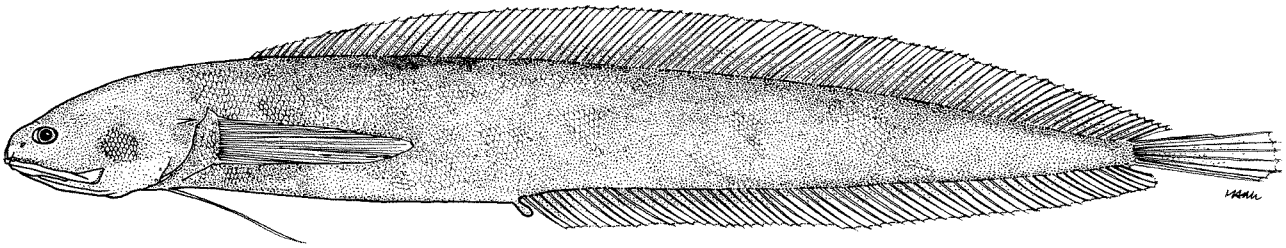


Fig. 115 ***Brosmolus longicaudis*** (after Machida, 1993b)

Diagnosis and description: Body slender, depth at anus 8.3 in standard length, completely covered with imbricate scales; snout blunt; **eye small, 7.6 in head length, less than snout length; large patch of scales present on cheek**; teeth needle-like; tongue long and sharply pointed; **developed gill rakers 4**; pore series present on head; branchiostegal rays 7; dorsal-fin rays 129; **anal-fin origin well anterior to midpoint of body**, anal-fin rays 94; pectoral-fin rays 23; pelvic fins with 1 ray in each; caudal-fin rays 16; **vertebrae 15+44=59**.

Revisions: None.

Geographical distribution: Known only from the type locality, Shoal Bay, Northern Territory, Australia.

Habitat and biology: No information but probably shallow water.

Interest to fisheries: None.

Size: Known only from the 58 mm holotype.

List of nominal species

Brosmolus longicaudis Machida, 1993b. Information see above. Rare.

Brosmophyciops Schultz, 1960

Type species: ***Brosmophyciops pautzkei*** Schultz, 1960 by original designation.

Synonyms: None.

Number of recognized species: 1.

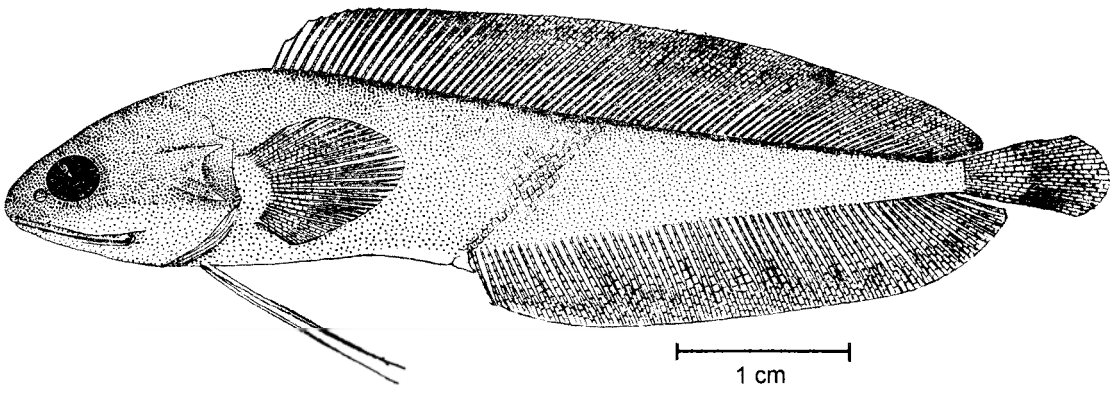


Fig. 116 ***Brosmophyciops pautzkei*** (from Schultz, 1960)

Diagnosis and description: Body tapering gradually to a slender caudal peduncle, covered with imbricate scales; head naked, about 4 times in standard length; snout rounded; **eye large, 4.5 to 5.8 in head length, equal to or greater than snout length; maxilla strongly sheathed, expanded posteriorly, with a pointed process at the posterioventral corner;** spine at upper angle of opercle (lower angle of opercle sometimes appears as a buried spine); branchiostegal rays 7; some teeth separate and pointed; tongue with a slender anterior prow; developed gill rakers 3; **fresh specimens tan, with median fins yellowish; male intromittent organ consists of penis encompassed by fleshy hood; dorsal-and anal-fin rays long, fin-ray length equal to or greater than adjacent body depth; dorsal fin originating over pectoral fins, fin rays 72 to 84; anal fin originating at about midlength of body, fin rays 54 to 62**; caudal-fin rays 11 or 12; pectoral-fin rays 23 to 29, fin mounted on a broad peduncle; precaudal vertebrae 12 or 13.

Revisions: Machida and Yoshida (1984); present additional information.

Geographical distribution: Widely distributed in the Indo-Pacific from the Gulf of Aqaba and Port Sudan to Madagascar, Mauritius, the Gulf of Thailand, New Guinea, Great Barrier Reef, Ryukyu Islands, Palau, Marshall Islands, Caroline Islands, and Pitcairn Island. This wide distribution is puzzling for a low fecundity live-bearing species with early life history stages that are not known from the plankton. Studies on geographical variation might serve as a basis for separating local populations.

Habitat and biology: Apparently cryptic in behavior, sometimes found in marine caves and beneath rocky ledges. Often taken with other genera of small free-tailed bythitids, from which it is immediately distinguished by its larger eye.

Interest to fisheries: None.

Size: At least 61 mm.

List of species

Brosmophyciops pautzkei Schultz, 1960. See information above. Ubiquitous but nowhere very common.

Remarks: ***Brosmophyciops*** is classified by Howes (1992) as closer to the neobythitine genera ***Monomitopus, Lamprogrammus*** and ***Glyptophidium*** than to the Bythitidae.

Brosmophycis Gill, 1861b

Type species: ***Brosmius marginatus*** Ayres, 1854 by original designation.

Synonym: ***Halias*** Ayres, 1860. Type species ***Brosmius marginatus*** Ayres, 1854.

Number of recognized species: 1.

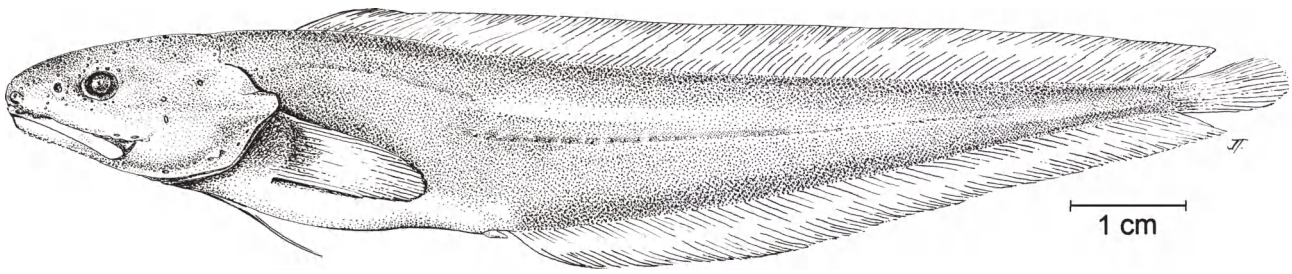


Fig. 117 ***Brosmophycis marginata*** (from Nielsen et al., 1968)

Diagnosis and description: Skin over head and fin bases thick, less so over body, **body covered with tiny scales arranged in regular rows;** small imbedded scales on head but snout naked, **eye diameter less than snout length;** branchiostegal rays 7; **live specimens red to brown dorsally, pink to white ventrally, fins with pale margins; anal-fin origin at about midlength of fish**; pectoral fins on a broad peduncle; pectoral-fin rays 26; dorsal-fin rays 99 to 105; anal-fin rays 73 to 81; caudal-fin rays 16 or 17; precaudal vertebrae 16 or 17.

Revisions: None; but Follett (1970) and Hart (1973) present information.

Geographical distribution: Southeast Alaska to northern Baja California.

Habitat and biology: Rocky areas at depths of 3 to 256 m, usually below 15 m. Cryptic in habit.

Interest to fisheries: None.

Size: At least 460 mm.

List of species

Brosmophycis marginata (Ayres, 1854). Information see above. Common.

Lucifuga Poey, 1858

Type species: ***Lucifuga subterranea*** Poey, 1858 by subsequent designation of Jordan and Evermann (1896).

Synonyms: ***Stygicola*** Gill, 1863a. Type species ***Lucifuga subterranea*** Poey, 1858.

Number of recognized species: 6.

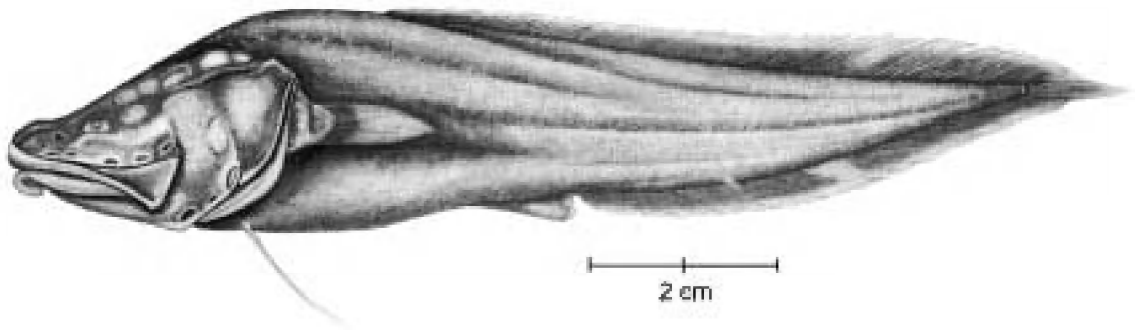


Fig. 118 ***Lucifuga spelaeotes*** (from Cohen and Robins, 1970)

Diagnosis and description: Body covered with imbricate scales; scales present on head; eyes small, often not externally visible; snout depressed; branchiostegal rays 7; **all or some of lateral-line canals on head cavernous**; caudal-fin rays 8 to 11, may be free from dorsal and anal fins, partly connected, or completely connected; **pectoral-fin peduncle broader than long**, pectoral-fin rays 10 to 22; precaudal vertebrae 11 to 14.

Revisions: Cohen and McCosker (1998).

Geographical distribution: Bahamas, Cuba and Galapagos Archipelago.

Habitat and biology: Marine, brackish and fresh-water caves, sinkholes and crevices at depths from about 0 to 21 m in the western Atlantic, to 202 m in the Galapagos. Individuals appear to avoid light. Both darkly pigmented and pale individuals may exist in the same population. An excellent account of the biology of 2 Cuban species, ***L. dentata*** and ***L. subterranea*** was presented by Eigenmann (1909).

Interest to fisheries: None.

Size: The largest known specimen (of an apparently undescribed Cuban species) is 156 mm.

Key to species

1a. Short sharp spine at lower angle of preopercle . . . . . ***L. inopinata***

1b. No spine at lower angle of opercle . . . . . → *2*

2a. Palatine with no teeth . . . . . → *3*

2b. Palatine with teeth . . . . . → *4*

3a. Upper jaw length 6.1 to 8.7 in standard length; dorsal-fin rays 80 to 87; pectoral-fin rays 11 to 14 . . . . . ***L. subterranea***

3b. Upper jaw length 5.4 to 5.6 in standard length; dorsal-fin rays 78 to 80; pectoral-fin rays 10 or 11 . . . . . ***L. teresinarum***

4a. Dorsal-fin rays 70 to 77; anal-fin rays 57 to 60; pectoral-fin rays 11 to 14 . . . . . ***L. simile***

4b. Dorsal-fin rays 83 to 95; anal-fin rays 66 to 78; pectoral-fin rays 15 to 20 . . . . . → *5*

5a. Pectoral-fin rays 15 to 17; vertebrae 46 to 48; area between preopercular and lateral head canals naked . . . . . ***L. dentata***

5b. Pectoral-fin rays 18 to 20; vertebrae 52 or 53; area between preopercular and lateral head canals covered with scales . . . . . ***L. spelaeotes***

List of nominal species

Lucifuga dentata Poey, 1858. North and south slopes of west-central Cuba. It has been caught with ***L. subterranea*** and ***L. teresinarum***. Apparently common in appropriate habitats.

L. inopinata Cohen and McCosker, 1998. Under a rock ledge at 202 m depth on a sea mount in the Galapagos Archipelago. Rare.

L. simile Nalbant, 1981. Found in several caves in Matanzas Province, Cuba, at salinities ranging from fresh water to 22 ppm. Co-occurs with ***L. subterranea*** and ***L. teresinarum***. Uncommon.

L. spelaeotes Cohen and Robins, 1970. Widely distributed in the Bahamas, where it lives in brackish to marine waters at depths ranging from about 1 to 21 m in marine and inland caves and sinkholes in total darkness or reduced light. Common.

L. subterranea Poey, 1858. Found at shallow depths in caves, sinkholes and crevices in southwestern Cuba, sometimes sympatrically with ***L. dentata*** and ***L. teresinarum***. Common.

L. teresinarum Diaz Perez, 1988. Known from 2 specimens, each from a different Cuban cave, where it lives with ***L. subterranea*** and ***L. dentata***. Rare.

Remarks: Neither amount of pigmentation nor degree of eye development are good taxonomic characters. Colour may vary within species from dark brown to pale, with dark and light individuals occurring together; in some species pigmentation increases with age. In some species degree of eye development decreases with age.

Melodichthys Nielsen and Cohen, 1986

Type species: ***Melodichthys hadrocephalus*** Nielsen and Cohen, 1986 by original designation.

Synonyms: None.

Number of recognized species: 2.

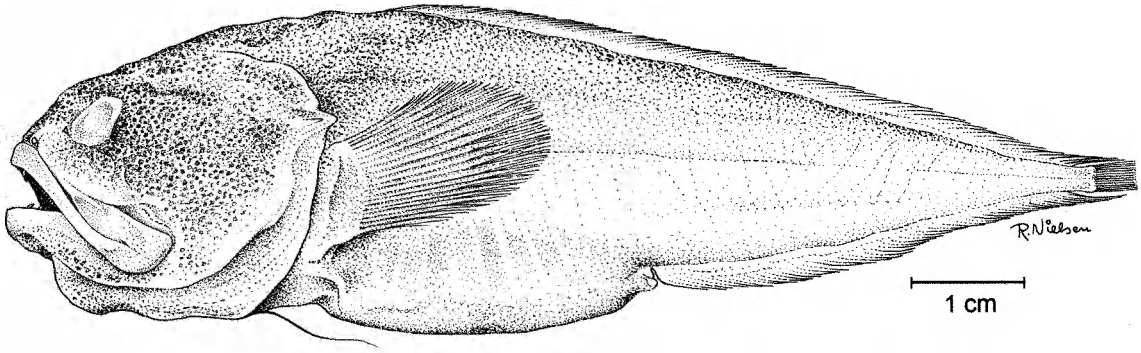


Fig. 119 ***Melodichthys hadrocephalus*** (from Nielsen and Cohen, 1986)

Diagnosis and description: **Body short** with indistinct lateral line; **small imbricate scales on body**, head with non-imbricate scales or naked; anal-fin origin well behind midpoint of fish; upper jaw ends well behind eye; opercular spine strong; **palatines with teeth**; **anterior gill arch with 11 to 15 developed rakers**; pectoral radials somewhat elongated but peduncle broader than long; **pelvic fins with 1 ray in each, not reaching end of pectoral-fin rays**; 12 or 13 precaudal vertebrae.

Revision: None.

Geographical distribution: Known from the holotypes only, off Brittany and New South Wales.

Habitat and biology: Benthopelagic at 165 and 400 m.

Interest to fisheries: None.

Key to species

1a. Scales present on head; skin thick . . . . . ***M. hadrocephalus***

1b. Scales absent from head; skin thin . . . . . ***M. paxtoni***

List of species

Melodichthys hadrocephalus Nielsen and Cohen, 1986. Off Brittany, France at 300 to 400 m. Rare.

M. paxtoni Nielsen and Cohen, 1986. Off New South Wales at 165 to 275 m. Rare.

Remarks: The 2 species differ so much from each other that it may be necessary to classify them in separate genera. Inasmuch as ***Melodichthys*** is known from only the 2 female holotypes, it is not possible to decide in which of the 2 brosmophycine tribes it belongs, as their separation is based on the male intromittent organ.

Parabrosmolus Machida, 1996

Type species: ***Parabrosmolus novaeguineae*** Machida, 1996 by original designation.

Synonyms: None.

Number of recognized species: 1.

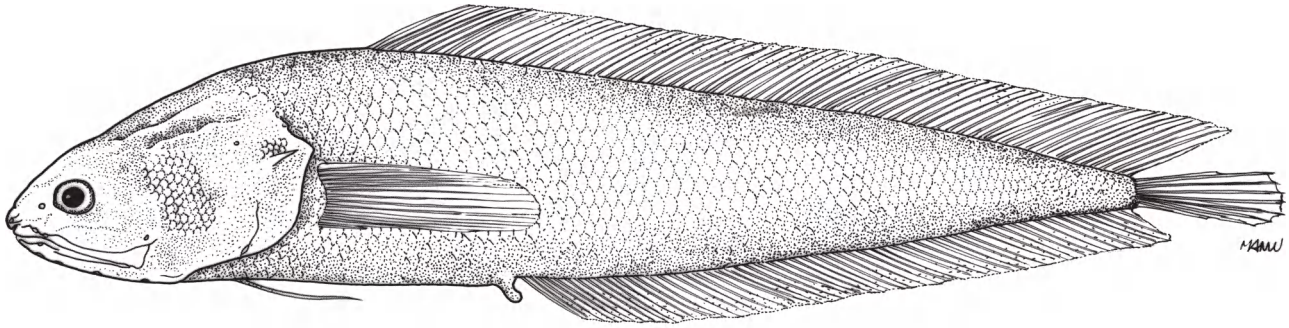


Fig. 120 ***Parabrosmolus novaeguineae*** (after Machida, 1993)

Diagnosis and description: Body covered with small imbricate scales; head with patch of scales on cheek and another above opercle spine; eye diameter less than snout length; teeth sharp-pointed and separate; developed gill rakers 3; **branchiostegal rays 6**; **anal fin originating close to midline of body**, 63 fin rays; dorsal-fin rays 76; caudal-fin rays 16; **vertebrae 10+33=43**.

