



NOAA Technical Report NMFS Circular 417

# Guide to the Identification of Genera of the Fish Order Ophidiiformes With a Tentative Classification of the Order

Daniel M. Cohen and Jørgen G. Nielsen

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**U.S. DEPARTMENT OF COMMERCE**

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**National Oceanic and Atmospheric Administration**

Richard A. Frank, Administrator

**National Marine Fisheries Service**

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# Guide to the Identification of Genera of the Fish Order Ophidiiformes With a Tentative Classification of the Order

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## ABSTRACT

Objectives of the paper are to provide dichotomous keys for the identification of ophidiiform genera. For each genus a brief account is presented including synonymy, a short diagnosis, a list of species, distribution, references, when possible comments on relationships, and for most an outline drawing.

The genera are organized into an hierarchical classification which divides them into two sub-orders, Ophidioidei, which contains oviparous fishes with a high anterior nostril, and Bythitoidei which contains viviparous fishes with a low anterior nostril.

Ophidioidei is divided into two families. Carapidae, with a vexillifer larval stage, has two sub-families: Pyramodontinae with two genera and Carapinae with four. Ophidiidae has four sub-families: Brotulinae, with a single genus; Brotulotaeniinae (new family) with a single genus; Ophidiinae, the cusk eels, with eight genera in two tribes; and Neobythitinae, with 38 genera (*Epetriodus* and *Spottobrotula* are new genera based on new species from the Indian Ocean) in two tribes.

Bythitoidei contains two families, one of which, Aphyonidae has five genera characterized by many notenic features. Bythitidae is divided into the free-tailed *Brosomphycinae* with 13 genera in two tribes and *Bythitinae* with 15 genera.

## INTRODUCTION

The ophidiiform fishes comprise a diverse group containing approximately 135 nominal genera and between 300 and 400 species that dominate large areas of the floor of the deep sea and also live pelagically, on the continental shelf, in tropical reef areas, and even in estuarine and fresh waters.

There are so many species of these fishes and there is so little information on their anatomy that many years will pass before there is a comprehensive and well-documented study of their systematics. In order to facilitate such research, and also investigations on other aspects of the biology of ophidiiform fishes, we present in this paper keys to the genera, brief descriptions of each, and lists of included species. The keys are essentially updated versions of Norman's (1939) Synopsis of Oceanic Genera and its expanded successor (Norman 1966). Both of these works are essential references for anyone studying ophidiiform taxonomy but are outdated, covering literature no later than 1938.

The chief purpose of this paper is to distinguish genera from each other by means, whenever possible, of superficial and easily seen characters. For purposes of convenience we have clustered similar genera and similar assemblages of genera into a hierarchy of categories

(Table 1) that constitutes a classification of the order, one that varies in several respects from those in current usage. We do not here present this classification as a phylogeny. We believe, however, that the classification has good predictive value and will probably serve as a useful basis for a thorough phyletic study of the order.

Many species and several genera assigned to Ophidiiformes are based on fossil material, mostly otoliths. We have considered only those few based on remains adequate to place them in our classification, but we have reviewed names for possible instances of homonymy.

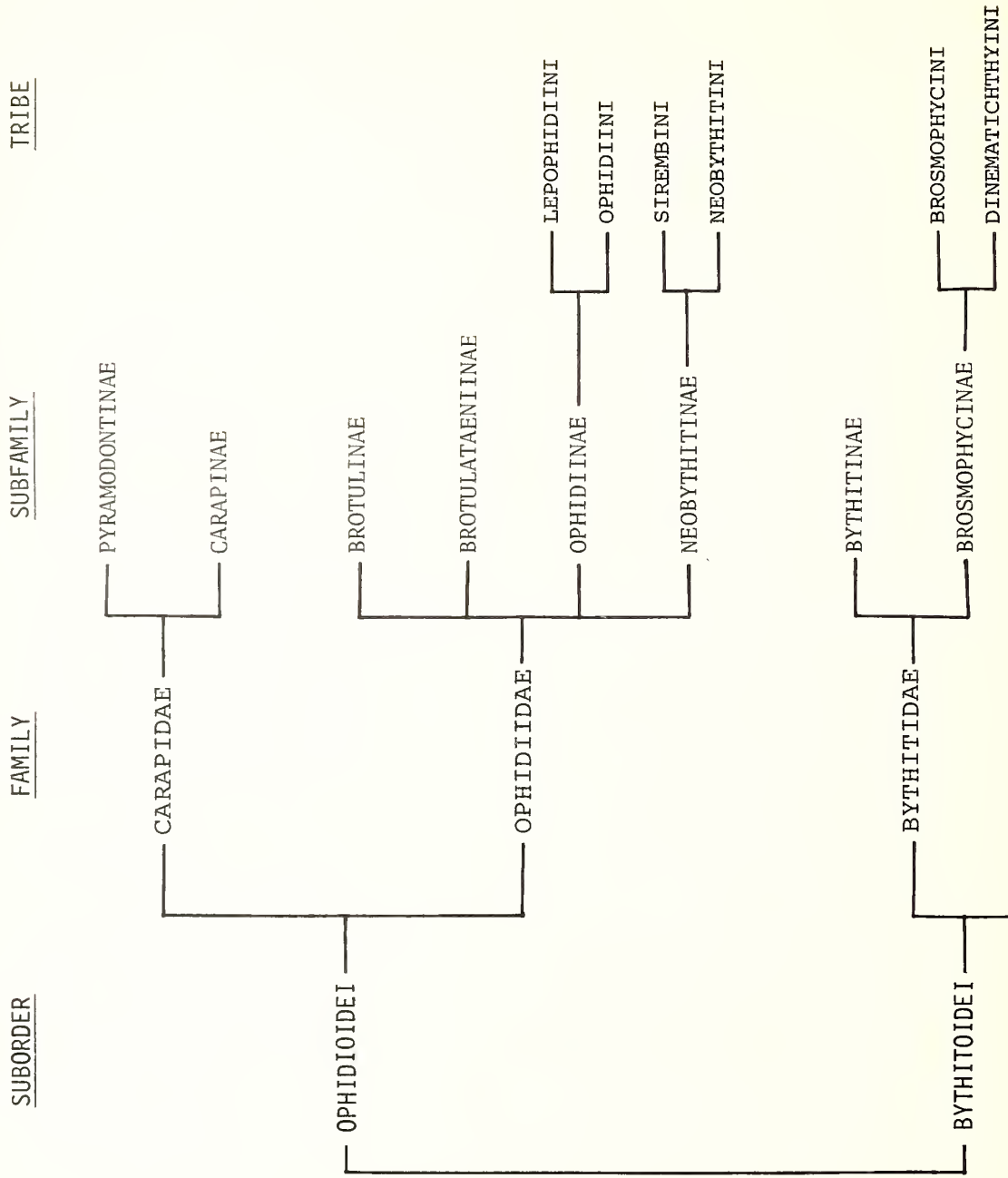
## MATERIALS AND METHODS

The most important of earlier collections, upon which many names are based, are those taken by *Blake* and *Albatross* and described by Goode and Bean, Garman, and Smith and Radcliffe and kept in Washington, D.C., in the U.S. National Museum of Natural History and in Cambridge, Mass., in the Harvard University Museum of Comparative Zoology; those caught by *Challenger* and reported upon by Günther and stored in London in the British Museum (Natural History); and those trawled by *Investigator* and studied by Alcock and maintained in Calcutta in the Indian Museum and in London. In Copenhagen and Washington, D.C., we have had at our disposal the rich collections taken more recently by *Galathea*, *Oregon I*, *Oregon II*, and various reef expeditions. Other collections of ophidiiform fishes are widely dispersed, and we have had access to most of them.

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Table 1. Classification of the order Ophidiiformes.



Species that we have examined are marked with an asterisk.

Descriptive terminology used in the keys and text is in most instances obvious or illustrated. Several characters however, require additional comment.

*Branchiostegal rays.* A useful but occasionally difficult character, as in some species they are covered with darkly pigmented or thick skin, which it may be necessary to strip away from the inner face of the branchiostegal membranes. The literature contains many inaccurate branchiostegal ray counts.

*Caudal fin rays.* The number of rays in the caudal fin is a useful taxonomic character. The count is relatively easy to determine with transmitted light; in many species the rays may be counted from X-ray photographs. For free-tailed genera, counts include all rays in the caudal fin. The equivalent count in genera with confluent median fins consists of those rays supported by the hypurals, including in some the parhypural as well, although it does not always support a ray. Epurals are rarely sufficiently well-developed to serve as fin ray supports. In a very few instances, *Brotula* for example, the caudal fin skeleton is more complex with rays being carried by a parhypural, two free hypural elements, and two epurals. In fishes with free or joined tails, care must be taken to distinguish between normal and regenerated tails.

*Gill rakers.* We have used the terms "long" or "developed" interchangeably throughout this paper to describe one kind of gill raker. Nearly all ophidiiform fishes have low pads or short tubercles at the anterior ends of the upper and lower arms of the first arch, and longer structures, ranging from short knobby tubercles to elongate, compressed, lathlike rakers closer to the angle of the arch, sometimes interspersed with pads or shorter tubercles. In a few species pads or short tubercles grade gradually into developed (= long) rakers. In most however, the two kinds are quite distinct, regardless of their absolute sizes (Fig. 1). A few species completely lack developed rakers.

*Intromittent organ.* Bythitoid fishes have a variously developed intromittent organ in the male. In most of these fishes the organ consists of a fleshy hood, a penis, and fleshy ridges, lobes, or flaps. In the genera that we include in the tribe Dinematchthyini there are one or more pairs of stiff, ossified lobes or prongs, two types of which are illustrated in this paper (Figs. 84,90). We call these structures pseudoclaspers, following the terminology of Suarez (1975) who has presented a detailed description of the genitalia of *Ogilbia cayorum* and cited pertinent literature.

*Maxillary sheath.* In some genera the posterior part of the maxillary is sheathed by a fold of skin that covers, to a greater or lesser extent, the dorsal part of the bone; in the carapine genus *Encheliophis* the maxillary is bound by skin to the side of the head. In other genera the posterodorsal part of the maxillary is completely free.

*Rocker bone.* Several genera of Ophidiinae and Carapidae have a prominent, median, bean-shaped bone (apparently part of a sound producing mechanism) associated with the anterior end of the swim bladder and located beneath the anterior several vertebral centra. This structure cannot be seen exteriorly but is visible on X-ray photographs. It has been described most recently by Courtenay and McKittrick (1970), who called it a rocker bone and by Svetovidov (1961), who called it a cuneiform bone.

*Teeth.* Many genera have jaw teeth that we call granular. They are minute, densely distributed, and rather blunt tipped. A patch of these teeth is like sandpaper to the touch. Other genera have larger, more widely distributed, needlelike teeth of varying sizes. Some genera have both types. In several genera the type of dentition may be related to degree of maturity and perhaps sex.

Most genera of Ophidioidei have one or more median basibranchial patches of granular teeth, which may vary in size and shape. Many ophidiiform genera have one pair of patches of granular teeth on the basibranchial. A

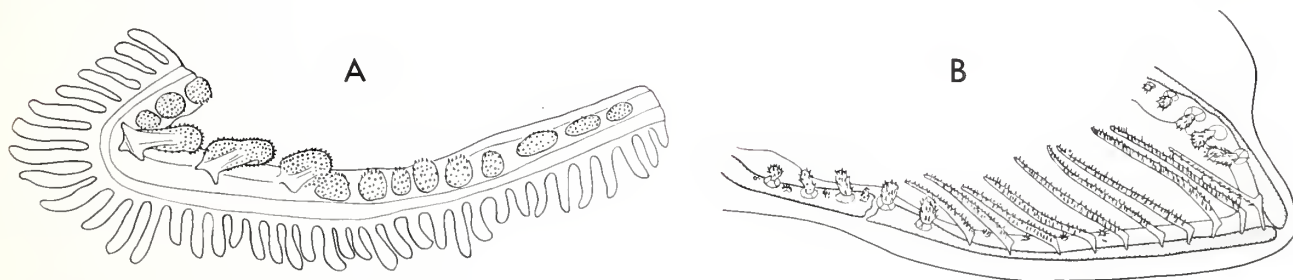


Figure 1.—Anterior gill arches of ophidiiform fishes. A. *Saccogaster tuberculata*, lateral view of right side showing three developed rakers; B. *Leucicorus atlanticus*, lateral view of left side showing 10 developed rakers.



patch of granular teeth is usually present at the base of each fifth gill arch and should not be confused with basi-branchial teeth (Fig. 2).

*Ventral fin rays.* Ophidiiform fishes with ventral fins, which includes most of them, have either one or two soft rays in each; a short hidden spine which is present in many is not included in our counts. We have checked many species by examining alizarin-stained specimens, dissecting fins, or examining cross sections of fins. We have observed the following conditions, which are shown in diagrammatic cross sections in Figure 3: a single ray in each fin, the two halves bound together; two rays in each fin, the rays separate from each other for all or part of the length of the fin, but the two halves of each ray bound together; and two rays in each fin, the rays bound together for the entire length of the fin. There are many incorrect statements in the literature; a common one is that each fin has a single ray, the two halves of which are separate; we have never observed this condition. In some species, however, the two halves of a ray may be of unequal lengths.

*Vertebrae.* In those few instances in which we give the total number of vertebrae, the ural centra are not included.

*Vexillifer stage.* One of the planktonic, preadult stages of most, perhaps all carapids. It is characterized by the presence of a long filamentous and usually ornamented structure placed anterior to the dorsal fin, which

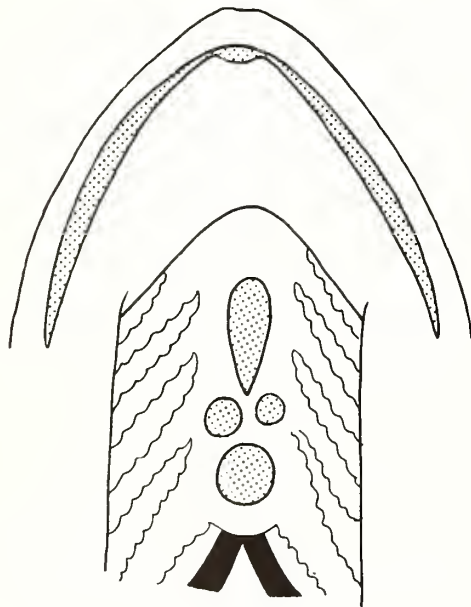


Figure 2.—Dentition in the floor of the mouth of *Holcomyteron*. Stippled areas include two median basihranchial tooth patches, one pair of basihranchial tooth patches, and the dentaries. The dark areas are the bases of the fifth arches.

is called the vexillum. It has been described and figured by many authors; see for example Strasburg (1965).

The keys in this paper are based chiefly on adults. They will identify earlier stages with various measures of success.

## ORDER OPHIDIIFORMES

It is not now possible to give a diagnosis of the order. The following characters, taken in combination, should help to identify a fish as an ophidiiform.

- 1) Ventral fins with one or two soft rays in each or completely absent.
- 2) Ventral fins inserted at about the level of the preopercle or farther anterior.
- 3) Ventral fins relatively 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 (although small pelvic spines are present in some genera).
- 6) Dorsal and anal fin pterygiophores more numerous than adjacent vertebrae.
- 7) Nostrils paired on each side of head.

There has never been complete agreement among ichthyologists as to the phyletic relationships, the constituents, or the taxonomic rank of the Ophidiiformes. It is not our purpose here to treat these topics in depth; however, a few brief comments are in order.

Two quite different opinions are current concerning the relationships of these fishes. A classification that relates ophidioids with gadoids and zoarcoids has been revived by Rosen and Patterson (1969), who merge all three in an expanded order Gadiformes, which they place in the superorder Paracanthopterygii, a group that they classify as distinct from and parallel with Acanthop-

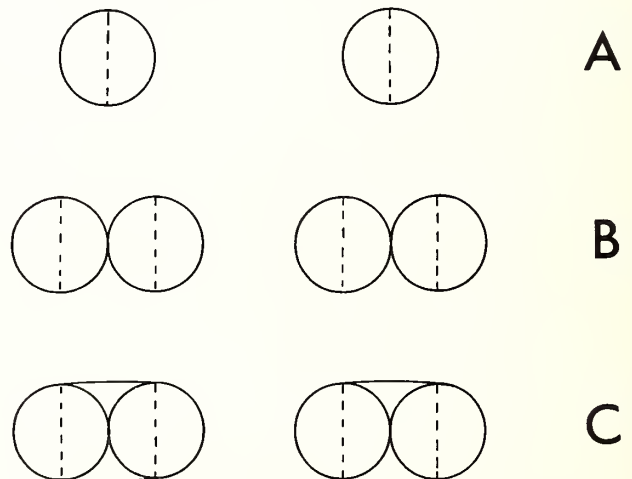


Figure 3.—Diagrams of cross sections through the ventral fins of three kinds of ophidiiform fishes, the dotted line in each separates the two halves of a single ray. A. One ray in each fin. B. Two separate rays in each fin. C. Two joined rays in each fin.



terygii. Previously unknown information on the pattern of the ramus lateralis accessorius nerve (Freihofer 1963; with additional data given in 1970) provide strong support for Rosen and Patterson's classification.

On the other hand, a perciform origin for the ophidioids was defended by Gosline (1968), who forwarded the enigmatic Australian freshwater genus *Gadopsis* as a link with more typical advanced spiny rayed fishes. Similarities in nerve patterns of ophidioids and gadoids were suggested as being instances of convergence in bottom living fishes by Gosline (1968), Fraser (1972), and Marshall and Cohen (1973). Additional support for the hypothesis of perciform relationships of ophidioids and their separation from gadiforms was given by studies on the molecular genetics of the lactate dehydrogenase C4 isozyme by Shaklee et al. (1973) and Shaklee and Whitt.<sup>3</sup>

In somewhat of a middle course the ophidioids were described as more primitive than the Perciformes and close to but distinct from Gadiformes by McAllister (1968).

Ophidioid fishes are so many, diverse, and poorly known that few of the current generalizations about the group are sufficiently well founded to serve as bases for resolving the question as to its phyletic affinities. We separate ophidiiform from gadiform and zoarcoid fishes for reasons presented by Fraser (1972), Marshall and Cohen (1973) and Shaklee and Whitt (see footnote 3). Most previous workers have treated the ophidiiforms as a suborder. We follow Mead et al. (1964), McAllister (1968), and Fraser (1972) in according them ordinal rank, not least of all because given current uncertainty as to

their placement, an order seems more easily movable baggage than does a suborder. We exclude *Gadopsis* from the group, though without prejudice as to its affinities; both Gosline (1968) and Rosen and Patterson (1969) have described numerous differences, which seem to us of sufficient magnitude to warrant this action.

The position of the ventral fins has been used by most ichthyologists as a primary character for distinguishing ophidiiform families. As a single character at such a level it is not a reliable indicator of relationships, as the ventrals may be in quite different positions in such obviously related genera as *Tauredophidium* and *Xyelacyba*, or even within a genus such as *Acanthonus* (Cohen 1961).

Mode of reproduction is a far more fundamental character in ophidiiform fishes, and we use it to delimit two suborders, one oviparous and the other viviparous.

Could viviparity have arisen more than once in ophidiiform fishes, as apparently it has done in other orders? Nearly all viviparous ophidiiforms have another specialized character, the position of the anterior nostril immediately above the upper lip. Such a combination of characters suggests a natural assemblage. However, the position of the anterior nostril is variable in the small assemblage of neotenic genera classified as the family Aphyonidae (Nielsen 1969) and is slightly to considerably above the upper lip in the shallow-water tropical reef dwelling genera *Dinematichthys* and *Stygnobrotula* and the pelagic *Thalassobathia*.

In contrast, most genera of oviparous ophidiiform fishes have the anterior nostril rather high above the upper lip; some cusk eels are exceptional in this respect in having the nostril low. Although there is not complete correspondence between position of the anterior nostril and mode of reproduction, character states do coincide in more than 90% of the genera and hence are useful to the taxonomist.

<sup>3</sup>Shaklee, J. B., and G. S. Whitt. 1975. A reassessment of the interrelationships of gadiform fishes based on the analysis of biochemical characters. American Society of Ichthyologists and Herpetologists, Abstracts, Fifty-fifth Annu. Meet., p. 115.

#### KEY TO SUBORDERS

- 1a. Oviparous, males lacking a developed external intromittent organ. Anterior nostril well above upper lip (Fig. 4a) in most (variable in some cusk eels). Median basibranchial tooth patches present or absent. Ventral fins at about the level of the 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. 4b) in most (variable in Aphyonidae and a few bythitid genera). Median basibranchial tooth patches absent. Ventral fins at about the level of the preopercle in position, when present. Caudal fin connected with dorsal and anal fins or free . . . . . Bythitoidei

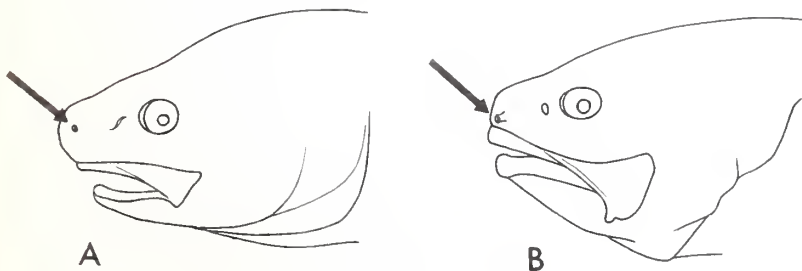


Figure 4.—Position of anterior nostril in two suborders of ophidiiform fishes. A. Ophidioidei, high on the snout; B. Bythitoidei, low on the snout.

SUBORDER OPHIDIOIDEI

As presently reconstituted this group includes the following oviparous fishes.

The pearlfishes, mostly inquiline in habit, are considered a subfamily of Carapidae; a second subfamily includes the probably free-living *Pyramodon* and *Snyderidia*.

The cusk eels proper are a small group of genera that many ichthyologists have considered to be a separate family, Ophidiidae; we treat them as a subfamily of an expanded Ophidiidae.

*Brotula* is placed in a monogeneric subfamily of Ophidiidae.

The aberrant pelagic *Brotulotaenia* is given subfamilial status within Ophidiidae.

A great host of genera, formerly lumped with many viviparous genera in the family Brotulidae, are here grouped together as the subfamily Neobythitinae of Ophidiidae.

Key to Families of Ophidioidei

- 1a. Supramaxillary absent. Anal fin rays longer than opposing dorsal fin rays . . . . . Carapidae
- 1b. Supramaxillary present. Dorsal fin rays usually equal to or longer than opposing anal fin rays . . . . . Ophidiidae

Carapidae Jordan and Fowler 1902

Supramaxillary absent. Anal fin rays longer than opposing dorsal fin rays. Scales absent. Vexillifer larval stage in most, possibly all species. For information and references on development and habits see Arnold (1956), Trott (1970), and Robertson (1975).

KEY TO SUBFAMILIES OF CARAPIDAE

- 1a. Pectoral fin rays 24-27. Precaudal vertebrae 12-15 . . . . . Pyramodontinae
- 1b. Pectoral fin rays 20 or fewer. Precaudal vertebrae 17-27 . . . . . Carapinae

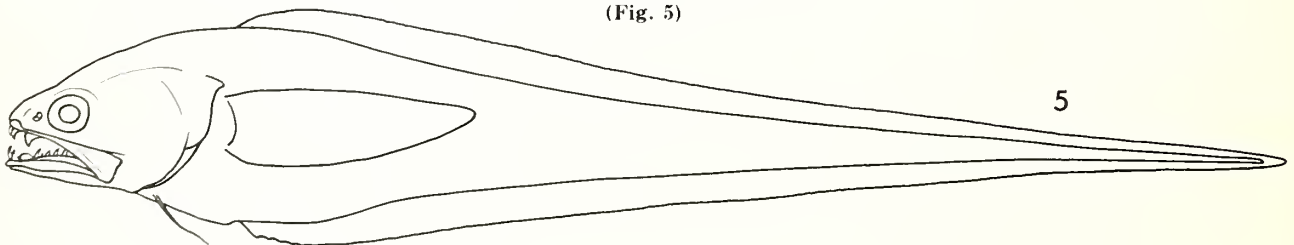
PYRAMODONTINAE SMITH 1955

Pectoral fin rays 24 to 27. Precaudal vertebrae 12 to 15. Probably free-living as adults. The taxonomic history of the following two genera has been summarized by Robins and Nielsen (1970), whom we follow in recognizing them as constituting a carapid subfamily.

Key to Genera of Pyramodontinae

- 1a. Ventral fins present. Origins of dorsal and anal fins approximately opposite each other . . . . . *Pyramodon*
- 1b. Ventral fins absent. Origin of dorsal fin anterior to origin of anal fin . . . . . *Snyderidia*

*Pyramodon* Smith and Radcliffe  
(Fig. 5)



*Pyramodon* Smith and Radcliffe in Radcliffe (1913:175; type-species by original designation *Pyramodon ventralis* Smith and Radcliffe).

*Cynophidium* Regan (1914:16; type-species by monotypy *Cynophidium punctatum* Regan 1914).

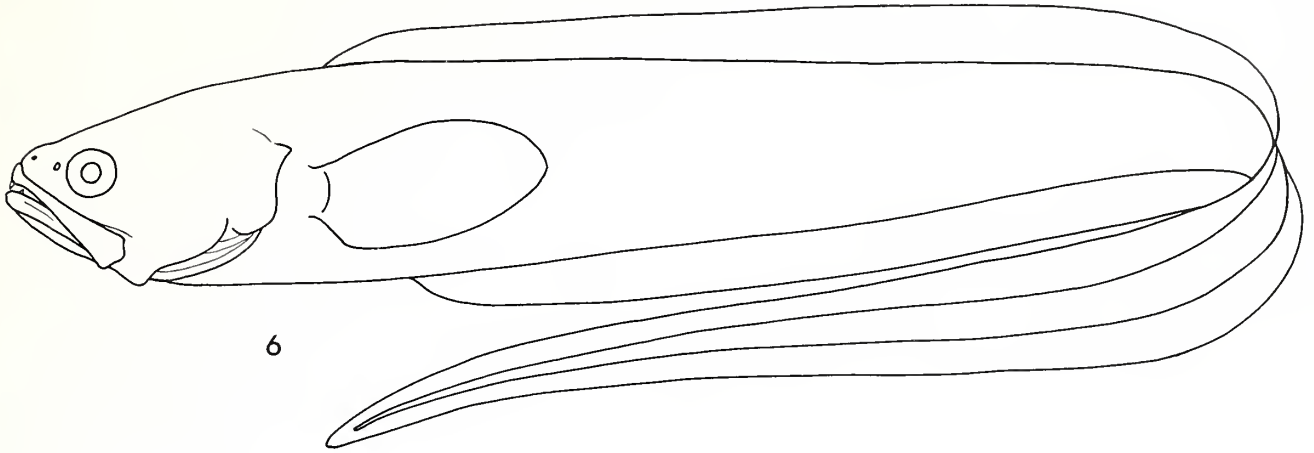
Ventral fins present. Origins of dorsal and anal fins approximately opposite each other. See Smith (1955a) for a discussion of the genus and species.

Taken on the shelf and upper slope.

South Africa, Japan, Indonesia, Australia, and New Zealand (as *Snyderidia*, see McCann 1972).

A single species, \**P. ventralis* Smith and Radcliffe in Radcliffe 1913.

***Snyderidia* Gilbert  
(Fig. 6)**



*Snyderidia* Gilbert (1905:654; type-species by monotypy *Snyderidia canina* Gilbert).

Ventral fins absent. Origin of dorsal fin anterior to origin of anal fin. The osteology of this genus has been discussed by Gosline (1960).

Adults have been taken on the shelf and upper slope. Larval stages are pelagic and resemble the early stages of carapines in bearing a vexillifer (Strasburg 1965).

Circumtropical.

Two nominal species: \**S. bothrops* Robins and Nielsen 1970, and \**S. canina* Gilbert 1905.

**Carapinae Jordan and Fowler 1902**

Pectoral rays 20 or fewer. Precaudal vertebrae 17 to 27.

The group has been revised by Arnold (1956). Consult his paper for references to citations in the following section, which are not included in the Literature Cited section of the present paper.

**Key to Genera of Carapinae**

- 1a. Teeth on jaws and palatine in a single row. Maxillary bound by skin to side of head (Fig. 7a) . . . *Encheliophis*
- 1b. Teeth on jaws and palatines in bands. Maxillary free (Fig. 7b) . . . . . 2

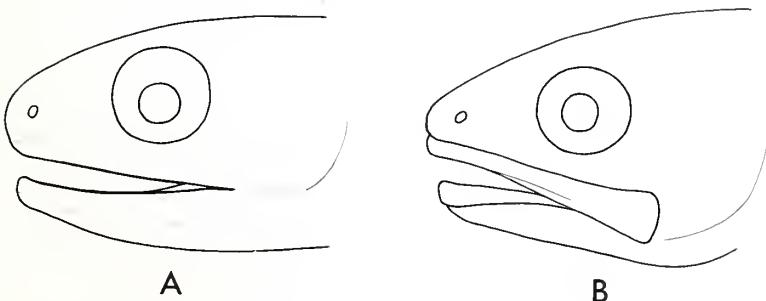


Figure 7.—Condition of maxillary in two genera of carapine fishes. A. *Encheliophis*, with the maxillary bound by skin to the side of the head; B. *Carapus*, with the maxillary free.

- 2a. Teeth in upper and lower jaws in a continuous row with no pronounced gap near tip of jaw. Enlarged teeth at jaw tip present or absent . . . . . *Carapus*
- 2b. Teeth in upper and lower jaw with a pronounced gap separating variously developed canines at or near the jaw tip from a following band of smaller teeth (Fig. 8) . . . . . 3

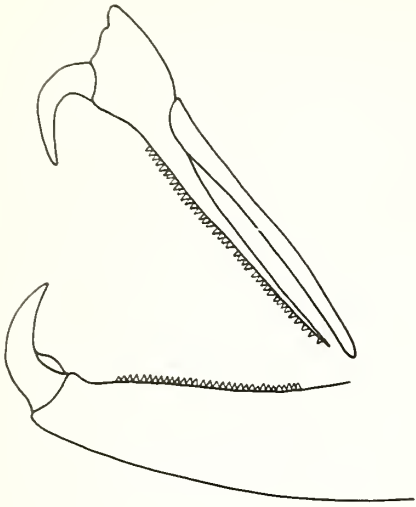
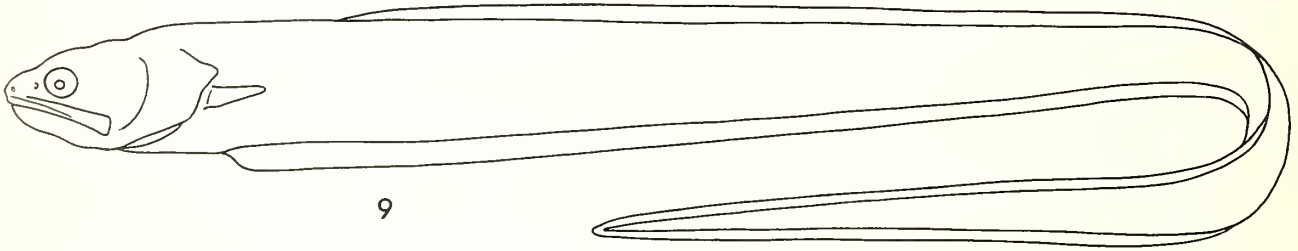


Figure 8.—Upper and lower jaw teeth in *Onuxodon*. Notice the gap between the large anterior teeth and the small posterior teeth.

- 3a. Rear of maxillary expanded; posterior margin a straight line. Body rather elliptical in cross section; width about 2 in depth . . . . . *Echiodon*
- 3b. Rear of maxillary slender; posterior margin rounded. Body strongly compressed; width 3 or more in depth . . . . . *Onuxodon*

***Carapus Rafinesque*  
(Fig. 9)**



*Carapus Rafinesque* 1810 (type-species according to Opinion 42 of the International Commission on Zoological Nomenclature *Gymnotus acus* Linnaeus).

See Arnold (1956) for a discussion of the complex nomenclature of this genus and a list of synonyms.