Revisions: None.

Geographical distribution: Madang Harbor, Papua New Guinea.

Habitat and biology: Taken at 5 to 25 m on a coral-sand bottom.

Interest to fisheries: None.

Size: The only known specimen is 37 mm.

List of species

Parabrosmolus novaeguineae Machida, 1996. Information see above. Rare.

Tribe Dinematichthyini Cohen and Nielsen, 1978

Number of recognized genera: 10 + 2?

Diagnosis: Male intromittent organ with 1 or more pairs of ossified pseudoclaspers.

Beaglichthys Machida, 1993b

(Treated under the tribe Brosmophycini on page 117.)

Brotulina Fowler, 1946

Type species: ***Brotulina fusca*** Fowler, 1946 by original designation.

Synonyms: ***Calcarbrotula*** Fowler, 1946. Type species ***Calcarbrotula erythrea*** Fowler, 1946.

Number of recognized species: 1 to 3.

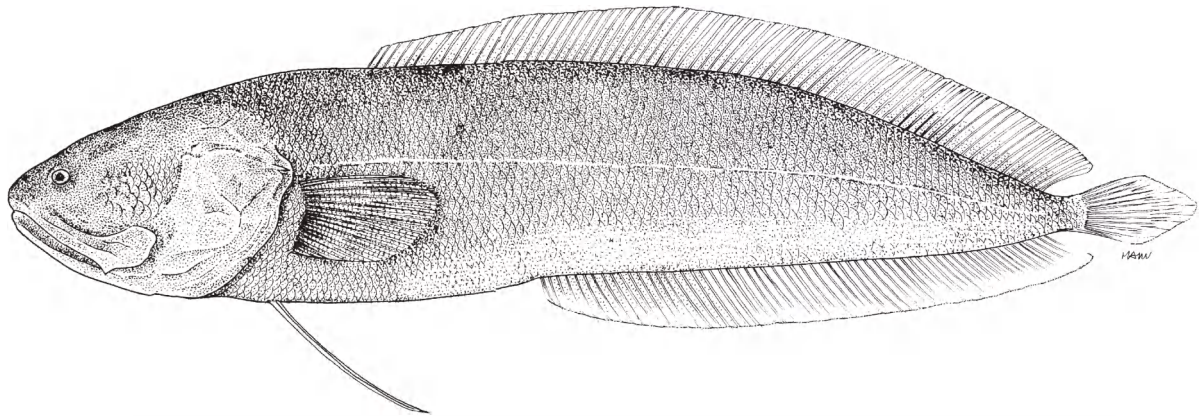


Fig. 121 *Brotulina erythrea*

Diagnosis and description: Body covered with small imbricate scales; head scales present on cheeks, absent from opercle; a sharp spine present on opercle; gill membranes free from isthmus; anterior nostril close to upper lip; **maxilla expanded posteriorly, its posterior margin rounded; developed gill rakers on first arch 3;** branchiostegal rays 7; **male intromittent organ with 2 pairs of pseudoclaspers, the largest one rounded and prong-like**; caudal-fin rays 12; precaudal vertebrae 10 or 11.

Revisions: None, but see Machida in Masuda et al. (1984).

Geographical distribution: Ryukyu Islands; perhaps more widely distributed in Indo-Pacific seas.

Habitat and biology: Lives on coral reefs.

Interest to fisheries: None.

Size: At least 70 mm.

Key to species: Not possible at present.

List of nominal species

Brotulina erythrea Fowler, 1946. Original description based on a single female specimen. Possibly a junior synonym of ***B. fusca***: although, Machida in Masuda et al. (1984) recognizes it as a distinct species. Ryukyu Islands. Rare.

B. fusca Fowler, 1946. Based on a single male specimen. Ryukyu Islands. Rare.

?*B. piger* (Alcock, 1890). Bay of Bengal. Rare.

Dermatopsis Ogilby, 1896

Type species: ***Dermatopsis macrodon*** Ogilby, 1896 by monotypy.

Synonyms: None.

Number of recognized species: 2.

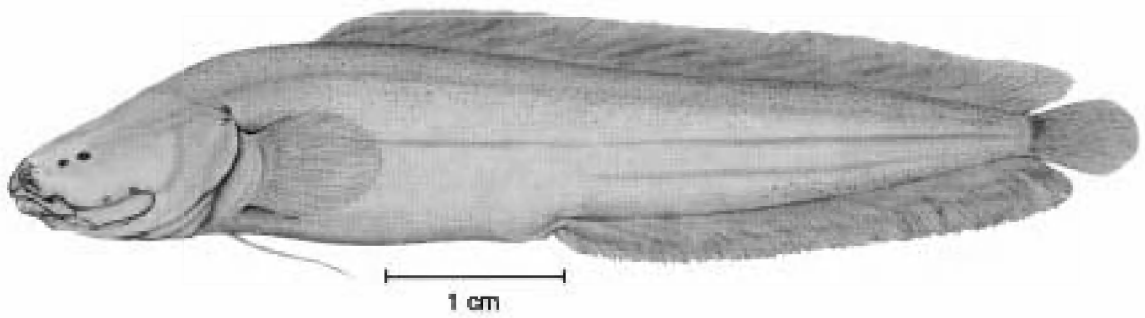


Fig. 122 ***Dermatopsis macrodon*** (from Cohen, 1966)

Diagnosis and description: Scales on body non-imbricate, absent from head; gill membranes broadly joined to isthmus anteriorly; eye tiny, 8 to 14 in head length, sunk beneath surface of head and covered by a window that is clear or translucent; opercle with a sharp spine; anterior nostril low, close to upper lip; **maxilla relatively narrow posteriorly, not expanded, with a ventrally directed pointed process that is anterior to the rear margin of the bone**; developed rakers on first gill arch 2 to 4; branchiostegal rays 7; **male intromittent organ with a single pair of prong-like pseudoclaspers directed laterally at their ends**; pectoral-fin rays 17 to 24; caudal fin rounded with 16 or more rays.

Revisions: Cohen (1966).

Geographical distribution: Tropical and temperate Australian waters, Lord Howe Island, and the North Island of New Zealand.

Habitat and biology: Secretive reef-dwellers.

Interest to fisheries: None.

Size: Reaches about 100 mm.

Key to species

1a. Body depth at anus 4.5 to 6.9 in standard length; dorsal-fin rays 71 to 80; anal-fin rays 45 to 57; total vertebrae 39 to 45 . . . . . ***D. macrodon***

1b. Body depth at anus 8.5 to 11.4 in standard length; dorsal-fin rays 98 to 114; anal-fin rays 64 to 72; total vertebrae 51 to 55 . . . . . ***D. multiradiatus***

List of species

Dermatopsis macrodon Ogilby, 1896. Tropical to temperate Australia; North Island, New Zealand. Found on inshore reefs. Common.

D. multiradiatus McCulloch and Waite, 1918. Temperate waters in South and Western Australia. Found on inshore reefs. Locally abundant.

Remarks: The New Zealand population of ***D. macrodon*** may represent a distinct species.

Dermatopsoides Smith, 1947

Type species: ***Dermatopsis kasougae*** Smith, 1943 by original designation.

Synonyms: None.

Number of recognized species: 2.

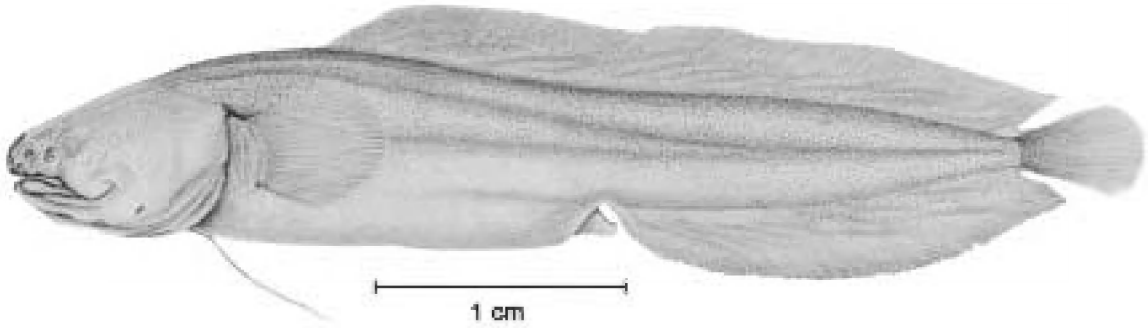


Fig. 123 ***Dermatopsoides talboti*** (from Cohen, 1966)

Diagnosis and description: Scales absent or non-imbricate on body, absent or widely scattered on head; eye tiny, 10 or more times in head length, in some specimens skincovered and sunk below surface of head; opercle spine absent; anterior nostril tubular, located immediately above upper lip; **maxilla narrow, not vertically expanded posteriorly, almost completely sheathed; gill rakers reduced to short stubby tubercles**; branchiostegal rays 6; **male intromittent organ with 2 rounded, recurved pseudoclaspers directed dorsally at their tips**; pectoral-fin rays 17 to 24; caudal-fin rays 16.

Revisions: Cohen (1966).

Geographical distribution: South Africa.

Habitat and biology: Secretive shallow-water fishes.

Interest to fisheries: None.

Size: At least 63 mm.

Key to species

1a. Pelvic fins reaching beyond tips of pectoral fins; pectoral-fin rays 24; dorsal-fin rays 100; anal fin-rays 71; salmon pink in life . . . . . ***D. kasougae***

1b. Pelvic fins not reaching beyond tips of pectoral fins; pectoral-fin rays 17 or 18; dorsal-fin rays 59 to 80; anal fin-rays 36 to 54; pale orange in life . . . . . ***D. talboti***

List of species

Dermatopsoides kasougae (Smith, 1943). A restricted distribution, from Algoa Bay to Port Alfred along the southeast coast of South Africa. Shallow water. Rare.

D. talboti Cohen, 1966. From Algoa Bay to Saldanha Bay along the south coast of South Africa. Uncommon.

Diancistrus Ogilby, 1898

Type species: ***Diancistrus longifilis*** Ogilby, 1898 by monotypy.

Synonyms: None.

Number of recognized species: 1.

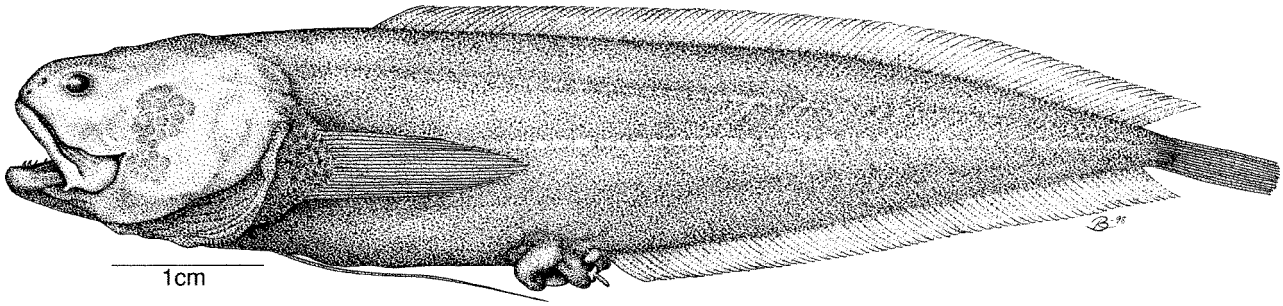


Fig. 124 *Diancistrus longifilis*

Diagnosis and description: Scales present on body and in patches on head; eye smaller than snout, 8.7 in head; spine present on opercle; maxilla spatulate; branchiostegal rays 6; male intromittent organ with a single pair of curved pseudoclaspers; pectoral-fin rays 20; **pelvic fin long, reaching anus; anal-fin origin anterior to midpoint of body**, fin rays 48; dorsal-fin rays 62.

Revisions: None.

Geographical distribution: Great Barrier Reef and Lord Howe Island, Australia.

Habitat and biology: Found on tropical reefs.

Size: At least 76 mm.

List of species

Diancistrus longifilis Ogilby, 1898. Information see above. Rare.

Dinematichthys Bleeker, 1855

Type species: ***Dinematichthys iluocoeteoides*** Bleeker, 1855 by monotypy.

Synonyms: None.

Number of recognized species: 7.

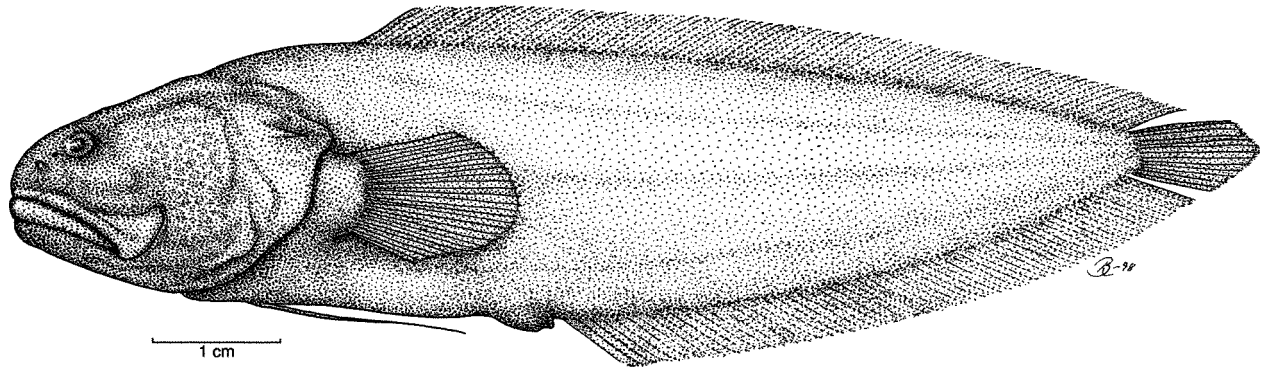


Fig. 125 *Dinematichthys riukiuensis*

Diagnosis and description: Body covered with small imbricate scales; head squamation variable, ranging from the cheeks only to the entire head; **anterior nostril relatively high, about midway between upper lip and posterior nostril** (Fig. 111); a sharp spine present on opercle, sometimes buried; **posterior end of maxilla expanded vertically; intromittent organ of male with 2 or more pairs of pseudoclaspers, the largest a compressed ear-shaped lobe; some precaudal neural spines rounded or truncate.**

Revisions: None.

Geographical distribution: Specimens identified as ***Dinematichthys*** have been recorded from most tropical and some subtropical seas except for the eastern Atlantic. A better understanding of the taxonomy of this genus is required before its distribution can be described.

Habitat and biology: Shallow water reefs. Aspects of the reproductive biology of specimens identified as ***D. iluocoeteoides*** have been described by Turner (1946) and Wourms and Bayne (1978).

Size: Apparently reaches 100 mm or more, although, some species here assigned to this genus appear to be sexually mature at half the size.

Key to species: Not possible at present.

List of species

Dinematichthys dasyrhynchus Cohen and Hutchins, 1982. Rottnest Island, Western Australia. Shallow reefs. Uncommon.

D. iluocoeteoides Bleeker, 1855. Although reported as widely distributed on Indo-Pacific reefs, this species has apparently been caught only at the Batu Islands off Sumatra. Unfortunately there is no type specimen and none of the specimens subsequently reported in the literature under this name agree with the original description. Rare.

D. indicus Machida, 1994. Tropical Indian Ocean at Chagos Archipelago and Comoros. To 15 m on coral reefs. Rare.

D. megasoma Machida, 1994. Northern Territory, Australia. 0 to 15 m. Rare.

D. minyoma Sedor and Cohen, 1987. Bay Islands, Honduras in the western Caribbean. Collected on a coral reef at 0 to 9 m. Uncommon.

D. randalli Machida, 1994. Kosrae Island, Micronesia. Collected at 6 to 9 m on coral reefs. Rare.

D. riukiuensis Aoyagi, 1952. Ryukyu Islands; Queensland, Australia; Fiji. Collected on reefs at 0 to 3 m. Uncommon.

Remarks: The limits of this genus are not clear due to uncertainty about the identity of the type species (see above and Cohen and Nielsen, 1978). Aspects of the reproductive biology of species identified as ***D. iluocoeteoides*** have been described by Turner (1946) and Wourms and Bayne (1978).

Dipulus Waite, 1905

Type species: ***Dipulus caecus*** Waite, 1905 by monotypy.

Synonyms: None.

Number of recognized species: 2.

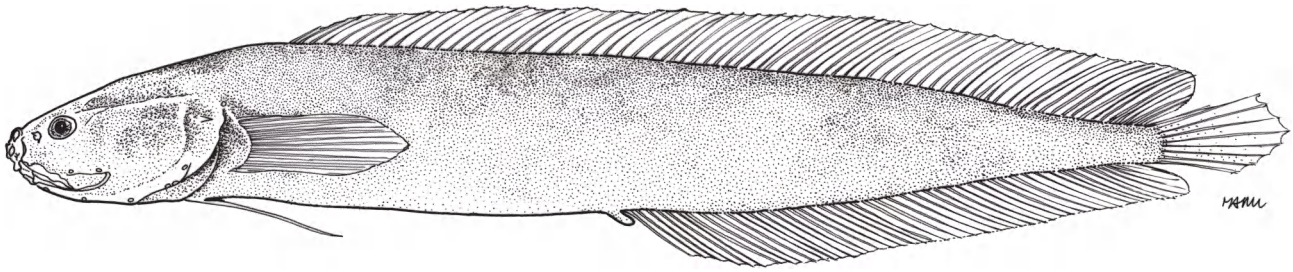


Fig. 126 ***Dipulus norfolkanus*** (after Machida, 1993a)

Diagnosis and description: Body relatively elongate, head length 4.3 to 6.5 or more in standard length; **scales absent from head and body; gill membranes joined to each other and to isthmus anteriorly; eye small, 7.6 or less in head length**, a short sharp spine on the opercle; **maxilla not vertically expanded posteriorly; branchiostegal rays 6; male intromittent organ with a single pair of pseudoclaspers**; dorsal-fin rays 89 to 183; anal-fin rays 58 to 120; pectoral-fin rays about 20. A freshly caught 117 mm specimen was brick-red with dark blue abdomen.

Revisions: Machida (1993).

Geographical distribution: West coast of Western Australia and Norfolk Island.

Habitat and biology: Shallow reefs. Apparently secretive in habit.

Interest to fisheries: None.

Size: At least 170 mm.

Key to species

1a. Anal-fin origin closer to snout than to caudal-fin base; precaudal vertebrae 22; anal-fin rays 112 to 120; pseudoclaspers much convoluted . . . . . ***Dipulus caecus***

1b. Anal-fin origin closer to caudal-fin base than to snout; precaudal vertebrae 13 to 15; anal-fin rays 58 to 65; pseudoclaspers of male not convoluted . . . . . ***D. norfolkanus***

List of species

Dipulus caecus Waite, 1905. Secretive in habit on shallow reefs along temperate to subtropical West Australian coasts. Uncommon.

D. norfolkanus Machida, 1993a. Apparently secretive in habit in shallow waters around Norfolk Island. Uncommon.

Fiordichthys Paulin, 1995

Type species: ***Fiordichthys slartibartfasti*** Paulin, 1995 by original designation.

Synonyms: None.

Number of recognized species: 1.

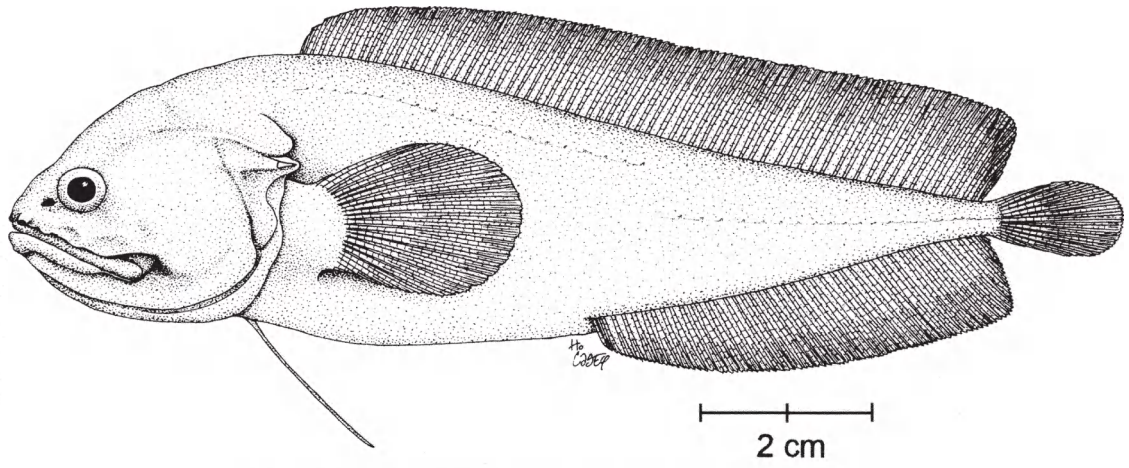


Fig. 127 ***Fiordichthys slartibartfasti*** (from Paulin, 1995)

Diagnosis and description: Body short, depth 4 in standard length; head about 1/2 of preanal length; body covered with small imbricate scales; head naked, about 3.5 in standard length; anterior nostril tubular, immediately above upper lip; teeth separate and sharp-pointed; opercular spine present; **maxilla expanded posteriorly and sheathed**; branchiostegal rays 7; fresh specimens yellow-tan; **male intromittent organ with a single pair of pointed ossified pseudoclaspers**; dorsal-fin origin over posterior margin of opercle; dorsal-fin rays 66; **anal-fin origin posterior to midpoint of body**; caudal-fin rays 14 or 15; pectoral-fin rays 21 to 23, mounted on a broad peduncle; precaudal vertebrae 15.

Revisions: None.

Geographical distribution: Known from 2 localities at the south end of South Island, New Zealand.

Habitat and biology: Areas of loose boulder rubble in holes and crevices at depths of 10 to 12 m.

Interest to fisheries: None.

Size: At least 111 mm.

List of species

Fiordichthys slartibartfasti Paulin, 1995. Information see above. Rare.

Gunterichthys Dawson, 1966

Type species: ***Gunterichthys longipenis*** Dawson, 1966 by original designation.

Synonyms: None.

Number of recognized species: 1.

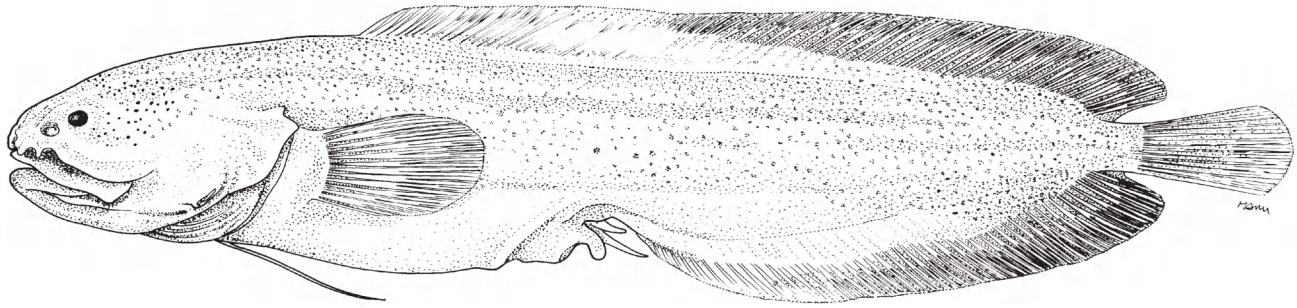


Fig. 128 ***Gunterichthys longipenis*** (after Dawson, 1966)

Diagnosis and description: Scales on body barely overlapping, absent from head; eye very small, about 18 in head; opercular spine slender and weak; maxilla slightly expanded posteriorly; gill membranes free from isthmus; developed gill rakers on first arch 7; branchiostegal rays 8; pectoral-fin rays 17 to 22; caudal-fin rays 12 to 15; precaudal vertebrae 11 or 12; **male intromittent organ with 1 pair of pseudoclaspers, each of which contains 2 ossified supports.**

Revisions: None.

Geographical distribution: In the northern Gulf of Mexico from Padre Island, Texas to southwest Florida.

Habitat and biology: Probably lives in burrows in a mud-sand substrate at depths to 9 m. Rarely collected except following an environmental disturbance, especially a heavy rain that lowers the salinity (Dawson, 1971).

Interest to fisheries: None.

Size: At least 55 mm.

List of species

Gunterichthys longipenis Dawson, 1966. Information see above. Probably common in its restricted habitat.

Melodichthys Nielsen and Cohen, 1986

(Treated under the tribe Brosmophycini on page 124.)

Monothrix Ogilby, 1897

Type species: ***Monothrix polylepis*** Ogilby, 1897 by monotypy.

Synonyms: None.

Number of recognized species: 2.

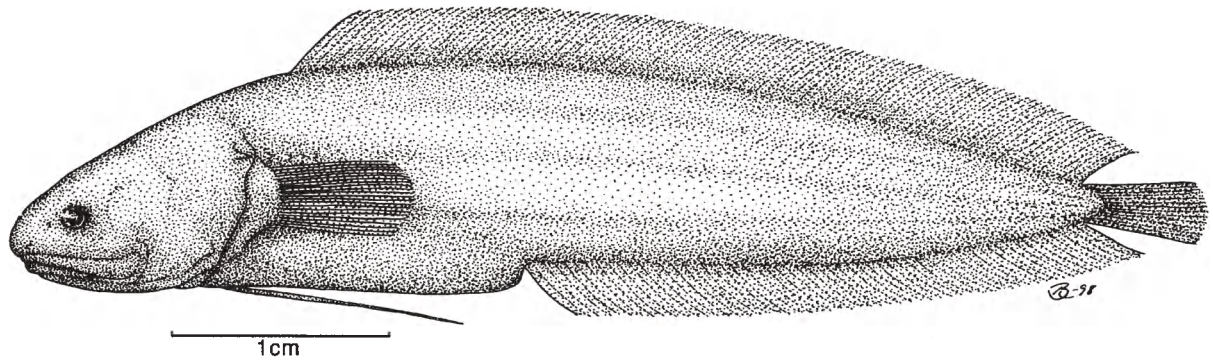


Fig. 129 *Monothrix polylepis*

Diagnosis and description: Most of body covered with imbricate scales, but loose skin at bases of vertical fins naked; head naked; maxilla expanded posteriorly, with a pointed process at the posterioventral corner; **opercle with 2 spines, the upper one directed posteriorly and the lower one, which is concealed, directed posterioventrally**; branchiostegal rays 7; pectoral-fin rays 22; caudal-fin rays 14; precaudal vertebrae 13 or 14.

Revisions: None.

Geographical distribution: New South Wales and north coasts of Australia.

Habitat and biology: Shallow water.

Interest to fisheries: None.

Size: At least 55 mm.

Key to species: Not possible at present.

List of species

Monothrix mizolepis (Günther, 1867). Tropical Australia. On shallow reefs. Common.

M. polylepis Ogilby, 1897. Temperate to subtropical coast of eastern Australia. Common on shallow reefs. Incorrectly recorded from Japan (Machida, 1992). Common.

Ogilbia Jordan and Evermann, 1898

Type species: ***Ogilbia cayorum*** Evermann and Kendall, 1898 by original designation.

Synonyms: ***Typhlias*** Hubbs, 1938. Type species ***Typhlias pearsei*** Hubbs, 1938. Preoccupied by ***Typhlias*** Bryce, 1910 in rotifers; ***Typhliasina*** Whitley, 1951. Replacement name for ***Typhlias*** Hubbs; takes the same type species; ***Caecogilbia*** Poll and Leleup, 1965. Type species ***Caecogilbia galapagosensis*** Poll and Leleup, 1965.

Number of recognized species: 6.

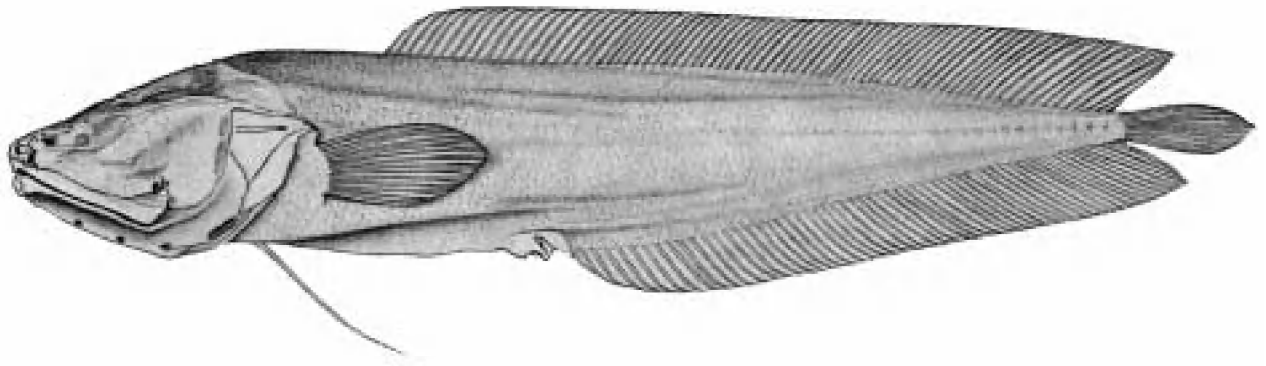


Fig. 130 ***Ogilbia galapagosensis*** (from Poll and Leleup, 1965)

Diagnosis and description: Body covered with imbricate scales; head squamation variable, scales present or absent on cheeks, absent from opercle; **eye diameter less than snout length (absent or minute and buried in some**); maxilla expanded and free posteriorly, **anterior nostril placed low on snout**; a sharp spine present on opercle, sometimes buried; branchiostegal rays 7; **intromittent organ of male with 2 pseudoclaspers, the larger a compressed ear-shaped lobe; precaudal neural spines pointed.**

Revisions: None.

Geographical distribution: So far as known found only in the New World tropics.

Habitat and biology: Living in habitats ranging from coral or rock reefs to fresh-water caves and sinkholes in the Yucatan and marine to brackish and fresh water in the Galapagos Islands. Reproductive biology has been described by Suarez (1975), and the comparative ecology of the 2 named Galapagos species has been discussed by van Moll (1967).

Interest to fisheries: None.

Size: Reaches to approximately 90 to 100 mm.

Key to species: Not possible at present.

List of species

Ogilbia cayorum Evermann and Kendall, 1898. Cryptic in shallow waters of the Florida Keys, possibly more widely distributed in the tropical western Atlantic. Locally abundant.

O. deroyi (Poll and van Mol, 1966). Cryptic in shallow water in the Galapagos Islands. Uncommon.

O. galapagosensis (Poll and Leleup, 1965). Known only from a few inland fresh to brackish water caves and crevices in the Galapagos Islands. Uncommon.

O. pearsei (Hubbs, 1938). Known only from caves and sinkholes in the Yucatan Peninsula. Uncommon.

O. ventralis (Gill, 1863a). Tropical eastern Pacific reefs; precise range unknown. Common.

O. verrillii (Garman, 1900). Either a Bermudan endemic or a junior synonym of ***O. cayorum.*** Uncommon.

Remarks: Unpublished research by Boyd Walker has demonstrated the existence of numerous undescribed species.

2.7 Family Aphyonidae

Family name: Aphyoninae Jordan and Evermann (1898).

Number of recognized genera: 6.

Diagnosis and description: Body elongate with **long dorsal- and anal-fin bases joined to caudal fin; scales absent, skin loose, transparent and gelatinous; eyes poorly developed or not visible; basibranchial tooth patches absent**; gill rakers present or absent; **swimbladder absent**; **viviparous**, males and often females with variously developed genital appendages; pelvic fin with 0 or 1 ray; **precaudal vertebrae 26 to 50.**

Habitat, distribution, and biology: Most probably living on or near the bottom at depths between 230 to 5 600 m. Found at lower latitudes in all oceans. Viviparous, with relatively few, large eggs and consequently large larvae. Except for ***Barathronus***, aphyonid larvae probably remain near the bottom.

Interest to fisheries: None.

Key to genera

1a. Anterior gill arch with 23 to 35 developed rakers; caudal-fin rays (9)10; adults with hour-glass shaped vertebral centra . . . . . ***Barathronus***

1b. Anterior gill arch with 0 to 14 developed rakers; caudal-fin rays 6 to 8; adults with rectangular vertebral centra in lateral view . . . . . → *2*

2a. Pectoral-fin peduncle much longer than wide . . . . . ***Sciadonus***

2b. Pectoral-fin peduncle as wide as long . . . . . → *3*

3a. Pelvic fins absent; no developed gill rakers on anterior arch . . . . . → *4*

3b. Pelvic fins with 1 ray in each; 3 to 19 developed gill rakers on anterior arch . . . . . → *5*

4a. Depth at anus about 7% standard length; mouth horizontal . . . . . ***Parasciadonus***

4b. Depth at anus more than 10% standard length; mouth oblique . . . . . ***Meteoria***

5a. Pectoral-fin rays 13 to 19; the almost horizontal mouth ending well behind eye . . ***Aphyonus***

5b. Pectoral-fin rays 23 to 27; the very oblique mouth ending in front of the vestigal eyes . . . . . ***Nybelinella***

List of nominal genera

Alexeterion Vaillant, 1888 (junior synonym of ***Barathronus***)
Aphyonus Günther, 1878
Barathronus Goode and Bean, 1886
Leucochlamys Zugmayer, 1911 (junior synonym of ***Sciadonus***)
Meteoria Nielsen, 1969
Nybelinella Nielsen, 1972
Nybelinia Nielsen, 1969 (preoccupied -substituted by ***Nybelinella***)
Parasciadonus Nielsen, 1984a
Sciadonus Garman, 1899

Aphyonus Günther, 1878

Type species: ***Aphyonus gelatinosus*** Günther, 1878 by monotypy.

Synonyms: None.

Number of recognized species: 4.

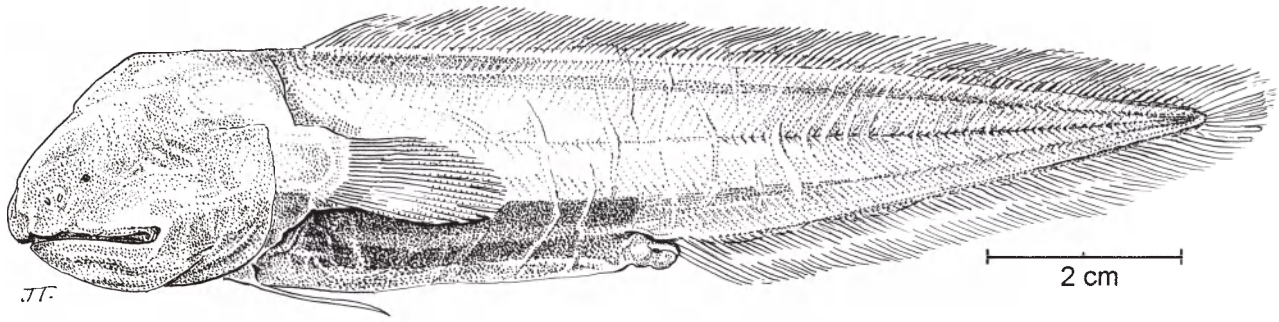


Fig. 131 ***Aphyonus gelatinosus*** (from Nielsen, 1969)

Diagnosis and description: **Body short**, **depth at anus more than 10% standard length**; eyes small or not externally visible; **palatines edentate**; anterior gill arch with **3 to 14 developed rakers**; dorsal-fin rays 68 to 116; caudal-fin rays 7 or 8; anal-fin rays 53 to 65; **pectoral fin with short peduncle and 13 to 19 rays; pelvic fin with 1 ray**; number of precaudal vertebrae 26 to 33, total vertebrae 55 to 84, **vertebral centra in adults rectangular in lateral view.**

Revisions: Nielsen (1974).