Teeth in continuous bands on jaws and palatines. Enlarged teeth present in some but not as recurved canines at the jaw tips. Maxillary free. Vent close to a vertical from base of pectoral fin. No median rocker bone at anterior end of swim bladder.

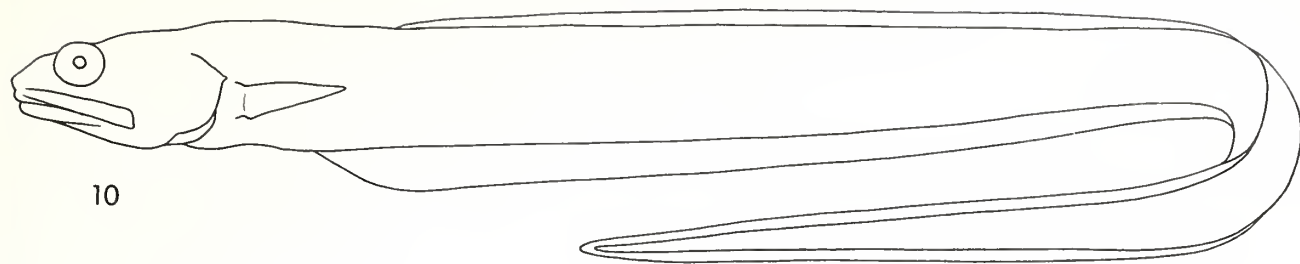
Inquiline in holothurians, asteroids, bivalve mollusks, and tunicates; so far as known commensal (Trott 1970).

Circumtropical, also in Mediterranean.

The following list of 15 valid species is according to Arnold (1956) and Trott (1970): \**C. acus* (Brünnich 1768), \**C. bermudensis* (Jones 1874), \**C. birpex* Arnold 1956, \**C. boraborensis* (Kaup 1856), \**C. caninus* (Günther 1862), \**C. cuspis* Arnold 1956, \**C. dubius* (Putnam 1874), \**C. homei* (Richardson 1844), \**C. houlti* (Ogilby 1922), \**C. kagoshimanus* (Steindachner and Doderlein 1877), \**C. mourlani* (Petit 1934), \**C. owasianus* Matsubara 1953, \**C. parvipinnis* (Kaup 1856), \**C. pindae* (Smith 1955), and \**C. variegatus* Fowler and Steinitz 1956.



*Echiodon* Thompson  
(Fig. 10)



*Echiodon* Thompson (1837:55; type-species by monotypy *Echiodon drummondii* Thompson).

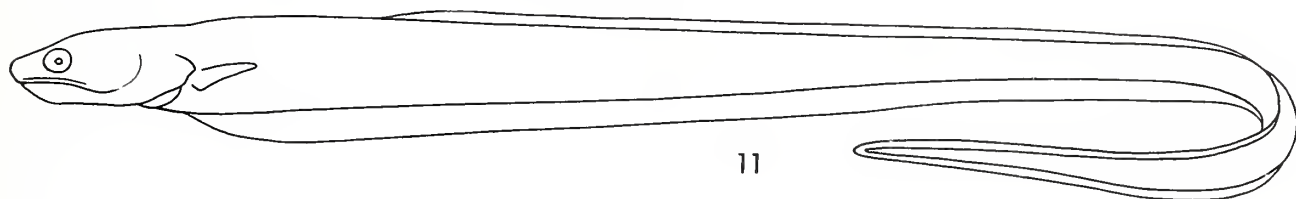
Teeth in bands on jaws and palatines. Upper and lower jaws with a pronounced gap between enlarged recurved canines at the jaw tips and the smaller teeth in bands. Maxillary free. Body rather elliptical in cross section. Vent well posterior to a vertical from base of pectoral fin. No median rocker bone at anterior end of swim bladder.

Probably free living (Trott 1970).

Tropical and temperate North Atlantic including the Mediterranean, tropical eastern Pacific, subantarctic seas, and possibly western Indian Ocean and southwestern Pacific.

The genus, which is being studied by M. Leiby, D. Markle, and J. Olney, contains at least three described species plus one or two undescribed and two problematic ones: *E. dentatus* (Cuvier 1817), \**E. drummondii* Thompson 1837, and *E. exsilium* Rosenblatt 1961. See Arnold (1956) concerning the status of *Carapus cinereus* Smith 1955 and *C. rendahli* Whitley 1941.

*Encheliophis* Muller  
(Fig. 11)



*Encheliophis* Müller (1842:205; type-species by monotypy *Encheliophis vermicularis* Müller).

*Jordanicus* Gilbert (1905:656; type-species by monotypy *Fierasfer umbratilis* Jordan and Evermann 1903).

*Encheliophiops* Reid (1940:47; type-species by original designation *Encheliophiops hancocki* Reid 1940).

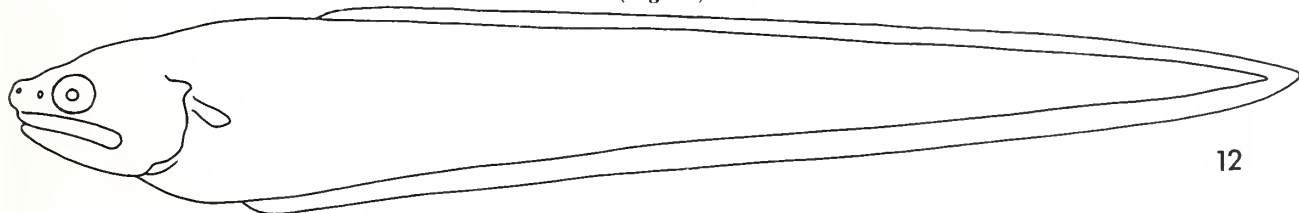
Teeth in single rows on jaws and palatines. No canines. No large gap in the tooth row near the tip of the jaw. Maxillary bound by skin to side of head (Fig. 7a). Vent close to a vertical from base of pectoral fin, or pectoral fin absent. No rocker bone at anterior end of swim bladder.

Parasitic in shallow-water holothurians (Trott 1970; Trott and Trott 1972).

Tropical Pacific and Indian Oceans.

Four species in two subgenera (see Arnold 1956 and Trott 1970, 1972): *E. (Encheliophis) jordani* Heller and Snodgrass 1903, \**E. (E.) vermicularis* Müller 1842, \**E. (Jordanicus) gracilis* (Bleeker 1856), and *E. (J.) sagamianus* (Tanaka 1908).

*Onuxodon* Smith  
(Fig. 12)



*Onuxodon* Smith (1955b:405; type-species by original designation *Carapus parvibrachium* Fowler).

Teeth in bands on jaws and palatines. One or more pair of enlarged recurved canines at the tip of each jaw, separated by a pronounced gap from the smaller teeth in bands (Fig. 8). Maxillary free. Head and body deep, compressed. Median rocker bone present at anterior end of swim bladder. (Courtenay and McKittrick 1970; Tyler 1970).

*Onuxodon* was treated as a subgenus of *Carapus* by Arnold (1956); however, Courtenay and McKittrick (1970) and Tyler (1970) have shown that it requires full generic status. It seems closer to *Echiodon* than to *Carapus*.

Inquiline in the mantle cavity of shallow-water bivalve mollusks, particularly *Pycnodonta hyotis* (Trott and Trott 1972).

Western Indian Ocean to the Philippines and Fiji.

At least two species: *\*O. margaritiferae* (Rendahl 1921), *\*O. parvibrachium* (Fowler 1927), *?Carapus reedi* Smith 1955b (see Arnold 1956).

### Ophidiidae Rafinesque 1810

Supramaxillary present. Dorsal fin rays usually equal to or longer than opposing anal fin rays. Scales present on body. So far as known no vexillifer larval stage.

#### KEY TO SUBFAMILIES OF OPHIDIIDAE

- 1a. Barbels present on snout and chin . . . . . Brotulinae
- 1b. No barbels on snout and chin . . . . . 2
- 2a. Scales in the form of small, nonimbricate prickles (Fig. 13) . . . . . Brotulotaeniinae
- 2b. Scales cycloid . . . . . 3

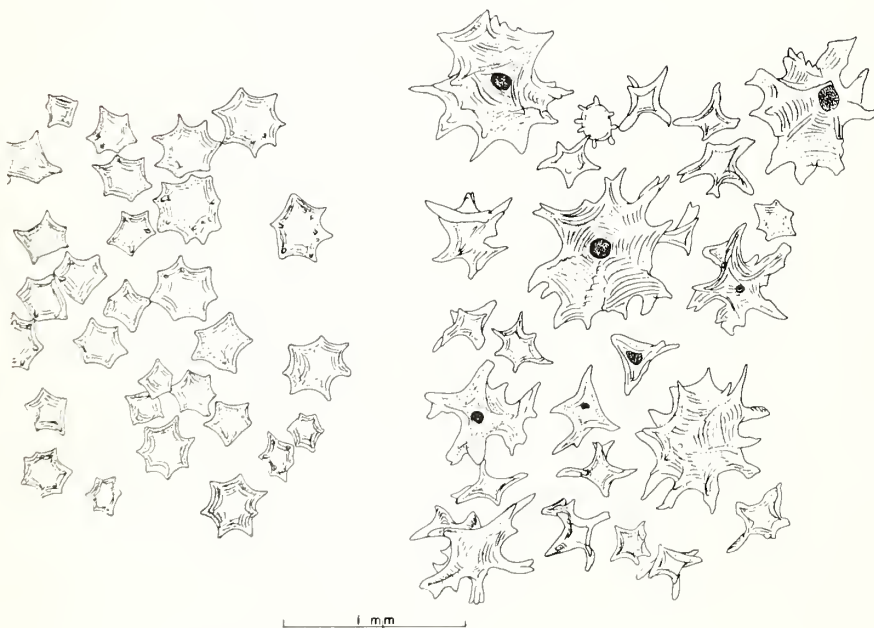


Figure 13.— *Brotulotaenia* body scales. Left, a juvenile; right, a very large specimen.

- 3a. Main body of the ventral arm of the cleithrum meeting its mate at about the level of the preopercle, whence a slender elongate filament of bone extends anteriorly to the ventral fins (Fig. 14a) inserted beneath the eye. Median basibranchial tooth patch present or absent . . . . . Ophidiinae
- 3b. Ventral arm of cleithrum meeting its mate and terminating at about level of preopercle or farther anteriorly, but no slender, elongate, anteriorly extending filament of bone (Fig. 14b). Ventral fin insertion variable in position, fin absent in a few species. One or more median basibranchial tooth patches (except absent in one *Bassozetus* and two *Lamprogrammus* species) . . . . . Neobythitinae



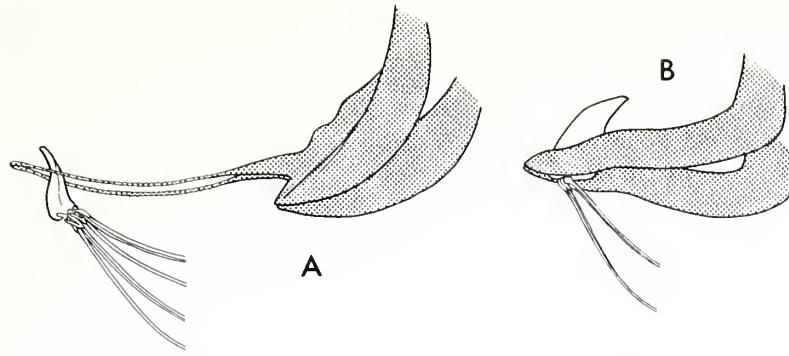


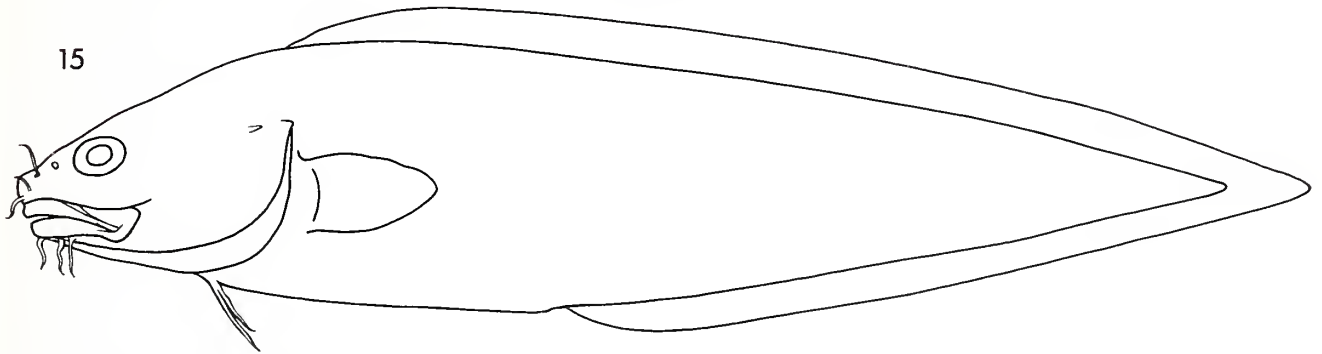
Figure 14.—Ventral fin support in two subfamilies of ophidiid fishes. A. Ophidiinae, note the slender filament of bone extending anteriorly from the main body of the cleithrum; B. Neobythitinae.

### BROTULINAE SWAINSON 1838

Barbels present on snout and chin. Body completely covered with small, imbricate cycloid scales. Ventral fins with 2 rays in each, at about the level of the preopercle in position, well behind the eye. Median basibranchial tooth patch absent. Caudal fin rays 10 or 11, supported by a parhypural, 2 free hypurals, and 2 epurals. Branchiostegal rays 8. Developed gill rakers on first arch 4 or fewer.

A single genus.

#### *Brotula* Cuvier (Fig. 15)



*Brotula* Cuvier (1829:335; type-species by monotypy *Enchelyopus barbatus* Bloch).

*Nematobrotula* Gill (1863a:252; type-species by original designation *Brotula ensiformis* Günther 1862).

*Geneiates* Tickell in Day (1888:804; type-species by monotypy *Geneiates ferruginosus* Tickell, places in synonymy of *Brotula multibarbata* by Day 1888).

Early stages pelagic and in reef areas, often spotted. Adults benthic offshore to depths of 650 m but most common shallower than 180 m.

Worldwide in tropical seas.

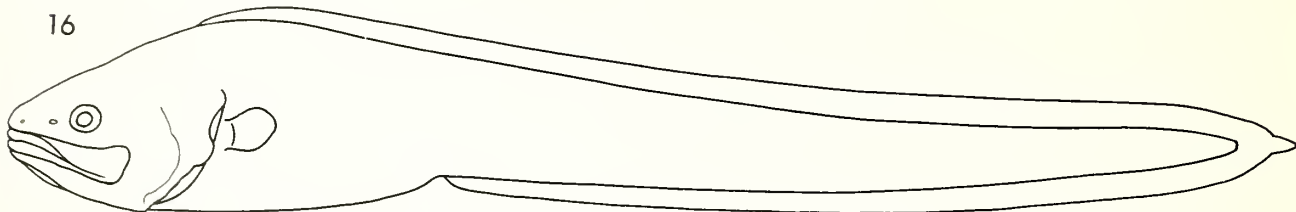
At least five species; see Hubbs (1944) and Gosline (1953) for additional references: \**B. barbata* (Bloch) in Bloch and Schneider 1801, \**B. clarkae* Hubbs 1944, \**B. multibarbata* Temminck and Schlegel 1846, *B. ordwayi* Hildebrand and Barton 1949, and *B. townsendi* Fowler 1900.

### BROTULOTAENIINAE NEW SUBFAMILY

No barbels on chin and snout. Scales in the form of small, nonimbricate prickles. Ventral fins absent. No anterior projection from the symphysis of the cleithrum, which is at about the level of the rear end of the maxillary, well posterior to the eye. Median basibranchial tooth patch absent. Gill rakers in the form of tooth-bearing tubercles. Caudal fin rays usually 9. Branchiostegal rays 7 (rarely 6). Otoliths minute, foreshortened, and compressed. See Cohen (1974a) for osteology.

A separate subfamily is proposed for *Brotulotaenia* because it is divergent from all other ophidiid genera and not obviously related to any of them. Three characters which immediately distinguish *Brotulotaenia* from all other ophidiid genera are the nature of its scales (Fig. 13), the form of its gill rakers (Cohen 1974a, figure 5), and the size and shape of its otolith (Cohen 1974a, figure 2; W. Schwarzhans, pers. commun.). *Brotulotaenia* further differs from Neobythitinae (except for two species of *Lamprogrammus* and one of *Bassozetus*) and resembles Brotulinae in lacking a median basibranchial tooth patch. Characters of Brotulinae that are not shared with *Brotulotaenia* include the presence of barbels, a notably elongated cranium, and a well-developed caudal fin support consisting of epurals, hypurals, and a parhypural. Ophidiinae differs in the slender anterior projection from the cleithrum (Fig. 14a).

***Brotulotaenia* Parr  
(Fig. 16)**



*Brotulotaenia* Parr (1933:48; type-species by original designation *Brotulotaenia nigra* Parr).

Meso- and bathypelagic in tropical seas.

The four nominal species have been reviewed by Cohen (1974a): \**B. brevicauda* Cohen 1974a, \**B. crassa* Parr 1934, \**B. nielsenii* Cohen 1974a, and \**B. nigra* Parr 1933.

**OPHIDIINAE RAFINESQUE 1810**

No barbels on snout and chin. Body covered with small, cycloid scales. Main body of the ventral arm of the cleithrum meeting its mate at about the level of the preoperculum, whence a slender, elongate filament of bone (Fig. 14a) extends anteriorly to the ventral fin, which is at about the level of the orbital region in position. Ventral fins with 2 rays in each. Median basibranchial tooth patch present or absent. Caudal fin rays 9. Developed gill rakers 10 or fewer. Branchiostegal rays 7.

In general, benthic fishes of the continental shelf.

**Key to Tribes of Ophidiinae**

- 1a. All body scales in regular rows, rounded . . . . . Lepophidiini
- 1b. All or most body scales at oblique angles to each other, elongate or elliptical (Fig. 17) . . . . . Ophidiini

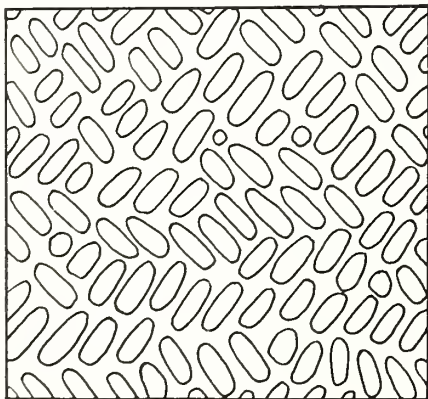


Figure 17.—Ophidiini body scales.

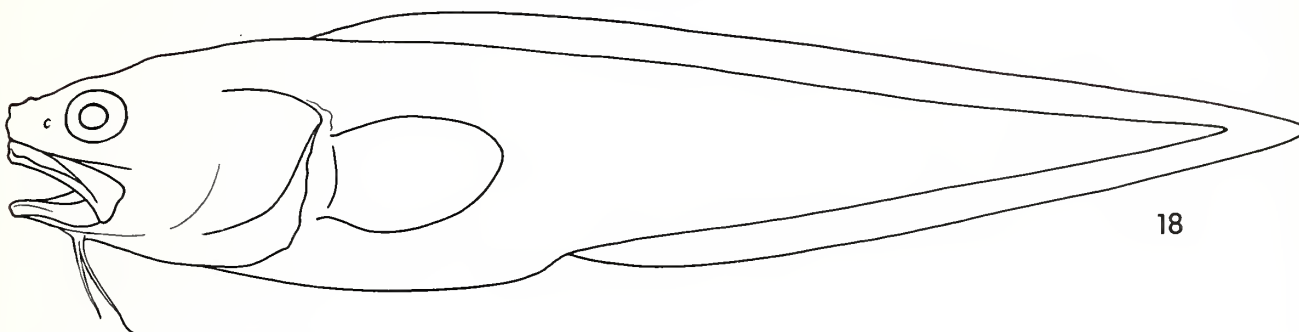
**Lepophidiini Robins 1961**

All body scales in regular rows, rounded. Three genera presently recognized (Robins 1962).

**Key to Genera of Lepophidiini**

- 1a. No well-developed spine on snout . . . . . *Genypterus*
- 1b. A well-developed spine present on snout . . . . . 2
- 2a. A narrow row of weak median basibranchial teeth. Peritoneum dark . . . . . *Cherublemma*
- 2b. No median basibranchial teeth. Peritoneum pale . . . . . *Lepophidium*

***Cherublemma* Trotter  
(Fig. 18)**



*Cherublemma* Trotter (1926:119; type-species by monotypy *Cherublemma lelepris* Trotter).  
*Brotuloides* Robins (1961:214; type-species by original designation *Leptophidium emmelas* Gilbert).

Well-developed spine on snout. Narrow row of weak median basibranchial teeth present. Peritoneum dark. Bones poorly ossified.

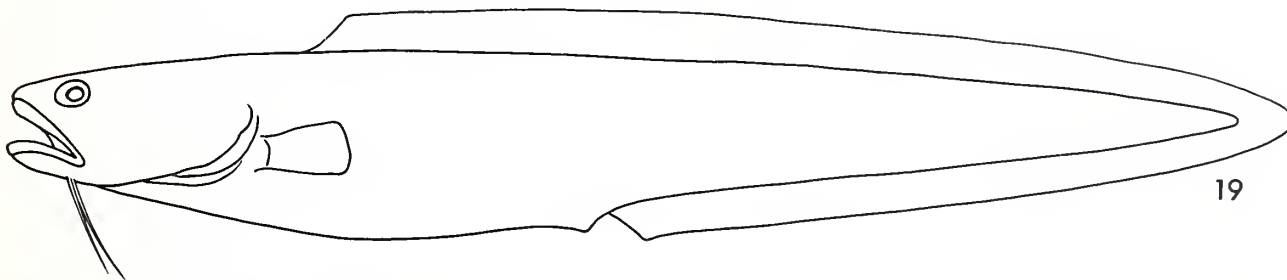
*Cherublemma* does not seem very similar to either of the other two genera in this tribe. Its immediate relationships may become more apparent when it is better known.

Tropical eastern Pacific.

Upper continental slope; early stages have been caught in midwater trawls.

A single species: \**C. emmelas* (Gilbert 1890) (\**Cherublemma lelepris* Trotter 1926 is a synonym).

***Genypterus* Philippi  
(Fig. 19)**



*Xiphiurus* Smith (1847 in 1838-47:110; type-species by monotypy *Xiphiurus capensis* Smith). Robins and Lea (1976) have appealed to the International Commission on Zoological Nomenclature to suppress this little used name.

*Genypterus* Philippi (1857:268; type-species by monotypy *Genypterus nigricans* Philippi 1857).

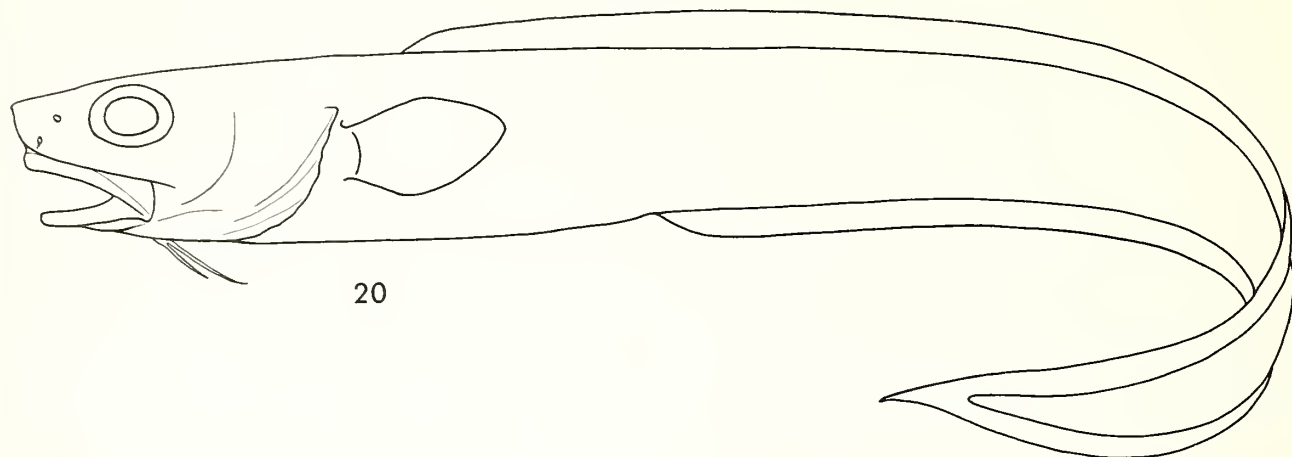
*Hoplophycis* Kaup (1858:92; type-species by monotypy *Hoplophycis lalandi* Kaup 1858).

No well-developed spine on snout. Basibranchial tooth patches present or absent. Peritoneum pale. The osteology of three Chilean species has been described by Toro and Dazarola (1969).

Abundant fishes of the continental shelf and slope in temperate waters of the Southern Hemisphere. Several species are fished commercially.

The nomenclature is tangled, and the literature is apparently filled with misidentifications. A much-needed revision of these important fishes is being carried on by C.R. Robins. At least five species: \**G. blacodes* (Schneider in Bloch and Schneider 1801), *G. capensis* (Smith 1847 in 1838-47), *G. chilensis* (Guichenot 1848), *G. maculatus* (Tschudi 1846 in 1844-46), and *G. microstomus* Regan 1903.

*Lepophidium* Gill  
(Fig. 20)



*Leptophidium* Gill (1863b:210; type-species by monotypy *Leptophidium profundorum* Gill). Preoccupied by *Leptophidium* Hallowell 1860 in snakes.

*Lepophidium* Gill (1895:167; replacement name for *Leptophidium* Gill 1863b, taking the same type species).

Well-developed spine on snout. No median basibranchial tooth patch. Peritoneum pale.

Tropical American continental shelf, although taken as far north as Georges Bank off New England in the western Atlantic and off southern California in the eastern Pacific. A single specimen of *L. cervinum* has been reported from the Mediterranean (Nielsen and Bini 1972).

There are 15 valid described species and at least five undescribed ones (see Robins 1958, 1962). Additional studies are in progress by Robins and name changes will be made. The species are: *L. aporrhox* Robins 1961, \**L. brevibarbe* (Cuvier 1829), \**L. cervinum* (Goode and Bean 1885), *L. graellsii* (Poey 1861), *L. jeannae* Fowler 1941, \**L. kallion* Robbins 1959. *L. marmoratum* (Goode and Bean 1885), *L. microlepis* (Gilbert 1890), \**L. negropinna* Hildebrand and Burton 1949. *L. pardale* (Gilbert 1890), \**L. pheromystax* Robins 1960, \**L. profundorum* (Gill 1863b), *L. prorates* (Jordan and Bollman 1890), \**L. staurophor* Robins 1958, and *L. stigmatistium* (Gilbert 1890).

### Ophidiini Rafinesque 1810

At least some body scales at oblique angles to each other and elliptical to elongate in shape.

The species of cusk eels with a basket-weave pattern of squamation are not at this time easily separated into genera. Norman (1966) placed them in two genera; we follow C. R. Robins and R. Lea (pers. commun.) in allocating the species among five. As the species become better known and numerous unnamed ones are described, a classification will emerge that is likely to differ considerably from the one presented below.

Many species are known to show a high degree of sexual dimorphism in the form of the swim bladder (Harry 1951). Additionally, some species have a prominent rocker bone at the anterior end of the swim bladder, which is controlled by a complex of muscles and ligaments (Svetovidov 1961; Rose 1961; Courtenay 1971). Although the swim bladder and associated structures have been used as taxonomic characters, there is not yet any clear phyletic pattern discernible in the distribution of various character states.

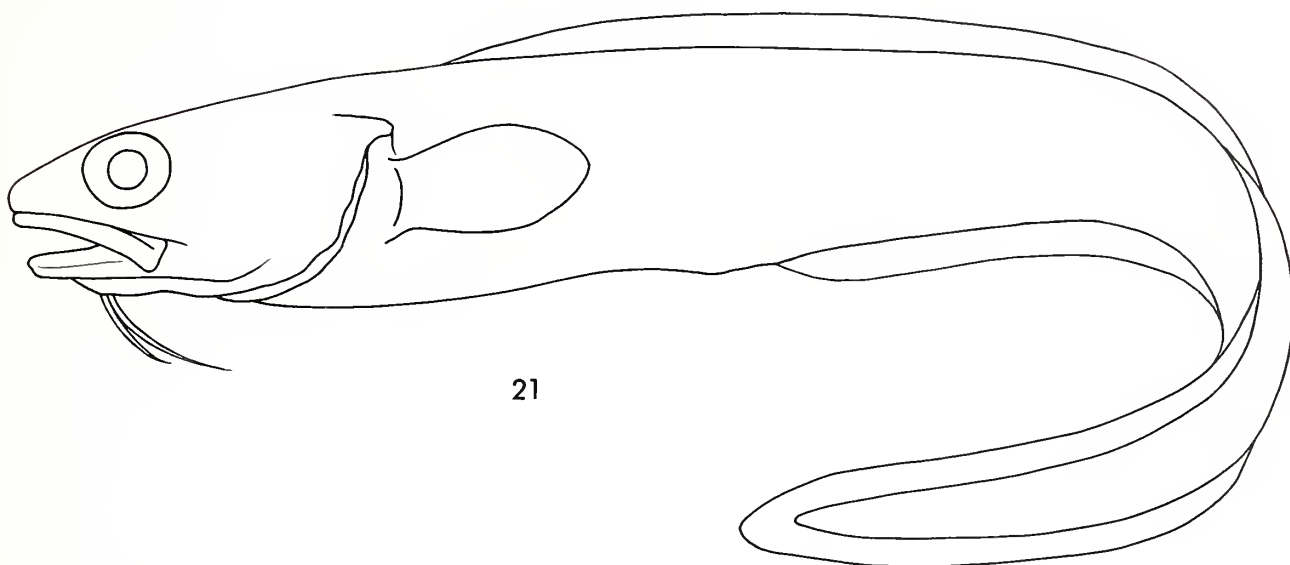
### Key to Genera of Ophidiini

- 1a. Scales absent on head (except in one species of *Ophidion* which has a small patch in front of the eye) . . . . . 3
- 1b. Scales present on the top and sides of the head . . . . . 2



- 2a. Rays of each pelvic fin equal in length or nearly so. Spine on snout weak or absent . . . . . *Parophidion*
- 2b. Rays of each pelvic fin unequal in length. Spine on upper part of snout short and strong, emergent or not . . . . . *Raneya*
- 3a. Dorsal fin rays about 200. Anal fin rays 150 or more. Precaudal vertebrae 19 . . . . . *Chilara*
- 3b. Dorsal fin rays rarely if ever more than 150. Anal fin rays rarely more than 125. Precaudal vertebrae 18 or fewer . . . . . 4
- 4a. Snout spine absent, or if present slender and anteriorly directed at its tip. Precaudal vertebrae 15-18 . . . . . *Ophidion*
- 4b. Snout spine present, stout, with a blunt, anterodorsally directed tip. Precaudal vertebrae 13-15 . . . . . *Otophidium*

***Chilara* Jordan and Evermann  
(Fig. 21)**



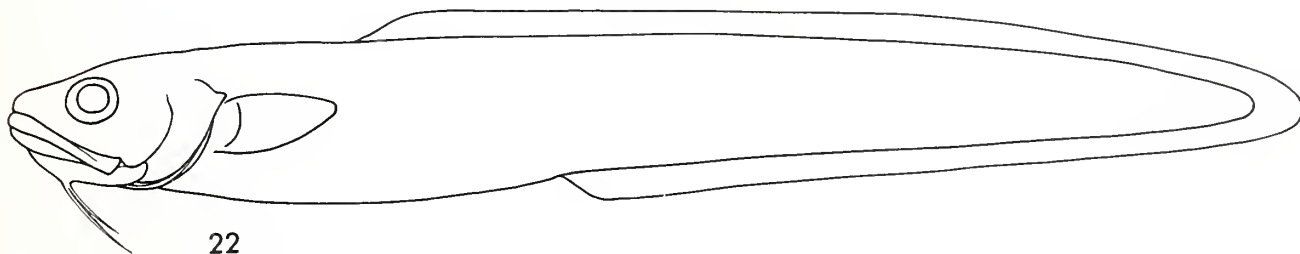
*Chilara* Jordan and Evermann (1896:482; type-species by monotypy *Ophidion taylori* Girard).