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthopelagic at 900 to 5 011 m.

Interest to fisheries: None.

Size: At least 25 cm.

Remarks: Material of 2 or 3 undescribed species is being studied.

Key to species

1a. Dorsal-fin rays 93 to 116; caudal vertebrae 50 to 53; predorsal length 28 to 30.5% standard length . . . . . ***A. gelatinosus***

1b. Dorsal-fin rays 68 to 75; caudal vertebrae 38 to 40; predorsal length 40.5 to 43.5% standard length . . . . . → *2*

2a. Long rakers on anterior gill arch 3 or 4; pectoral-fin rays 13 or 14 . . . . . ***A. rassi***

2b. Long rakers on anterior gill arch 9 to 14; pectoral-fin rays 16 or 17 . . . . . → *3*

3a. Long rakers on anterior gill arch 9; precaudal vertebrae 32; body depth at anterior end of dorsal fin 21% standard length; preanal length 59% standard length . . . . . ***A. brevidorsalis***

3b. Long rakers on anterior gill arch 14; precaudal vertebrae 26; body depth at anterior end of dorsal fin 11% standard length; preanal length 50% standard length . . . . ***A. bolini***

List of nominal species

Aphyonus bolini Nielsen, 1974. West Pacific Ocean, western Indian Ocean. Benthopelagic at 1 000 to 1 500 m. Rare.

A. brevidorsalis Nielsen, 1969. Off Southeast Africa. Benthopelagic at 1 500 m. Rare.

A. gelatinosus Günther, 1878. In all oceans. Benthic at 900 to 2 500 m. Uncommon.

A. mollis Goode and Bean, 1886 (junior synonym of ***A. gelatinosus***).

A. rassi Nielsen, 1975b. Caribbean Sea. Benthopelagic at 2 610 to 4 412 m. Rare.

Barathronus Goode and Bean, 1886

Type species: ***Barathronus bicolor*** Goode and Bean, 1886 by monotypy.

Synonyms: ***Alexeterion*** Vaillant, 1888, type species ***Alexeterion parfaiti*** Vaillant, 1888.

Number of recognized species: 9.

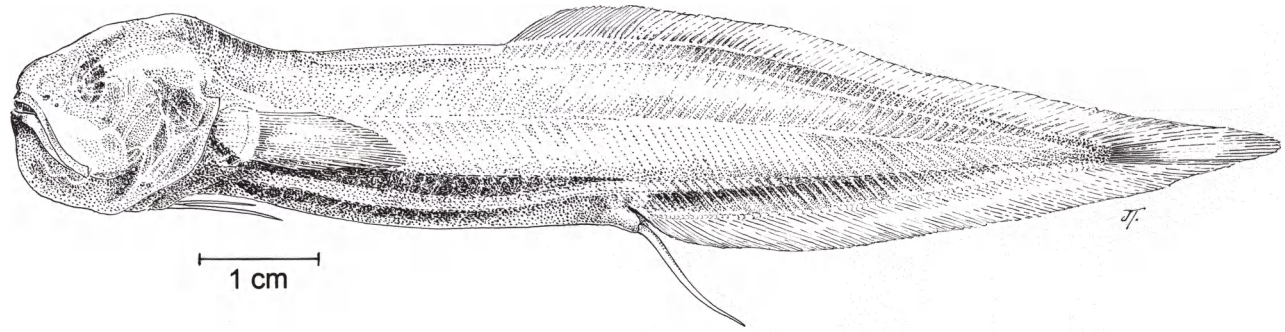


Fig. 132 ***Barathronus bicolor*** (from Nielsen, 1969)

Diagnosis and description: Body short; eyes deep-set; **palatine teeth present**; anterior gill arch with **23 to 35 developed rakers**; dorsal-fin rays 62 to 82; caudal-fin rays (9)10; anal-fin rays 49 to 73; **pectoral fin with short peduncle and 21 to 33 rays**; pelvic fin with 1 ray; precaudal vertebrae 26 to 38, total vertebrae 66 to 89, **vertebral centra in adults spindle-shaped in lateral view**.

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthic at 229 to 5 005 m. Okiyama and Kato (1997) described a 42 mm long epipelagic juvenile ***Barathronus pacificus***.

Interest to fisheries: None.

Size: At least 25 cm.

Remarks: Material of 2 or 3 undescribed species is being studied.

Key to species: Not possible at present.

List of species

Barathronus affinis Brauer, 1906. Indian Ocean. Benthopelagic at 2 919 m. Rare.

B. bicolor Goode and Bean, 1886. Gulf of Mexico and Caribbean Sea. Benthopelagic at 549 to 1561 m. Common.

B. bruuni Nielsen, 1969. Indian Ocean. Pelagic between 0 to 1 700 m. Rare.

B. diaphanus Brauer, 1906. Indian Ocean and West Pacific. Benthopelagic at 732 to 1 756 m. Rare.

B. maculatus Shcherbachev, 1976. Indian and West Pacific Oceans. Benthopelagic at 386 to 1 525 m. Rare.

B. multidens Nielsen, 1984b. Northwest Atlantic Ocean. Benthopelagic at 3 610 to 4 279 m. Rare.

B. pacificus Nielsen and Eagle, 1974. Northeast Pacific Ocean. Benthopelagic at 3 334 to 3 860 m. Rare.

B. parfaiti (Vaillant, 1888). East Atlantic Ocean. Benthopelagic at 1 845 to 5 005 m. Rare.

B. unicolor Nielsen, 1984b. Off Morocco and Florida. Benthopelagic at 2 931 to 3 934 m. Rare.

Meteoria Nielsen, 1969

Type species: *Meteoria erythrops* Nielsen, 1969 by monotypy.

Synonyms: None.

Number of recognized species: 1.

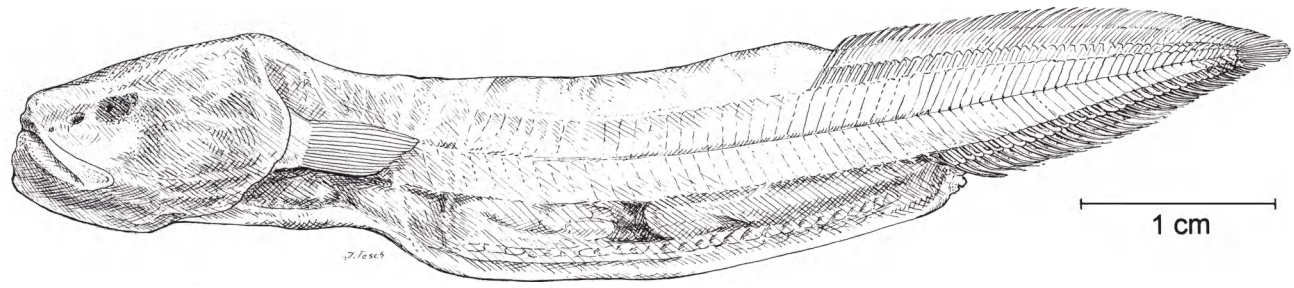


Fig. 133 *Meteoria erythrops* (from Nielsen, 1969)

Diagnosis and description: Body short, caudal part less than 1/3 of standard length; eyes minute; **palatines edentate; anterior gill arch with 0 developed and 7 or 8 vestigal rakers**; dorsal-fin rays 48 to 50; caudal-fin rays 8; anal-fin rays 34 to 40; **pectoral fin with short peduncle and 13 to 15 rays**; **pelvic fin absent**; precaudal vertebrae 39 to 41, total vertebrae 68 to 70, **vertebral centra in adults rectangular in lateral view.**

Revisions: Nielsen (1969).

Geographical distribution: Atlantic Ocean between 28° and 42°N.

Habitat and biology: Benthopelagic at 4 540 to 5 320 m.

Interest to fisheries: None.

Size: At least 75 mm.

Remarks: Material of 1 undescribed species is being studied.

List of species

M. erythrops Nielsen, 1969. Information see above. Rare.

Nybelinella Nielsen, 1972

Type species: ***Barathronus erikssoni*** Nybelin, 1957 by monotypy.

Synonyms: ***Nybelinia*** Nielsen, 1969 (preoccupied).

Number of recognized species: 2.

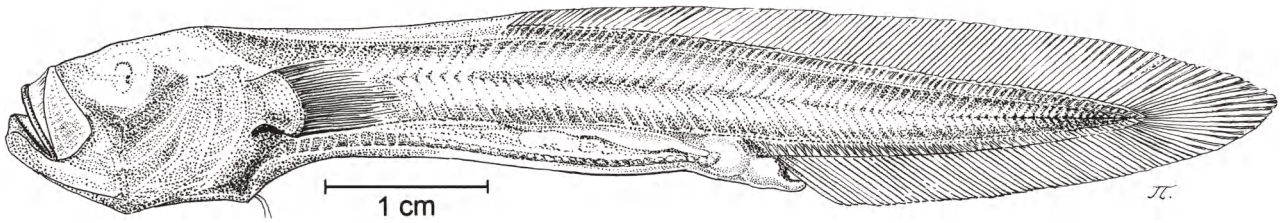


Fig. 134 ***Nybelinella erikssoni*** (from Nielsen, 1969)

Diagnosis and description: Narrow body, **caudal part about 1/3 of standard length**; eyes indistinct; **palatines edentate; anterior gill arch with 6 to 19 developed and 4 to 18 vestigal rakers**; dorsal-fin rays 70 to 102; caudal-fin rays 8; anal-fin rays 50 to 57; **pectoral fin with short peduncle and 23 to 27 rays**; pelvic fin with 1 ray; precaudal vertebrae 36 to 41, total vertebrae 70 to 79, **vertebral centra in adults rectangular in lateral view.**

Revisions: None.

Geographical distribution: Indian and Atlantic Oceans.

Habitat and biology: Benthopelagic at 4 640 to 5 440 m.

Interest to fisheries: None.

Size: At least 97 mm.

Remarks: Material of 1 undescribed species is being studied.

Key to species

1a. Long rakers on anterior gill arch 6 or 7; predorsal 40 to 42% standard length . . ***N. erikssoni***

1b. Long rakers on anterior gill arch 19; predorsal 52% standard length . . . . ***N. brevidorsalis***

List of species

Nybelinella brevidorsalis Shcherbachev, 1976. Southeastern Indian Ocean. Benthopelagic at 5 160 m. Rare.

N. erikssoni (Nybelin, 1957). Atlantic Ocean between 45°N and 27°S. Benthopelagic at 4 640 to 5 440 m. Rare.

Parasciadonus Nielsen, 1984

Type species: ***Parasciadonus brevibrachium*** Nielsen, 1984a by monotypy.

Synonyms: None.

Number of recognized species: 2.

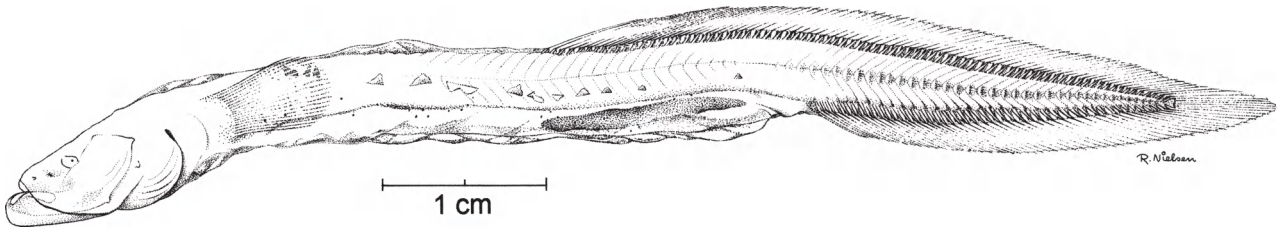


Fig. 135 ***Parasciadonus brevibrachium*** (from Nielsen, 1984)

Diagnosis and description: Body long and slender with lower jaw protruding and an almost horizontal mouth, head twice as wide as body, **depth of body at origin af anal fin about 7% standard length**; eyes extremely small; dentition very weak with **edentate palatines**; **anterior gill arch with 0 developed and 10 to 15 vestigal rakers**; dorsal-fin rays 47 to 78; caudal-fin rays 7 or 8; anal-fin rays 40 to 48; **pectoral fin with short peduncle and 12 to 20 rays; pelvic fin absent**; precaudal vertebrae 34 to 50, total vertebrae 62 to 85, **vertebral centra in adults rectangular in lateral view.**

Revisions: Nielsen (1997).

Geographical distribution: Central Atlantic Ocean and off New Caledonia.

Habitat and distribution: Benthopelagic at 3 680 to 5 073 m. No males known and females are without intromittant organ.

Interest to fisheries: None.

Size: At least 72 mm.

Key to species

1a. Dorsal-fin rays 78; anal-fin rays 48; pectoral-fin rays 20; precaudal vertebrae 50; anteriormost anal-fin ray below 33rd dorsal-fin ray . . . . . ***P. brevibrachium***

1b. Dorsal-fin rays 47; anal-fin rays 40; pectoral-fin rays 12; precaudal vertebrae 34; anteriormost anal-fin ray below 11th dorsal-fin ray . . . . . ***P. pauciradiatus***

List of species

Parasciadonus brevibrachium Nielsen, 1984a. Central Atlantic Ocean. Benthopelagic at 5 073 m. Rare.

P. pauciradiatus Nielsen, 1997. Off New Caledonia. Benthopelagic at 3 680 to 3 700 m. Rare.

Sciadonus Garman, 1899

Type species: ***Sciadonus pedicellaris*** Garman, 1899 by monotypy.

Synonyms: ***Leucochlamys*** Zugmayer, 1911, type species ***Leucochlamys cryptophthalmus*** Zugmayer, 1911.

Number of recognized species: 4.

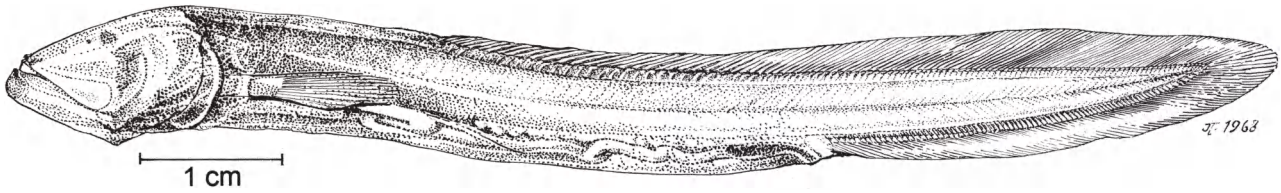


Fig. 136 ***Sciadonus galatheae*** (from Nielsen, 1969)

Diagnosis and description: Body long and slender with protruding lower jaw and almost horizontal mouth; eyes indistinct; **palatines edentate; anterior gill arch with 0 developed** and **1 to 15 vestigal rakers;** dorsal-fin rays 68 to 108; caudal-fin rays 6 or 7; anal-fin rays 42 to 48; **pectoral fin with 9 to 14 rays, pectoral-fin peduncle much longer than wide**; pelvic fin with 0 or 1 ray; precaudal vertebrae 39 to 48, total vertebrae 68 to 86, **vertebral centra in adults rectangular in lateral view.**

Revisions: Nielsen (1969).

Geographical distribution: Below tropical and subtropical areas of all oceans.

Habitat and biology: Benthopelagic at 1 785 to 5 610 m.

Interest to fisheries: None.

Size: At least 100 mm.

Remarks: Recently caught ***Sciadonus*** material indicates a wide variation of many of the meristic characters. Further studies may result in synonymizing some of the species.

Key to species: Not possible at present.

List of nominal species

Sciadonus cryptophthalmus (Zugmayer, 1911). Northeastern Atlantic Ocean. Benthopelagic at 5 000 m. Rare.

S. galatheae (Nielsen, 1969). Atlantic and Pacific Oceans. Benthopelagic at 1 785 to 5 440 m. Rare.

S. jonassoni (Nybelin, 1957). Atlantic Ocean. Benthopelagic at 5 045 to 5 610 m. Rare.

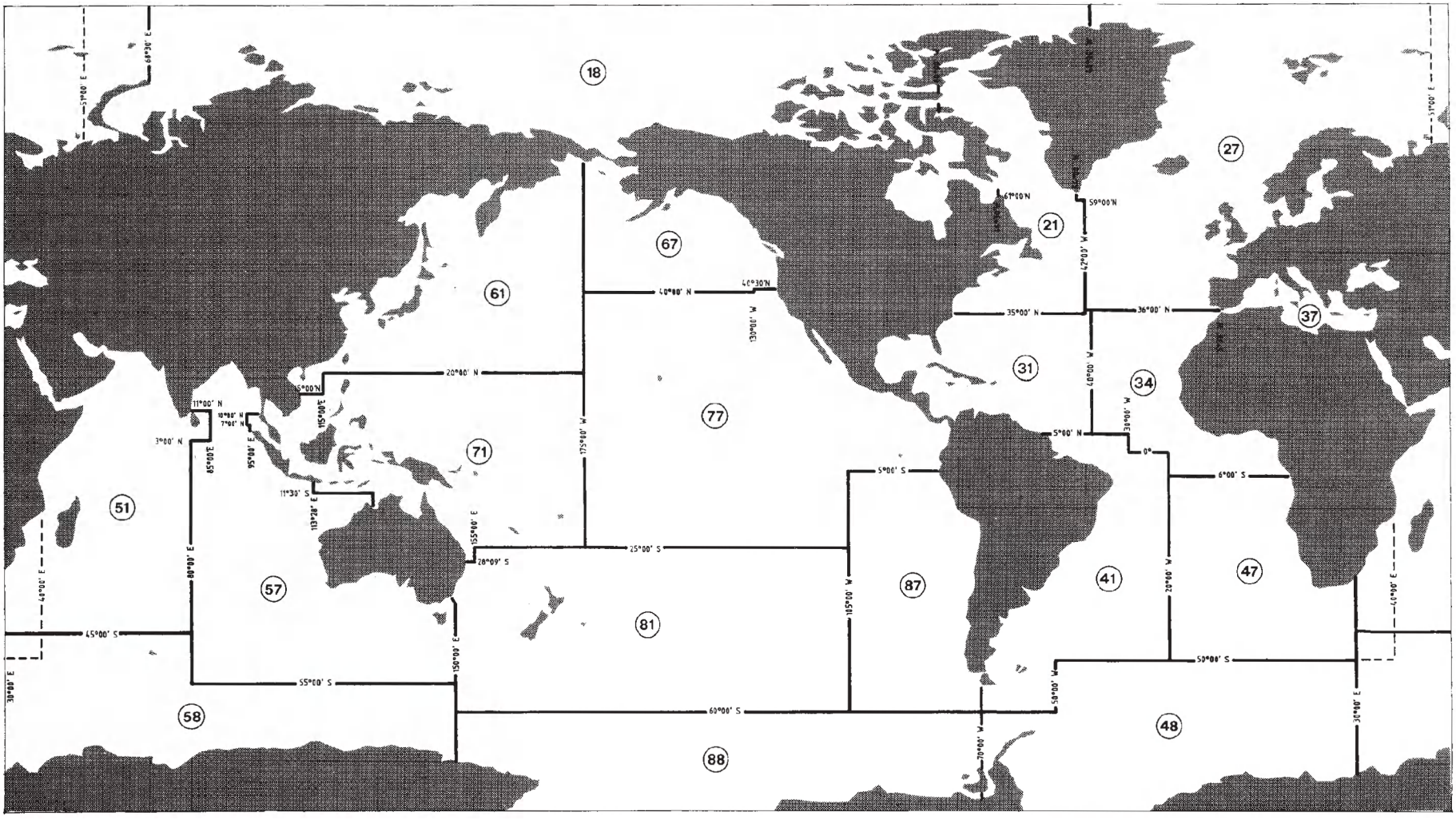
S. kullenbergi Nybelin, 1957 (junior synonym of ***S. pedicellaris***).

S. pedicellaris Garman, 1899. East Pacific and North Atlantic Oceans. Benthopelagic at 1 847 to 4 880 m, including ***Sciadonus*** **sp.** from Nielsen and Eagle (1974). Rare.

3. LIST OF SPECIES BY MAJOR FISHING AREAS

SPECIES	PAGE	GEOGRAPHICAL DISTRIBUTION										
		MAJOR FISHING AREAS FOR STATISTICAL PURPOSES										
		31	34	41	47	51	57	61	71	77	81	87
Brotula barbata	24	●	●	●	●							
Brotula multibarbata	25					●	●	●	●	●		
Genypterus blacodes	29			●			●				●	●
Genypterus capensis	31				●							
Genypterus chilensis	32											●
Genypterus maculatus	33											●
Genypterus tigerinus	34						●					
Lepophidium brevibarbe	36	●		●								
Lepophidium negropinna	37									●		●
Ophidion holbrooki	41	●		●								

MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES



4. BIBLIOGRAPHY

Aboussouan, A. 1980. Déscription d'une larve géante "rubaniforme", attribuée au genre Brotulotaenia (Pisces, Gadiformes, Ophidioidei, Ophidiidae) et récolté a l'est des Nouvelles Hebridés. *Cybium*, 3(10):51-64.

Alcock, A. 1889. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator". - No. 13. On the bathybial fishes of the Bay of Bengal and neighbouring waters, obtained during the seasons 1885-1889. *Ann.Mag.Nat.Hist.*, 6(4):376-399.

Alcock, A. 1890a. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator". - No. 16. On the bathybial fishes collected in the Bay of Bengal during the season 1889-90. *Ann.Mag.Nat.Hist.*, 6(6):197-222.

Alcock, A. 1890b. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator". - No. 18. On the bathybial fishes of the Arabian Sea, obtained during the season 1889-90. *Ann.Mag.Nat.Hist.*, 6(6):295-311.

Alcock, A. 1890c. Natural history notes from H.M. Indian Survey Steamer "Investigator". - No. 20. On some undescribed shore-fishes from the Bay of Bengal. *Ann.Mag.Nat.Hist.*, 6(6):425-443.

Alcock, A. 1891. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator". - Ser. II, No. 1. On the results of deep-sea dredging during the seasom 1890-91. *Ann.Mag. Nat.Hist.*, 6(6):16-34.

Alcock, A. 1892a. *Illustrations of the Zoology of H.M. Indian Marine Survey Steamer INVESTIGATOR*. Part. I, plates I-VII.

Alcock, A. 1892b. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator". - Ser.II, No. 5. On the bathybial fishes collected during the season of 1891-92. *Ann.Mag. Nat.Hist.*, 6(10):345-365.

Alcock, A. 1893. New species of *Lophius, Physiculus, Neobythites, Odontostomus*, and *Congromuraena*. *J.Asiatic Soc.Bengal*, 62:177-184.

Alcock, A. 1894. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator". - No. 11. An account of a recent collection of bathybial fishes from the Bay of Bengal and from the Laccadive Sea. *J.Asiatic Soc.Bengal*, 58(2):115-140.

Alcock, A. 1895. Natural History notes from H.M. Indian Survey Steamer "Investigator". - Ser.II, No. 18. On a new species of viviparous fish of the family Ophidiidae. *Ann.Mag.Nat.Hist.*, 6(16):144-146.

Alcock, A. 1896. A supplementary list of the marine fishes of India, with descriptions of 2 new genera and 8 new species. *J.Asiatic.Soc.Bengal*, 65:301-338.

Alcock, A. 1898. Natural history notes from H. M. Indian Survey Steamer "Investigator". - Ser. II, No. 25. A note on the deep-sea fishes, with descriptions of some new genera and species, including another probably viviparous ophidioid. *Ann.Mag.Nat.Hist.*, 7(2):136-156.

Ambrose, D.A. 1996. Ophidiiformes, 512-545. In H.G. Moser (ed.): *The early stages of fishes in the California current region*. California Cooperative Oceanic fisheries Investigations. Atlas No. 33:1-1489.

Ancona-Lopez, A.A. 1956. Ocorrencia de *Carapus* Raf. (= *Fierasfer* Oken) no Brazil (Teleostei-Carapidae). *Pap.Avulsos Dep.Zool.(Sao Paulo)*, 12:389-398.

Aoyagi, H. 1952. Studies on the coral fishes of the Riu-kiu Islands. VIII. Gobiesocidae, Limnichthidae, Parapercidae, Brotulidae, Bothidae, and Soleidae. *Zool.Mag.*, 61:233-236.

Arai, R. 1969. *Bythites matsubarai*, a new brotulid fish from Japan. *Japan.J.Ichthyol.*, 16:74-77.

Arambourg, C. 1967. Résultats scientifiques de la mission C. Arambourg en Syrie et en Iran (1938-1939). II. Les poissons Oligocènes de l'Iran. *Not.Mém.Moyen-Orient, Mus.Nat.Hist. Nat.Paris*, 8:11-210.

Arnold, D.C. 1956. A systematic revision of the fishes of the teleost family Carapidae (Percomorphi, Blennioidea), with descriptions of two new species. *Bull.British Mus.(Nat. Hist.)*, 4(6):245-307.

Ayres, W.D. 1854. (Description of new fishes from California). *Proc.Calif.Acad.Sci.*, 1:3-22.

Ayres, W.D. 1860. (Descriptions of new species of fishes). *Proc.Calif.Acad.Sci.*, 2:52-64.

Balanov, A.A. and V.V. Fedorov. 1996. About some deep-sea fishes new to the Bering Sea. *J.Ichthyol.*, 36(4):313-316.

Barnard, K.H. 1927. A monograph of the marine fishes of South Africa. Part II. *Ann.S.Afr.Mus.*, 21:419-1065.

Barnard, K.H. 1934. New records and descriptions of two new species of South African marine fishes. *Ann.Mag.Nat.Hist.*, 10(13):228-234.

Bini, G. 1969. *Atlante dei pesci delle coste Italiane*. Vol. VII:1-200.

Bleeker, P. 1854. Lets over visshen levende in zweesterren en over eene nieuwe soort van *Oxybelus*. *Nat.Tijdschr.Ned.-Ind.*, 7:162-163.

Bleeker, P. 1855. Bijdrage tot di kennis der ichthyolische fauna van de Batoe Islanden. *Nat.Tijdschr. Ned.-Ind.*, 8:305-328.

Bleeker, P. 1856. Vijrae bijdrage tot de kinnis der ichthyologische fauna van de Banda-eilander. *Nat. Tijdschr.Ned.-Ind.*, 11:93-110.

Bleeker, P. 1858. Vierde bijdrage tot de kennis der ichthyologische fauna van Japan. *Act.Soc.Sci. Indo-Nederlandicae*, 3:1-46.

Bloch, M.E. and J.G. Schneider. 1801. *Systema ichthyologiae iconobus ex illustratum*. Berlin, 584 pp.

Boeseman, M. 1960. Notes on marine fishes from the Netherlands Antilles, with the description of a new species, *Eutyx tumidifrons* (Brotulidae). *Zool.Med.*, 37:11-16.

Böhlke, J. 1955. The brotulid fish genus *Petrotyx* from the Great Bahama Bank. *Acad.Nat.Sci.Phila. Not.Nat.*, 273:1-6.

Böhlke, J.E. 1957. A new shallow-water ophidioid fish from the Great Bahama Bank. *Acad.Nat.Sci. Phila.Not.Nat.*, 295:1-8.

Böhlke, J.E. and C.C.G. Chaplin. 1968. *Fishes of the Bahamas and adjacent tropical waters*. Livingston Publ. Comp., Wynnewood, Pa., 771 pp.

Böhlke, J.E. and D.M. Cohen. 1966. A new shallow water ophidoid fish from the West Atlantic. *Acad. Nat.Sci.Phila.Not.Nat.*, 396:1-8.

Böhlke, J.E. and C.R. Robins. 1959. Studies on fishes of the family Ophidiidae. II. Three new species from the Bahamas. *Proc.Acad.Nat.Sci.Philad.*, 111:37-52.

Bougis, P. and M. Ruivo. 1954. Recherches sur le poisson de profondeur *Benthocometes robustus* (Goode et Bean) (= *Pteridium armatum*, Doederlein) (Brotulidae). Vie et Milieu, suppl. 3:155-209.

Brauer, A. 1906. Die Tiefsee-Fische. 1. Systematischer Teil. *Wiss.Ergeb.Disch.Tiefsee-Exped.*, 15(1):1-420.

Breder, C.M. 1936. Scientific results of the second oceanographic expedition of the PAWNEE 1926. Heterosomata to Pediculati. *Bull.Bing.Oceanogr.Coll.*, 2(3):1-56.

Brunnich, M.T. 1768. *Ichthyologia Massiliensis, sitens piscium descriptiones eorumque apud incolas nomina.* Accedunt Spolia Maris Adriatici. Hafniae et Lipsiae, 110 pp.

Byrne, L.W. 1906. A new species of *Pteridium* (Scopoli) from the North-east Atlantic. *Ann.Mag.Nat. Hist.*, 7(18):448-450.

Carrasson, M. and J. Matallanas. 1990. Preliminary data about the feeding habits of some deep-sea Mediterranean fishes. *J.Fish.Biol.*, 36:461-463.

Carter, H.J. 1983. *Apagesoma edentatum*, a new genus and species of ophidiid fish from the western North Atlantic. *Bull.Mar.Sci.*, 33:94-101.

Carter, H.J. and D.M. Cohen. 1985. *Monomitopus magnus*, a new species of deep-sea fish (Ophidiidae) from the western North Atlantic. *Bull.Mar.Sci.*, 36:86-95.

Carter, H.J. and J.A. Musick. 1985. Sexual dimorphism in the deep-sea fish *Barathrodemus manatinus* (Ophidiidae). *Copeia*, 1985:69-73.

Carter, H.J. and K.J. Sulak. 1984. A new species and a review of the deep-sea fish genus *Porogadus* (Ophidiidae) from the western North Atlantic. *Bull.Mar.Sci.*, 34:358-379.

Cervigón, F. 1991. *Los peces marinos de Venezuela.* Second edition.

Chan, W. L. 1966. A new genus and species of deep-sea brotulid from the South China Sea. *Japan. J. Ichthyol.*, 14:4-8.

Chirichigno F.N. 1974. Clave para identificar los peces marinos del Peru. *Inf.Inst.Mar Péru*, 44:1-387.

Cohen, D.M. 1961. A new genus and species of deepwater ophidiiid fish from the Gulf of Mexico. *Copeia*, 1961:288-292.

Cohen, D.M. 1963. A new genus and species of bathypelagic ophidioid fish from the western North Atlantic. *Breviora*, 196:1-8.

Cohen, D.M. 1964a. A review of the ophidioid fish genus *Luciobrotula* with the description of a new species from the western North Atlantic. *Bull.Mar.Sci.*, 14:387-398.

Cohen, D.M. 1964b. A review of the ophidioid genus *Oligopus* with the description of a new species from West Africa. *Proc.U.S.Nat.Mus.*, 116:1-22.

Cohen, D.M. 1966. A new tribe and a new species of ophidioid fish. *Proc.Biol.Soc.Wash.*, 79:189-204.

Cohen, D.M. 1973. Viviparous ophidioid fish genus *Calamopteryx*: new species from western Atlantic and Galapagos. *Proc.Biol.Soc.Wash.*, 86:339-350.

Cohen, D.M. 1974. A review of the pelagic ophidioid fish genus *Brotulataenia* with descriptions of two new species. *Zool.J.Linn.Soc.*, 55:119-149.

Cohen, D.M. 1981a. New and rare ophidiiform fishes from the eastern Atlantic: Canary Islands to the Cape of Good Hope. *Proc.Biol.Soc.Wash.*, 94:1085-1103.

Cohen, D.M., 1981b. *Saccogaster melanomycter* (Ophidiiformes: Bythitidae), a new fish species from the Caribbean. *Proc.Biol.Soc.Wash.*, 94:374-377.

Cohen, D.M. 1982. The deepsea fish genus *Enchelybrotula* (Ophidiidae): description of a new species, notes on distribution, and osteology. *Bull.Mar.Sci.*, 32:99-111.

Cohen, D.M. 1986. Bythitidae, pp. 354-356. In: M.M. Smith and P.C. Heemstra (eds): *Smiths' Sea Fishes*. J.L.B. Smith Inst. of Ichthyology, Grahamstown,1047 pp.

Cohen, D.M. 1987. Notes on the bythitid fish genus *Saccogaster* with a new species from the Gulf of Mexico. *Nat.Hist.Mus. Los Angeles Co.Contrib.Sci.*, 385:1-4.

Cohen, D.M., D.A. Hensley and J.J. Kimmel III. 1991. The deepsea ophidiid fish genus *Lamprogrammus*, a senior synonym of *Bassobythites*, with notes on the synonymy and distribution of *L. brunswigi*. *Japan.J.Ichthyol.*, 38:125-132.

Cohen, D.M. and J.B. Hutchins. 1982. Description of a new *Dinematichthys* (Ophidiiformes: Bythitidae) from Rottnest Island, Western Australia. *Rec.West.Aust.Mus.*, 9(4):341-347.

Cohen, D.M. and J.E. McCosker. 1998. A new species of bythitid fish, genus *Lucifuga*, from the Galapagos Islands. *Bull.Mar.Sci.*, 63:179-187.

Cohen, D.M. and J.G. Nielsen. 1972. A review of the viviparous ophidioid fishes of the genus *Saccogaster*. *Proc.Biol.Soc.Wash.*, 85:445-468.

Cohen, D.M. and J.G. Nielsen. 1978. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. *NOAA Tech. Rep. NMFS Circ.*, 417:1-72.

Cohen, D.M. and J.G. Nielsen. 1982. *Spottobrotula amaculata*, a new ophidiid fish from the Philippines. *Copeia*, 1982:497-500.

Cohen, D.M. and C.R. Robins. 1970. A new ophidioid fish (genus *Lucifuga*) from a limestown sink, New Providence Island, Bahamas. *Proc.Biol.Soc.Wash.*, 83:133-144.

Cohen, D.M. and C.R. Robins. 1986. A review of the ophidiid fish genus *Sirembo* with a new species from Australia. *Mem. Qd. Mus.*, 22:252-263.

Cohen, D.M. and B.A. Rohr. 1993. Description of a giant circumglobal *Lamprogrammus* species (Pisces: Ophidiidae). *Copeia*, 1993:470-475.

Cohen, D.M., R.H. Rosenblatt and H.G Moser. 1990. Biology and description of a bythitid fish from deep-sea thermal vents in the tropical eastern Pacific. *Deep-Sea Research*, 37:267-283.

Cohen, D.M. and J.P. Wourms. 1976. *Microbrotula randalli*, a new viviparous fish from Samoa and New Hebrides, whose embryos bear trophotaeniae. *Proc.Biol.Soc.Wash.*, 89:81-98.

Cuvier, G. 1815. Observations et recherches critiques sur différentes poissons de la Méditerranée et, à leur occasion, sur des Poissons des autres mers, plus ou moins liés avec eux. *Mem. Mus.Natl.Hist.Nat.*, 1:119.