Scales absent from head. Rays of each pelvic fin unequal in length. Spine on snout absent. This genus, which is close to *Ophidion*, is apparently characterized by its high fin ray and vertebral counts. Dorsal fin rays about 200; anal fin rays about 150 or more; developed gill rakers on first arch 5 to 9; precaudal vertebrae 19.

Continental shelf of the temperate eastern North Pacific from Oregon to Baja California.

A single species, \**C. taylori* (Girard 1858).

***Ophidion* Linnaeus  
(Fig. 22)**



*Ophidion* Linnaeus (1758:259; type-species by subsequent designation of Jordan and Evermann 1896, *Ophidion barbatum* Linnaeus).

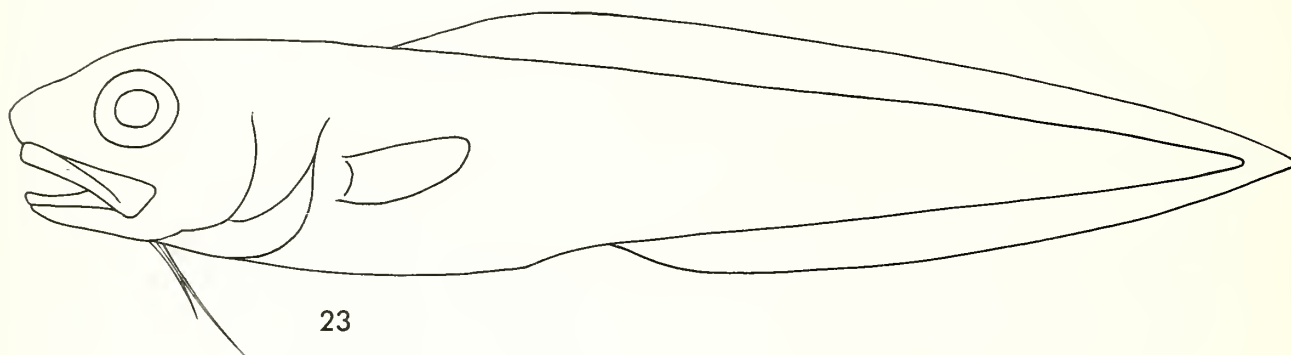
*Rissola* Jordan and Evermann (1896:483; type-species by monotypy *Ophidion marginatum* DeKay).

Scales absent from top of head and from sides as well, except in a single, presently unnamed species, which has a small patch in front of the eye (C. R. Robins, pers. commun.). Rays of each ventral fin unequal in length. Developed rakers on first gill arch 4 to 7. Precaudal vertebrae 15 to 18. Snout spine absent or, if present, slender and directed anteriorly at its tip.

Tropical and warm temperate waters around the world. Continental shelf, including reefs.

The taxonomy of *Ophidion* requires clarification. R. Lea and C. R. Robins, who are studying the genus, mentioned 10 species in the western Atlantic alone. Tentatively assigned to *Ophidion* are the following 18 described species: *O. asiro* (Jordan and Fowler 1902), *O. barbatum* Linnaeus 1758, *\*O. beani* Jordan and Gilbert 1883, *\*O. fulvum* (Hildebrand and Barton 1949), *\*O. galeoides* (Gilbert 1890), *O. genyopus* Ogilby 1897, *\*O. grayi* (Fowler 1948), *\*O. holbrooki* (Putnam 1874), *O. iris* Breder 1936 (*O. nigricauda* Breder 1936 is a synonym), *\*O. lagochila* (Böhlke and Robins 1959), *\*O. marginatum* (DeKay 1842), *\*O. muraenolepis* (Günther 1880), *\*O. nocomis* Robins and Böhlke 1959, *\*O. rochei* Müller 1845, *O. scrippsae* (Hubbs 1916), *\*O. selenops* Robins and Böhlke 1959, *\*O. smithi* (Fowler 1934), and *\*O. welshi* (Nichols and Breder 1922).

***Otophidium* Gill  
(Fig. 23)**



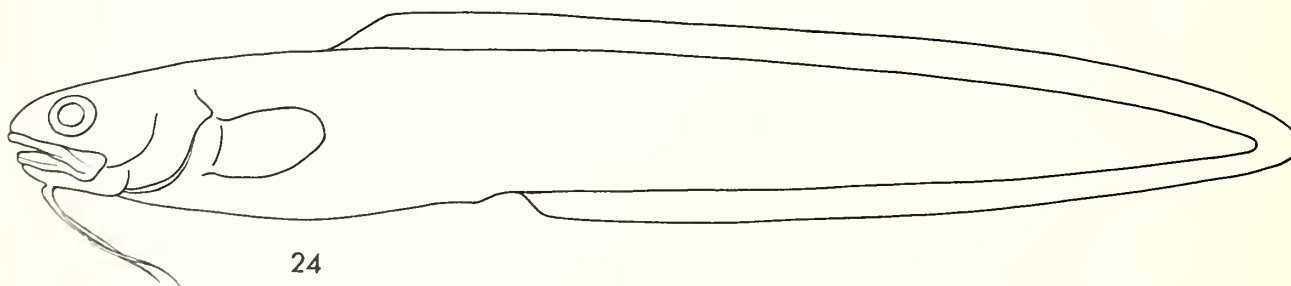
*Otophidium* Gill in Jordan (1887:126; type-species by original designation *Genypterus omostigma* Jordan and Gilbert).

Scales absent from head. Rays of each ventral fin unequal in length. Developed rakers on each gill arch 4 to 7. Precaudal vertebrae 13 to 15. Snout spine blunt, anterodorsally directed at its tip.

Warm temperate and tropical waters of the Americas. Found on the continental shelf, including reefs.

Four described species are tentatively assigned to this genus, which is being studied by C. R. Robins: *\*O. chickcharney* Böhlke and Robins 1959, *O. dormitator* Böhlke and Robins 1959, *\*O. indefatigabile* Jordan and Bollman 1890, and *\*O. omostigmum* (Jordan and Gilbert 1882).

***Parophidion* Tortonese  
(Fig. 24)**





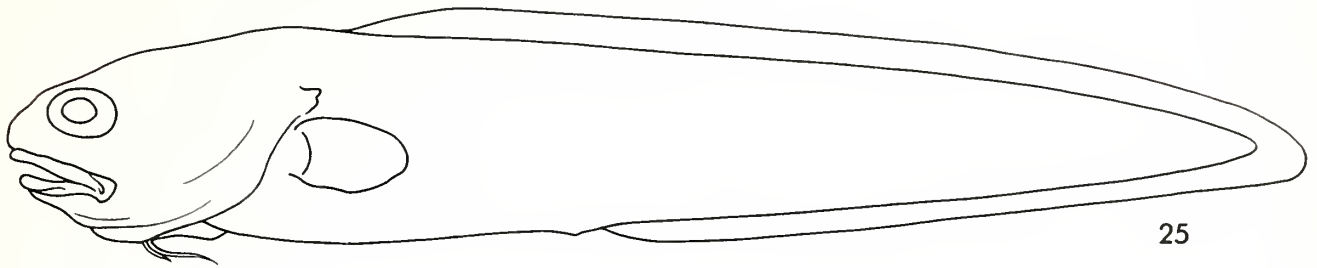
*Parophidion* Tortonese (1954:5; type-species by original designation *Ophidion vassali* Risso).

Scales present on top and sides of head. Rays of each ventral fin equal in length or nearly so. Spine on snout weak or absent. Precaudal vertebrae 15 or 16. Developed rakers on first arch 4.

Tropical western North Atlantic and Mediterranean in shallow water.

At least two species: *P. schmidti* (Woods and Kanazawa 1951), and \**P. vassali* (Risso 1810).

**Raneya Robins**  
(Fig. 25)



*Raneya* Robins (1961:212; type-species by original designation *Lepophidium fluminense* Ribeiro).

Scales present on top and sides of head. Rays of each ventral fin unequal in length. Spine on upper part of snout short and strong, sometimes buried. Precaudal vertebrae 15. Developed gill rakers on first arch 4.

Continental shelf of Brazil and Argentina (Menni and Lopez 1974).

A single species, \**Raneya fluminensis* (Ribeiro 1903).

**NEOBYTHITINAE RADCLIFFE 1913**

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. Ventral fin present in most genera, at about the level of the preopercle or farther forward, with 1 or 2 rays in each fin. Median basibranchial tooth patches 1 or more (except absent in some species of *Lamprogrammus* and *Bassozetus*); paired basibranchial tooth patches 0 or 1. Caudal fin rays 6 to 12. Developed gill rakers 0 to 27. Branchiostegal rays 7 to 9.

A large and diverse group found around the world from the littorai to the greatest depth at which a fish has been caught. Mostly benthopelagic in habit.

Two tribes.

**Key to Tribes of Neobythitinae**

- 1a. Ventral fins at about the level of the orbital region in position, or if more posterior, then the fins are widely separated on the isthmus (Fig. 26B) . . . . . Sirembini
- 1b. Ventral fins at about the level of the preopercle in position and close together (Fig. 26A), or absent . . . . . Neobythitini

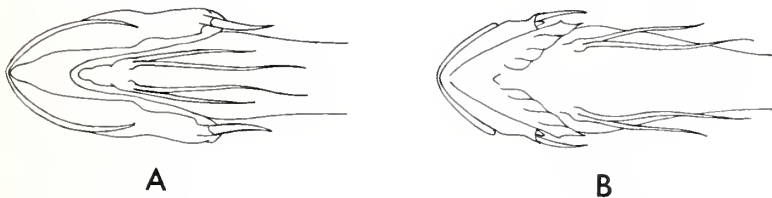


Figure 26.—Ventral fin insertions in two genera of Sirembini. A. *Xyelacyba*, close together; B. *Tauredophidium*, widely separate.

**Sirembini Gill 1863a**

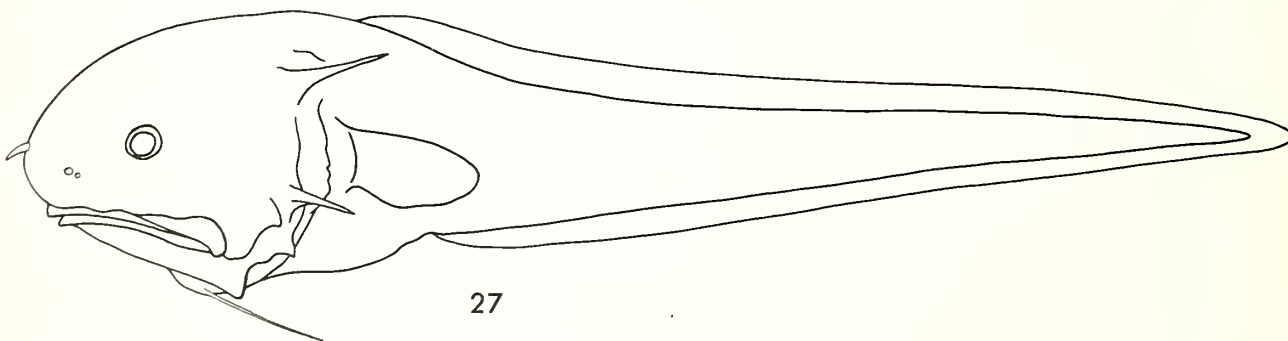
Symphysis of the cleithra and the pelvic girdle at about the level of the orbital region (except in *Tauredophidium*, which has them at about the level of the preopercle but which may be distinguished from all other ophidiiform fishes by its widely separated ventral fins; see below).

Sirembini as here constituted is most likely a heterogeneous assemblage, which probably will be reclassified. Within the tribe, *Hoplobrotula* and *Dannevigia* resemble each other; *Xyelacyba*, *Tauredophidium*, and possibly *Acanthonus* constitute another cluster; *Sirembo* is not very similar to any of the others.

**Key to Genera of Sirembini**

- 1a. Each ventral fin with a single ray. No spines on preopercle . . . . . *Sirembo*
- 1b. Each ventral fin with 2 rays. Spines variously developed on preopercle . . . . . 2
- 2a. Spine on opercle long, extending well beyond rear margin of head. Deepest part of fish usually at rear of head . . . . . 4
- 2b. Spine on opercle short, extending barely if at all beyond rear margin of head. Deepest part of fish usually posterior to rear part of head . . . . . 3
- 3a. Several weak, skin-covered, or barely emergent spines at angle of preopercle. Pelvic fins inserted near the level of the rear margin of the eye . . . . . *Dannevigia*
- 3b. Three strong emergent spines at angle of preopercle. Pelvic fins inserted beneath eye . . . . . *Hoplobrotula*
- 4a. Prominent, protruding, bifid spine on snout . . . . . *Acanthonus*
- 4b. No spine on snout . . . . . 5
- 5a. Pelvic fins close to each other (Fig. 26a). Small but well-developed eyes at surface of head . . . . . *Xyelacyba*
- 5b. Pelvic fins widely separated from each other (Fig. 26b). Eyes not visible at the surface of the head . . . . . *Tauredophidium*

***Acanthonus* Günther  
(Fig. 27)**



*Acanthonus* Günther (1878:22; type-species by monotypy *Acanthonus armatus* Günther).

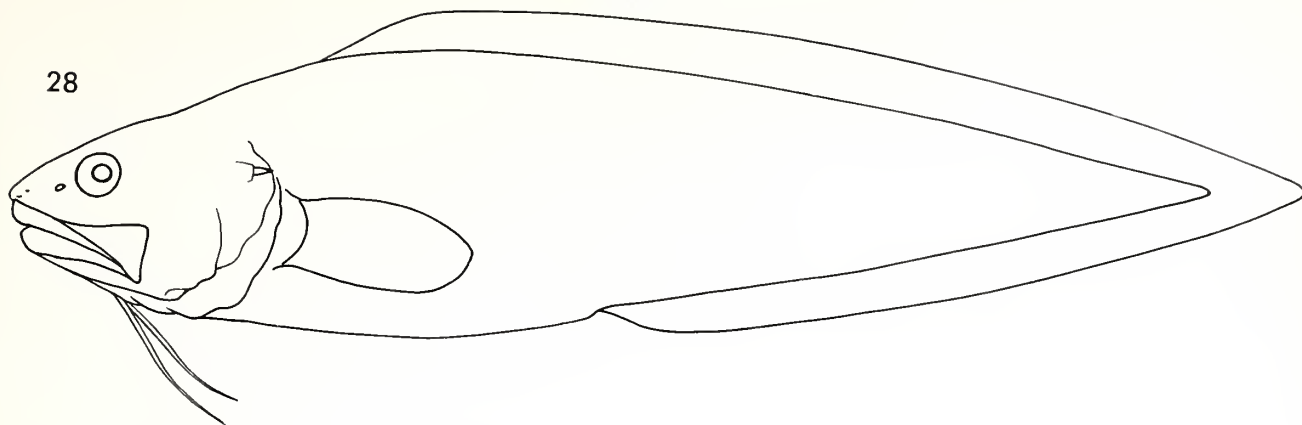
Prominent protruding bifid spine on snout. Ventral fins close together, each with 2 rays, inserted slightly posterior to the orbit. Spine on opercle long and slender, extending well beyond the rear margin of the head. Well-developed spines at lower angle of preopercle. Eyes at surface of head, small. Deepest part of fish at rear of head. Developed gill rakers on first arch 16 to 22. Median basibranchial tooth patches 1 to 4. No dark spots on dorsal fin. A revision of the genus was presented by Nielsen (1965).

Circumtropical at abyssal depths.

A single species, \**A. armatus* Günther 1878 (\**A. spinifer* Garman 1899 is a synonym).

*Dannevigia* Whitley  
(Fig. 28)

28



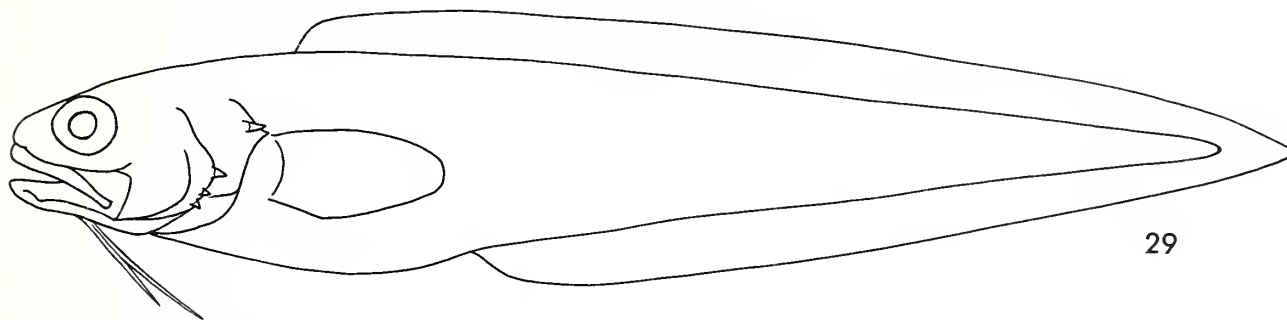
*Dannevigia* Whitley (1941:42; type-species by original designation *Dannevigia tusca* Whitley).

Ventral fins with 2 rays in each, fins closely adjacent, inserted close to the level of the rear margin of the eye. Several short weak concealed spines at angle of preopercle. Spine on opercle barely, if at all, reaching beyond rear margin of head. Eyes well-developed. Deepest part of fish well posterior to head. Developed gill rakers on first arch 4. Median basibranchial tooth patches 2. No dark spots on dorsal fins.

Apparently restricted to the Great Australian Bight.

A single species. \**D. tusca* Whitley 1941.

*Hoplobrotula* Gill  
(Fig. 29)



29

*Hoplobrotula* Gill (1863a:253; type-species by original designation *Brotula armata* Temminck and Schlegel).

Ventral fins with 2 rays in each, fins closely adjacent, inserted beneath the eye. Three strong emergent spines at angle of preopercle. Spine on opercle reaching barely if at all beyond rear margin of head. Eyes well-developed. Deepest part of fish generally posterior to head. Developed gill rakers on first arch 4 or 5. Basibranchial with 1 median and 1 pair of tooth patches.

Deeper part of continental shelf. Japan and Indian Ocean.

Two nominal species: \**H. armata* (Temminck and Schlegel 1846), and \**H. gnathopus* Regan 1921.

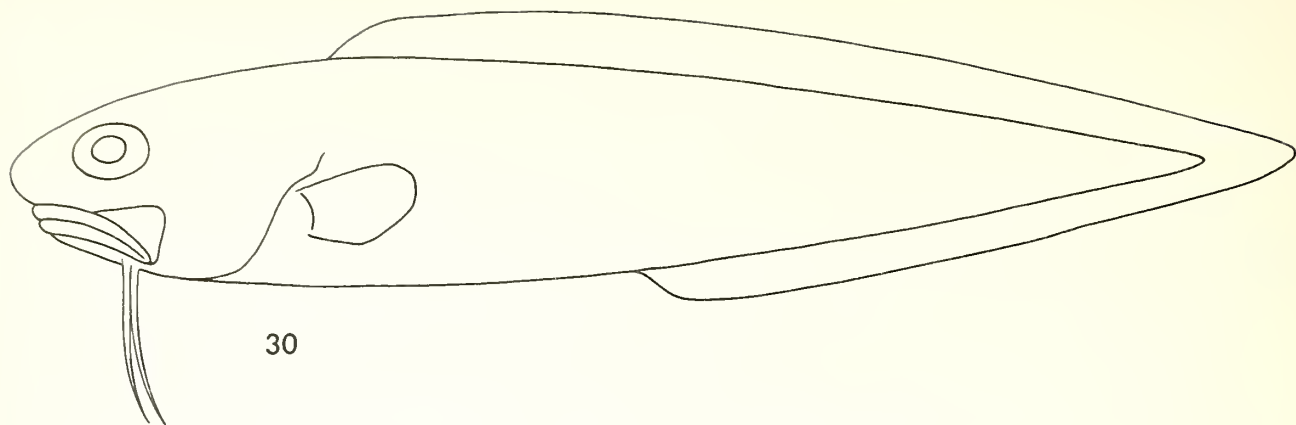
*Sirembo* Bleeker  
(Fig. 30)

*Sirembo* Bleeker (1858:22; type-species by subsequent designation of Vaillant 1888, "*Sirembo imberbis* Schleg." = *Brotula imberbis* Temminck and Schlegel).

*Brotella* Kaup (1858:92; type-species by subsequent designation of Jordan 1919, *Brotula imberbis* Temminck and Schlegel).

*Umalius* Herre and Herald (1951:310; type-species by original designation *Umalius philippinus* Herre and Herald).

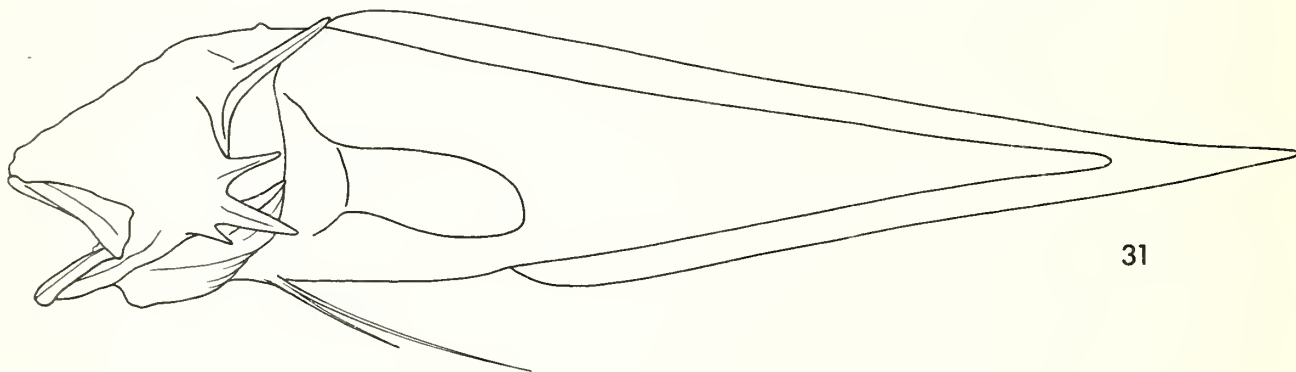
Ventral fins immediately adjacent to each other, each with a single ray, inserted beneath or immediately behind the eye. No spines on preopercle. Spine on opercle short, not reaching rear margin of opercle. Eyes well-developed. Deepest part of fish well posterior to head. Developed gill rakers on first arch 4. A single median basibranchial tooth patch. Several prominent dark spots on dorsal fin.



Continental shelf from the Red Sea to Japan, the Philippines, and Australia.

The genus has never been revised, Indian Ocean specimens are discussed by Menon and Rama Rao (1970) and Rao (1972). There are four nominal species: *S. everriculi* Whitley 1936, \**S. imberbis* (Temminck and Schlegel 1846), *S. jerdoni* (Day 1888), \**S. philippinus* (Herre and Herald 1951).

***Tauredophidium* Alcock**  
(Fig. 31)



*Tauredophidium* Alcock (1890a:212; type-species by monotypy *Tauredophidium hextii* Alcock).

No spine on snout. Ventral fins inserted at about the level of the preopercle and widely separated from each other, on opposite sides of the isthmus (Fig. 26b). Spines on opercle and preopercle long, extending well beyond the rear margin of the head. Basibranchial with 1 median and 1 pair of tooth patches. Eyes not visible at the surface of the head. Deepest part of fish near rear of head. Developed gill rakers on first arch 8 or 9. No dark spots on dorsal fin.

*Tauredophidium* is unique among ophidiiform fishes in the wide separation of its ventral fins. Except for this separation, the more posterior placement of the ventral, and the regression of the eyes, the genus is very similar to *Xyelacyba*.

Abyssal depths in the Indian Ocean.

A single species, \**T. hextii* Alcock 1890a.

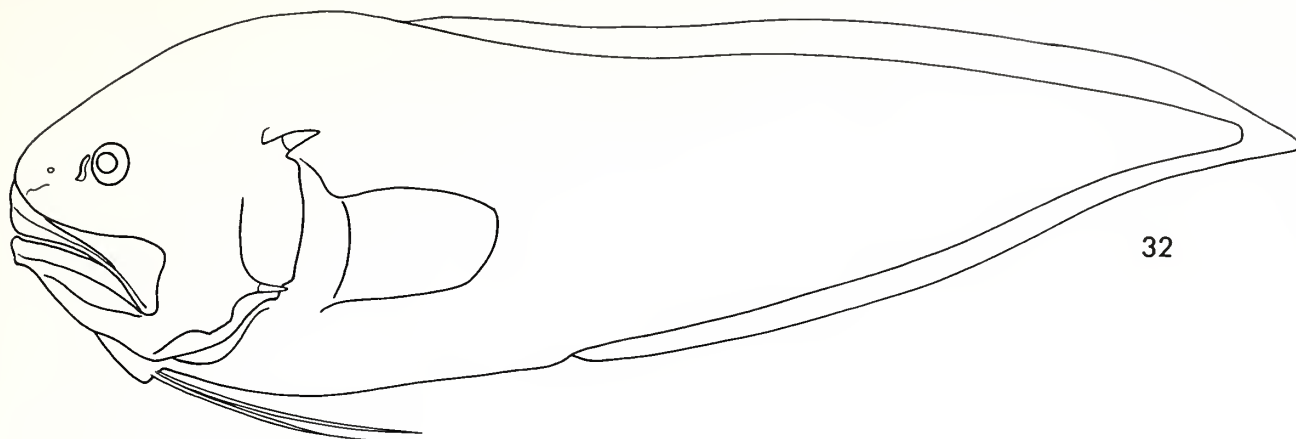
***Xyelacyba* Cohen**  
(Fig. 32)

*Xyelacyba* Cohen (1961:288; type-species by original designation *Xyelacyba myersi* Cohen).

No spine on snout. Ventral fins relatively close together, each with 2 rays (Fig. 26a); position variable, inserted between the level of the orbit and the rear of the maxillary. Spine on opercle long, extending beyond the rear margin of the head. Well-developed spines at lower angle of preopercle. Eyes at surface of head, small. Deepest part of fish near rear of head. Developed rakers on first gill arch about 16. Median basibranchial tooth patches 2 or 3. No dark spots on dorsal fin.

Atlantic and Pacific at abyssal depths.

Possibly two or more species; only one of which is described, \*X. myersi Cohen 1961.



**Neobythitini Radcliffe 1913**

Symphysis of the cleithra and the pelvic girdle at about the level of the preopercle, well behind the eye. Ventral fins usually present, close together.

Further study will allow the partitioning of this tribe into groups of related genera. For the present, we note under those genera for which we have information their apparent relationships.

**Key to Genera of Neobythitini<sup>5</sup>**

- 1a. Ventral fins present, each with 1 or 2 well-developed rays . . . . . 3
- 1b. Ventral fins absent or rudimentary, the rays represented by tiny stubs . . . . . 2
- 2a. Opercular spine absent or weak, flattened and flexible . . . . . *Lamprogrammus*
- 2b. Opercular spine strong, somewhat rounded in cross section . . . . . *Bassobythites*
- 3a. Orbit large but eye lens rudimentary or lacking . . . . . *Leucicorus*
- 3b. Orbit large to small; developed lens present or eyes buried and not externally visible . . . . . 4
- 4a. Head massively inflated. Eyes not externally developed or very small . . . . . *Typhlonus*
- 4b. Head variously developed but not massively inflated. Eyes large to small, present externally . . . . . 5
- 5a. Head about one-half or more than preanal length . . . . . 8
- 5b. Head much less than one-half preanal length . . . . . 6
- 6a. Developed gill rakers 3 or fewer. Vomerine teeth in a narrow row . . . . . *Enchelybrotula*
- 6b. Developed gill rakers 5 or more. Vomerine teeth in a diamond-shaped patch . . . . . 7

<sup>5</sup>*Parabassogigas* is entered twice in this key after couplet number 5. *Porogadus* is entered twice after couplet number 12. *Dicrolene* is entered twice after couplet number 20.



7a.	Median basibranchial tooth patch 1. Branchiostegal rays 7 . . . . .	<i>Barathrites</i>
7b.	Median basibranchial tooth patches 2. Branchiostegal rays 8 . . . . .	<i>Parabassogigas</i> (? <i>Spectrunculus</i> )
8a.	Developed gill rakers 7 or more . . . . .	.12
8b.	Developed gill rakers 4 or fewer . . . . .	9
9a.	Median basibranchial tooth patches 2. Preopercle with 2 or 3 spines at lower angle . . . . .	<i>Pycnocraspedum</i>
9b.	Median basibranchial tooth patches 1. Preopercle with 0 or 1 spine at lower angle . . . . .	.10
10a.	Opercular spine present . . . . .	<i>Luciobrotula</i>
10b.	Opercular spine absent . . . . .	.11
11a.	Mouth inferior. Snout with numerous small papillae . . . . .	<i>Petrotyx</i>
11b.	Mouth terminal or lower jaw slightly longer. Snout without numerous small papillae . . . . .	<i>Hypopleuron</i>
12a.	Opercular spine sometimes hidden but strong, narrow, usually rounded in cross section . . . . .	.20
12b.	Opercular spine absent or weak; if present rather broad, flattened, and flaplike or incorporated in opercular bone . . . . .	.13
13a.	Pectoral fin narrow and constricted proximally, originating on only part of pectoral peduncle; some of the rays greatly elongated, equaling one-half or more the standard length . . . . .	<i>Mastigopterus</i>
13b.	Pectoral fin not constricted proximally, originating on the entire pectoral peduncle; fin short or only lower rays greatly prolonged . . . . .	.14
14a.	Pectoral fin rays 10-11 . . . . .	<i>Abyssobrotula</i>
14b.	Pectoral fin rays 15 or more . . . . .	.15
15a.	Eye diameter equal to or greater than snout length . . . . .	<i>Glyptophidium</i>
15b.	Eye diameter less than snout length . . . . .	.16
16a.	Maxillary sheathed posterodorsally . . . . .	.18
16b.	Maxillary free posterodorsally . . . . .	.17
17a.	All pectoral fin rays joined. Median basibranchial tooth patch 1. Body depth at vent 10 or more times in standard length . . . . .	<i>Porogadus</i>
17b.	Lower rays of pectoral fin free. Median basibranchial tooth patches 2. Body depth at vent 9.5 or fewer times in standard length . . . . .	<i>Bathyonus</i>



18a.	Rear margin of maxillary at the level of or anterior to rear margin of eye . . . . .	<i>Alcockia</i>
18b.	Rear margin of maxillary well posterior to rear margin of eye . . . . .	.19
19a.	Pectoral fin extending a short distance if at all beyond anus, not divided . . . . .	<i>Bassozetus</i>
19b.	Lower part of pectoral fin extending well beyond anus, or if rays not prolonged the fin is divided .	<i>Eretmichthys</i>
20a.	Opercular spine straight . . . . .	.22
20b.	Opercular spine curved . . . . .	.21
21a.	Snout long, broad, and strongly depressed. Eye diameter one-third or less than snout length . . . . .	<i>Penopus</i>
21b.	Snout short and blunt. Eye diameter equal to one-half or more than snout length . . . . .	<i>Dicrolene</i>
22a.	Pectoral fin entire; ventral fins with 1 or 2 rays in each . . . . .	.24
22b.	Lower rays of pectoral fin free; ventral fins with 2 rays in each . . . . .	.23
23a.	Eye diameter much less than one-half of snout length. Lower rays of pectoral fins shorter than upper rays. Pelvic fin rays flattened . . . . .	<i>Holcomycteronus</i>
23b.	Eye diameter equal to one-half or more of snout length. Lower rays of pectoral fin longer than upper rays. Pelvic fin rays filamentous . . . . .	<i>Dicrolene</i>
24a.	Caudal fin with 5 or 6 rays. Body depth at vent 10 times or more in standard length . . . . .	<i>Porogadus</i>
24b.	Caudal fin with 8 or more rays. Body depth at vent 8.5 times or less in standard length . . . . .	.25
25a.	Median basibranchial tooth patches 2 . . . . .	.29
25b.	Median basibranchial tooth patch 1 . . . . .	.26
26a.	Ventral fin longer than head. Pectoral fin placed low on body, closer to belly than to midline . . .	<i>Homostolus</i>
26b.	Ventral fin equal to or shorter than head. Pectoral fin inserted higher on body, closer to midline than to belly . . . . .	.27
27a.	Teeth along rear of jaws enlarged. Opercular spines 2 . . . . .	<i>Benthocometes</i>
27b.	Jaw teeth granular, small, and close-set. Opercular spine 1 . . . . .	.28
28a.	Ventral fin fleshy, reaching nearly to vent. Prominent dark spots on side of body and fins . . . .	<i>Spottobrotula</i>
28b.	Ventral fin filamentous, falling far short of vent. No spots on body and fins . . . . .	<i>Monomitopus</i>
29a.	Teeth larger, needlelike, separate from each other . . . . .	<i>Epetriodus</i>
29b.	Teeth small, granular, close set . . . . .	.30

- 30a. Ventral rays 1 in each fin . . . . . *Selachophidium*
- 30b. Ventral rays 2 in each fin . . . . . .31
- 31a. Eye diameter about equal to or greater than snout length. Many species with prominent spots, blotches, or bands . . . . . *Neobythites*
- 31b. Eye diameter less than snout length. No spots, blotches, or bands . . . . . .32
- 32a. Anterior nostril with a thick, fleshy raised rim (Fig. 33) . . . . . *Parabassogigas*
- 32b. Anterior nostril a simple pore or with a thin tube, but not as above . . . . . .33

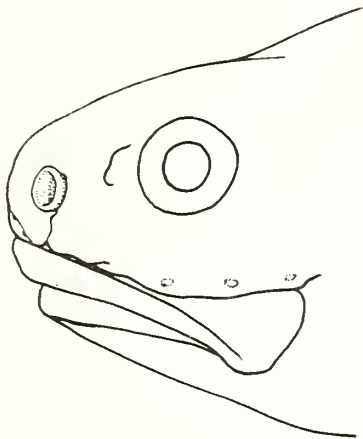
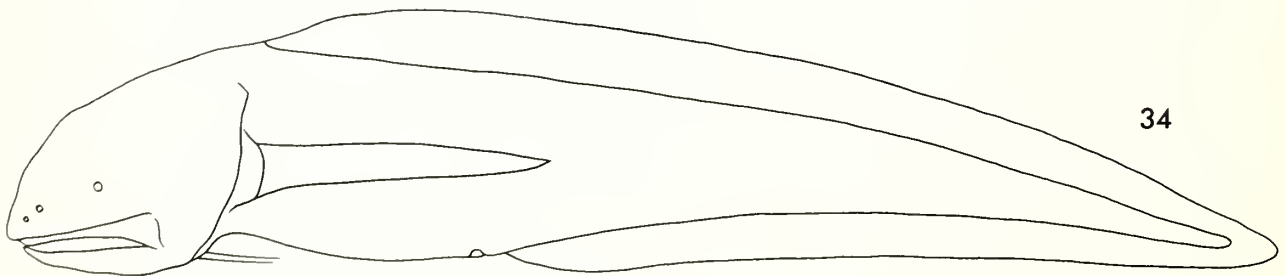


Figure 33.—*Parabassogigas* head. Note the thick, fleshy, raised rim of the anterior nostril.