Cuvier, G. L. 1829. *Le règne animal distribué d'apres son organisation, pour servir de base à l'histoire naturelle des animaux, et l'introduction l'anatomie comparée*. Second edition, 2:1-406. Paris.

Dawson, C.E. 1966. *Gunterichthys longipenis*, a new species of ophidioid fish from the northern Gulf of Mexico. *Proc.Biol.Soc.Wash.*, 79:205-214.

Dawson, C.E. 1971. Supplemental observations on *Gunterichthys longipenis*, a northern Gulf of Mexico brotulid fish. *Copeia*, 1971:154-167.

Day, F. 1888. *Fishes of India*. Suppl. London, pp. 779-816.

de Astarola, J.M.D. and D.E. Figueroa. 1993. Las especies del género *Genypterus* (Pisces, Ophidiiformes) presentes en aguas argentinas. *Univ. Católica del Norte, Fac. Ciencias del Mar, Ser. Occ.*, 2:47-56.

DeKay, J.E. 1842. Zoology of New York; or the New York State Fauna; comprising detailed descriptions of all animals observed within the state of New York, with brief notices of those occasionally found near its borders. In *Natural History of New York, Part 4. Fishes*, 415 pp.

Doederlein, P. 1886. Descrizione zoologico-zootomica di una novella specie de pesce del mar di Sicilia, *Pteridium armatum* Dod. *Nat.Sicil.*, 5:73-80.

Diaz Perez, P.A. 1988. *Lucifuga teresinarum* sp. nov. Nueva especie Cubano de peces troglobios (Ophidiiformes, Bythitidae). *Revista Biol.*, 2:37-43.

Dollo, M.L. 1906. *Neobythites brucei*, poisson abyssal nouveau recuilli par l'Expédition Antarctique Nationale Ecossaise. Note préliminaire. *Proc.R.Soc.Edinbourg*, 26:172-182.

Eigenmann, C.H. 1909. Cave vertebrates of America. *Carnegie Inst. Wash. Publ.*, 104, 241 pp.

Eschmeyer, W.N. 1998. *Catalog of fishes*. California Academy of Sciences. Special publication No. 1 of the Center for Biodiversity Research and Information. Vols. 1-3:1-2905.

Evermann, B.W. and W.C.Kendall. 1898. Descriptions of new or little known species of fishes from the United States. *Bull.U.S.Fish Comm.(1897)*, 17:125-133.

Fahay, M.P. 1992. Development and distribution of cusk eel eggs and larvae in the Middle Atlantic Bight with a description of *Ophidion robinsi* n.sp. (Teleostei: Ophidiidae). *Copeia*, 1992(3):799-819.

Fischer, J.G. 1885. Ichthyologische und herpetologische Bemerkungen. *Jahrb.Hamburg wiss.Anst.*, 2:49-119.

Filippi, F. de, and A. Kolliker. 1856. Ueber de Schwimmblase des *Oligopus ater* Risso. *Z.Wiss Zool.*, 7:170-171.

Fitch, J.E. and R.J. Lavenberg. 1968. *Deep-water fishes of California*. University of California Press, 155 pp.

Follett, W.I. 1970. Benthic fishes cast ashore by giant waves near Pt. Joe, Monterey County, California. *Proc.Calif.Acad.Sci.*, (4)37:473-488.

Fourmanoir, P. and J. Rivaton. 1979. Poissons de la pente récifale externe de Nouvelle-Calédonie et des Nouvelles-Hébrides. *Cahiers de l'Indo-Pac.*, 1:405-443.

Fowler, H.W. 1900. Contributions to the ichthyology of the tropical Pacific. *Proc.Acad.Nat.Sci.Phila.*, (1900):493-528.

Fowler, H.W. 1925. New taxonomic names of West African marine fishes. *Am.Mus.Novitates*, 162:1-5.

Fowler, H.W. 1927. Fishes of the tropical central Pacific. *Bull.Bishop Mus.*, 38:1-38.

Fowler, H.W. 1934. Fishes obtained by Mr. H.W. Bell-Marley chiefly in Natal and Zululand in 1929 to 1932. *Proc.Acad.Nat.Sci.Philad.*, 86:405-514.

Fowler, H.W. 1938. The fishes of the George Vanderbilt South Pacific Expedition, 1937. *Monogr. Acad.Nat.Sci.Philad.*, 2:1-349.

Fowler, H.W. 1941. Notes on Florida fishes with descriptions of seven new species. *Proc.Acad.Nat.Sci.Philad.*, 93:81-106.

Fowler, H.W. 1946. A collection of fishes obtained in the Riu Kiu Islands by Captain Ernest R. Tinkham A.U.S. *Proc.Acad.Nat.Sci.Philad.*, 98:123-218.

Fowler, H.W. 1948. Description of a new cusk (*Otophidium grayi*) from the east coast of Florida. *Not.Nat.Philad.*, 204:1-4.

Fowler, H.W. and H. Steinitz. 1956. Fishes from Cyprus, Iran, Israel and Oman. *Bull.Res.Counc.Israel* 5B, 260-292.

Garman, S. 1899. The fishes. *Mem.Mus.comp.Zool.Harv.*, 24:1-431.

Garman. S. 1900. Additions to the ichthyological fauna of the Bermudas, from the collections of the Yale expedition of 1898. *Trans.Conn.Acad.*, 10:510-512.

Gasco, F. 1870. Intorno ad un nuovo genere di pesci. *Bull.Assoc.Nat.Med.Napoli*, 1870:59-61.

Gibbs, M.A. 1991. Notes on the distribution and morphology of the rubynose brotula (*Cataetyx rubrirostris*) off Central California. *Calif.Fish and Game*, 77:149-152.

Giglioli, E.H. 1883. Intorno a due nuovi pesci dal Golfo di Napoli. *Zool.Anz.*, 6:397-400.

Gilbert, C.H. 1890. Preliminary report on the fishes collected by the steamer Albatross on the Pacific Coast of North America during the year 1889, with descriptions of 12 new genera and ninety-two new species. *Proc.U.S.Natl.Mus.*, 13:49-126.

Gilbert, C.H. 1891. Descriptions of thirty-four new species of fishes collected in 1888 and 1889, principally among the Santa Barbara Islands and the Gulf of California. *Proc.U.S.Natl. Mus.*, 14:539-566.

Gilbert, C.H. 1905. Part II, Section II. The deepsea fishes, pp. 577-713. In D.S. Jordan and B.W. Evermann (eds.). *The aquatic resources of the Hawaiian Islands. Bull.U.S.Fish.Comm.*, 23.

Gilchrist, J.D.F. 1903. Descriptions of new South African fishes. *Mar.Invest.S.Afr.*, 2:203-211.

Gilchrist, J.D.F. and C. von Bonde. 1924. Deep-sea fishes procurred by the S.S. "Pickle" (pt. 2). *Union S.Afr.Fish Mar.Biol.Surv.* 1922, Spec. Rept. VII: 1-24.

Gill, T.N. 1861a. Catalogue of the fishes of the western coast of North America. *Proc.Acad.Nat.Sci. Philad.* (1861), suppl., 63 pp.

Gill, T.H. 1861b. Notes on some genera of fishes on the western coast of North America. *Proc.Acad.Nat.Sci.Philad.,* (1861):164-168.

Gill, T.N. 1862. Notice of a collection of the fishes of California, presented to the Smithsonian Institution, by Mr. Samuel Hubbard. *Proc.Acad.Nat.Sci.Philad.*. (1862):274-282.

Gill, T.N. 1863a. Descriptions of the genera of gadoid and brotuloid fishes of western North America. *Proc.Acad.Nat.Sci.Philad.,* 15:242-254.

Gill, T.N. 1863b. Description of a new generic type of ophidioids. *Proc.Acad.Nat.Sci.Philad,* 15:209-211.

Gill, T.N. 1864. On the affinity of several doubtful British fishes. *Proc.Acad.Nat.Sci.Philad,* 16:199-208.

Gill, T.N. 1884. Diagnosis of new genera and species of deep-sea fish-like vertebrates. *Proc.U.S. Natl.Mus.*, 6:253-260.

Gill, T.N. 1895. The genus *Leptophidium.Amer.Nat.*, 29(338): 167-168.

Girard, C.F. 1858a. Fishes. In *General report upon zoology of the several Pacific railroad routes, 1852*. U.S. Senate Misc. Doc., 78:400 pp.

Girard, C.F. 1858b. Notes upon various new genera and new species in the museum of the Smithsonian Institution, and collected in connection with the United States and Mexican Boundary survey: Major William Emory, Commissioner. *Proc.Acad.Nat.Sci.Philad,* 10:167-171.

Goode, G.B. and T.H. Bean. 1883. Reports on the results of dredging under the supervision of Alexander Agassiz, on the east coast of the United States, during the summer of 1880, by the U. S. Coast Survey steamer "Blake". XIX. Report on the fishes. *Bull.Mus.Comp. Zool.Harvard Coll.*, 10:183-226.

Goode, G.B. and T.H. Bean. 1885a. Description of *Lepophidium cervinum* and *L. marmoratum*, new fishes from deep water off the Atlantic and Gulf coasts. *Proc.U.S.Natl.Mus.*, 8(533): 422-424.

Goode, G.B. and T.H. Bean. 1885b. Description of new fishes obtained by the United States Fish Commission mainly from deep water off the Atlantic and Gulf coasts. *Proc.U.S.Natl.Mus.*, 8:589-605.

Goode, G.B. and T.H. Bean. 1886. Description of thirteen species and two genera of fishes from the "Blake" collection. *Bull.Mus.Comp.Zool.Harvard Coll.*, 12:153-170.

Goode, G.B. and T.H. Bean. 1896. Oceanic Ichthyology. *U.S.Natl.Mus.Spec.Bull.* 2, 553 pp.

Gordon, D.J., D.F. Markle and J.E. Olney. 1984. Ophidiiformes: Development and relationships, pp. 308-319. In H.G. Moser et al. (ed.): *Ontogeny and systematics of fishes*. Special publ., No. 1. American Society of Ichthyologists and Herpetologists, 760 pp.

Gosline, W.A. 1953. Hawaiian shallow-water fishes of the family Brotulidae, with the description of a new genus and notes on brotulid anatomy. *Copeia*, 1953:215-225.

Gosline, W.A. 1954. Fishes killed by the 1950 eruption of Mauna Loa. II. Brotulidae. *Pac.Sci.*, 8:68-83.

Gregory, W.K. 1959. *Fish skulls - a study of the evolution of natural mechanisms*. Lundberg, Florida, 481 pp.

Grey, M. 1951. Additions to the fish fauna of Bermuda, with the description of *Grammonus mowbrayi*, a new brotulid. *Copeia*, 1951:153-161.

Grey, M. 1958. Descriptions of abyssal benthic fishes from the Gulf of Mexico. *Fieldiana Zool.*, 39(16):149-183.

Guichenot, A. 1848. Peces de Chile. In C. Gay: *Historia fisica y politica de Chile*, Zoologia, 2: 149-183.

Günther, A. 1862. *Catalogue of the fishes in the British Museum*, 4:1-534.

Günther, A. 1867. Additions to the knowledge of Australian reptiles and fishes. *Ann.Mag.Nat.Hist.*, 3(20):45-68.

Günther, A. 1877. Preliminary notes on new fishes collected in Japan during the expedition of H.M.S. "Challenger". *Ann.Mag.Nat.Hist.*, 4(20):433-446.

Günther, A. 1878. Preliminary notices of deep-sea fishes collected during the voyage of H.M.S. Challenger. *Ann.Mag.Nat.Hist.*, 5(2):17-28.

Günther, A. 1880. Report on the shore fishes procured during the voyage of H.M.S. Challenger in the years 1873-1876. In *Report on the scientific results of the voyage of H.M.S. Challenger during the years 1873-76. Zoology.* Vol. 1 (part 6): 1-82.

Günther, A. 1887. Report on the deep-sea fishes collected by H. M. S. Challenger during the years 1873-76. *Zool.Challenger Exped.*, 5(22):1-335.

Günther, A. 1909. Andrew Garrett's Fische der Südsee. *Jour. Mus.Godeffroy*, 6:261-388.

Harbison, G.R., K.L. Smith and R.H. Backus. 1973. *Stygiomedusa fabulosa* from the North Atlantic, its taxonomy, with a note on its natural history. *J.Mar.Biol.Assoc.U.K.*, 53:615-617.

Harry, R.R. 1951. A new cusk-eel of the genus *Ophidion* from California with notes on the genus. *Stanford Ichthyol.Bull.*, 4(1): 30-35.

Heller, E. and R.E. Snodgrass. 1903. Papers from the Hopkins Stanford Galapagos Expedition, 1898-1899. XV. New fishes. *Proc.Acad.Sci.Wash.*, 5:189-229.

Hart, J. L. 1973. Pacific Fishes of Canada. *Bull.Fish.Res.Board Canada*, 180:1-740.

Herre, A.W. 1935. New fishes obtained by the Crane Pacific Expedition. *Publ.Field Mus.Zool.*, 18:383-438.

Herre, A.W. 1953. Check list of Philippine fishes. U. S. Fish and Wildlife Service, *Res. Rep.*, 20:1-977.

Herre, A.W. and E.S. Herald. 1951. Noteworthy additions to the Philippine fish fauna with descriptions of a new genus and species. *Philipp.J.Sci.*, 79:309-399.

Hildebrand, S.F. and O. Barton. 1949. A collection of fishes from Talara, Perú. *Smithson.Misc.Collect.*, 111(10):1-36.

Howell Rivero, L. 1934. Nuevo genero de peces para Cuba. *Mem.Soc.Cubano.Hist.Nat.*, 8:69-72.

Howes, G.J. 1992. Notes on the anatomy and classification of ophidiiform fishes with particular reference to the abyssal genus *Acanthonus* Günther, 1878. *Bull.Br.Mus.nat.Hist.(Zool.)*, 58:95-131.

Howes, G.J. 1997. Observations on the head anatomy of the abyssal ophidiiform genus *Typhlonus* Günther, 1878, with comments on its phylogenetic relationships. *South African J.Sci.*, 93:574-578.

Hubbs, C.L. 1916. Notes on the marine fishes of California. *Univ.Calif.Publ.Zool.*, 16(13):153-169.

Hubbs, C.L. 1938. Fishes from the caves of Yucatan. *Carnegie Inst. Wash. Publ.*, 491:153-169.

Hubbs, C.L. 1944. Species of the circumtropical fish genus *Brotula. Copeia*, 1944:162-178.

Hureau, J.-C. and J.G. Nielsen. 1981. Les poissons Ophidiiformes des campagnes du n. o. "Jean Charcot" dans l'Atlantique et la Méditerranée. *Cybium*, 5:3-27.

Hureau, J.-C., J.C. Staiger and J.G. Nielsen. 1979. A new species of deep-sea brotulid fish, *Typhlonus delosommatus*, from the tropical Atlantic Ocean. *Bull.Mar.Sci.*, 29:272-277.

Hutton, F.W. 1875. Contributions to the ichthyology of New Zealand. *Trans.N.Z.Inst.*, 8:209-218.

Jenkins, O.P. 1901. Descriptions of fifteen new species of fishes from the Hawaiian Islands. *Bull.U.S. Fish Comm.*, 19(1899):387-404.

Jones, J.M. 1874. A new fish. *The Zool.*, 9:3837-3838.

Jordan, D.S. 1885. A catalogue of the fishes known to inhabit the waters of North America, north of the Tropic of Cancer, with notes on species discovered in 1883 and 1884. *Rep.U.S.Fish Comm.*, 13: 789-793. (1887, separate issued 1885).

Jordan, D.S. 1919. The genera of fishes, pt. II. *Stanford Univ.Publ.Univ.Ser.*, 36:167-284.

Jordan, D.S. and C.H. Bollman. 1890. Descriptions of new species collected at the Galapagos Islands and along the coast of the United States and Colombia, 1877-88. *Proc.U.S.Natl.Mus.*, 12(770):149-183.

Jordan, D.C. and B.F. Evermann. 1896. A check-list of the fishes and fish-like vertebrates of North and Middle America. *Rep.Comm.U.S.Fish Comm.* for 1895, 584 pp.

Jordan, D.S. and B.F. Evermann. 1898. The fishes of North and Middle America. *Bull.U.S.natn.Mus.*, 47(III):2183-3136.

Jordan, D.S. and B.F. Evermann. 1902. Notes on a collection of fishes from the Island of Formosa. *Proc.U.S.Natl.Mus.*, 25:315-368.

Jordan, D.S. and B.W. Evermann, 1903. Descriptions of new genera and species of fishes from the Hawaiian Islands. *Bull.U.S.Fish Comm.*, 22:161-208.

Jordan, D.S. and H.W. Fowler. 1902. A review of the ophidioid fishes of Japan. *Proc.U.S.Natl.Mus.*, 25:743-766.

Jordan, D.S. and C.H. Gilbert, 1882a. Descriptions of thirty-three new species of fishes from Mazatlan, Mexico. *Proc.U.S.Natl.Mus.*, 4:338-365.

Jordan, D.S. and C.H. Gilbert. 1882b. Notes on fishes observed about Pensacola, Florida, and Galveston, Texas, with descriptions of new species. *Proc.U.S.Natl.Mus.*, 5:241-307.

Jordan, D.S. and C.H. Gilbert. 1883. Description of two new species of fishes (*Aprion ariommus* and *Ophidium beani* from Pensacola, Florida. *Proc.U.S.Natl.Mus.*, 6(355):142-144.

Jordan, D. S. and C. L. Hubbs. 1925. Record of fishes obtained by David Starr Jordan in Japan, 1922. *Mem.Carnegie Mus.*, 10:93-346.