- 33a. Snout notably inflated. Maxillary sheathed. Developed gill rakers 12 or more . . . . . *Barathrodemus*
- 33b. Snout not inflated. Maxillary free. Developed gill rakers 7 . . . . . *Bassogigas*

***Abyssobrotula* Nielsen  
(Fig. 34)**



34

*Abyssobrotula* Nielsen (1977:41; type-species by original designation *Abyssobrotula galathea* Nielsen).

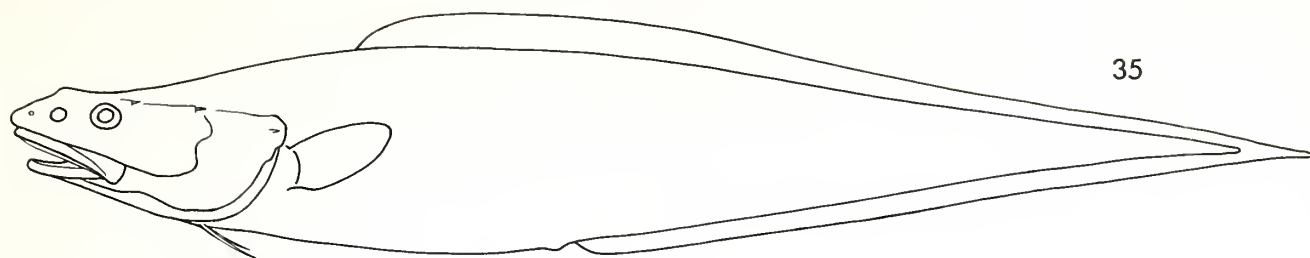
Snout swollen. Mouth slightly inferior. Eyes small. Opercular spine poorly developed. Basibranchial with 2 median and 1 pair of tooth patches. Vomer with a V-shaped tooth patch. Anterior gill arch with 8 to 11 long rakers. Pectoral fin with 10 or 11 rays; extending beyond anus. Ventral fins with 2 rays in each. Precaudal vertebrae 18 to 21. Branchiostegal rays 7 or 8.

Probably related to *Enchelybrotula* and *Barathrites*.

Circumglobal at abyssal and hadal depths. A specimen trawled from the Puerto Rico trench at 8,370 m (Staiger 1972) is the deepest recorded fish (as *Bassogigas profundissimus*).

A single species, \**A. galathea* Nielsen 1977.

*Alcockia* Goode and Bean  
(Fig. 35)



*Alcockia* Goode and Bean (1896:329; type-species by original designation *Porogadus rostratus* Günther).

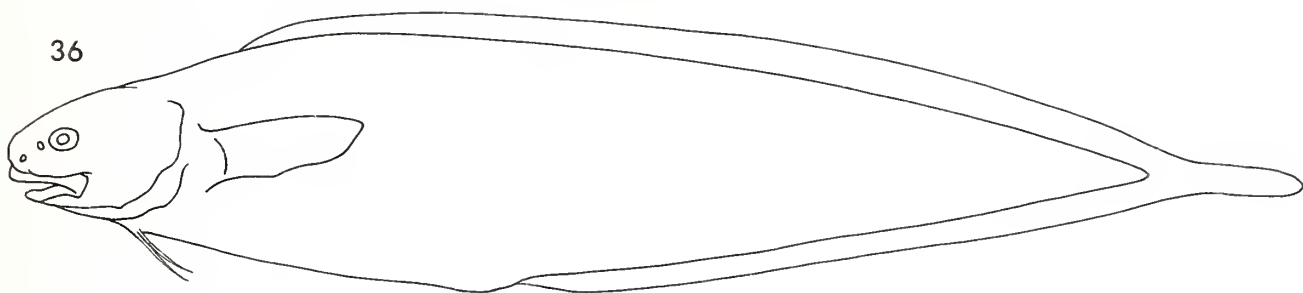
Head depressed. Eye diameter about 2 times in snout length. Opercular spine flat and weak. Spines on head sharp and well-developed, particularly behind posterior nostril, above eye, and above cheek. Suborbital bones membranous. Maxillary strongly sheathed posterodorsally. Median basibranchial tooth patches 2. Developed rakers on anterior arch 7. Branchiostegal rays 8. Ventral fins with 2 rays in each. Precaudal vertebrae 15 or 16.

Possibly related to *Porogadus*, some species of which it resembles in having similar armature on the head. There are, however, numerous differences between the two genera.

Known from 7 specimens caught at abyssal depths between the Celebes and Madagascar.

A single species, \**A. rostrata* (Günther 1878).

*Barathrites* Zugmayer  
(Fig. 36)



*Barathrites* Zugmayer (1911:11; type-species by monotypy *Barathrites iris* Zugmayer).

Ventral fins with 2 rays in each. Caudal fin rays 8. Abdomen long; head short, about 3 times in preanal distance. Tips of pectorals falling well short of vent. Eyes small. Median basibranchial tooth patch 1, small. Vomerine teeth in a diamond-shaped patch. Branchiostegal rays 7. Developed gill rakers on first arch 5 to 7. Opercular spine short, sharp, rounded in cross section. Precaudal vertebrae 18.

Possibly related to *Abyssobrotula* and *Enchelybrotula*, which also have 7 branchiostegal rays and to *Parabassogigas*, with which it shares a high number of precaudal vertebrae.

Abyssal from the tropical Atlantic and Pacific.

This genus is being studied by D. M. Cohen. Three described species, of which probably only two are valid: \**B. iris* Zugmayer 1911 (\**B. abyssorum* Roule 1916 is probably a synonym), and \**B. parri* Nybelin 1957.

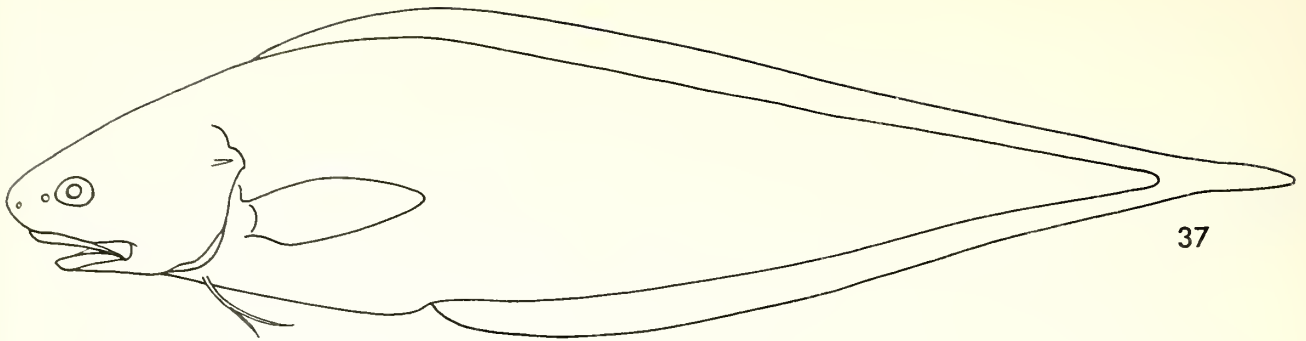
*Barathrodemus* Goode and Bean  
(Fig. 37)

*Barathrodemus* Goode and Bean (1883:200; type-species by monotypy *Barathrodemus manatinus* Goode and Bean).

Ventral fins with 2 rays in each. Caudal fin rays 8. Abdomen short, pectoral fin reaching nearly to vent or beyond. Snout inflated. Maxillary strongly sheathed. Median basibranchial tooth patches 2. Vomerine tooth patch triangular. Branchiostegal rays 8. Developed gill rakers on first arch 12 to 15. Opercular spine short, sharp. Precaudal vertebrae 12 to 14. Pectoral fin rays 19 to 25.

Possibly related to *Parabassogigas*.

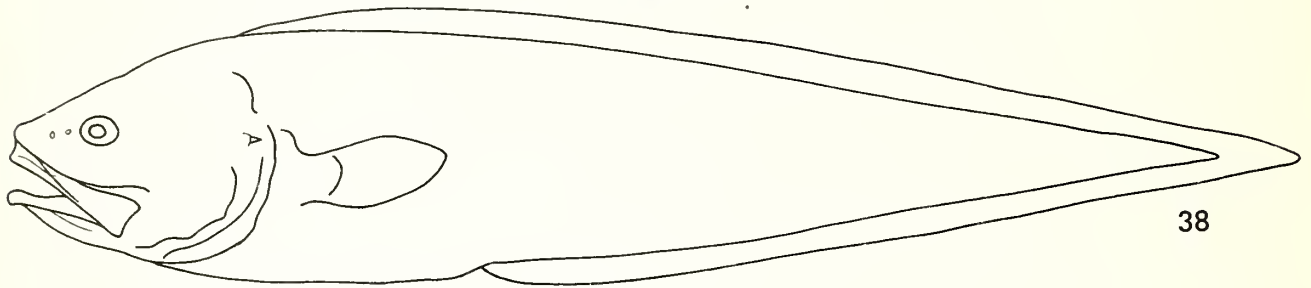
Continental slopes of the tropical Atlantic and western Pacific.



37

Three nominal species may be assigned to this genus, which is being studied by D. M. Cohen: \**B. manatinus* Goode and Bean 1883, \**B. microps* Parr 1933, and \**B. nasutus* Smith and Radcliffe in Radcliffe 1913.

**Bassobythites Brauer**  
(Fig. 38)



38

*Bassobythites* Brauer (1906:307; type-species by monotypy *Bassobythites brunswigi* Brauer).

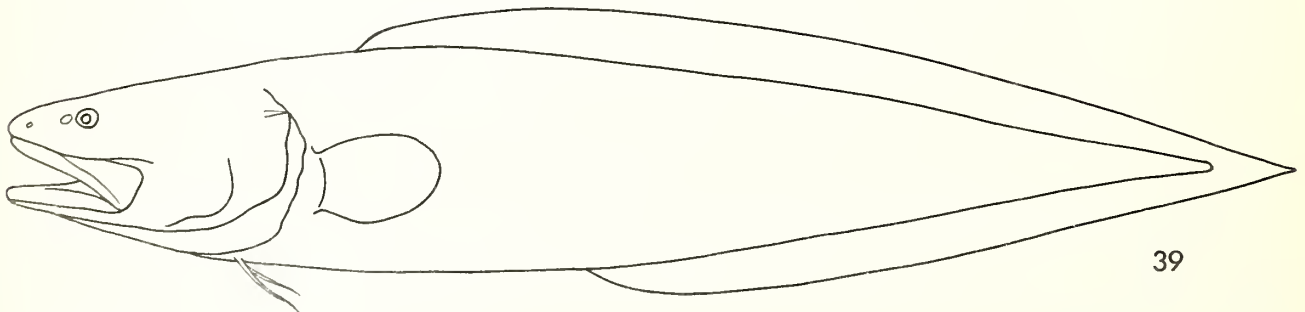
Ventral fins absent. Median basibranchial tooth patch 1. Branchiostegal rays 8. Caudal fin rays 8. Mouth terminal. Teeth granular. Precaudal vertebrae 13. Opercular spine somewhat rounded in cross section, sharp pointed. Head bones relatively well ossified. Lateral line similar to that of *Lamprogrammus* but outer covering of scales more strongly adherent: marked externally in several specimens by a single series of pores with fleshy raised rims, extending along the body a short distance beneath the dorsal profile. Scales on body large and small.

Closely related to and possibly identical with *Lamprogrammus*.

Indian Ocean, western Pacific, and eastern Atlantic.

Two nominal species: \**B. brunswigi* Brauer 1906, and \**B. macropterus* (Smith and Radcliffe in Radcliffe 1913).

**Bassogigas Goode and Bean**  
(Fig. 39)



39

*Bassogigas* Goode and Bean (1896:328; type-species by subsequent designation of Jordan and Evermann 1896, *Bassogigas gillii* Goode and Bean).

Snout much longer than eye. Opercular spine strong. Median basibranchial tooth patches 2. Vomerine tooth patch V-

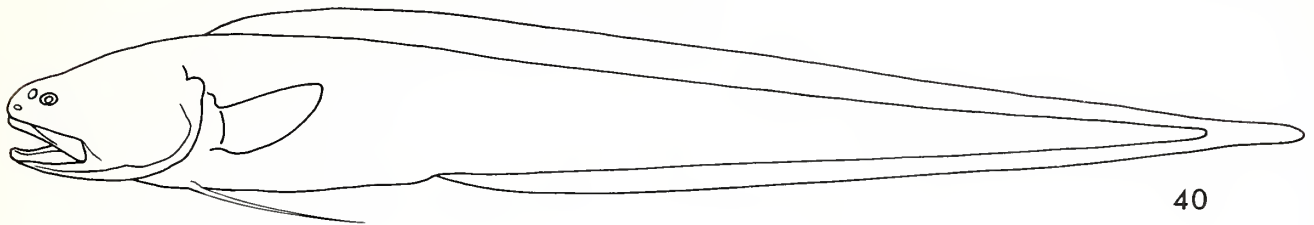
shaped. Developed rakers on first gill arch 7 to 9. Pectoral fin short and rounded, with 27 to 31 rays. Ventral fins with 2 rays in each. Branchiostegal rays 8. Precaudal vertebrae 15 or 16. A distinct dorsal lateral line.

Related to *Holcomycteronus*.

Tropical Atlantic at bathyal and abyssal depths.

Although a number of species have been referred to *Bassogigas*, Neilsen (manuscr. in prep.) has restricted the genus to the type-species, \**B. gillii* Goode and Bean 1896.

***Bassozetus* Gill  
(Fig. 40)**



*Bassozetus* Gill (1884:259; type-species by monotypy *Bassozetus normalis* Gill).

*Pterodicromita* Fowler (1925:5; type-species by original designation *Sirembo oncercephalus* Vaillant).

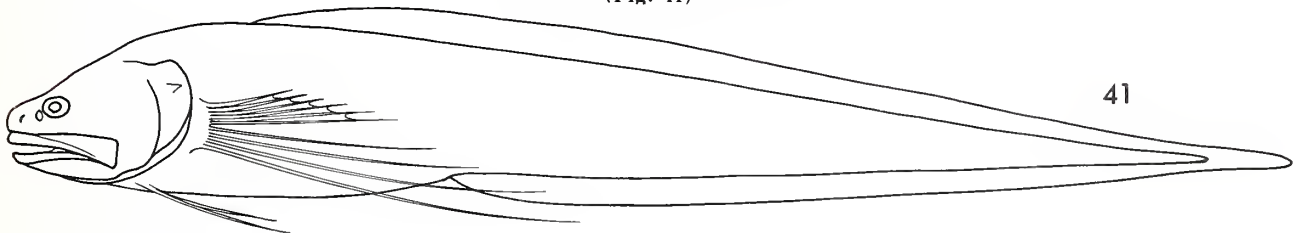
Mouth terminal. Snout somewhat inflated. Eye diameter 2.5 or more times in snout. Opercular spine weak or absent. Preoperculum unarmed and posteriorly expanded, in most species reaching almost to the posterior margin of operculum. Median basibranchial tooth patch 1 (except 0 in *B. zenkevitchi*). Developed rakers on anterior gill arch 12 to 16. Pseudobranchial filaments 2. Pectoral fin short, not reaching far beyond anus, with 23 to 31 rays. Ventral fins with 1 ray in each. Precaudal vertebrae 11 to 16. Lateral line indistinct.

Very closely related to *Eretmichthys*.

A rather common circumtropical genus at deep-bathyal and abyssal depths.

The genus requires revision. Nine nominal species and at least one undescribed: \**B. compressus* (Günther 1878), \**B. elongatus* Smith and Radcliffe in Radcliffe 1913, \**B. glutinosus* (Alcock 1890a), *B. nasus* Garman 1899, \**B. normalis* Gill 1884, \**B. oncercephalus* (Vaillant 1888), \**B. robustus* Smith and Radcliffe in Radcliffe 1913, \**B. taenia* (Günther 1887), and \**B. zenkevitchi* Rass 1955.

***Bathyonus* Goode and Bean  
(Fig. 41)**



*Bathynectes* Günther (1878:20; type-species by subsequent designation of Jordan 1919, *Bathynectes laticeps* Günther<sup>6</sup>; preoccupied by *Bathynectes* Stimpson 1870 in Crustacea).

*Bathyonus* Goode and Bean (1886:603; replacement name for *Bathynectes* Günther, takes the same type-species).

*Mixonus* Günther (1887:108; type-species by monotypy *Bathynectes laticeps* Günther).

*Nematonus* Günther (1887:114; type-species by monotypy *Bathyonus pectoralis* Goode and Bean 1886).

Body depth 9.5 or fewer times in standard length. Head length equal to approximately one-half preanal length. No prominent spines on top or side of head. Median basibranchial tooth patches 2. Developed rakers on first gill arch 10 or more. Caudal fin rays 6. Pectoral fin with lower rays free and stronger and longer than those above. Ventral fins with 2 rays in each. Branchiostegal rays 8. Precaudal vertebrae 17 to 19.

For possible relationships see *Porogadus*.

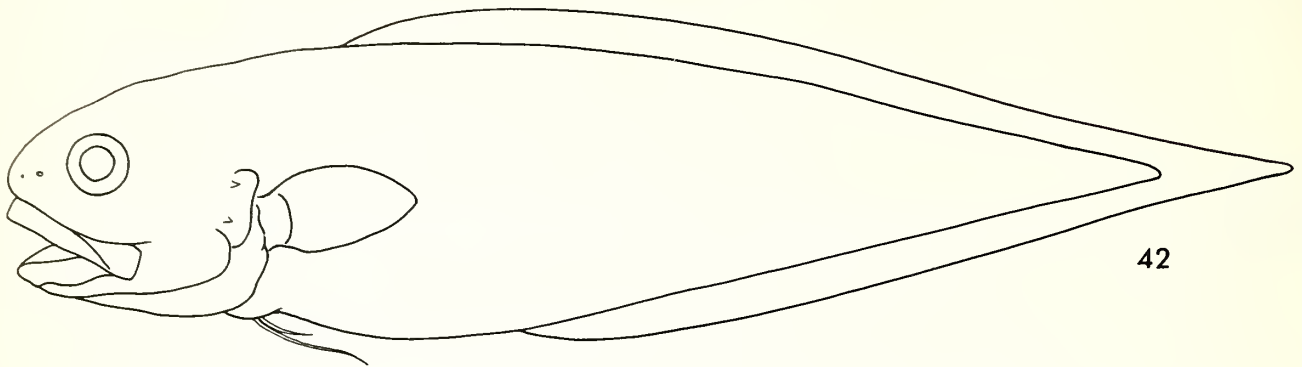
Circumtropical at abyssal depths.

<sup>6</sup>The name *compressus* is given by Jordan and Evermann (1898:2507) in parenthesis after the name and citation for *Bathynectes* Günther (which they list in the synonymy of *Bassozetus*). We do not accept Jordan and Evermann's action as constituting designation of a type species for *Bathynectes* for reasons discussed by Follett and Cohen (1958) and China (1962).



Three nominal species may be assigned to this genus, which is being studied by D. M. Cohen: \**B. caudalis* (Garman 1899), \**B. laticeps* (Günther 1878), and \**B. pectoralis* (Goode and Bean 1886).

***Benthocometes* Goode and Bean  
(Fig. 42)**



*Benthocometes* Goode and Bean (1896:327; type-species by subsequent designation of Jordan and Evermann 1896, *Neobythites robustus* Goode and Bean).

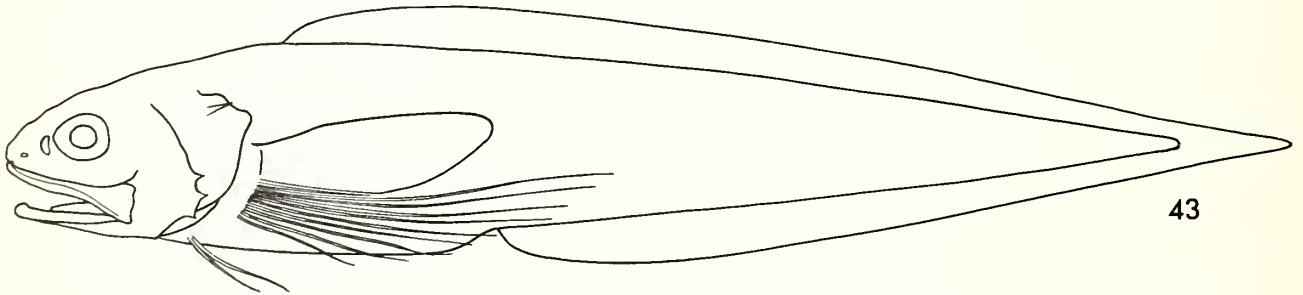
Body rather short and stubby; depth at vent 4 or 5 times in standard length. Mouth terminal. Eye diameter about equal to or greater than snout length. Opercle with 2 posteriorly directed spines. Median basibranchial tooth patch single. Teeth along rear of jaws somewhat enlarged. Vomerine tooth patch without arms. Developed rakers on first gill arch 8 to 11. Pseudobranchial filaments about 5. Pectoral fin rays 27 to 30. Caudal fin rays 10 or 11. Ventral fins with 2 rays in each. Branchiostegal rays 8. Precaudal vertebrae 11 or 12. Lateral line distinct.

Perhaps related to *Neobythites*.

Tropical Atlantic and Mediterranean at depths of 500 to 1,000 m.

A single species was recognized by Bougis and Ruivo (1954) in their study of the genus, \**B. robustus* (Goode and Bean 1886) (synonyms are *Pteridium armatum* Doderlein 1886 and *Siremba muraenolepis* Vaillant 1888).

***Dicrolene* Goode and Bean  
(Fig. 43)**



*Dicrolene* Goode and Bean (1883:202; type-species by monotypy *Dicrolene intronigra* Goode and Bean).

*Pteroidonus* Günther (1887:106; type-species by monotypy *Pteroidonus quinquarius* Günther).

*Paradicrolene* Alcock (1889:387; type-species by monotypy *Paradicrolene multifilis* Alcock).

*Brachydicrolene* Norman (1939:86; type-species by original designation *Paradicrolene nigricaudis* Alcock).

Snout rather blunt. Eyes large, equal to one-half or more than snout length; 4 to 8.3 times in head length. Opercular spine strong and straight (except curved in *D. kanazawai*). Margin of preoperculum usually with 3 sharp spines. Median basibranchial tooth patches 1 or 2; a single paired set of tooth patches (except 0 in *D. kanazawai*). Developed gill rakers on anterior arch 7 to 15. Pectoral fin rays 22 to 33; the lower 5 to 11 rays free and longer than the upper rays. Ventral fins with 2 rays in each. Precaudal vertebrae 13 to 16.

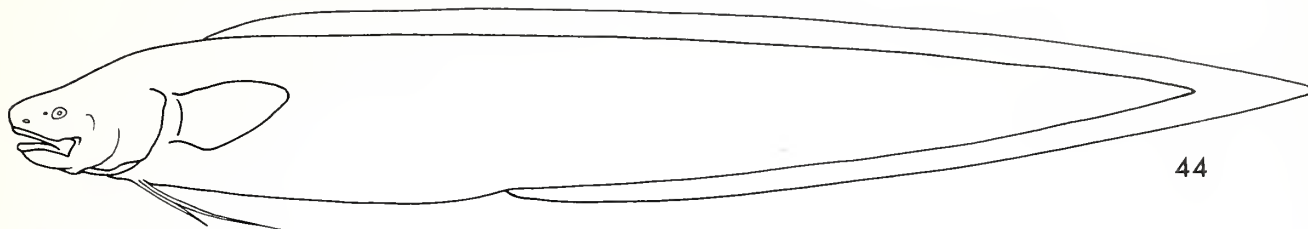
Apparently related to *Mastigopterus*.

Common fishes found in tropical and temperate seas at bathyal and upper abyssal depths (about 500-3,200 m).

*Dicrolene* as presently characterized is highly variable. A much needed revision may show that more than one genus should be recognized. Thirteen described species may be ascribed to this genus; an undescribed one is known (Nielsen et

al., manusc.): \**D. filamentosa* Garman 1899, \**D. gregoryi* Trotter 1926, \**D. hubrechtii* Weber 1913, \**D. intronigra* Goode and Bean 1883, \**D. kanazawai* Grey 1958, \**D. longimana* Smith and Radcliffe in Radcliffe 1913, \**D. multifilis* (Alcock 1889), \**D. nigra* Garman 1899, \**D. nigricaudis* (Wood-Mason and Alcock 1891), \**D. pullata* Garman 1899, \**D. quinquarius* (Günther 1887), \**D. tristis* Smith and Radcliffe in Radcliffe 1913, and \**D. vaillanti* (Alcock 1890b).

*Enchelybrotula* Smith and Radcliffe  
(Fig. 44)



*Enchelybrotula* Smith and Radcliffe in Radcliffe (1913:154; type-species by original designation *Enchelybrotula paucidens* Smith and Radcliffe).

Ventral fins with 2 rays in each. Caudal fin rays 8. Body long and compressed. Abdomen long, head 3 times or more in preanal distance. Eyes small. Jaw teeth sharp-pointed, compressed, in a single row. Median basibranchial tooth patches 2. Vomerine teeth in a narrow row. Branchiostegal rays 7. Gill rakers on the first arch short, spiny tubercles. Opercular spine short, sharp, rounded in cross section. Precaudal vertebrae 22.

Possibly related to *Barathrites*, which also has 7 branchiostegal rays and to *Parabassogigas*, with which it shares a high number of precaudal vertebrae. Although *Barathrodemus* has a shorter body it is similar in appearance.

Abyssal from the Bay of Bengal to the Gulf of Panama.

A single described species, \**E. paucidens* Smith and Radcliffe in Radcliffe 1913, and possibly an unnamed one. This genus is being studied by D. M. Cohen.

*Epetriodus* New Genus

Type species *Epetriodus freddyi* new species.

Body relatively short, depth at vent between 5 and 6 times in standard length; preanal length about 2.3 times in standard length. Head somewhat longer than one-half of preanal distance, about 4 times in standard length. Lower jaw slightly included. Body completely covered with small cycloid scales in regular rows; head completely scale covered. Eye diameter about one-half of snout length, 7 to 8 times in head length. Anterior nostril a prominent round pore in mid-snout, posterior nostril larger, crescent-shaped, in front of eye. Opercle bearing a short, sharp spine, which does not reach the rear margin of the head. Preopercle lacking spines. Branchiostegal rays 8. Developed rakers on first arch at least 20, grading into tubercles at the anterior end of the lower arm of the first arch. Pseudobranch with 2 filaments. Maxillary extending far beyond the rear margin of the eye, dorsal margin free posteriorly. Jaw teeth sharp-pointed and needlelike, not close set and granular; in two series on the premaxillary, the outer teeth larger, and on the dentary, the inner teeth larger. Teeth present also on vomer and palatines. Median basibranchial tooth patches 2; no paired basibranchial tooth patches.

Lateralis system on head with obvious pores. Lateral line on body deciduous but apparently in three series.

Pectoral rays 25 to 29; the fin is naked, broad, and rounded, extending to about the level of the vent. Ventral fins with 2 rays in each, inserted behind the symphysis of the cleithra by a distance about equal to the horizontal diameter of the eye; the rays are bound together proximally and covered with thick skin, free and filamentous distally. Median fins covered with translucent, naked skin. Caudal fin rays 8.

Precaudal vertebrae 12 or 13. Neural spine on first centrum shorter than those following. Neural spines pointed, those on middle precaudal centra depressed. The posterior face of centrum 4 and the anterior face of centrum 5 are expanded. Centra 1 and 2 appear to lack ribs (based on X-ray photographs); ribs originate directly on centra 3 to 7 and on parapophyses from subsequent precaudal centra. Epipleural ribs are present.

*Epetriodus* appears similar to *Holcomycteropus* in body and head shape. Other resemblances are in having 2 median basibranchial tooth patches, 8 branchiostegal rays, 8 caudal fin rays, the apparent absence of ribs on the first 2 centra, a short, sharp opercular spine, and small eyes. *Epetriodus* is more specialized in its dentition and modified fourth and fifth centra (a condition we have noted on X-ray photographs of all 3 specimens and which in our experience is unique in the order); *Holcomycteropus* is more specialized in its modified paired fins and its very deepwater habitat.

Tropical and subtropical southwest Indian Ocean at depths ranging from about 1,000 to 1,750 m.

The name *Epetriodus* is derived from the Greek *epetron* = needle and *odous* = tooth, and refers to the distinctive teeth of this genus.

A single species, described below.

*Epetriodus freddyi* New Species  
(Fig. 45)

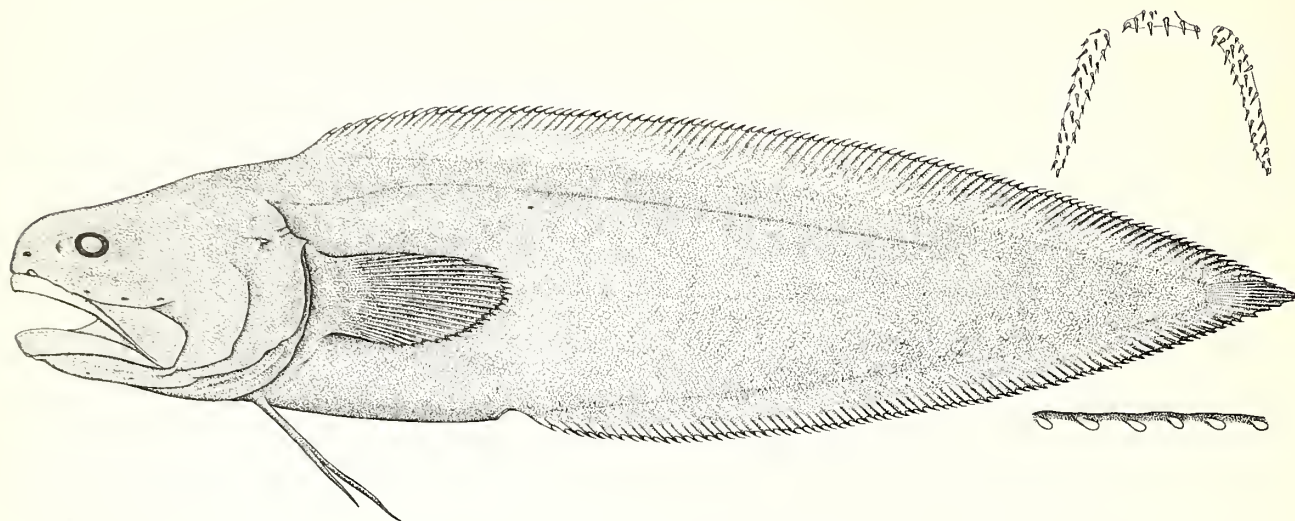


Figure 45.—*Epetriodus freddyi*; holotype, U.S. National Museum 206942. Upper right, tooth bearing surfaces of vomer palatines; lower right, details of dorsal lateral line from South African Museum 27745. Drawn by Keiko Hiratsuka Moore.

Table 2.—Counts and measurements in millimeters for *Epetriodus freddyi* n.sp. Numbers in parenthesis are percent of standard length.

	USNM 206942 Holotype	SAM 27745 Paratype	MNHM 1977-303 Paratype
Dorsal fin rays	95	96	97
Anal fin rays	76	74	76
Pectoral fin rays	25	29	25
Vertebrae	12+42=54	13+40=53	13+40=53
Lateral scale rows	? 140	? 146	—
Gill rakers on 1st arch			
Upper arm	5 short + 2 long	6 short + 2 long	5 short + 2 long
Angle	1 long	1 long	1 long
Lower arm	19 long + 4 short	19 long + 4 short	18 long + 7 short
Standard length	215	176	170
Preanal	94.3 (43.9)	76.8 (43.6)	77.0 (45.3)
Predorsal	56.1 (26.1)	44.1 (25.1)	45.5 (26.8)
Body depth at vent	42.5 (19.8)	31.8 (18.1)	31.6 (18.6)
Head length	55.0 (25.6)	42.1 (23.9)	43.9 (25.8)
Snout length	16.4 (7.6)	10.9 (6.2)	12.2 (7.2)
Upper jaw length	36.0 (16.7)	27.0 (15.3)	28.4 (16.7)
Maxillary depth at end	8.5 (3.9)	6.2 (3.5)	6.5 (3.8)
Eye diameter, horizontal	6.9 (3.2)	5.8 (3.3)	5.8 (3.4)
Interorbital, pigmented	18.7 (8.7)	14.8 (8.4)	13.7 (8.1)
Pectoral fin length	31.5 (14.6)	26.7 (15.2)	24.7 (14.5)
Pectoral peduncle depth	14.2 (6.6)	10.9 (6.2)	11.4 (6.7)
Ventral fin length	29.0 (13.5)	21.2 (12.0)	—
Symphysis of cleithra to ventral fin origin	7.0 (3.3)	5.7 (3.2)	6.0 (3.5)

Counts and measurements are presented in Table 2.

A single, rayless pterygiophore precedes the dorsal fin. Developed (long) gill rakers close-set and compressed, the longest about equal in length to the eye diameter; longest filaments on first arch notably shorter.



Lateralis canals on head with the following pore counts: lateral 1, supraorbital 1, infraorbital 5, and preoperculummandibular 8. All three lateral lines on the body are present (in part) only on SAM 27745. The dorsalmost lateral line parallels the base of the dorsal fin for about three-fourths the length of the body and consists of a narrow, naked tube with a series of about 30 pores, which are at the ends of short, ventrally directed tubes anteriorly and on the main canal posteriorly. Remnants are present of a second, naked, pore-bearing lateral line beginning at about the tip of the pectoral fin and extending posteriorly in the midline at least as far as does the dorsal line.

The presence of a third line is suggested by the presence of several naked pores on the side over the anal fin base near the anus.

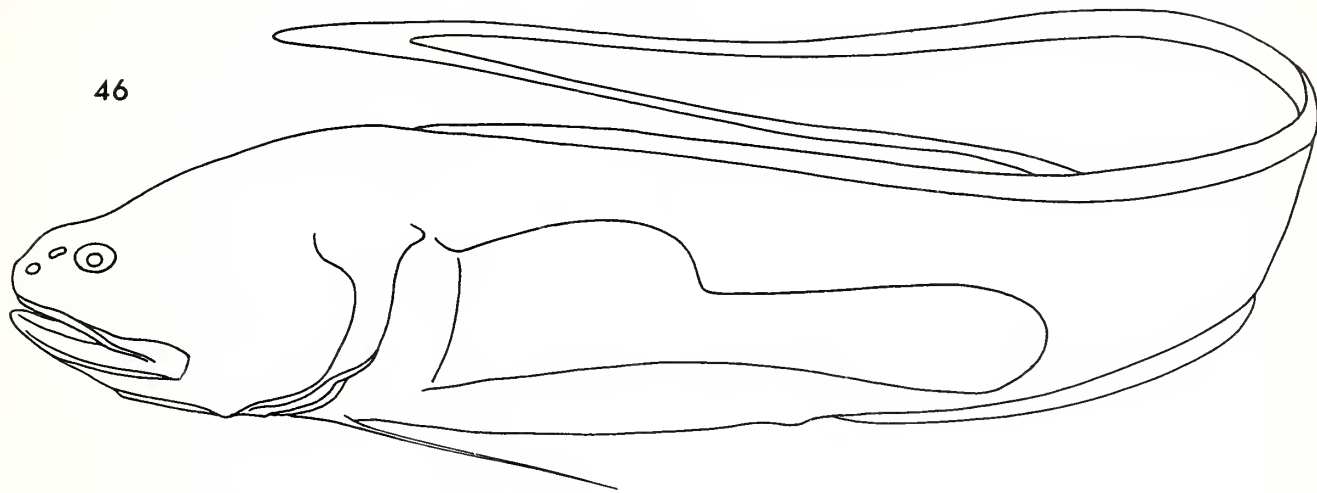
The body is pale brown; in the holotype the pectoral fins are slightly darker, as are the tips of the ventrals and the median fins; the paratypes have all fins notably darker, as are the lateral lines; the head of SAM 27745 is dusky.

Observations were made of the body cavities and associated areas of the holotype and of SAM 27745. The lining of the peritoneal cavity is black, as is the intestinal tract anterior to the pyloric region. The guts are pale posteriorly. Pyloric caeca are absent. A prominent liver is present and reaches to or beyond the posterior curve of the stomach. The rear part of the intestine is narrow, thin-walled, and highly convoluted. The swim bladder is relatively thick walled and large, extending to nearly the end of the body cavity. The kidney is a prominent bulky mass of tissue located dorsal to the rear end of the peritoneal cavity and posterior to the swim bladder; it is soft and rather glandular in appearance and has a pair of lobes, each of which extends anteriorly lateral to the posterior end of the swim bladder. In both specimens examined the gonads are paired, scarcely developed strands of light colored tissue, perhaps ovaries.

Holotype: U.S. National Museum 206942; lat. 21°18'S, long. 36°18'E, 1,510-1,600 m; *Anton Brunn* cruise 8, stn. 399C, shrimp trawl; 2 Oct. 1964. Paratypes: Museum National d'Histoire Naturelle 1977-303; lat. 18°00'S, long. 43°00'E, 1,715-1,750 m; A. Crosnier coll., Madagascar Channel 127; trawl; 16 Jan. 1975. South African Museum 27745; lat. 28°37.8'S, long. 32°38.4'E, 1,000-1,200 m; *Meiring Naude* SM107; 25 May 1976.

This species is named for Professor N. B. (Freddy) Marshall in recognition of his contributions to knowledge of the biology of deepsea fishes.

*Eretmichthys* Garman  
(Fig. 46)



*Eretmichthys* Garman (1899:164; type-species by subsequent designation of Jordan (1920), *Eretmichthys pinnatus* Garman).

Mouth terminal. Eye diameter 1.5 or more times in snout. Preoperculum and operculum lacking spines. Preoperculum posteriorly expanded, reaching almost to the posterior margin of operculum. A single median basibranchial tooth patch. Developed rakers on anterior arch 15 to 19. Pseudobranchial filaments 2. Pectoral fin divided, with the rays of the lower part extending well behind anus; a total of 25 to 29 rays. Ventral fins with 1 ray in each. Precaudal vertebrae 14 or 15. Lateral line indistinct.

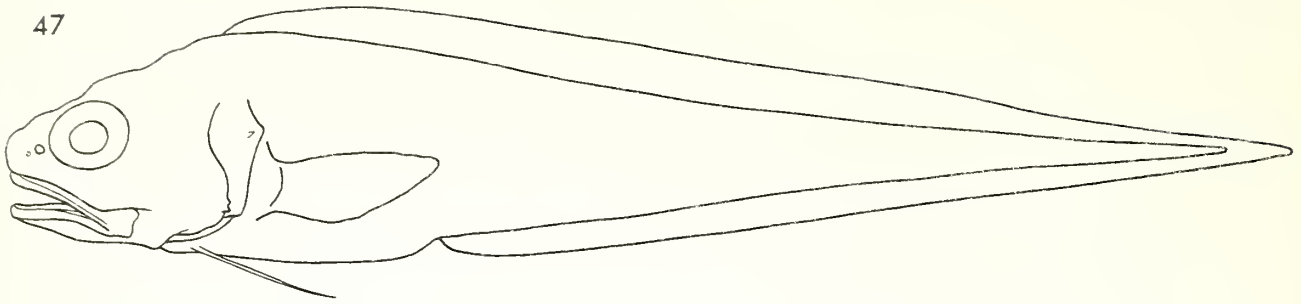
Closely related to *Bassozetus*. The only difference seems to be the presence in *Eretmichthys* of oarlike, prolonged lower pectoral fin rays. In specimens with damaged pectorals it is hardly possible to distinguish between the two genera. Each of the two syntypes of *E. ocella* has damaged pectoral fin rays and therefore may be specimens of *Bassozetus*.

Rarely caught fishes, taken at bathyal and upper abyssal depths in the Indian and Pacific Oceans.

Three nominal species: \**E. ocella* Garman 1899, \**E. pinnata* Garman 1899, and \**E. remifer* Smith and Radcliffe in Radcliffe 1913.

*Glyptophidium* Alcock  
(Fig. 47)

47



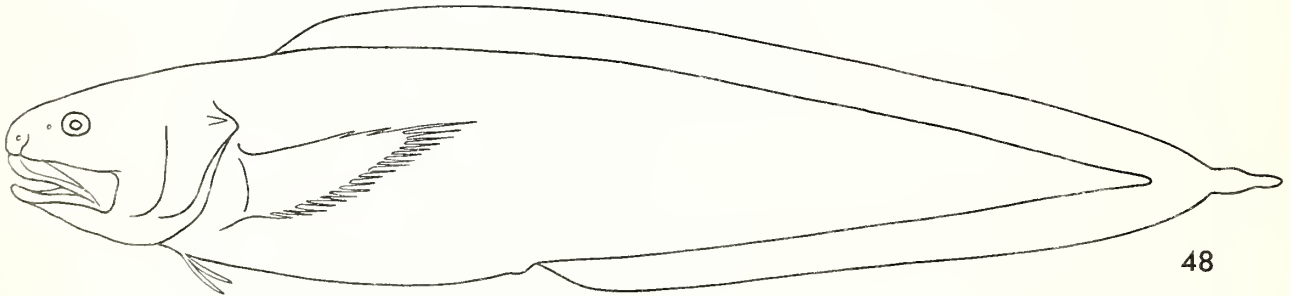
*Glyptophidium* Alcock (1889:390; type-species by monotypy *Glyptophidium argenteum* Alcock).

Head large, equal to or greater than one-half preanal distance. Eye diameter equal to or greater than length of snout. Opercular spine broad, flat, and weak (except in an undescribed species in which it is narrow and pointed). Head bones thin with crests. Basibranchial with 1 or 2 median and 1 pair of tooth patches. Vomer with a V-shaped tooth patch. Developed rakers on anterior gill arch 15 to 35. Pectoral fin rays 23 to 27. Ventral fins with 1 or 2 rays in each. Precaudal vertebrae 11 to 13.

Bathyal depths from the western Indian Ocean to Hawaii.

Five valid described Recent species are listed below. In addition, *G. litheus* has been described from the Miocene of Japan (Satō 1962). Another Recent species is being described by J. G. Nielsen, who is studying the genus. The five species are: \**G. argenteum* Alcock 1889, \**G. longipes* Norman 1939, \**G. lucidum* Smith and Radcliffe in Radcliffe 1913, \**G. macropus* Alcock 1894, and \**G. oceanicum* Smith and Radcliffe in Radcliffe 1913 (*G. japonicum* Kamohara 1936 is a synonym).

*Holcomycteronus* Garman  
(Fig. 48)



48

*Holcomycteronus* (Garman 1899:162; type-species by monotypy *Holcomycteronus digitatus* Garman).  
*Grimaldichthys* (Roule 1913:2; type-species by monotypy *Grimaldichthys profundissimus* Roule).

Snout longer than eye. Opercular spine strong. Mucous cavities on head not prominent. Basibranchial with 2 median and 1 pair of tooth patches. Vomer with a V-shaped tooth patch. Developed rakers on first gill arch 7 to 10. Pectoral fin rays 15 to 21, the ventral ones more or less free. Ventral fins with 2 rays in each, flattened distally, somewhat thicker in males. Branchiostegal rays 8. Precaudal vertebrae 18 to 21.

Possibly related to *Bassogigas*, also see *Epetriodus*.

Circumglobal at bathyal, abyssal, and hadal depths. *Holcomycteronus brucei* is known from a single specimen caught in the Weddell Sea (lat. 68°S, long. 37°W), an extraordinary locality for an ophidioid fish.

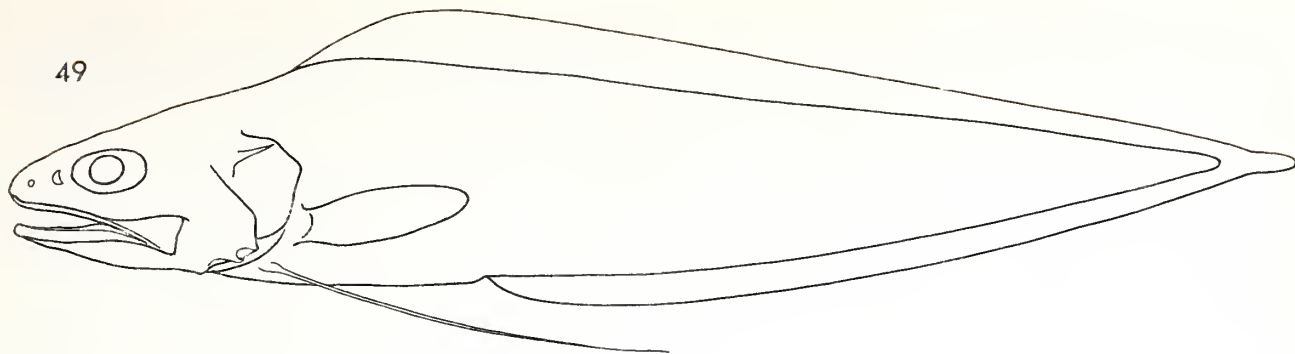
The genus is being revised by J. G. Nielsen. Six species are recognized: \**H. aequatoris* (Smith and Radcliffe in Radcliffe 1913), \**H. brucei* (Dollo 1906), \**H. digitatus* Garman 1899, \**H. profundissimus* (Roule 1913), \**H. pterotus* (Alcock 1890a), and \**H. squamosus* (Roule 1916) (*Bassogigas* (*Holcomycteronus*) *koefoedi* Nybelin 1954 is a synonym).

*Homostolus* Smith and Radcliffe  
(Fig. 49)

*Homostolus* Smith and Radcliffe in Radcliffe (1913:146; type-species by original designation *Homostolus acer* Smith and Radcliffe).



49



Lower jaw ending in a rather blunt point. Eye diameter equal to or larger than snout length. One or more short sharp spines at lower angle of preopercle. Jaw teeth granular, in narrow bands. Median basibranchial tooth patch one. Developed rakers on first gill arch 27 to 42. Pectoral fin placed low on the body, with 21 to 23 rays. Ventral fins with 1 ray in each, longer than head. Branchiostegal rays 8. Precaudal vertebrae 13.

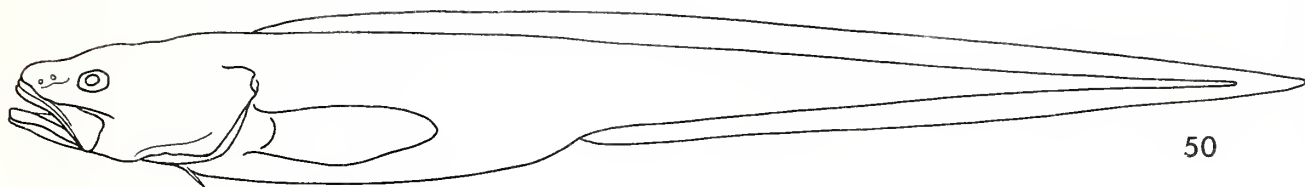
Apparently related to *Monomitopus* and *Selachophidium*.

Taken off the Philippines and Japan from depths of 380 to 1,000 m.

Two species have been described: \**H. acer* Smith and Radcliffe in Radcliffe 1913, and *H. japonicus* Matsubara 1943.

*Hypopleuron* Smith and Radcliffe

(Fig. 50)



50

*Hypopleuron* Smith and Radcliffe in Radcliffe (1913:164; type-species by original designation *Hypopleuron caninum* Smith and Radcliffe).

Jaws equal in length or lower jaw slightly longer. Some teeth enlarged, a small canine at the front of each upper jaw. No spines on opercle and preopercle. Lateral line with small scales overlying an inner series of larger scales. Developed gill rakers 3. Median basibranchial tooth patch single. Ventral fins with 1 ray in each. Pectoral fin rays 26. Branchiostegal rays 8. Precaudal centra 22. Parapophyses of precaudal centra broad and inflated, enclosing the thick-walled swim bladder.

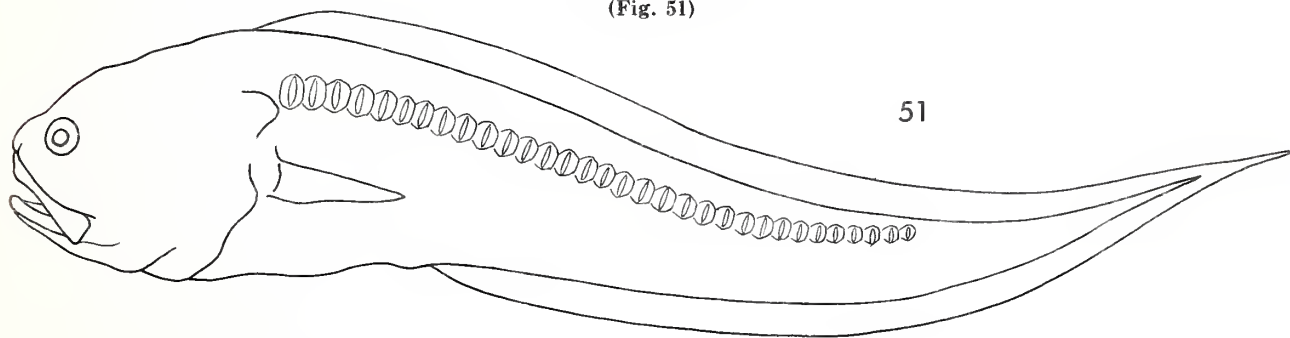
For possible relationships see *Lamprogrammus*.

Taken from Philippine waters and the Arabian Sea at depths ranging from 300 to 485 m.

A single species, \**H. caninum* Smith and Radcliffe in Radcliffe 1913.

*Lamprogrammus* Alcock

(Fig. 51)



51

*Lamprogrammus* Alcock in Wood-Mason and Alcock (1891:32; type-species by monotypy *Lamprogrammus niger* Alcock).

Ventral fins absent in adults, apparently present as stublike rudiments in juveniles of at least *L. niger*. Median basi-branchial tooth patches absent in *L. niger* and *L. illustris*, 1 in other species. Branchiostegal rays 8. Caudal fin rays 8. Mouth terminal. Teeth granular. Precaudal vertebrae 12 to 14. Opercular spine absent or flattened, weak, and flexible. Swim bladder small and thick-walled, supported by broad, strong parapophyses. Ribs on anterior several centra enlarged. Head cavernous, bones delicate, poorly ossified.

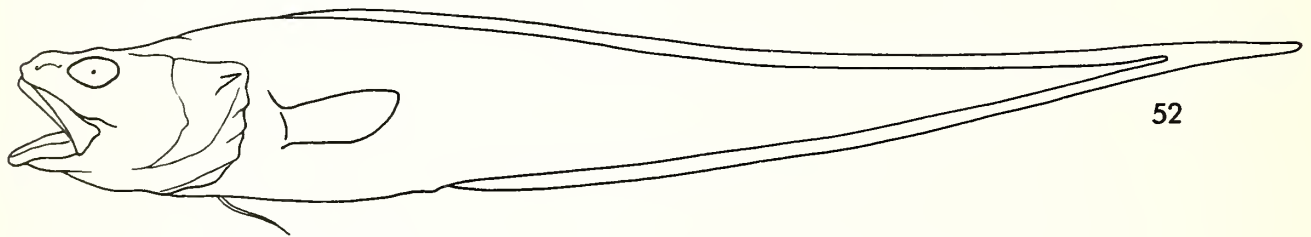
The lateral line of *L. niger* and probably most other species is highly distinctive and consists of a single series covered with small scales and placed high on the body, of vertically oriented, spindle-shaped neuromasts, each of which is mounted on a large, vertically elongate scale (see Garman 1899, pl. 34 for an illustration of this character in *L. illustris*). The lateral line system and its skin and scale cover are deciduous in some species and are often entirely or partly absent in preserved specimens. These structures have not been found on all described species, and the extent to which they constitute a common generic character is not known.

Similar lateral lines in *Lamprogrammus* and *Hypopleuron* have been noted by Smith and Radcliffe (in Radcliffe 1913). The latter also has enlarged parapophyses and anterior ribs. *Eolamprogrammus* from the Paleocene of Turkmenia has been suggested as a relative of *Lamprogrammus* (Danil'chenko 1968) on the basis of body shape and absence of pelvic fins. It also has enlarged anterior ribs but small parapophyses. *Lamprogrammus* has been grouped with *Glyptothidium* in several keys, chiefly on the basis of the frail crested head bones and thin skin in both. It seems unlikely, though, that the two genera are very closely related.

Circumtropical, probably meso- and bathypelagic, although large individuals are caught in bottom trawls as well as midwater nets.

It may be necessary to recognize two genera for the four species listed below and one or more undescribed ones: \**L. exutus* Nybelin and Poll 1958, \**L. fragilis* Alcock 1892, \**L. illustris* Garman 1899, and \**L. niger* Alcock in Wood-Mason and Alcock 1891. (We transfer *L. macropterus* to *Bassobythites*.)

***Leucicorus* Garman  
(Fig. 52)**



*Leucicorus* Garman (1899:146; type-species by monotypy *Leucicorus lusciosus* Garman).

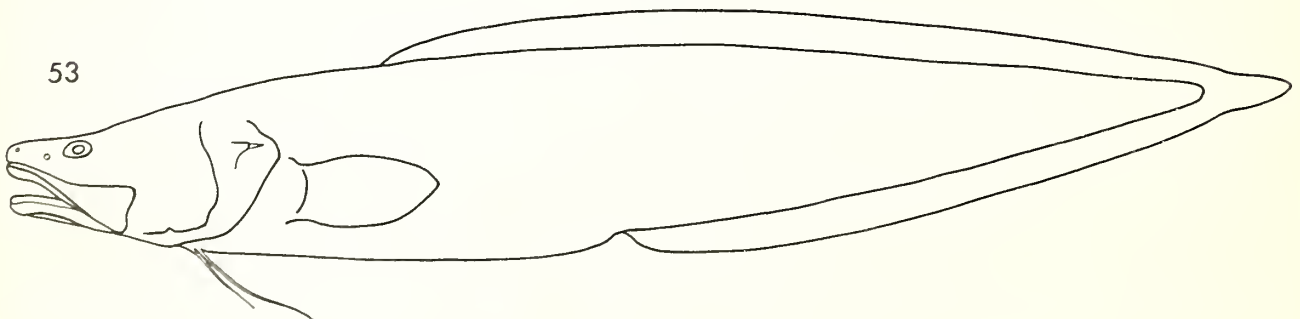
Orbit large, but eye lens rudimentary or lacking. Head with prominent mucous cavities and distinctive rows of pores. Mouth terminal, with granular teeth. Anterior gill arch with 8 to 12 long rakers. Median basibranchial tooth patch single. Opercular spine weak. Branchiostegal rays 8. Ventral fins with 2 rays in each. Caudal fin rays 8. Precaudal vertebrae 13 or 14. Swim bladder single-chambered and thin walled.

Apparently related to *Bathyonus*. *Leucicorus* has been revised by Nielsen (1975a).

Abyssal in the eastern Pacific and abyssal-hadal in the Caribbean.

Two species: \**L. atlanticus* Nielsen 1975a, and \**L. lusciosus* Garman 1899.

***Luciobrotula* Smith and Radcliffe  
(Fig. 53)**



*Luciobrotula* Smith and Radcliffe in Radcliffe (1913:170; type-species by original designation *Luciobrotula bartschi* Smith and Radcliffe).

*Volcanus* Gosline (1954:78; type-species by original designation *Volcanus lineatus* Gosline).

Snout depressed, naked, bearing fleshy flaps and ridges at the tip. Head large, equal to about one-half preanal length. Rear margin of preopercle free, lacking spines. Opercle with a spine at the upper angle. Developed gill rakers 3. Teeth granular. Median basibranchial tooth patch single. Branchiostegal rays 8. Caudal fin rays 10 to 12. Ventral fins with 2 rays in each. Pectoral fin rays 25 to 29. Precaudal vertebrae 14 to 16.

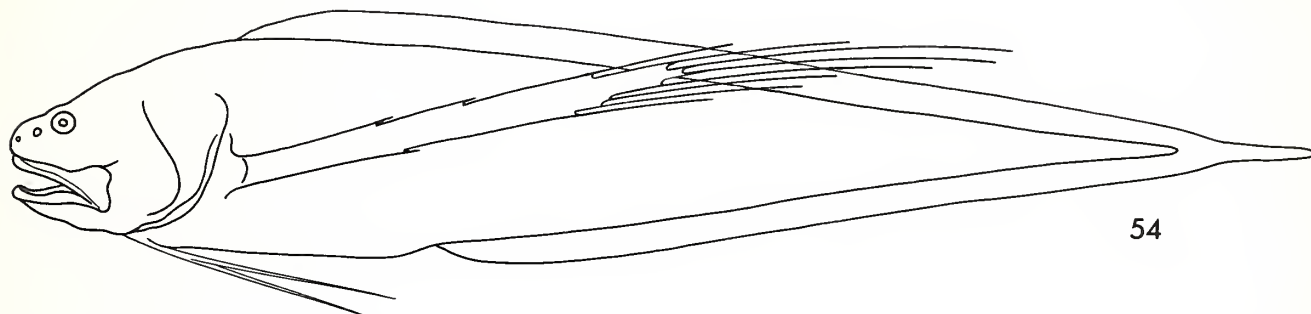
For possible relationships see *Spottobrotula*.

Circumtropical at continental slope depths.

For additional information see Cohen (1964a, 1974b). Three described species and possibly two undescribed: \**L. bartschi* Smith and Radcliffe in Radcliffe 1913, \**L. corethromycter* Cohen 1964a, and \**L. lineata* (Gosline 1954).

#### ***Mastigopterus* Smith and Radcliffe**

(Fig. 54)



*Mastigopterus* Smith and Radcliffe in Radcliffe (1913:158; type-species by original designation *Mastigopterus imperator* Smith and Radcliffe).

Head large; mouth subterminal. Eye diameter less than snout length. Opercular spine broad and flattened, weak. Prominent mucous cavities and pores below eyes and on rear margin of preoperculum. Median basibranchial tooth patches 2. Vomer with V-shaped tooth patch. Anterior gill arch with 10 long rakers. Pectoral fin with 12 to 14 rays, the longest of which are about one-half or more of the standard length. Ventral fins with 2 joined rays in each. Caudal fin rays 6. Branchiostegal rays 8. Precaudal vertebrae 15.

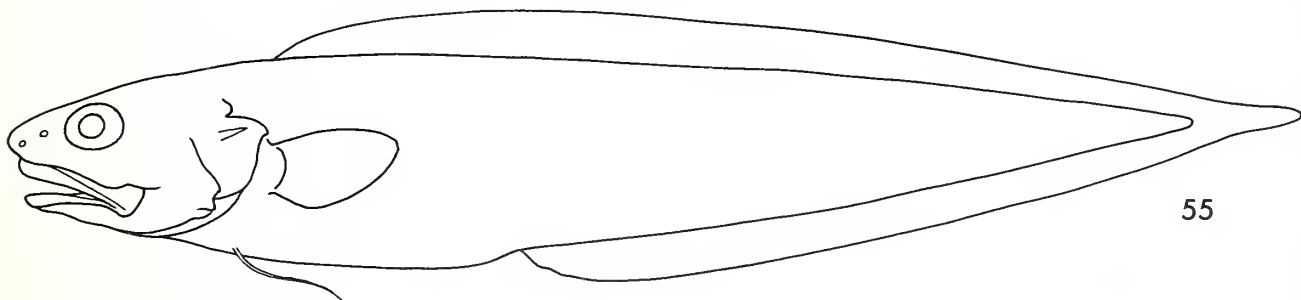
Possibly related to *Dicrolene* and *Bathyonus*.

Known from 3 specimens fished from the bottom between 1,500 and about 2,350 m off Madagascar and in Philippine waters.

Two described species: \**M. imperator* Smith and Radcliffe in Radcliffe 1913, and \**M. praetor* Smith and Radcliffe in Radcliffe 1913.

#### ***Monomitopus* Alcock**

(Fig. 55)



*Monomitopus* Alcock (1890b:297; type-species by monotypy *Siremba nigripinnis* Alcock).

*Dicromita* Goode and Bean (1896:319; type-species by subsequent designation of Jordan and Evermann (1896), *Dicromita agassizii* Goode and Bean).

*Monomeropus* Garman (1899:158; type-species by original designation *Monomeropus malispinosus* Garman).



Mouth terminal or subterminal. Eye diameter equal to or slightly shorter than snout length. Opercular spine strong. Preoperculum with 2 or 3 more or less distinct spines at the lower angle. Median basibranchial tooth patch single. Developed rakers on anterior gill arch 17 to 27. Pectoral fin rays 26 to 33. Ventral fins with 1 or ?2 rays in each. Precaudal vertebrae 12 to 14.