Jordan, D.S. and J.O. Snyder. 1901. List of fishes collected in 1883 and 1885 by Pierre Louis Jouy and preserved in the United States National Museum, with descriptiion of six new species. *Proc.U.S.Natl.Mus.*, 23:740-769.

Jordan, D.S. and W.F. Thompson. 1914. Record of fishes obtained in Japan in 1911. *Mem.Carnegie Mus.*, 6:205-313.

Kamohara, T. 1936. Supplementary note on the fishes collected in the vicinity of Kocho-shi (IX). *Zool.Mag.,Tokyo*, 48(6):306-311 (in Japanese with English summary).

Kamohara, T. 1938. *On the offshore bottom-fishes of Prov. Tosa, Shikoku, Japan*. Maruzen, Tokyo, 86 pp.

Kaup, J.J. 1856a. Einiges über die Unterfamilie Ophidinae. *Arch.Naturgesch.*, 22:93-100.

Kaup, J.J. 1856b. *Catalogue of the apodal fish in the collection of the British Museum*. London, 163 pp.

Kaup, J.J. 1858. Übersicht der Familie Gadidae. *Arch.Naturgesch.*, 24:85-93.

Kaup, J.J. 1860. On some new genera and species of fishes collected by Doctors Keferstein and Heckle at Messina. *Ann.Mag.Nat.Hist.*, 6:270-273.

Klausewitz, W. and F. Uiblein. 1994. Tiefenwasser- und Tiefseefische aus dem Roten Meer. XVII. *Oligopus robustus*, a new record for the Red Sea, with comparative studies on specimens from the Gulf of Aden (Pisces: Ophidiiformes: Bythitidae). *Senckenbergiana maritima*, 25:21-28.

Klunzinger, C.B. 1872. Zur Fischfauna von Süd-Australien. *Arch.Naturgesch.*, 38(1):17-47,

Kotthaus, A. 1979. Fische des Indischen Ozeans, XXI. *"Meteor" Forsch.-Ergebnisse*, Reihe D(28):6-54.

Koefoed, E. 1927. Fishes from the Sea Bottom. *Rep. Sci. Res. "Michael Sars" N. Atlantic Deep-Sea Exped. 1910*, 4(1):1-147.

Last, P.R., E.O.G. Scott and F.H. Talbot. 1983. *Fishes of Tasmania*. Tasmanian Fisheries Development Authority, 563 pp.

Lay-son, J.C. 1984. Contribution to the taxonomy of *Genypterus blacodes* (Schneider, 1801) (Osteichthyes, Ophidiiformes). *Cienc. y Tec. del Mar. CONA*, 8:27-39.

Lea, R.N. 1980. *Systematics and zoogeography of cusk-eels of the family Ophidiidae, subfamily Ophidiinae, from the eastern Pacific.* Ph.d., University of Miami, 188 pp.

Lea, R.N. 1995. Ophidiidae. Brótolas, congriperlas. In W. Fischer, F. Krupp, W. Schneider, C. Sommer, K.E. Carpenter, and V.H. Niem (eds). *Guia FAO para la identificación de especies para los fines de la pesca. Pacifico centro-oriental*, FAO, Rome, pp. 1342-1348.

Lea, R.N. 1997. A new and unique ophidiine cusk-eel from the Panamic region of the eastern North Pacific. *Bull.Mar.Sci.*, 60(3):960-965.

Lea, R.N. and P. Béarez. 1999. Occurrence of *Chilara taylori* (Ophidiidae) from Ecuadorian waters. *Cybium*, 23(1):99-100.

Lee, R.S. 1974. *Thalassobathia nelsoni*, a new species of bathypelagic fish from Chilean waters. *Copeia*, 1974:629-632.

Linnaeus, C. 1758. Systema naturae sive regna tria naturae secundum classes, ordines, genera, species, cum charecteribus, differentiis synonymis, locis. 10th edition, Vol. 1. Holmiae Salvii, 824 pp.

Linnaeus. C. 1766. Systema naturae sive regna tria naturae secundum classes, ordines, genera, species, cum charecteribus, differentiis synonymis, locis. Laurentii Salvii, Holmiae. Twelfth edition, (pt.1), 532 pp.

Lowe, R.T. 1843. Notices of fishes newly observed or discovered in Madeira during the years 1840, 1841 and 1842. *Proc.Zool.Soc.London*, 1843 (pt. 11):81-95.

Lloyd, R.E. 1909. A description of the deep-sea fish caught by the R.I.M.S. "Investigator" since the year 1900, with supposed evidence of mutation in *Malthopsis*. *Mem. Indian Mus.*, 2:139-180.

Machida, Y. 1984. Ophidiidae. In *Fishes of the Okinawa Trough and adjacent waters*. Vol. I. Japan. Fish. Res. Conservation Ass. 414 pp.

Machida, Y. 1989a. A new deep-sea ophidiid fish, *Bassozetus levistomatus*, from the Izu-Bonin Trench, Japan. *Japan.J.Ichthyol.*, 36:187-189.

Machida, Y. 1989b. First record of the deep-sea fish *Xyelacyba myersi* (Ophidiidae, Ophidiiformes) from Japan. *Japan.J.Ichthyol.*, 36:120-125.

Machida, Y. 1990. A new ophidiid species, *Hoplobrotula badia*, from Sagami Bay, Central Japan. *Japan.J.Ichthyol.*, 37:209-214.

Machida, Y. 1992. Comments on the scientific and Japanese names of small bythitid species inhabiting coral reefs. *Japan.J.Ichthyol.*, 39:270-271

Machida, Y. 1993a. *Dipulus norfolkanus*, a new shallow-water bythitid fish from Australia (Ophidiiformes). *Japan.J.Ichthyol.*, 40:43-46.

Machida, Y. 1993b. Two new genera and species of the subfamily Brosmophycinae (Bythitidae, Ophidiiformes) from northern Australia. *Japan.J.Ichthyol.*, 39:281-286.

Machida, Y. 1994. Descriptions of three new and one resurrected species of the bythitid genus *Dinematichthys* (Ophidiiformes). *Japan.J.Ichthyol.*, 40:451-464.

Machida, Y. 1996. *Parabrosmolus novaeguineae*, a new genus and species of the subfamily Brosmophycinae from Papua New Guinea (Bythitidae, Ophidiiformes). *Ichthyol.Res.*, 43:47-151.

Machida, Y. 1997. *Hastatobythites arafurensis*, a new bythitid genus and species from Australia (Bythitidae, Ophidiiformes). *Ichthyol.Res.*, 44:385-388.

Machida, Y. and O. Okamura. 1992. Revision of the bathyal fish genus *Homostolus* (Ophidiiformes, Ophidiidae). *Japan.J.Ichthyol.*, 38:341-347.

Machida, Y. and O. Okamura. 1993. The sympatric occurrence of the carapid fishes *Pyramodon ventralis* and *P. lindas* in Japanese waters. *Japan.J.Ichthyol.*, 40:153-160.

Machida, Y., H. Wu, J. Zhong and H. Endo. 1997. Notes on a specimen of the deep-sea pelagic fish *Brotulotaenia nielseni* from the South China Sea (Ophidiidae). *Ichthyol.Res.*, 44:421-424.

Machida, Y. and T. Yochida. 1984. First record of *Brosmophycis pautzkei* (Bythitidae, Ophidiiformes) from Japan. *Mem.Fac.Sci.Kochi Univ.Ser.D (Biol.)*, 5:37-41.

Mann F., G. 1954. *La vida de los peces en aguas chilensis*. Min. de Agricultura, Chile, 339 pp.

Markle, D.F. 1989. Aspects of character homology and phylogeny of the Gadiformes, pp. 59-88. In D.M. Cohen (ed.): *Papers on the systematics of gadiform fishes*. Los Angeles Co. *Mus.Nat. Hist.Sci.Ser.*, 32:1-262.

Markle, D.F. and J.E. Olney. 1990. Systematics of the pearlfishes (Pisces: Carapidae). *Bull.Mar.Sci.*, 47:269-410.

Markle, D.F., J.T. Williams and J.E. Olney. 1983. Description of a new species of *Echiodon* (Teleostei: Carapidae) from the Antarctic and adjacent seas. *Proc.Biol.Soc.Wash.*, 96:745-657.

Masuda, H., K. Amaoka, C. Araga, T. Uyeno and T. Yoshino (eds). 1984. *The fishes of the Japanese Archipelago*. Tokai Univ. Press, 437 pp., 370 pls.

Matallanas, J. 1990. *Ophidion lozanoi*, (Pisces: Ophidiiformes) an undescribed ophidiid from the north east Atlantic. *J.Fish.Biol.*, 37(3):449-453.

Matsubara, K. 1943. *Ichthyological annotations from the depth of the Sea of Japan*. I-VII. *J. Sigenkagaku Kenkyusyo*, 1:37-81.

Matsubara, K. 1953. On a new pearl-fish, *Carapus owasianus*, with notes on the genus *Jordanicus* Gilbert. *Japan.J.Ichthyol.*, 3:29-32.

Mayer, R.F. and T.T. Nalbant. 1972. Additional species of fishes in the fauna of Peru Trench. Results of the 11th cruise of R/V "Anton Bruun", 1965. *Rev. Roum.Biol.-Zoologie*, 17:159-165.

McCulloch, A.R. and E.R. Waite. 1918. Some new and little-known fishes from South Australia. *Rec. S. Aust. Mus. Adelaide*, 1:39-78.

Mead, G.W., E. Bertelsen and D.M. Cohen. 1964. Reproduction among deep-sea fishes. *Deep-Sea Res.*, 11:569-596

Meek, S.E. and S.F. Hildebrand, 1928. The marine fishes of Panama. Part III. *Publ. Field Mus. Nat. Hist. (Zool.)*, 15:709-1045.

Menni, R.C. and H.L. López. 1974. Presencia en la Argentina de *Raneya fluminensis* (Miranda-Ribeiro, 1903) Robins, 1961. *Neotropica*, 20:1-6.

Meyer-Rochow, V.B. 1970. *Cataetyx memoriabilis* n. sp.- ein neuer Tiefsee-Ophidiide aus dem südöstlichen Atlantik. *Abh. Verh. Naturwiss. Ver. Hamburg* (NF), 14:37-53.

Miranda-Ribeiro, A. de. 1903. Pescas do "Annie". *A Lavoura, Bol. Soc. Nac. Agric. Rio de Janeiro*, 1903 (nos. 4-7):1-53.

Müller, J. 1842. Fortsetzung der Untersuchungen über die Schwimmblase der Fische mit Bezug auf einige neue Fischgattungen. *Ber.Verh.Preuss Akad.Wiss.*, 1842:202-210.

Müller, J. 1845. Untersuchungen über die Fische, Schluss der vergleichende Anatomie der Myxinoiden. *Abh.Preuss.Akad.Wiss.*, 1843:109-170.

Nakamura, I. 1986. Ophidiidae. In I. Nakamura (ed.): *Important fishes trawled off Patagonia*. Japan Marine Fishery Resources Center for Tokyo, pp. 142-149.

Nalbant, T.T. 1981. A study of the subterranean species of *Lucifuga* from Cuba, with the description of *Lucifuga simile* sp. n. (Pisces, Ophidiiformes, Bythitidae). *Res.Exped. Biospel Cubano-Roumaines a Cuba*, 3:185-190.

Nalbant, T.T. and R.F. Mayer. 1971. New and rare species of fishes from the Peru-Chile Trench, collected during the 11th cruise of R/V "Anton Bruun" (1965). *Rev.Roum.Biol.-Zool.*, 16(5):315-324.

Nelson, J.S. 1994. *Fishes of the world*. Third edition, 600 pp.

Nichols, J.T. and C.M. Breder, Jr. 1922. *Otophidium welshi*, a new cusk eel, with notes on two others from the Gulf of Mexico. *Proc.Biol.Soc.Wash.*, 35:13-16.

Nielsen, J.G. 1965. On the genera *Acanthonus* and *Typhlonus* (Pisces, Brotulidae). *Galathea Rept.*, 8:33-47.

Nielsen, J.G. 1969. Systematics and biology of the Aphyonidae (Pisces, Ophioidea). *Galathea Rept.*, 10:7-88.

Nielsen, J.G. 1971. Redescription of the genus *Selachophidium* (Pisces, Brotulidae) with two new species. *Arch.Fischereiwiss.*, 22:17-33.

Nielsen, J.G. 1972. Rare Northeast Atlantic aphyonid fishes (Ophidioidei). *"Meteor" Forsch.-Ergebnisse*, Reihe D. No. 12:52-55.

Nielsen, J.G. 1974. *Aphyonus bolini*, a new deep sea fish from the South China Sea (Pisces, Ophidioidei, Aphyonidae). *Steenstrupia*, 3:179-182.

Nielsen, J.G. 1975a. A review of the oviparous ophidioid fishes of the genus *Leucicorus*, with description of a new Atlantic species. *Trudy Inst.Okeanol.*, 101:106-123. (Translation 74 from NOAA, Washington D. C.).

Nielsen, J.G. 1975b. List of ophidioid fishes from the 14th cruise of the "Akademik Kurchatov" with a new species of *Aphyonus*. *Trudy Inst.Okeanol.*, 100:348-353.

Nielsen, J.G. 1977. The deepest living fish *Abyssobrotula galatheae*. A new genus and species of oviparous ophidioids (Pisces, Brotulidae). *Galathea Rept.*, 14:41-48.

Nielsen, J.G. 1980. *Holcomycteronus* Garman, 1899: An ophidiid genus distinct from *Bassogigas* Goode and Bean, 1896 (Pisces, Ophidiiformes). *Steenstrupia*, 6:17-20.

Nielsen, J.G. 1984a. *Parasciadonus brevibrachium* n. gen. et sp. - An abyssal aphyonid from the Central Atlantic (Pisces, Ophidiiformes). *Cybium*, 1984, 8(1):39-44.

Nielsen, J.G. 1984b. Two new, abyssal *Barathronus* spp. from the North Atlantic (Pisces, Aphyonidae). *Copeia*, 1984(3):579-584.

Nielsen, J.G. 1986. *Leptobrotula breviventralis*, a new bathyal fish genus and species from the Indo-West Pacific (Ophidiiformes, Ophidiidae). *Copeia*, 1986:166-170.

Nielsen, J.G. 1995. A review of the species of the genus *Neobythites* (Pisces: Ophidiidae) from the western Indian Ocean, with descriptions of seven new species. *Ichthyol.Bull.*, 2:1-19.

Nielsen, J.G. 1997. Deepwater ophidiiform fishes from off New Caledonia with six new species. In B. Séret (ed.), Résultats des Campagnes MUSORSTOM, 16. *Mém.natn.Hist.nat.*, vol. 170:1-33.

Nielsen, J.G. 1999. Atlantic occurrence of the genus *Neobythites* (Pisces, Ophidiidae) with three new species. *Bull.Mar.Sci.Gulf and Carib.*

Nielsen, J.G. and G. Bini. 1972. A Mediterranean record of the West Atlantic fish, *Lepophidium cervinum* (Ophidiidae). *Copeia*, 1972(3):597-599.

Nielsen, J.G. and D.M. Cohen. 1968. Redescription of *Bellottia apoda* Giglioli, 1883 (Pisces, Ophidioidea). *Proc.Linn.Soc.London*, 179:99-106.

Nielsen, J.G. and D.M. Cohen. 1973. A review of the viviparous ophidioid fishes of the genera *Bythites* Reinhardt and *Abythites* New (Pisces, Ophidioidei). *Steenstrupia*, 3:71-88.

Nielsen, J.G. and D.M. Cohen. 1986. *Melodichthys*, a new genus with two new species of upper bathyal bythitids (Pisces, Ophidiiformes). *Cybium*, 1986, 10:381-387.

Nielsen, J.G. and R.J. Eagle. 1974. Description of a new species of *Barathronus* (Pisces, Aphyonidae) and four specimens of *Sciadonus* sp. from the eastern Pacific. *J.Fish.Res.Board Can.*, 31:1067-1072.

Nielsen, J.G. and S. Evseenko. 1989. Larval stages of *Benthocometes robustus* (Ophidiidae) from the Mediterranean. *Cybium*, 13:7-12.

Nielsen, J.G. and J.-C. Hureau. 1980. Revision of the ophidiid genus *Spectrunculus* Jordan and Thompson, 1914, a senior synonym of *Parabassogigas* Nybelin, 1957 (Pisces, Ophidiiformes). *Steenstrupia*, 6:149-169.

Nielsen, J.G., A. Jespersen and O. Munk. 1968. Spermatophores in Ophidioidea (Pisces, Percomorphi), *Galathea Rept.*, 9:230-254.

Nielsen, J.G. and Y. Machida. 1988. Revision of the Indo-Pacific fish genus *Glyptophidium* (Ophidiiformes, Ophidiidae). *Japan.J.Ichthyol.*, 35:289-319.

Nielsen, J.G. and O. Nybelin. 1963. Brotulidae (Pisces, Percomorpha) from tropical West Africa. *Atl. Rep.*, 7:195-213.

Nielsen, J.G. and J.-C. Quero. 1991. Quelques Ophidiiformes de l'ile de la Réunion: déscription d'une espèce nouvelle. *Cybium*, 15:193-198.

Nielsen, J.G. and M.E. Retzer. 1994. Two new bathyal *Neobythites* spp. from the Caribbean Sea (Pisces, Ophidiidae). *Copeia*, 1994:992-995.

Nielsen, J.G. and F. Uiblein. 1993. Tiefenwasser und Tiefseefische aus dem Roten Meer. XVI. A new species of *Neobythites* from the NW Indian Ocean and the Red Sea. *Senckenbergiana maritima*, 23:109-113.

Nielsen, J.G. and N.R. Merrett. (in press). Revision of the cosmopolitan deep-sea genus *Bassozetus* (Pisces, Ophidiidae) with two new species. *Galathea Rept.*, 18.

Norman, J.R. 1939. Fishes. *The John Murray Expedition 1933-34 scientific reports*, 7(1):1-116.