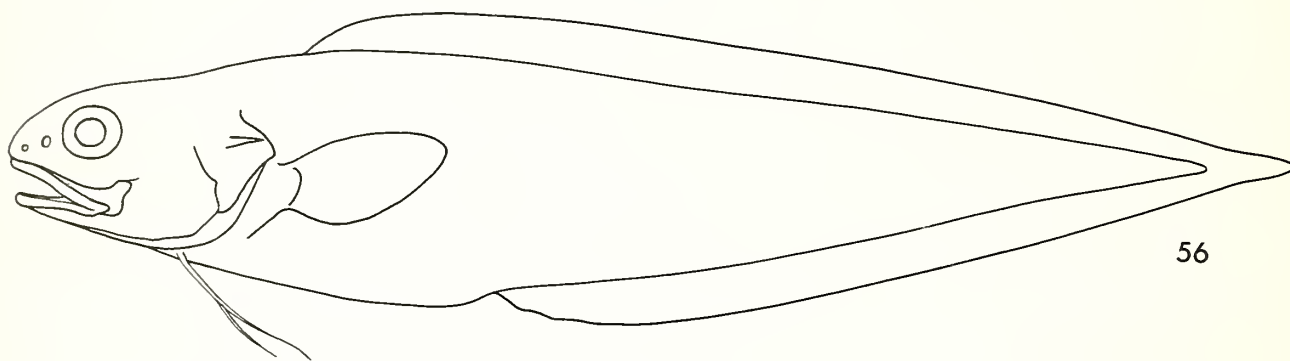
*Monomeropus* is here considered a junior synonym of *Monomitopus*. The characters used for separating it from *Monomitopus*, degree of head armature, cavernous structure of the head, distinctness of lateral line, length of ventral fins, etc., are all variable within *Monomitopus* (sensu stricto).

*Selachophidium* and probably *Homostolus* appear to be derivatives of *Monomitopus*.

Found around the world beneath tropical and subtropical seas at depths ranging from about 200 to 1,870 m.

We tentatively refer 13 described species to this genus, which is much in need of revision. An unnamed species from the Blake Plateau will be described by D. M. Cohen. The species are: \**M. agassizii* (Goode and Bean 1896), \**M. americanum* (Nielsen 1971), \**M. conjugator* (Alcock 1896), \**M. garmani* (Smith and Radcliffe in Radcliffe 1913), \**M. kumae* Jordan and Hubbs 1925, \**M. longiceps* Smith and Radcliffe in Radcliffe 1913, \**M. malispinosus* (Garman 1899), \**M. metriostoma* (Vaillant 1888), \**M. microlepis* Smith and Radcliffe in Radcliffe 1913, \**M. nigripinnis* (Alcock 1889), \**M. pallidus* Smith and Radcliffe in Radcliffe 1913, \**M. torvus* Garman 1899, and \**M. vitiazi* (Nielsen 1971).

***Neobythites* Goode and Bean  
(Fig. 56)**



*Neobythites* Goode and Bean (1886:600; type-species by monotypy *Neobythites gillii* Goode and Bean).

*Tetranematopus* Günther ? (1887:100; nomen nudum).

*Watasea* Jordan and Snyder (1901:765; type-species by original designation *Watasea sivicola* Jordan and Snyder).

Mouth terminal or subterminal. Body relatively short, tail not long and tapering. Eye diameter equal to or slightly shorter than snout length. Opercular spine strong. Median basibranchial tooth patches 2. Developed rakers on first gill arch 7 to 20. Pseudobranchial filaments 3 to 7. Pectoral fin rays 22 to 28. Ventral fins with 2 rays in each. Precaudal vertebrae 11 to 14. Lateral line distinct. Most species with spots or bands on the sides and/or median fins.

Possibly related to *Benthocometes* among shallow-water genera and to *Bassogigas* among the deeper water forms.

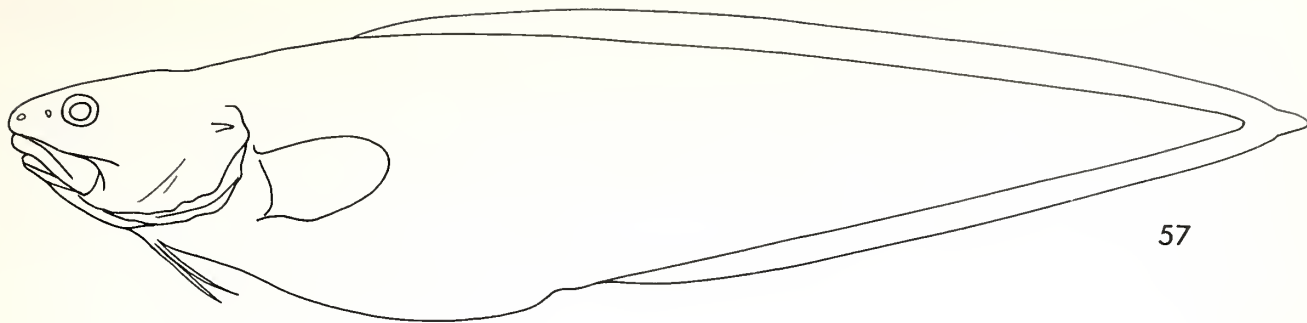
Circumtropical at bathyal depths. Common.

Many species now referred to other genera were originally described in *Neobythites*. We tentatively recognize 14 species of *Neobythites*, but a much needed revision undoubtedly will show that some of these are conspecific: \**N. analis* Barnard 1927, \**N. fasciatus* Smith and Radcliffe in Radcliffe 1913, \**N. gillii* Goode and Bean 1886, \**N. longipes* Smith and Radcliffe in Radcliffe 1913, \**N. macrops* Günther 1887, \**N. malayanus* Weber 1913, \**N. marginatus* Goode and Bean 1886, \**N. nigromaculatus* Kamohara 1938, \**N. ocellatus* Günther 1887, \**N. purus* Smith and Radcliffe in Radcliffe 1913, \**N. sivicola* (Jordan and Snyder 1901), \**N. steatiticus* Alcock 1893, \**N. stelliferoides* Gilbert 1890, and \**N. unimaculatus* Smith and Radcliffe in Radcliffe 1913.

***Parabassogigas* Nybelin  
(Fig. 57)**

*Parabassogigas* Nybelin (1957:298; type-species by original designation *Sirembo grandis* Günther).

Head more than 2 times in preanal length in adults, less in juveniles. Snout longer than eye. Opercular spine strong. Median basibranchial tooth patches 2. Vomer with a diamond-shaped tooth patch. Developed rakers on first arch 7 or 8. Pectoral fin rays 21 to 27; fin short, not reaching vent. Ventral fins with 2 rays in each. Branchiostegal rays 8. Precaudal vertebrae 19 to 24. Lateral line short.



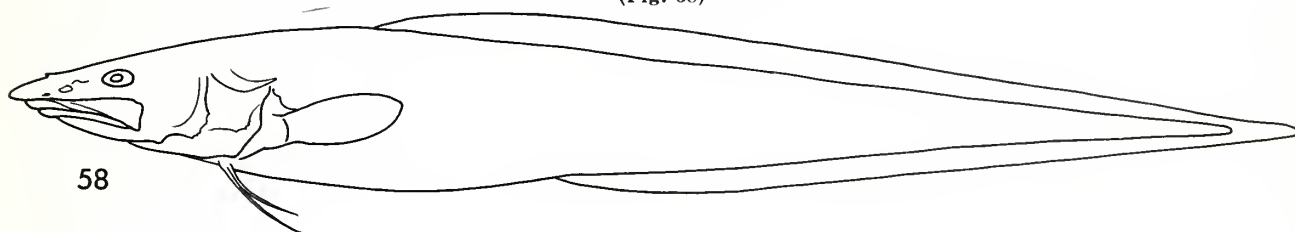
Probably related to *Barathrites* and *Barathrodemus*.

For comments on the possible larval form see the following nominal genus, *Spectrunculus*.

Abyssal and bathyal in the Pacific and Atlantic.

Three nominal species are assigned to this genus, which is being revised by J. G. Nielsen: \**P. coheni* (Mayer and Nalbant 1972), \**P. crassus* (Vaillant 1888), and \**P. grandis* (Günther 1877).

***Penopus* Goode and Bean  
(Fig. 58)**



*Penopus* Goode and Bean (1896:335; type-species by monotypy *Penopus macdonaldi* Goode and Bean).

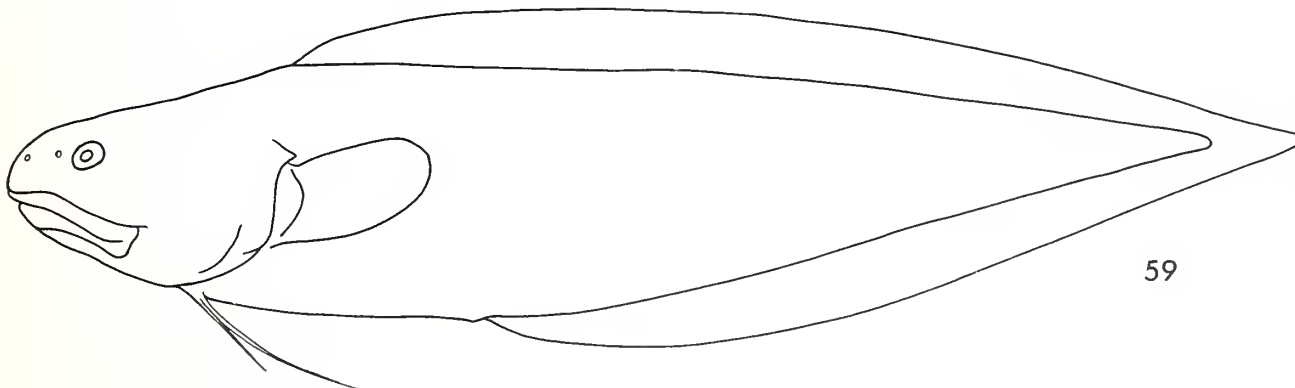
Head depressed anteriorly. Snout long; projecting over mouth. Body long and slender, depth at vent about 11 times in standard length. Eyes minute. Preoperculum with 4 or 5 spines at the lower angle. Operculum with a strong, curved spine dorsally and 2 or 3 weak, flattened projections at the lower angle. Median basibranchial tooth patches 2, the posterior one small. Lateral line represented by 3 rows of circular organs. Developed rakers on first arch 8 to 10. Pectoral fin with 18 or 19 rays. Ventral fins with 2 rays in each, bound together for the length of rays. Branchiostegal rays 8. Precaudal vertebrae 18 or 19.

Related to *Porogadus*.

Tropical Atlantic Ocean at bathyal and abyssal depths.

Two nominal species, of which only one may be valid: \**P. macdonaldi* Goode and Bean 1896, and \**P. microphthalmus* (Vaillant 1888).

***Petrotyx* Heller and Snodgrass  
(Fig. 59)**



*Petrotyx* Heller and Snodgrass (1903:222; type-species by monotypy *Petrotyx hopkinsi* Heller and Snodgrass).



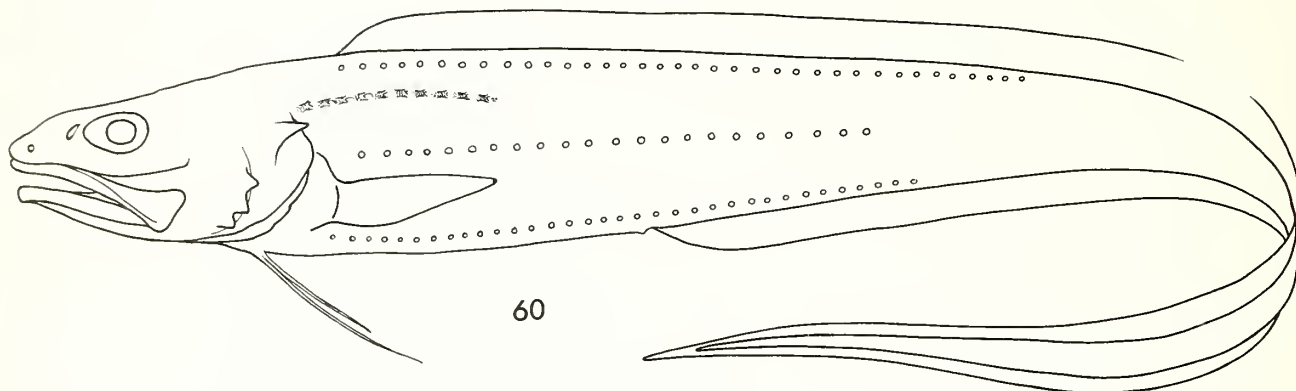
*Pseudobythites* Meek and Hildebrand (1928:968; type-species by original designation *Pseudobythites sanguineus* Meek and Hildebrand).

Snout naked, densely covered with small, fleshy papillae. Rear margin of preopercle overgrown with skin. No spines on preopercle or opercle. Upper margin of maxillary sheathed. Developed gill rakers 3. Median basibranchial tooth patch single; paired patches 1. Branchiostegal rays 8. Pectoral fin rays 24 to 27. Caudal fin rays 10. Ventral fins with 2 rays in each. Precaudal vertebrae 12.

Shallow-water, reef-dwelling fishes of tropical American seas.

The genus has been reviewed by Böhlke (1955), who recognized two species: \**P. hopkinsi* Heller and Snodgrass 1903, and \**P. sanguineus* (Meek and Hildebrand 1928).

***Porogadus* Goode and Bean  
(Fig. 60)**



*Porogadus* Goode and Bean (1886:602; type-species by monotypy *Porogadus miles* Goode and Bean).

*Dermatorus* Alcock (1890b:298; type-species by monotypy *Dermatorus trichiurus* Alcock).

*Celema* Goode and Bean (1896:329; type-species by subsequent designation of Jordan 1920, *Porogadus nudus* Vaillant).

*Moebia* Goode and Bean (1896:331; type-species by original designation *Bathynectes gracilis* Günther 1878).

Body long and slender, depth at vent 10 times or more in standard length. Head length equal to approximately one-half preanal length. Prominent mucous cavities beneath orbital region and on posterior margin of preopercle. Lateral line represented by 3 rows of circular organs, large and prominent in some species, less so in others (sometimes missing from trawled specimens), and by a row of modified scales, deciduous in most specimens. Spines on top and sides of head variously developed in different species. Median basibranchial tooth patch single. Vomer with a V-shaped tooth patch. Developed rakers on first gill arch 13 to 20. Caudal fin rays 6. Pectoral fin rays 17 to 20. Ventral fin with ?1 or 2 rays in each. Branchiostegal rays 8. Precaudal vertebrae 16 to 18.

*Porogadus* is apparently related to *Bathyonus*, differing chiefly in having a longer tail, larger eyes, and normal pectoral fins. It is similar to *Penopus* in its lateral line and may be related also to *Alcockia*.

Circumglobal beneath tropical and temperate seas at bathyal and abyssal depths.

Fourteen described species may be referred to *Porogadus*, which is much in need of revision. Species groups have been discussed by Nybelin (1957). The species are: \**P. abyssalis* Nybelin 1957, *P. atripectus* Garman 1899, *P. breviceps* Garman 1899, \**P. catena* (Goode and Bean 1886), \**P. gracilis* (Günther 1878), *P. guentheri* Jordan and Fowler 1902, *P. longiceps* Garman 1899, \**P. melampeplus* (Alcock 1896), \**P. melanocephalus* (Wood-Mason and Alcock 1891), \**P. miles* Goode and Bean 1886, \**P. nudus* Vaillant 1888, \**P. promelas* Gilbert 1891, \**P. subarmatus* Vaillant 1888, \**P. trichiurus* (Alcock 1890b).

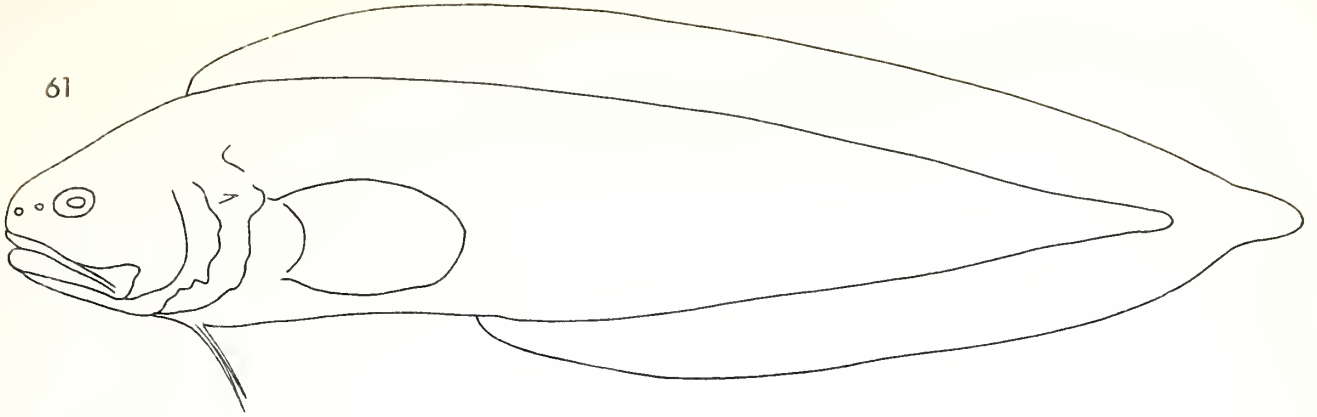
***Pycnocraspedum* Alcock  
(Fig. 61)**

*Pycnocraspedum* Alcock (1889:386; type-species by monotypy *Pycnocraspedum squamipinne* Alcock).

*Itatius* Matsubara (1943:40; type-species by original designation *Itatius microlepis* Matsubara).

Rear margin of preopercle free, lower angle with 3 spines. A single strong spine on opercle. Eye relatively large, equal to or slightly smaller than snout. Head large, longer than one-half preanal length. Developed gill rakers 4. Teeth granular. Median basibranchial tooth patches 2. Branchiostegal rays 8. Pectoral fin rays 24 to 28. Caudal fin rays 10. Ventral fins with 2 rays in each. Precaudal vertebrae 12.

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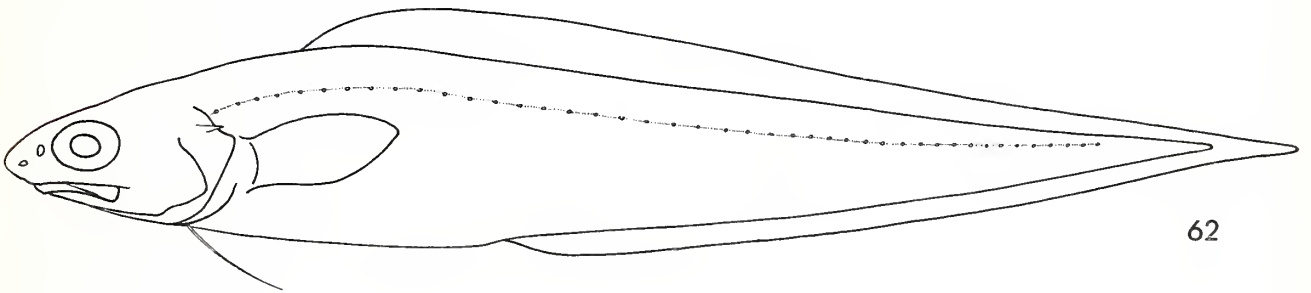
For possible relationships see *Spottobrotula*.

Juvenile a deep-bodied pelagic form; adults benthic at moderate depths.

Tropical western Atlantic, Indian Ocean, Japan, and Hawaii.

The genus is being studied by D. M. Cohen. There are four nominal species, of which possibly only one or two are valid: \**P. armatum* Gosline 1954, \**P. microlepis* (Matsubara 1943), \**P. phyllosoma* (Parr 1933), and \**P. squamipinne* Alcock 1889.

***Selachophidium* Gilchrist  
(Fig. 62)**



62

*Selachophidium* Gilchrist (1903:209; type-species by monotypy *Selachophidium guentheri* Gilchrist).

Snout inflated; mouth inferior. Eye large, diameter greater than length of snout. Opercular spine distinct, although not very strong. Median basibranchial tooth patches 2. Vomer with a rather triangular tooth patch. Developed rakers on first arch 15 to 21. Pseudobranchial filaments 3 to 6. Pectoral fin rays 26 to 29. Ventral fins with 1 ray in each. Branchiostegal rays 8 or 9. Precaudal vertebrae 17 or 18. Lateral line distinct.

Related to *Monomitopus*.

Taken at bathyal depths off South Africa.

A single species, \**S. guentheri* Gilchrist 1903. Nielsen (1971) described two new species in this genus, which we transfer to *Monomitopus*.

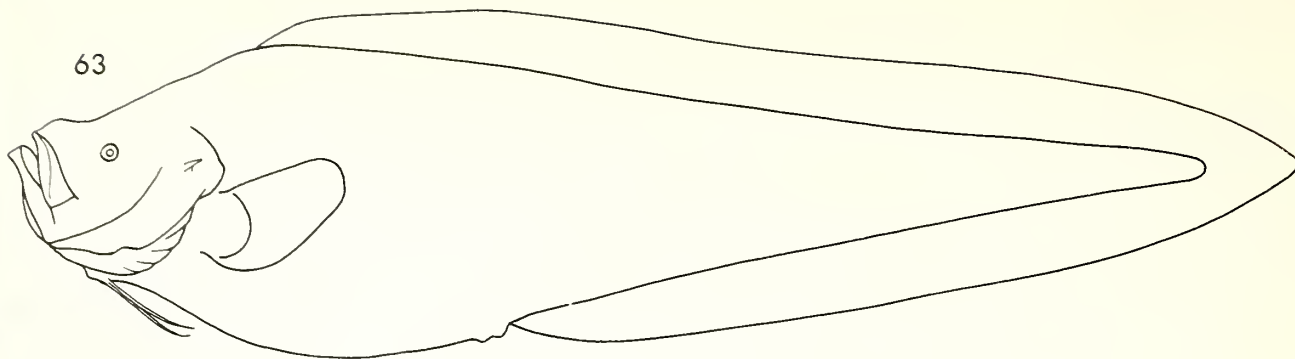
***Spectrunculus* Jordan and Thompson  
(Fig. 63)**

*Spectrunculus* Jordan and Thompson (1914:301; type-species by monotypy *Spectrunculus radcliffei* Jordan and Thompson).

Head short, 2 to 3 times in preanal length. Mouth almost vertical. Eye diameter much less than snout length. Opercular spine strong. Teeth developed on dentaries, few elsewhere. Developed rakers on first gill arch 7 to 9. Pectoral fin rays 27 to 29. Ventral fins with 2 thick rays in each. Branchiostegal rays 8. Precaudal vertebrae 21 to 23. Vertebral centra rectangular in lateral view.

Epipelagic in the Pacific and Atlantic.

The four known specimens range from 52 to 59 mm in standard length. Gonads are not recognizable in any. Teeth are poorly developed. Vertebral centra appear typically larval in shape. These and other features lend substance to Norman's (1939:91) remark, "This genus is perhaps based upon a post-larval fish." Meristic characters and distribution



agree well with *Parabassogigas*. The proper identity of *Spectrunculus* is being studied by J. G. Nielsen and will be further discussed and documented in a separate paper.

A single nominal species, \**S. radcliffei* Jordan and Thompson 1914.

### *Spottobrotula* New Genus

Type species *Spottobrotula mahodadi* new species.

Body relatively short, depth at vent about 5 times in standard length; preanal length about 2.3 times in standard length. Head compressed, about 2 times in preanal length and 4.4 times in standard length. Body completely covered with small, cycloid scales in regular rows. Head with similar scales, but anterior parts of snout and throat naked.

Eye diameter about equal to snout length, 4.6 times in head length. Anterior nostril with a thick, raised, rim about midway between tip of snout and anterior margin of eye; posterior nostril a simple pore immediately before eye. Opercle bearing a strong, pointed spine, which does not reach the rear margin of the head. Preopercle lacking spines. Branchiostegal rays 8. Developed rakers on first gill arch 10. Pseudobranch well-developed, nearly as long as upper arm of first arch, bearing 25 to 30 filaments. Maxillary extending slightly beyond the rear margin of the eye (when mouth is closed), dorsal margin sheathed by subocular bones for most of its length, but free at the rear. Lower lips covered with tiny, densely distributed papillae. Teeth small and granular, in broad bands on the premaxillary, dentary, palatine, and vomer; a single, elongate, basibranchial tooth patch; no paired basibranchial tooth patches.

Lateralis system on head with very small pores, canals deeply buried. Lateral line on body a narrow naked tube extending along the side to nearly the end of the tail. About 50, short, ventrally directed branches, each with a tiny flap at its end, originating along the lateral line.

Pectoral rays 30, the fin rounded and ending considerably short of vent, scale-covered proximally, a prominent flap of skin above its base. Ventral fins with 2 rays in each, inserted behind the symphysis of the cleithra by a distance about equal to the vertical diameter of the eye; rays bound together for the length of the fin by tough white skin and bearing many small papillae on the rather flattened distal half. Median fins covered with thick skin, scale-covered basally. Caudal fin rays 10.

Precaudal vertebrae 15. Neural spine on first centrum slightly shorter than those following; neural spines on precaudal centra rather blunt. Precaudal centra square in side view; caudal centra progressively more elongate. Ribs originating directly on centra 1 to 7 and on parapophyses from centra 8 to 15. Ribs on first three centra appear to be expanded and longer than those following. Epipleural ribs present.

Color of head and body light brown; dark spots on dorsal part of body and dorsal fin. Ventral fin pale. Other fins darker than body.

*Spottobrotula* does not appear very similar to any known ophidiid genus; however, its closest affinities may lie with *Petrotyx*, *Lucibrotula*, and *Pycnocraspedum*, a cluster of apparently related genera discussed by Cohen (1964a). It most resembles the first two in having a single, median basibranchial tooth patch and resembles all three in the form of its lateral line and in having at least 10 caudal fin rays. It differs from all in its higher number of developed gill rakers, its fleshy ventral fin rays, bound together for the entire length of the fin, its large pseudobranch, and its spotted color pattern. It may be further distinguished from *Petrotyx*, which has no opercular spine; from *Lucibrotula*, which has a more elongate head and body; and from *Pycnocraspedum*, which has 2 median basibranchial tooth patches and a spiny preopercle. *Spottobrotula* appears at least superficially similar to *Brotula* in several respects, particularly its compressed head, general body shape, and fin configuration, and in having a large pseudobranch. Also, juveniles of some species of *Brotula* have spots. Notable differences between the two genera are the presence in *Brotula* of barbels and the absence of a median basibranchial tooth patch. Also, *Brotula* has quite a different kind of lateral line, a series of small organs along the side of the body, which are connected by an imbedded, scale-covered canal.

Andaman Sea.

The name is taken from the Middle English word *spotte*, in reference to the color pattern.

A single species, described below.



*Spottobrotula mahodadi* New Species  
(Fig. 64)

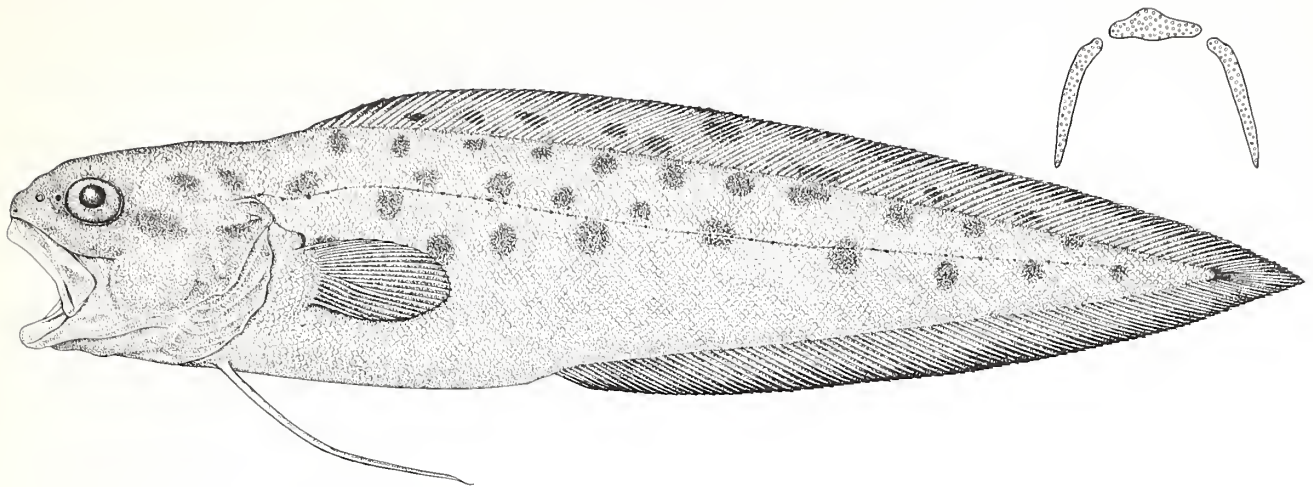


Figure 64.—*Spottobrotula mahodadi*; holotype, Kasetsart University 02842. Upper right, tooth bearing surfaces of vomer and palatines. Drawn by Keiko Hiratsuka Moore.

Dorsal fin rays 101, not including a single, rayless, predorsal pterygiophore; anal fin rays 77; pectoral fin rays 30, including a small dorsal and a small ventral splint; developed gill rakers on first arch  $3 + 1 + 6$ , rakers strong with a spiny inner margin, the longest raker equal to about one-half the horizontal diameter of the eye; longest gill filaments on first arch about equal in length to longest rakers. Vertebrae  $15 + 39 = 54$ . Lateral scale rows about 165.

Lateralis system on head marked by small pores, difficult to see; canals deeply buried. Supraorbital pores at least 2, suborbital at least 6, lateral at least 2, supratemporal at least 2, mandibular 5, preopercular an undetermined number.

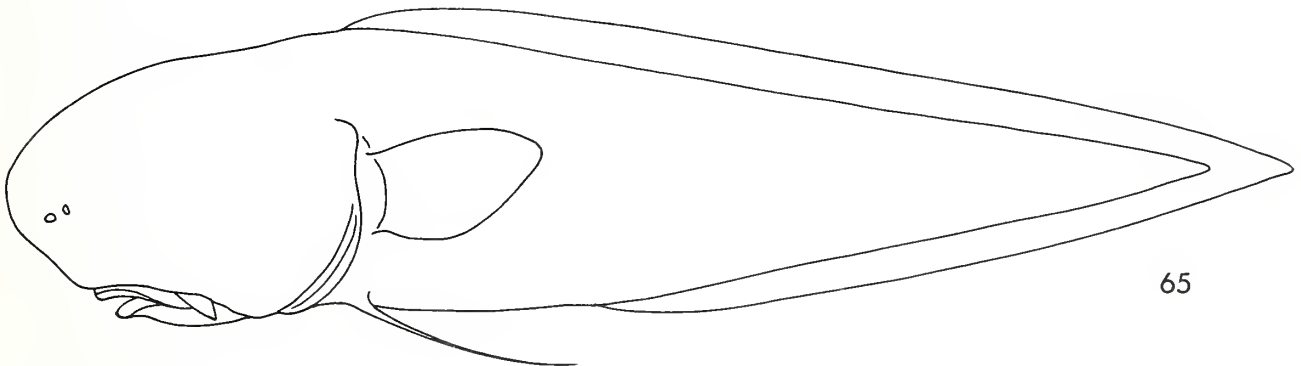
The following measurements are in millimeters, followed by percent of standard length in parentheses. Standard length 216, predorsal 52.0 (24.1), preanal 94.4 (43.7), preventral 37.9 (17.5), depth at vent 42.8 (19.8), head length 49.5 (22.9), horizontal diameter eye 10.8 (5.0), least pigmented interorbital width 13.1 (6.1), snout 10.4 (4.8), jaw length 23.8 (11.0), maxillary width 8.8 (4.1), pectoral length 29.1 (13.5), pectoral peduncle width 9.4 (4.3), and ventral fin length 48.8 (22.6).

The lining of the peritoneal cavity is dusky; the stomach and intestines are pale. Pyloric caecae numerous, about 85. The liver is elongate, extending beyond the level of the posterior curve of the stomach on the left side of the body only. The swim bladder has a notably thick, tough wall, and an oval-shaped opening posteriorly. The unripe gonads are a pair of short, bean-shaped structures, joined together in the midline.

Holotype and only known specimen, Kasetsart University, Bangkok, College of Fisheries no. 02842. Andaman Sea, Andaman Islands, near Baren Island. Taken with hook and line at a depth of about 40 m. ? 14-15 April 1970.

The name *mahodadi* is an ancient Indian name for the Bay of Bengal.

*Typhlonus* Günther  
(Fig. 65)



65

*Typhlonus* Günther (1878:21; type-species by monotypy *Typhlonus nasus* Günther).

Head massively inflated. Head and body soft. Mouth inferior, with protrusible jaws. Teeth granular. Developed rakers on first gill arch 10 to 13. Median basibranchial tooth patch single or absent. Eyes small or not at all visible at surface of head. Opercular spine absent. Branchiostegal rays 7 or 8. Ventral fins with 1 ray each. Pectoral fin rays 24 to 28. Caudal fin rays 8. Precaudal vertebrae 13 or 14. Swim bladder single-chambered and thin-walled.

Abyssal depths in the Indo-Australian area and the tropical Atlantic.

The single described species, \**T. nasus* Günther 1878, has been redescribed by Nielsen (1965). A second species, from the Atlantic, is being described by J. Staiger, J. C. Hureau, and J. G. Nielsen.

### SUBORDER BYTHITOIDEI

We include in this suborder (which is defined in the Key to Suborders) the following viviparous fishes.

In the subfamily Bythitinae of Bythitidae are placed those genera with confluent vertical fins, which formerly were referred to Brotulidae. Many were considered to be close relatives of genera that we include in the ophidiid subfamily Neobythitinae.

The subfamily Brosmophycinae of Bythitidae contains genera with a free caudal fin. These also were placed in Brotulidae.

The aphyonid genera, here treated as a distinct family, are characterized chiefly, but not entirely, by many neotenic characters. Aphyonids have been considered by most authors as members of Brotulidae.

Various aspects of the reproductive biology of a number of species of bythitoid fishes have been discussed by Nielsen et al. (1968).

### Key to Families of Bythitoidei

- 1a. Most species with scales. Precaudal vertebrae 9-22. Swim bladder present . . . . . Bythitidae
- 1b. Scales absent. Precaudal vertebrae 26-48. Swim bladder absent . . . . . Aphyonidae

### Bythitidae Gill 1861a

Precaudal vertebrae 9 to 22. Swim bladder present. Anterior neural spine shorter than those following. Scales present in all but a few species. Developed rakers on first gill arch 6 or fewer.

### KEY TO FAMILIES OF BYTHITIDAE

- 1a. Caudal fin joined to dorsal and anal fins . . . . . Bythitinae
- 1b. Caudal fin free from dorsal and anal fins . . . . . Brosmophycinae

### BYTHITINAE GILL 1861a

Caudal fin joined to dorsal and anal fins, although strongly exerted in some species. Male intromittent organ with no ossified parts. Squamation on head and body variable, a few species completely naked. Ventral fins absent or with a single ray in each (except 2 in *Thalassobathia* and the fossil *Propteridium*), closely adjacent (except in *Thalassobathia*, see below).

An account is presented of the fossil genus *Propteridium*, although it is not included in the following key.

A diverse group found from freshwaters to abyssal depths. Most species live at moderate depths.

### Key to Genera of Bythitinae

- 1a. Ventral fins with 2, short, fleshy rays in each (Fig. 66) . . . . . *Thalassobathia*
- 1b. Ventral fins absent or with a single filamentous ray in each . . . . . 2
- 2a. Palatine teeth present . . . . . 5
- 2b. Palatine teeth absent . . . . . 3



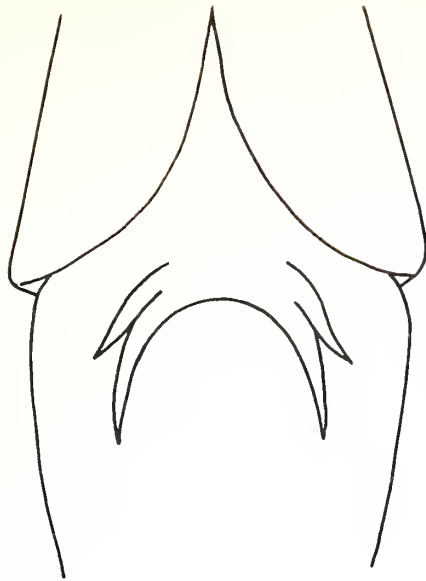


Figure 66.—Short, fleshy ventral fins of *Thalassobathia*.

- 3a. Rear of maxillary rounded, not expanded (Fig. 67a) . . . . . *Stygnobrotula*
- 3b. Rear of maxillary expanded (Fig. 67b) . . . . . 4

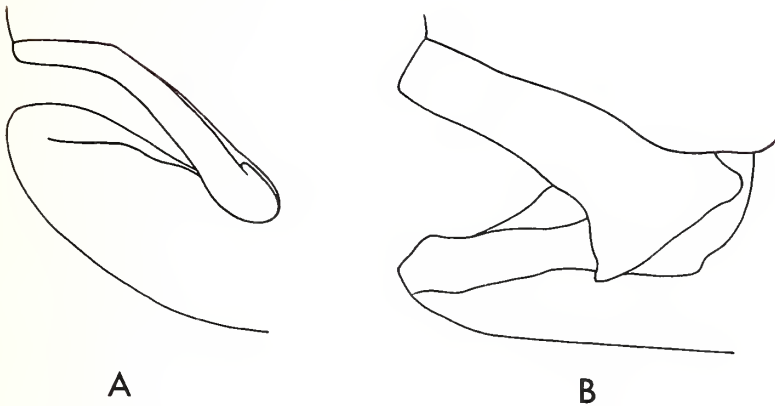


Figure 67.—Maxillary bone in two bythitine genera. A. *Stygnobrotula*, note the slender, rounded posterior end; B. *Oligopus*, note the expanded, truncate posterior end.

- 4a. Neural spines on precaudal centra truncate . . . . . *Oligopus*
- 4b. Neural spines on precaudal centra pointed . . . . . *Grammonoides*
- 5a. Scales present on head . . . . . 9
- 5b. Scales absent on head . . . . . 6
- 6a. Ventral fins absent . . . . . *Hepthocara*
- 6b. Ventral fins present . . . . . 7
- 7a. Squamation on body absent or incomplete. Pectoral radials elongate . . . . . *Saccogaster*
- 7b. Squamation on body complete. Pectoral radials normal . . . . . 8

- Sa. Jaw teeth close-set and granular. A prominent skin flap with a pore at its end above opercle (Fig. 68) . . . . . *Diplacanthopoma*
- Sb. Jaw teeth somewhat separate from each other and needlelike. No prominent skin flap above opercle . . . . . *Bythites*

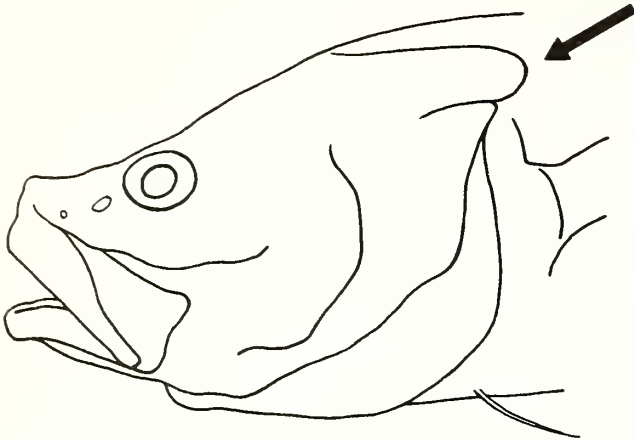


Figure 68.—Prominent skin flap on the head of *Diplacanthopoma*.

- 9a. Pectoral fin on an elongate peduncle . . . . . *Calamopteryx*
- 9b. Pectoral fin peduncle not elongate . . . . . 10
- 10a. Circumorbital head pores large, a prominent median interorbital pore (Fig. 69) . . . . . *Pseudonus*
- 10b. Circumorbital head pores variously developed. No prominent median interorbital pore . . . . . 11

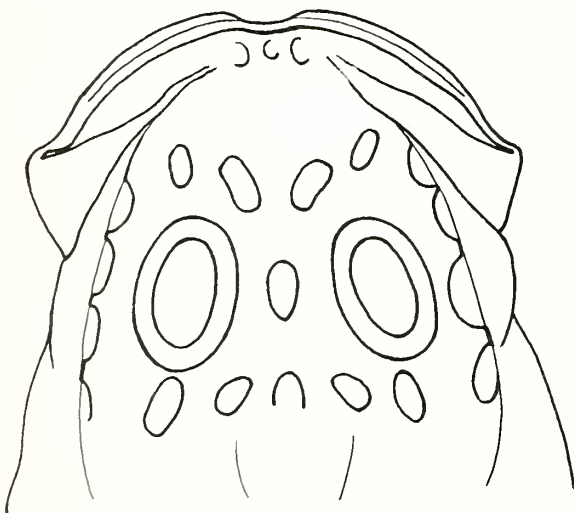
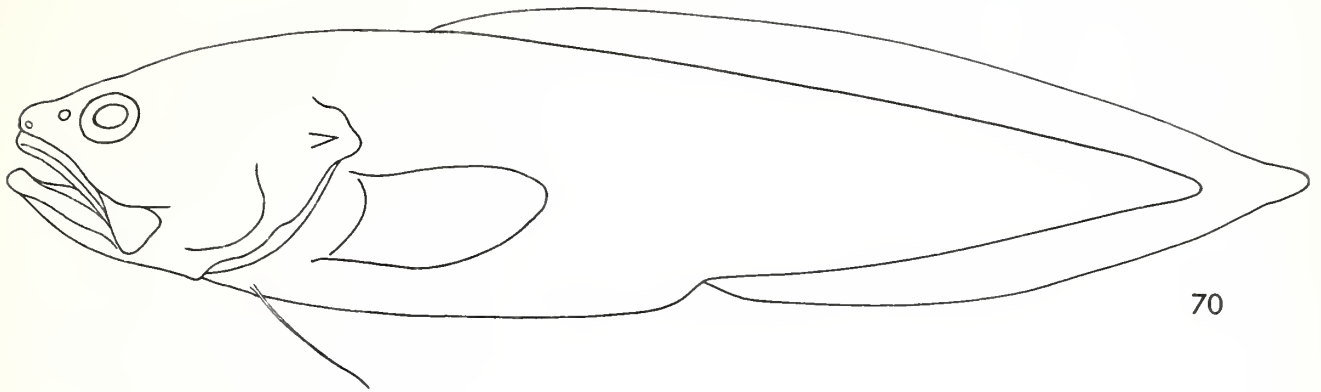


Figure 69.—Large pores on the head of *Pseudonus*.

- 11a. Ventral fins absent. Preopercle with several sharp-pointed spines at lower angle . . . . . *Bellottia*
- 11b. Ventral fins present. Preopercle without spines at lower angle . . . . . 12
- 12a. Vomerine teeth in a triangular patch or a V-shaped or U-shaped band. Branchiostegal rays 8 . . . . . 13
- 12b. Vomerine teeth completely or nearly divided into two separate patches. Branchiostegal rays 7 . . *Microbrotula*

- 13a. Eye relatively large, 4 to 5 times in head length . . . . . *Abythites*  
 13b. Eye relatively small, 7 or more times in head length . . . . . *Catactyx*

*Abythites* Nielsen and Cohen  
 (Fig. 70)



*Abythites* Nielsen and Cohen (1973:82; type-species by original designation *Bythites lepidogenys* Smith and Radcliffe).

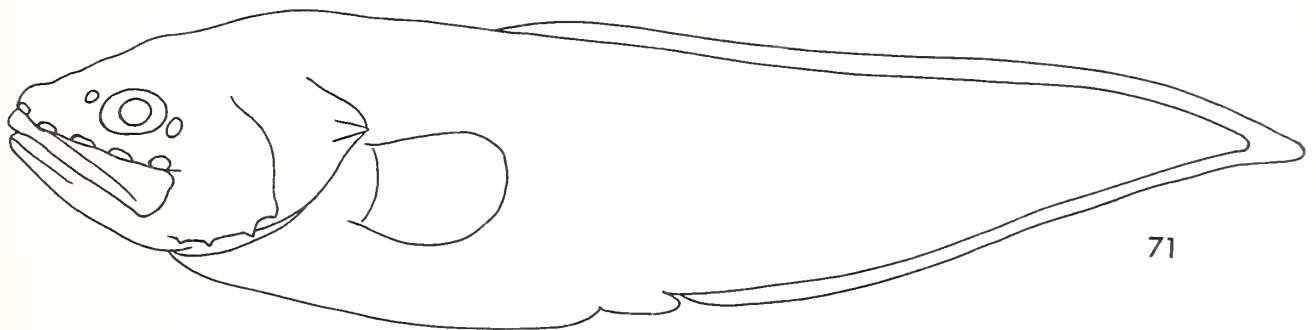
Body short and robust, depth at vent 4 to 5 times in standard length. Eye large, 4 to 5 times in head length, slightly shorter than snout. Scales present on head. Opercular spine strong. Teeth granular. Palatine teeth present. Developed rakers on anterior gill arch 3. Ventral fins with 1 ray in each. Pectoral fin rays 22 to 24. Caudal fin rays 10. Branchiostegal rays 8. Precaudal vertebrae 13 or 14. Male with a stalked intromittent organ.

Close to *Catactyx*. See *Propteridium* for further discussion.

Western Pacific and off Madagascar at depths ranging from 100 to 400 m.

A single species, most recently treated by Nielsen and Cohen (1973), *A. lepidogenys* (Smith and Radcliffe in Radcliffe 1913) (*\*Bythites matsubarai* Arai 1969 is a synonym).

*Bellottia* Giglioli  
 (Fig. 71)



*Bellottia* Giglioli (1883:399; type-species by monotypy *Bellottia apoda* Giglioli).

*Xenobythites* Smith and Radcliffe in Radcliffe (1913:173; type-species by original designation *Xenobythites armiger* Smith and Radcliffe).

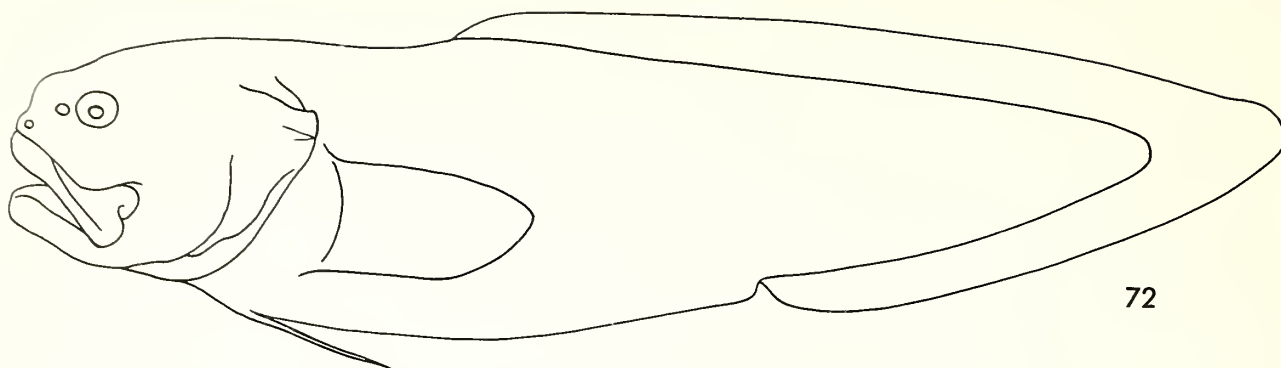
Ventral fins absent. Several sharp spines at lower angle of preopercle. Scales present on head. Palatine teeth present. Developed rakers on anterior gill arch 3 to 6. Pectoral fin rays 22 or 23. Precaudal vertebrae 10 to 12.

Perhaps related to *Abythites*.

North Atlantic, Mediterranean, and western Pacific at depths ranging from 30 to 527 m.

Two nominal species: *\*B. apoda* Giglioli 1883, *\*B. armiger* (Smith and Radcliffe in Radcliffe 1913), and perhaps another, undescribed one. Recent descriptions have been presented by Nielsen and Cohen (1968) and Maul (1976). The genus is being further studied by D. Cohen and R. G. Gilmore.

**Bythites Reinhardt**  
(Fig. 72)



*Bythites* Reinhardt (1835:7; type-species by monotypy *Bythites fuscus* Reinhardt).

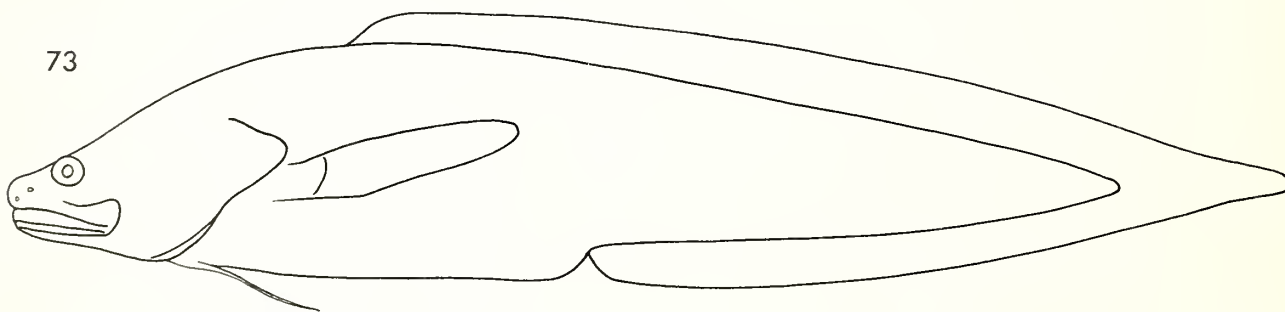
Body short, depth at vent 5 to 6 times in standard length. Preanal long, anal fin originating on posterior half of body. Opercular spine strong. Teeth somewhat separate, needlelike. Palatine teeth present. Head naked. Developed rakers on anterior gill arch 0 or 1. Ventral fins with 1 ray in each. Pectoral fin rays 24 to 30. Caudal fin rays 10 to 12. Branchiostegal rays 7 or 8. Precaudal vertebrae 14 or 15. Male with a stalked intromittent organ.

Perhaps related to *Diplacanthopoma*.

Taken off Iceland and in the western Atlantic from west Greenland to Florida at depths ranging from 200 to 800 m.

A recent revision by Neilsen and Cohen (1973) recognized three species: \**B. fuscus* Reinhardt 1837, \**B. gerdæ* Nielsen and Cohen 1973, and \**B. islandicus* Nielsen and Cohen 1973.

**Calamopteryx Böhlke and Cohen**  
(Fig. 73)



*Calamopteryx* Böhlke and Cohen (1966:2; type-species by original designation *Calamopteryx goslinei*).

Pectoral fin supported by an elongate peduncle. Preanal distance long, anal fin origin on posterior half of body. Preopercle with a curved, anteriorly directed spine at the lower angle. Opercular spine flattened and flaplike. Palatine teeth present. Scales present on head. Developed rakers on first gill arch 2 or 3. Ventral fins with 1 ray in each. Pectoral fin rays 13 to 19. Caudal fin rays 8 to 10. Branchiostegal rays 7. Precaudal vertebrae 10 or 11.

Tropical western North Atlantic and Galapagos Islands from the intertidal to 220 m.

Three species: \**C. goslinei* Böhlke and Cohen 1966, \**C. jeb* Cohen 1973, and \**C. robinsorum* Cohen 1973.

**Cataetys Günther**  
(Fig. 74)

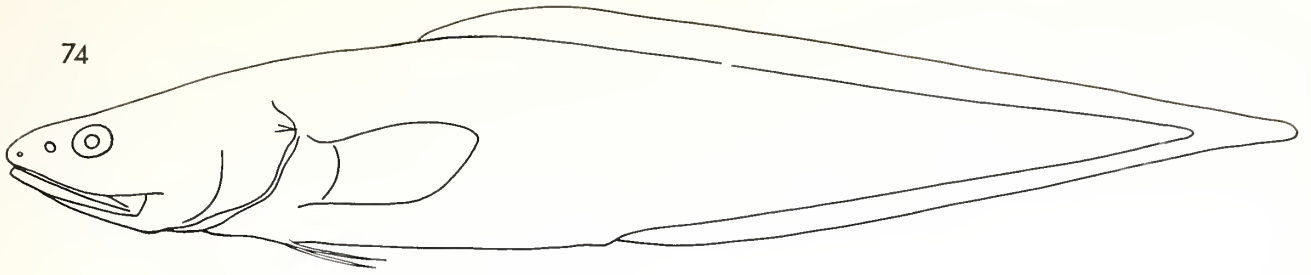
*Cataetys* Günther (1887:104; type-species by monotypy *Siremba messieri* Günther).

*Oculospinus* Koefoed (1927:137; type-species by monotypy *Oculospinus brevis* Koefoed).

Scales present on head. Opercular spine strong. Most species with a sharp spine on cleithrum above upper pectoral ray. Lateral ethmoid 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. Ventral fins with 1 ray in each. Pectoral fin rays 25 to 32. Caudal fin rays 8 to 11. Branchiostegal rays 8 or 9. Precaudal vertebrae 13 to 16.

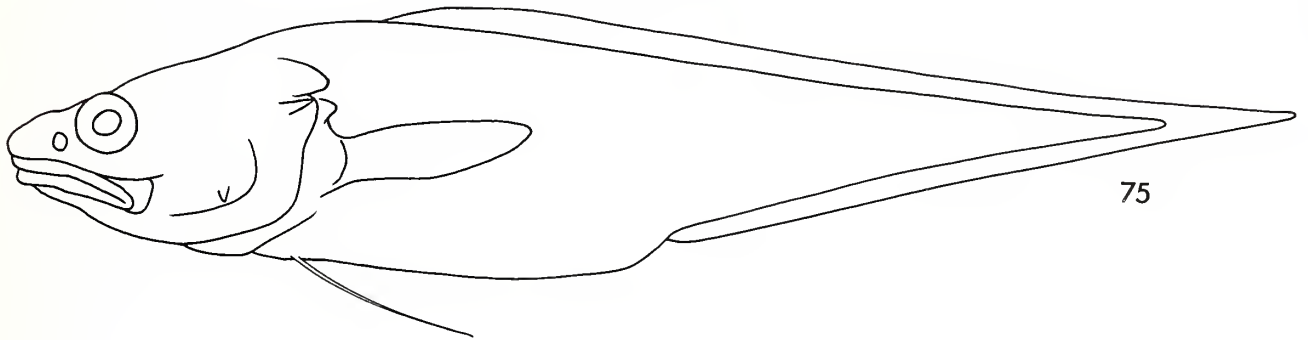


74



Found around the world in tropical and temperate seas at depths ranging from the continental shelf to the abyss. *Cataetyx* is much in need of revision and is being studied by D. M. Cohen. In a recent paper, Meyer-Rochow (1970) presented a key to the species, taken mostly from the literature and containing many inaccuracies. He included two species that we refer to *Pseudonus* and omitted two species that were previously included in a distinct genus *Oculospinus*. We consider *Oculospinus* to be a junior synonym of *Cataetyx*, as specimens of the latter genus also have the retrorse spine on the lateral ethmoid that is the chief diagnostic character of *Oculospinus*. As here characterized, *Cataetyx* is highly diverse and further study may give reason to recognize more than one genus. For the present we include the following 8 nominal species (there is at least one other, undescribed one): \**C. alleni* (Byrne 1906) (which has as synonyms ?*Grammonus leucos* Osorio 1917 and \**Oculospinus brevis* Koefoed 1927), \**C. bruuni* (Nielsen and Nybelin 1963), \**C. hawaiiensis* Gosline 1954, \**C. laticeps* Koefoed 1927, \**C. memoriabilis* Meyer-Rochow 1970, \**C. messieri* (Günther 1887), \**C. rubrirostris* Gilbert 1890, and \**C. simus* Garman 1899.

***Diplacanthopoma* Günther**  
(Fig. 75)



75

*Diplacanthopoma* Günther (1887:115; type-species by monotypy *Diplacanthopoma brachysoma* Günther).  
*Myxocephalus* Steindachner and Döderlein (1887:281; type-species by monotypy *Myxocephalus japonicus* Steindachner and Döderlein).  
*Sarcocara* Smith and Radcliffe in Radcliffe (1913:167; type-species by original designation *Diplacanthopoma (Sarcocara) brunnea* Smith and Radcliffe).

Scales absent from head and bases of dorsal and anal fins. Opercular spine strong. A prominent, pore-bearing skin flap over the opercle (Fig. 68). Jaw teeth granular. Palatine teeth present. Developed rakers on first arch 3 or 4. Ventral fins with 1 ray in each. Pectoral fin rays 21 to 28. Branchiostegal rays 8. Precaudal vertebrae 14 to 19.

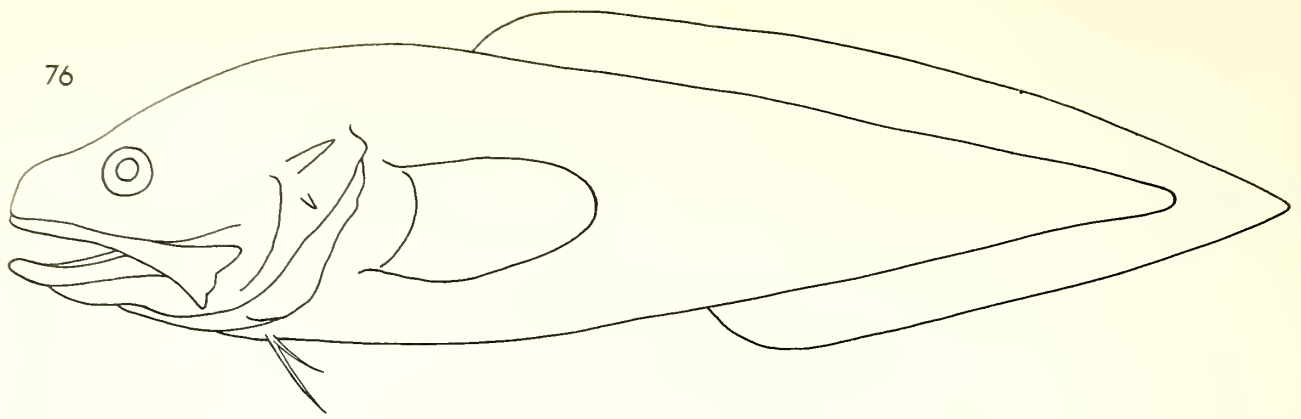
Found around the world in temperate and tropical seas ranging from the continental shelf to the abyss.

This genus, which is much in need of revision, is being studied by D. M. Cohen. The following 8 nominal species are tentatively referred to the genus (there appear to be one or more undescribed ones): *D. alcockii* Goode and Bean 1896, \**D. brachysoma* Günther 1887, \**D. brunnea* Smith and Radcliffe in Radcliffe 1913, \**D. japonicus* (Steindachner and Döderlein 1887), \**D. jordani* Garman 1899, *D. nigripinnis* Gilchrist and von Bonde 1924, \**D. raniceps* Alcock 1898, and \**D. rivers-andersoni* Alcock 1895.

***Grammonoides* Smith**  
(Fig. 76)

*Grammonoides* Smith (1947:343; type-species by original designation *Grammonus opisthodon* Smith).

Opercular spine strong. Palatine teeth absent. Jaw teeth separate, pointed, conical in an irregular row. Developed



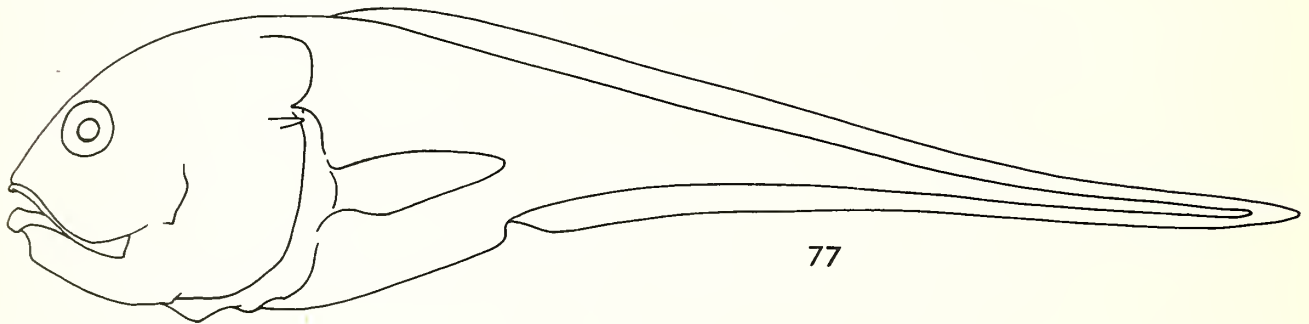
rakers on first gill arch 3. Pectoral fin rays 23. Branchiostegal rays 8. Precaudal vertebrae 13. Neural spines on pre-caudal centra bluntly pointed.

Apparently close to *Oligopus*.

Indian Ocean, Port Alfred, South Africa.

A single species, \**Grammonoides opisthodon* (Smith 1934), based on one specimen in poor condition.

***Hepthocara* Alcock  
(Fig. 77)**



*Hepthocara* Alcock (1892:349; type-species by monotypy *Hepthocara simum* Alcock).

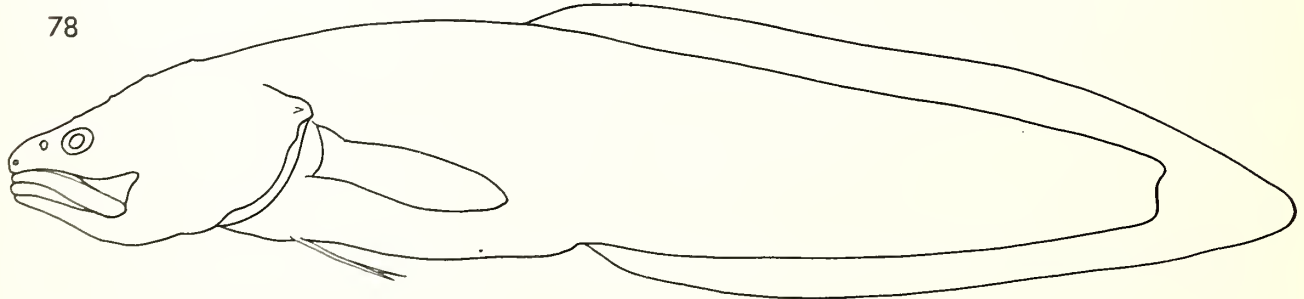
Ventral fins absent. Scales absent from head, which is very deep, and from fin bases. Head bones, including opercular spine, weak and soft; skin diaphanous. A very large pore-bearing flap over the opercle. Jaw teeth granular, in narrow bands on the vomer and palatines. Developed rakers on first arch 3 or 4. Pectoral fin rays 16 to 19. Caudal fin rays 6 or 7. Branchiostegal rays 8. Precaudal vertebrae 18 to 21.

Derived from *Diplacanthopoma*.

Indo-Pacific from Bay of Bengal to South America on the continental slope.

This genus is being studied by J. G. Nielsen. Two described species and another undescribed: \**H. crassiceps* Smith and Radcliffe in Radcliffe 1913, and \**H. simum* Alcock 1892.

***Microbrotula* Gosline  
(Fig. 78)**



*Microbrotula* Gosline (1953:218; type-species by original designation *Microbrotula rubra* Gosline).

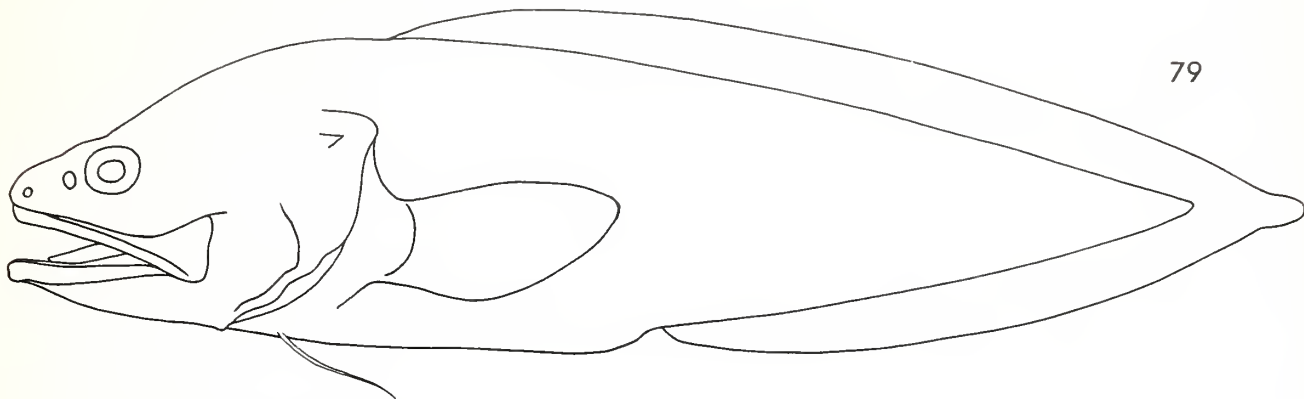
Scales present on head. Spine on opercle sharp and needlelike. Palatine teeth present. Developed rakers on first gill arch 3 or 4. Ventral fins with 1 ray in each. Pectoral fin rays 11 to 14. Branchiostegal rays 7. Precaudal vertebrae 11 or 12. Tiny fishes, reaching only about 45 mm in standard length.