Nybelin, O. 1957. Deep-sea bottom-fishes. *Rep. Swed. deep Sea Exped.*, 2 (Zool. No. 20):247-345.

Nybelin, O. and M. Poll. 1958. Brotulidae des cotes africaines de l'Atlantique Sud avec déscription d'une espèce nouvelle de *Lamprogrammus*. *Inst.Roy.Sci.Nat.Belg.Bull.*, 34(19):1-7.

Ogilby, D. 1896. Descriptions of two new genera and species of Australian fishes. *Proc.Linn.Soc. N.S.W.*, 21:136-142.

Ogilby, D. 1897. New genera and species of Australian fishes. *Proc.Linn.Soc.N.S.W.*, 22:65-95.

Ogilby, D. 1898. Additions to the fauna of Lord Howe Island. *Proc.Linn.Soc.N.S.W.*, 23:730-745.

Ogilby, J.D. 1922. Three new Queensland fishes. *Mem.Qld.Mus.*, 7:301-304.

Oken, L. 1817. V. Kl. Fische. In *Isis oder Encyclopädische Zeitung*, v. 8:1779-1782 (for 1179-1182).

Okiyama, M. and H. Kato. 1997. A pelagic juvenile of *Barathronus pacificus* (Ophidiiformes: Aphyonidae) from the Southwest Pacific, with notes on its metamorphosis. *Ichthyol.Res.*, 44:222-226.

Osorio, B. 1917. Nota sobre alguna especes de peixes que vivem no Atlantico ocidental. *Arq.Univ. Lisboa*, 4:103-131.

Parr, A.E. 1933. Deepsea Berycomorphi and Percomorphi from the waters around the Bahama and Bermuda Islands. *Bull.Bingham Oceanogr.Coll.*, 3(6):1-51.

Parr, A.E. 1934. Report on experimental use of a triangular trawl for bathypelagic collecting with an account of the fishes obtained and a revision of the family Cetomimidae. *Bull.Bingham Oceanogr.Coll.*, 4(6):1-59.

Patterson, C. and D.E. Rosen. 1989. The Paracanthopterygii revisited: order and disorder, pp. 5-36. In D.M. Cohen (ed.): *Papers on the systematics of gadiform fishes. Science ser. No. 32.* Nat. Hist. Mus. Los Angeles County:1-262.

Paulin, C.D. 1995. Description of a new genus and two new species of bythitid fishes, and a redescription of *Bidenichthys consobrinus* (Hutton) from New Zealand. *J.Nat.Hist.*, 29:249-258.

Paulin, C. D. and C.D. Roberts. 1989. A new genus and species of bythitid Fish (Teleostei: Ophidiiformes) from New Zealand. *J.Nat.Hist.*, 23:355-361.

Peters, W. 1855. Uebersicht der in Mossambique beobachteten Fische. *Arch.Naturgesch.*, 21:234-282.

Petit, M.G. 1934. Un fierasfer nouveau de Madagascar. *Bull.Hist.Nat.Paris*, 2:393-397.

Philippi, R.A. 1857. Ueber einige Chilienische Vögel und Fische. *Arch.Naturgesch.*, 23(1):212-272.

Poey, F. 1861. *Memorias sobra la historia natural de las Isla de Cuba, acompañadas de sumarios Latinos y extractos en Francés*, 2:337-442.

Popta, C.M.L. 1912. Fortsetzung der Beschreibung von neuen Fischarten der Sunda-Expedition. *Notes Leyden Mus.*, 34:185-193.

Poll, M. and N. Leleup. 1965. Un poisson aveugle noveau de famille des Brotulidae. *Bull.Acad. R. Belge cl.Sci.*, 5(51):464-474.

Poll, M. and J.J. Van Mol. 1966. Au suject d'une espèce inconnue de brotulidae littoral de isles Galapagos, apparentee à la espèce aveugle *Caecogilbia galapagosensis* Poll et Leleup. *Bull Acad.R.Belge cl.Sci*, 5(52):1444-1451.

Putnam, F.W. 1874. Notes on Ophidiidae and Fierasferidae, with descriptions of new species from America and the Mediterranean. *Proc.Boston Soc.Nat.Hist.*, 16:339-348.

Radcliffe, L. 1913. Descriptions of seven new genera and thirty-one new species of fishes of the families Brotulidae and Carapidae from the Philippine Islands and the Dutch East Indies. *Proc.U.S.Natl.Mus.*, 44:135-176.

Rafinesque, C.S. 1810. *Indice d'Ittiologia Siciliana*. Mesina, 70 pp.

Rass, T.C. 1955. Deep-sea fishes of the Kurile-Kamchatka Trench. *Trudy Okean. Inst.*, 12:328-339.

Reed, E.P. 1962. El congrio chileno. Anales de la Acad. *Chilena de Ciencias Naturales*, 5:131-134.

Regan, C.T. 1903a. Description of a new fish of the genus *Genypterus*, with notes on the allied species. *Ann.Mag.Nat.Hist.*, 7:11(66):599-600.

Regan, C.T. 1903b. On a collection of fishes made by Dr. Goeldi at Rio Janeiro. *Proc.Zool.Soc. London*, 2 (pt. 1):59-68.

Regan, C.T. 1914. Fishes. British Antarctic ('Terra Nova') expedition, 1910. *Nat.Hist.Rep.Zoology*, vol. 1:1-54.

Regan, C.T. 1921. New fishes from deep water off the coast of Natal. *Ann.Mag.Nat.Hist.*, 2(7):412-420.

Reid, E.D. 1940. A new genus and species of pearl fish, family Carapidae, from off Gorgona Island, Colombia. *Allen Hancock Pacific Exped.*, 9:47-50.

Reinhardt, J. 1835. {Preliminary Report}. *Overs. K. Danske Vidensk. Selsk. Forh. 1834-35*:1-40.

Reinhardt, J. 1837. *Ichthyologiske bidrag til den grønlandske fauna*. 1. Copenhagen, 122 pp.

Rendahl, H. 1921. Results of Dr. E. Mjoberg's Swedish Scientific Expeditions to Australia, 1910-1913. XXVIII, Fische. *K. Svenska Vetensk. Akad. Handl.*, 61:1-24.

Richardson, J. 1846. Ichthyology, pp. 1-139. In *The zoology of the voyage of HMS "Erebus" and "Terror" under the command Capt. Sir J. C. Ross during 1839-43*. London.

Richardson, J. 1848. Fishes. In A. Adams. *The Zoology of the Voyage of H.M.S. "Samarang" under the command of Captain Sir Edward Belcher during the years 1843-1846*. London, 28 pp.

Risso, A. 1810. *Ichthyologie de Nice, ou histoire naturelle des poissons du departement des Alpes Maritimes*. F. Schoell, Paris, 388 pp.

Risso, A. 1826. *Histoire naturelle de principales productions de l'Europe Meridionale*. Levrault, Paris, 480 pp.

Robins, C.R. 1957. Effects of storms on the shallow-water fish fauna of southern Florida with new records of fishes from Florida. *Bull.Mar.Sci.Gulf and Carib.*, 7(3):266-275.

Robins, C.R. 1959a. Studies on fishes of the family Ophidiidae.- I. A new species of *Lepophidium* from the Caribbean Sea. *Bull.Mar.Sci.Gulf and Carib., 8(4):360-368 (1958).*

Robins, C.R. 1959b. Studies on fishes of the family Ophidiidae.- III. A new species of *Lepophidium* from Barbados. *Breviora*, 104:1-7.

Robins, C.R. 1960. Studies on fishes of the family Ophidiidae.- V. *Lepophidium pheromystax*, a new Atlantic species allied to *Lepophidium jeannae* Fowler. *Bull.Mar.Sci.Gulf and Carib.*, 10(1):83-95.

Robins, C.R. 1961. Studies on fishes of the family Ophidiidae. VI. Two new genera and a new species from American waters. *Copeia*, 1961(2):212-221.

Robins, C.R. 1962. Studies on fishes of the family Ophidiidae. VII. The Pacific species of *Lepophidium*. *Copeia*, 1962(3):487-498.

Robins, C.R. 1985. The status of the ophidiid fish *Ophidium brasiliense* Kaup. *Japan.J.Ichthyol.*, 31:441-443.

Robins, C.R. 1991. Two new species of *Ophidion* (Pisces: Ophidiidae) from remote islands of the eastern Pacific. *Contr.Sci.Nat.Hist. Mus.Los Angeles Co.*, 427:1-11.

Robins, C.R. and R.N. Lea. 1978. Fishes of the family Ophidiidae. IX. Analysis of geographic variation in *Lepophidium microlepis* with descriptions of two new subspecies. *Bull.Mar.Sci.*, 28(4):716-727.

Robins, C.R. and J.G. Nielsen. 1970. *Snyderidia bothrops*, a new tropical amphiantlantic species (Pisces: Carapidae). *Stud.Trop.Oceanogr.*, 4:285-293.

Robins, C.R. and G.C. Ray. 1986. *A Field Guide to Atlantic Coast Fishes*. Houghton Mifflin Co., Boston, 354 pp.

Rose, J.A. 1961. Anatomy and sexual dimorphism of the swim bladder and vertebral column in *Ophidion holbrooki* (Pisces: Ophidiidae). *Bull.Mar.Sci.Gulf and Carib.*, 11(2):280-308.

Rosen, D.E. 1985. An essay on euteleostean classification. *Am.Mus.Nov.*, 2827:1-57.

Rosenblatt, R.H. 1961. A new pearlfish (Family Carapidae) from the Gulf of California. *Proc.Biol. Soc.Wash.*, 74:207-212.

Roule, L. 1913. Notice préliminaire sur *Grimaldichthys profundissimus*, nov.gen., nov.sp. Poisson abyssal recueilli a 6.035 mètres de profondeur dans l'Ocean Atlantique par S.A.S. le Prince de Monaco. *Bull.Inst.Océanogr.Monaco*, 261:1-8.

Roule, L. 1916. Notice préliminaire sur quelques espèces nouvelles ou rares des poissons provenant des croisières de S.A.S. le Prince de Monaco. *Bull.Inst.Océanogr.Monaco*, 320:1-31.

Schultz, L.P. 1938. A new species of fish of the family Disparichthyidae from off Cuba. *J. Wash. Acad.Sci.*, 28:492-494.

Schultz, L.P. 1960. Suborder Ophidina. In L. P. Schultz, W. M. Chapman, E. Lachner, and L. P. Woods: Fishes of the Marshall and Marianas Islands. *Bull.U.S.Nat.Mus.*, 202(2):382-396.

Sedor, N.A and D.M. Cohen. 1987. New bythitid fish, *Dinematichthys minyomma*, from the Caribbean Sea. *Nat.Hist.Mus.Los Angeles County, Contrib.Sci.*, 385:5-10.

Seret, B. 1988. Captures nouvelles de *Penopus microphthalmus* (Vaillant, 1888), et statut de *Penopus macdonaldi* Goode and Bean, 1896 (Pisces, Ophidiidae). *Cybium*, 12:281-286.

Shcherbachev, Y.N. 1976. New species of the family Aphyonidae from the Indian Ocean (Pisces, Ophidioidea). *Vopr.Ikhtiol.*, 16:162-165.

Shcherbachev, Y.N. 1980. A preliminary review of deep-sea ophidiids (Ophidiidae, Ophidiiformes) of the Indian Ocean. *Trudy Okean.Inst.*, 110:105-176. (Translated 1981).

Smith, A. 1847. Pisces. In *Illustrations of the Zoology of South Africa; consisting chiefly of figures and descriptions of the objects of natural history collected during an expedition into the interior of South Africa in 1834-36*. Smith, Elder and Co., London (unpaginated).

Smith, J.L.B. 1934. Marine fishes of seven genera new to South Africa. *Trans.Roy.Soc.S.Africa*, 22:89-90.

Smith, J.L.B. 1935. New and little known fishes from South Africa. *Rec.Albany Mus.*, 4:169-235.

Smith, J.L.B. 1943. Interesting new fishes of three genera new to South Africa, with a note on *Mobula diabolis* (Shaw). *Trans.Roy.Soc.S.Africa*, 30:67-77.

Smith, J.L.B. 1947. Brief revisions and new records of South African marine fishes. *Ann.Mag.Nat Hist.*, Ser. 11(14):335-346.

Smith, J.L.B. 1955. The fishes of the family Carapidae in the western Indian Ocean. *Ann.Mag.Nat Hist.*, 12:401-416.

Smith, M.M. and P.C. Heemstra (eds.). 1986. *Smiths' sea fishes*. J.L.B. Smith Inst. of Ichthyology, Grahamstown, 1047 pp.

Staiger, J.C. 1972. *Bassogigas profundissimus* (Pisces, Brotulidae) from the Puerto Rico Trench. *Bull.Mar.Sci.*, 22:26-33.

Steindachner, F. and L. Döderlein. 1887. Beiträge zur Kenntniss der Fische Japan's (IV). *Denksch. K. Akad. Wiss. Wien, Math.-Wiss. cl.*, 53:257-296.

Suarez, S.S. 1975. The reproductive biology of *Ogilbia cayorum*, a viviparous brotulid fish. *Bull. Mar.Sci.*, 25:143-173.

Swainson, W.R. 1839. *The natural history and classification of fishes, amphibians and reptiles, or monocardian animals*. London, vol. 2:1-448.

Tanaka, S. 1908. Descriptions of eight new species of fishes from Japan. *Ann.Zool.Jap.*, 7:27-46.

Temminck, C.J. and H. Schlegel. 1846. Pisces, pp. 173-269. In P. F. von Siebold, (ed.). *Fauna Japonica*, part 5. Leiden.

Thompson, W. 1837. Notes relating to the natural history of Ireland, with a description of a new genus of fishes (*Echiodon*). *Proc.Zool.Soc.London*, 5:52-63.

Torre y Huerta, C. de la. 1930. Un pez de nueva especie, el "*Benthocometes claudei* Torre" cogida en el tubo de la planta de M. Claude. *Rev.Soc.Geogr.Cuba*, 3:170-171.

Tortonese, E. 1954. On *Ophidion vassali* Risso type of a new genus of ophidiid fishes (*Parophidion*) *Pubbl.Staz.Zool.Napoli*, 25(2):372-379.

Trotter, E.S. 1926. Brotulid fishes from the Arcturus Oceanographic Expedition. *Zoologica* (N.Y.), 8:107-125.

Tschudi, J.J. von. 1846. Ichthyology. In *Untersuchungen über die Fauna Peruana*. Scheitlin and Zollikofer, St. Gallen, 33 pp.

Turner, C.L. 1946. Male secondary sexual characters of *Dinematichthys iluocoeteoides*. *Copeia*, 1946:192-196.

Vaillant, L. 1888. *Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882, 1883. Poissons*. Paris, 406 pp.

Vaillant, L. 1893. Sur un nouveau genre de poissons, voisin de *Fierasfer*. *C.R.Acad.Sci.Paris*, 117:745-746.

Vaillant, L. and H.E. Sauvage. 1875. Note sur quelques espèces nouvelles de poissons des Iles Sandwich. *Rev. et Mag.Zool.*, 38(sèr. 3, vol. 3):278-287.

Van Mol, J.J. 1967. Écologie comparée de deux espèces de brotulidae (Pisces) des îles Galapagos: *Caecogilbia deroyi* Poll et Van Mol et *Caecogilbia galapagosensis* Poll et Leleup 1965. *Bull.Acad R. Belge. cl. Sci.*, 5(53):232-248.

Waite, E.R. 1905. Notes on fishes from Western Australia. *Rec.Aust.Mus.*, 6:55-82.

Weber, M. 1905. *Fierasfer Sluiteri n. sp. Tijdschr. Nederl. Dierk. Ver.*, (2)9, p. 4.

Weber, M. 1913. *Die Fische der Siboga-Expedition.* Brill, Leiden, 710 pp.

Whitley, G.P. 1936. More ichthyological miscellanea. *Mem.Qld.Mus.*, 11:23-51.

Whitley, G.P. 1941. Ichthyological notes and illustrations. *Austral.Zool.*, 10:1-50.

Whitley, G.P. 1951. New fish names and records. *Proc.R.Zoo.Soc.N.S.W.*, 1949-50:61-68.

Williams, J.T. 1984. Studies on *Echiodon* (Pisces: Carapidae), with description of two new Indo-Pacific species. *Copeia*, 1984:410-422.

Williams, J.T. and R.L. Shipp. 1982. A new species of the genus *Echiodon* (Pisces: Carapidae) from the eastern Gulf of Mexico. *Copeia*, 1982:845-851.

Wood-Mason, J. and A. Alcock. 1891. Natural history notes from H. M. Indian Marine Survey Steamer "Investigator". Ser. II, No. 1. On the results of deep-sea dredging during the season 1890-91. *Ann.Mag.Nat.Hist.*, 6(8):16-34.

Woods, L.P. and R.H. Kanazawa. 1951. New species and new records of fishes from Bermuda. *Fieldiana Zool.*, 31 (53):629-644.

Wourms, J.P. and O. Bayne. 1973. Development of the brotulid fish *Dinematichthys iluocoeteoides*. *Copeia*, 1973:32-40.

Wourms, J.P. and D.M. Cohen. 1975. Trophotaeniae, embryonic adaptations, in the viviparous ophidioid fish *Oligopus longhursti*: a study of museum specimens. *J.Morphol.*, 147:385-402.

Zugmayer, E. 1911. Diagnoses de poissons nouveaux provenant des campagnes du yacht "Princess-Alice" (1901-1910). *Bull.Inst.Océanogr.Monaco*, 193:1-14.

5. INDEX OF SCIENTIFIC AND VERNACULAR NAMES

Explanation of the System

Italics : Valid scientific names (genera and species).

Italics : Synonyms (genera and species), misidentifications.

ROMAN : Family names.

ROMAN : Names of suborders.

Roman : Subfamilies, tribes and FAO and local names.

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