Possibly a shallow-water derivative of *Cataetyx*.

Red Sea to Hawaii in reef areas at depths of 1 to 55 m.

The genus is being studied by D. M. Cohen. Two described species (and possibly one or two others): \**M. randalli* Cohen and Wourms 1976, and \**M. rubra* Gosline 1953.

*Oligopus* Risso  
(Fig. 79)



*Oligopus* Risso (1810:142; type-species by monotypy *Oligopus ater* Risso).

*Gadopsis* (not Agassiz 1845; not Richardson 1848) Filippi and Kölliker (1856:170; type-species by monotypy *Oligopus ater* Risso).

*Grammonus* Gill in Goode and Bean (1896:317; type-species by monotypy *Oligopus ater* Risso).

*Verater* Jordan (1919:343; type-species by original designation *Oligopus ater* Risso).

*Eutyx* Heller and Snodgrass (1903:224; type-species by monotypy *Eutyx diagrammus* Heller and Snodgrass).

*Bathystorreus* Howell Rivero (1934:69; type-species by original designation *Benthocometes claudoi* Torre).

Scales present on head. Palatine teeth absent. Developed rakers on first arch 2 or 3. Ventral fins with 1 ray in each. Pectoral fin rays 19 to 29. Branchiostegal rays 8. Precaudal vertebrae about 12, with most neural spines truncate. Maxillary expanded posteriorly.

*Oligopus* may have been derived from a fish similar to *Abythites*, which it resembles in general body shape and in having truncate neural spines. The most notable difference is the absence of palatine teeth in *Oligopus*.

Circumtropical at depths ranging from the intertidal to 346 m. The reproductive biology of *O. longhursti* has been discussed by Wourms and Cohen (1975).

The genus was revised by Cohen (1964b) who recognized the following 6 species: \**O. ater* Risso 1810 (*O. niger* Risso 1826 is a synonym), \**O. claudoi* (Torre 1930) (\**Grammonus mowbrayi* Grey 1951 is a synonym), \**O. diagrammus* (Heller and Snodgrass 1903), \**O. longhursti* Cohen 1964b, \**O. robustus* (Smith and Radcliffe in Radcliffe 1913), and \**O. waikiki* Cohen 1964b (\**Microbrotula nigra* Gosline 1953 is a synonym).

#### *Propteridium* Arambourg

*Propteridium* Arambourg (1967:130; type-species by monotypy *Urenchelys douvillei* Priem).

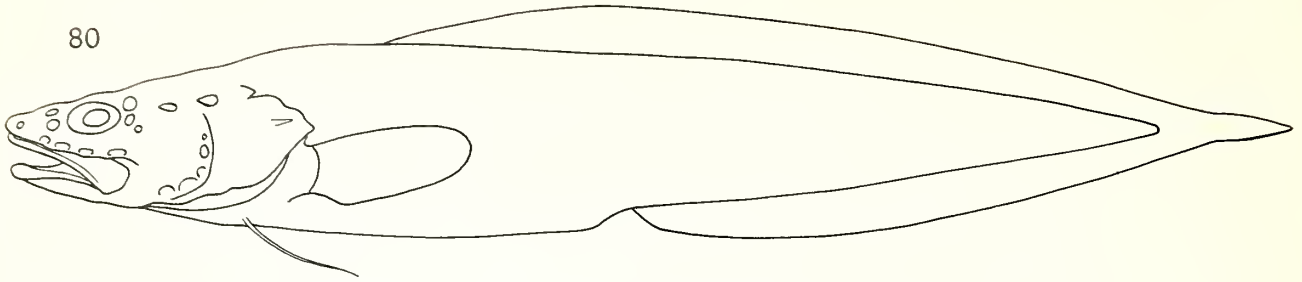
Scales present on body. Opercular spine present. Palatine teeth present. Jaw teeth somewhat enlarged, relatively widely spaced, not granular. Developed rakers on first arch 3. Ventral fins with 2 rays in each. Branchiostegal rays 8. Precaudal vertebrae about 12, with neural spines rather pointed. Caudal fin rays 9 to 10. Dorsal fin rays about 80. Anal fin rays 63 or 64.

This genus, from the middle Oligocene of Persia, is represented by very good material that we have been able to examine and thereby supplement the generally excellent account given by Arambourg (1967). In most of the characters listed above, *Propteridium* appears to be a relatively generalized fish for the subfamily and must surely be close to the stock from which Recent Bythitinae evolved. Of Recent genera it is probably as close to *Abythites* as to any, differing most notably in having 2 ventral rays in each fin rather than 1 and in having widely spaced needlelike jaw teeth rather than granular ones.

A single species, \**P. douvillei* (Priem 1908).

*Pseudonus* Garman  
(Fig. 80)

80



*Pseudonus* Garman (1899:169; type-species by monotypy *Pseudonus acutus* Garman).

Head pores prominent; a large elliptical median, interorbital pore. Head depressed. Scales present on head. Opercular spine strong. Cleithrum with a sharp spine projecting above the upper pectoral ray. Lateral ethmoid with a blunt cartilaginous knob in front of eye. Jaw teeth granular. Palatine teeth present. Developed rakers on first arch 3. Ventral fins absent or with 1 ray in each. Pectoral fin rays 18 to 22. Caudal fin rays 7 to 9. Branchiostegal rays 8. Precaudal vertebrae 16.

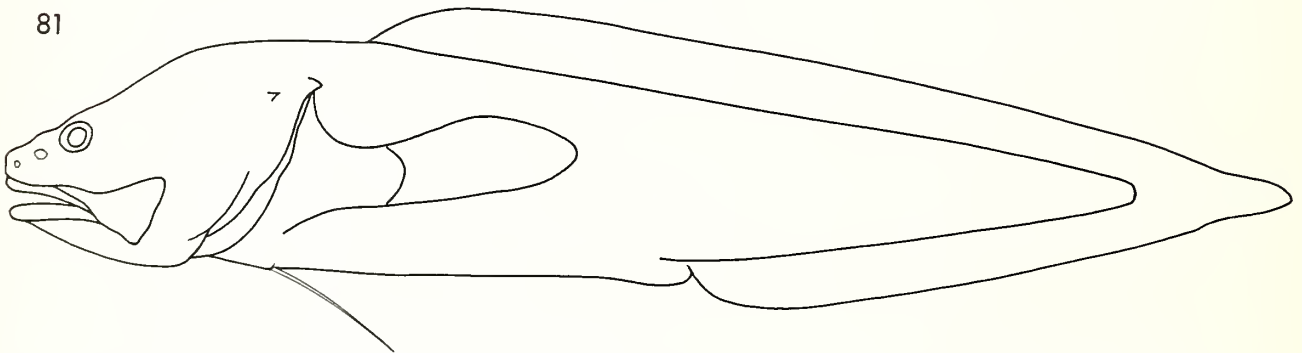
Derived from *Cataetix*, some species of which it resembles, being separated chiefly by the development of the lateralis system on the head. Further work may show that species presently placed in *Cataetix* should be transferred to this genus or that *Pseudonus* should be considered a subgenus of *Cataetix*.

Arabian Sea to Panama on the continental slope.

This genus is being studied by D. M. Cohen. Known from fewer than a dozen specimens that are placed in 3 nominal species: \**P. acutus* Garman 1899, \**P. platycephalus* (Smith and Radcliffe in Radcliffe 1913), and \**P. squamiceps* (Lloyd 1909).

*Saccogaster* Alcock  
(Fig. 81)

81



*Saccogaster* Alcock (1889:389; type-species by monotypy *Saccogaster maculatus* Alcock).

*Barbuliceps* Chan (1966:4; type-species by original designation *Barbuliceps tubercularis* Chan, error for *tuberculatus*).

Scales absent from head, reduced or absent on body. Pectoral fin supported by elongate radials. Opercular spine present. Jaw teeth granular. Palatine teeth present. Developed rakers on first gill arch 0 to 6. Ventral fins with 1 ray in each. Pectoral fin rays 14 to 23. Branchiostegal rays 8. Precaudal vertebrae 12 to 16. Males with a stalked intromittent organ.

Perhaps derived from *Diplacanthopoma*.

Rarely taken circumtropical fishes caught at depths ranging from about 100 to 800 m.

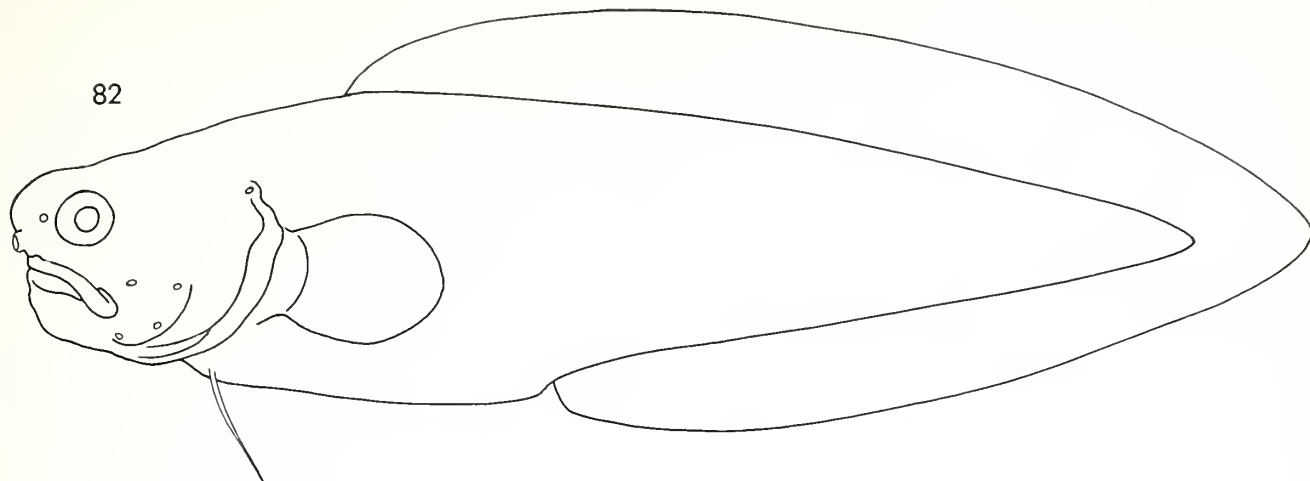
The genus has been revised by Cohen and Nielsen (1972) who recognized the following six species: \**S. hawaii* Cohen and Nielsen 1972, \**S. maculata* Alcock 1889, \**S. normae* Cohen and Nielsen 1972, \**S. parva* Cohen and Nielsen 1972, \**S. staigeri* Cohen and Nielsen 1972, and \**S. tuberculata* (Chan 1966).

Corrected type-locality for this species: lat. 24°21'S, long. 43°54'W, 500 m.



*Stygnobrotula* Böhlke  
(Fig. 82)

82



*Stygnobrotula* Böhlke (1957:1; type-species by original designation *Stygnobrotula latebricola* Böhlke).

Head and body notably compressed. Anterior profile of head quite blunt. Maxillary narrow posteriorly. Scales present on head. Anterior nostril slightly above upper lip. Some enlarged jaw teeth. Palatine teeth absent. Developed rakers on first gill arch 3 or 4. Ventral fins with 1 ray in each. Pectoral fin rays 21 to 23. Caudal fin rays 6. Branchiostegal rays 7. Precaudal vertebrae 14, with pointed neural spines.

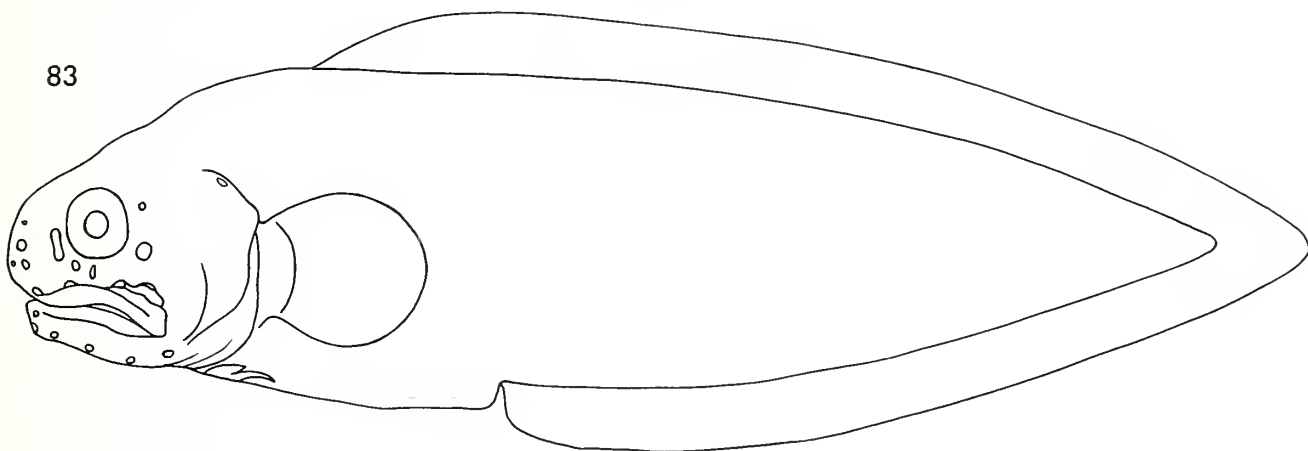
Apparently derived from *Oligopus*.

Found in tropical western North Atlantic reefs.

A single species. \**S. latebricola* Böhlke 1957 (\**Eutyx tumidirostris* Boeseman 1960 is a synonym).

*Thalassobathia* Cohen  
(Fig. 83)

83



*Thalassobathia* Cohen (1963:1; type-species by original designation *Thalassobathia pelagica*).

Ventral fins with 2 rays in each, the fins diverging from each other and covered with thick, fleshy skin. Head and body compressed. Anterior profile of head blunt. Scales absent from head and reduced or absent on body. Anterior nostril lacking a tube and placed high on snout. Maxillary narrow posteriorly. Bones poorly ossified. Skin thick. Jaw teeth needlelike. Palatine teeth present, but patch short. Pectoral fin rays 19 to 27. Caudal fin rays 10. Branchiostegal rays 7. Precaudal vertebrae 12, with pointed neural spines.

Although the pelagic *Thalassobathia* and the tiny reef-dwelling *Stygnobrotula* are distinct in several important respects, they bear an astonishing resemblance to each other. We cannot say whether they are in fact closely related.

*Thalassobathia* is one of the few bythitoids with an elevated anterior nostril. A low-placed nostril would not appear to have functional significance for a pelagic fish.

Caught in the tropical and North Atlantic and the southeast Pacific. Possibly living in association with a large scyphozoan jellyfish (Harbison et al. 1973).

Two species: \**T. nelsoni* Lee 1974, and \**T. pelagica* Cohen 1963.

**BROSMOPHYCINAE GILL 1862**

Caudal fin free from dorsal and anal fins, although the anal fin may be basally connected in some species (*Lucifuga* is particularly variable with respect to this character, having at most a very short caudal peduncle). Male intromittent organ with or without ossified parts. Squamation on head and body complete or not. Ventral fins closely adjacent, with a single ray in each.

Mostly small, shallow-water, reef-dwelling fishes, some living in fresh waters.

**Key to Tribes of Brosmophycinae**

- 1a. Male intromittent organ without ossified parts . . . . . Brosmophycini
- 1b. Male intromittent organ with one or more pairs of ossified pseudoclaspers (Fig. 84) . . . . . Dinematchthyini

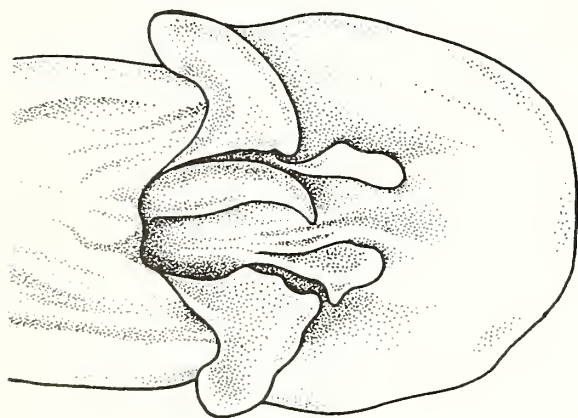


Figure 84.—Male intromittent organ (ventral view) in *Ogilbia*, a genus of Dinematchthyini; note the two pairs of ossified pseudoclaspers.

**Brosmophycini Gill 1862**

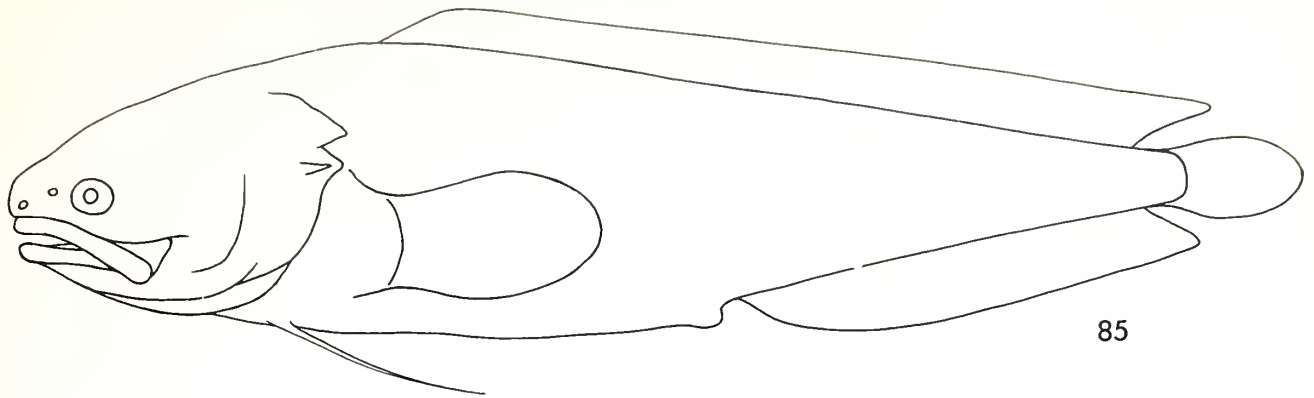
Male intromittent organ with no ossified parts. Body completely covered with imbricate scales. Developed rakers on first gill arch 3 or 4.

Possibly an artificial group.

**Key to Genera of Brosmophycini**

- 1a. Scales present on head . . . . . *Lucifuga*
- 1b. Scales absent from head . . . . . 2
- 2a. Anal fin origin well posterior to midlength of fish. Branchiostegal rays 8 . . . . . *Bidenichthys*
- 2b. Anal fin origin at about midlength of fish. Branchiostegal rays 7 . . . . . 3
- 3a. Eye diameter equal to or greater than snout length. Maxillary strongly sheathed posteriorly . *Brosmophyciops*
- 3b. Eye diameter less than snout length. Maxillary free posteriorly . . . . . *Brosmophycis*

*Bidenichthys* Barnard  
(Fig. 85)



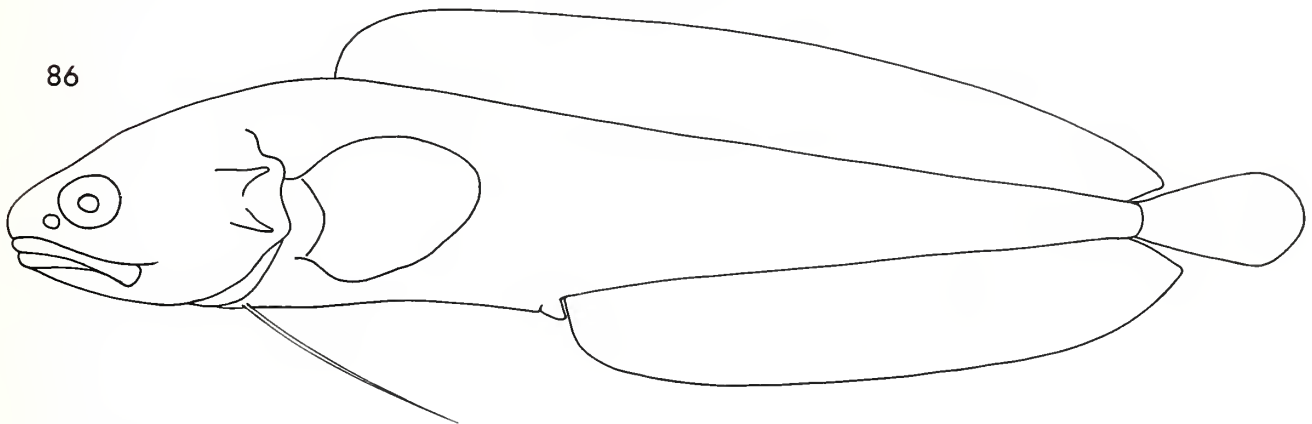
*Bidenichthys* Barnard (1934:234; type-species by monotypy *Bidenichthys capensis* Barnard).

Anal fin origin far posterior to midlength of fish. Eye diameter less than snout length. Maxillary expanded and free posteriorly. Pectoral radials elongated, fin on a prominent peduncle. Jaw teeth needlelike, separate from each other. Branchiostegal rays 8. Pectoral fin rays 21. Caudal fin rays 14 to 16. Precaudal vertebrae 15.

Cape of Good Hope to East London in tide pools.

A single species, \**B. capensis* Barnard 1934.

*Brosmophyciops* Schultz  
(Fig. 86)



*Brosmophyciops* Schultz (1960:384; type-species by original designation *Brosmophyciops pautzkei* Schultz).

Anal fin origin at about midlength of fish. Eye diameter equal to or greater than snout length. Snout rounded, jaws inferior. Maxillary strongly sheathed. Pectoral fin on a broad peduncle, radials not elongated. Jaws with some teeth needlelike and elongated.

Branchiostegal rays 7. Pectoral fin rays 25 to 29. Caudal fin rays 12. Precaudal vertebrae 12 or 13.

Tropical reefs from the Red Sea to the Marshall Islands and Samoa.

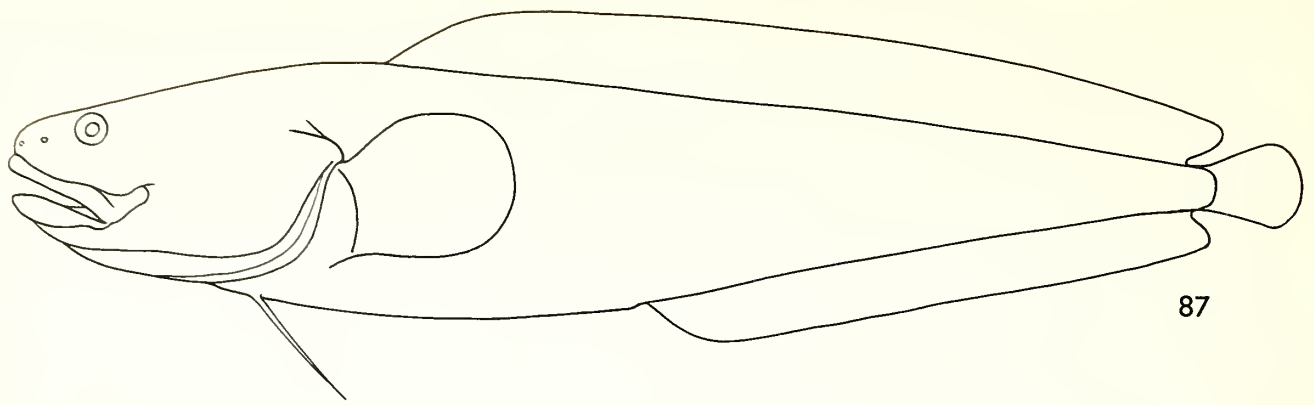
A single described species, \**B. pautzkei* Schultz 1960, another unnamed. This genus is being studied by D. M. Cohen.

*Brosmophycis* Gill  
(Fig. 87)

*Brosmophycis* Gill (1861b:168; type-species by original designation *Brosmius marginatus* Ayres).

*Haliás* Ayres (1863:52; type-species by original designation *Brosmius marginatus* Ayres).

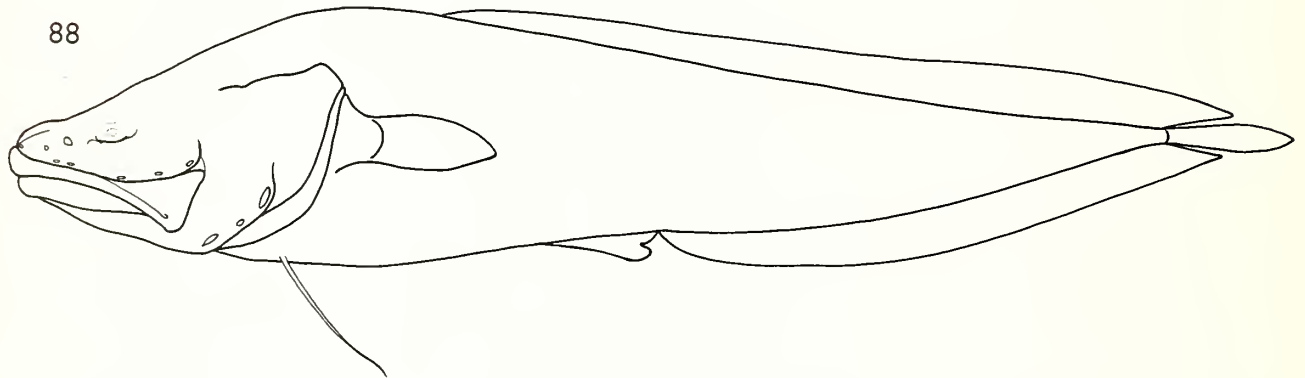
Anal fin origin at about midlength of fish. Thick skin over head, body, and fins. Eye diameter less than snout length. Pectoral fin on a broad peduncle, radials not elongated. Jaw teeth mostly needlelike and discrete. Branchiostegal rays 7. Pectoral fin rays 26. Caudal fin rays 16. Precaudal vertebrae 16 or 17.



Temperate eastern North Pacific at depths of 3 to 256 m. Recent records and meristics have been presented by Follett (1970).

A single described species, \**B. marginata* (Ayres 1854), perhaps another, undescribed.

*Lucifuga* Poey  
(Fig. 88)



*Lucifuga* Poey (1858:95; type-species by subsequent designation of Jordan and Evermann 1896, *Lucifuga subterraneus*).

*Stygicola* Gill (1863a:252; type-species by monotypy *Lucifuga dentatus* Poey).

Scales present on head. Opercular spine flattened and weak. Palatine teeth present or absent. Jaw teeth granular. Pectoral fin rays 12 to 20. Caudal fin connected basally with dorsal and anal fins in some specimens, with 8 to 11 rays. Branchiostegal rays 7. Precaudal vertebrae 11 to 13. Eyes poorly developed, often not externally visible.

Caves and sinkholes in limestone formations of Cuba and the Bahamas, where they are found in waters of various salinities ranging from fresh to highly saline.

The biology of *Lucifuga* in Cuba has been studied by Eigenmann (1909). The taxonomy of the genus has been treated most recently by Cohen and Robins (1970).

Three species in two subgenera are known; reports persist of other species in the Bahamas and Jamaica: \**L. (Lucifuga) subterraneus* Poey 1858, \**L. (Stygicola) dentatus* Poey 1858, and \**L. (S.) spelaeotes* Cohen and Robins 1970.

**Dinematichthyini Whitley 1928**

Male intromittent organ with one or more pairs of ossified pseudoclaspers (Fig. 84). Head scales present or absent. Body squamation complete, partial, or absent. Scales when present imbricate or not. Jaw teeth at least in part needle-like, not granular.

The distinguishing characteristics of *Brotulina* (including *Calcarbrotula*), *Dinematichthys*, *Monothrix*, and *Ogilbia* (including *Caecogilbia* and *Typhliasina*) are not at all clear. There are many undescribed species that can be assigned to these nominal genera and consequently scant knowledge is available of the range in variation of characters with potential diagnostic value in defining genera. When additional data are available it may be necessary to realign the genera.



Key to Genera of Dinematichthyini

- 1a. Gill membranes free from isthmus. Maxillary more or less expanded vertically at its posterior end . . . . . 5
- 1b. Gill membranes attached to the isthmus anteriorly. Maxillary not greatly expanded vertically at its posterior end . . . . . 2
- 2a. Opercle lacking spines . . . . . *Dermatopsoides*
- 2b. Opercle with sharp-pointed spine, sometimes skin covered . . . . . 3
- 3a. Ventral fins reaching vent . . . . . *Diancistrus*
- 3b. Ventral fins falling short of vent . . . . . 4
- 4a. Branchiostegal rays 6. Scales absent from body. Head about 6.5 or more times in standard length . . . . . *Dipulus*
- 4b. Branchiostegal rays 7. Scales present on body, sometimes imbedded. Head less than about 6.5 times in standard length . . . . . *Dermatopsis*
- 5a. Anterior nostril rather high above upper lip, about midway between lip and posterior nostril (Fig. 89) . . . . . *Dinematichthys*
- 5b. Anterior nostril closer to upper lip . . . . . 6

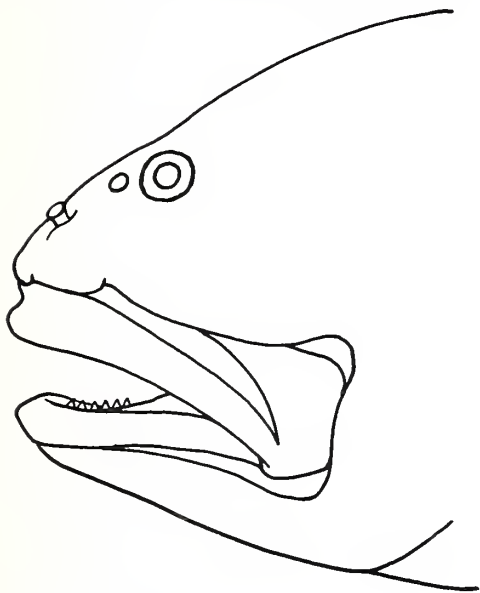


Figure 89.—Head of *Dinematichthys* showing the anterior nostril placed high above the upper lip.

- 6a. Branchiostegal rays 8. Scales on body scarcely imbricate . . . . . *Gunterichthys*
- 6b. Branchiostegal rays 7 (rarely 8 on one side). Scales on body imbricate in most species . . . . . 7
- 7a. Male intromittent organ with one pair of pseudoclaspers. Head naked . . . . . *Monothrix*
- 7b. Male intromittent organ with two or more pairs of pseudoclaspers. Head usually with scales, naked in a few species . . . . . 8

- Sa. Largest pseudoclasper a compressed lobe (Fig. 84) . . . . . *Ogilbia*
- Sb. Largest pseudoclasper a rather rounded prong (Fig. 90) . . . . . *Brotulina*

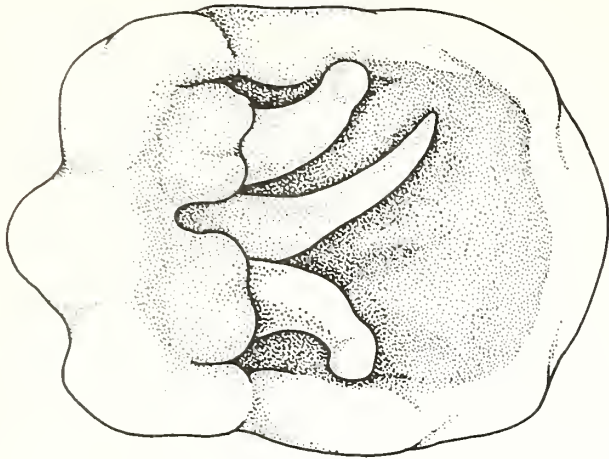
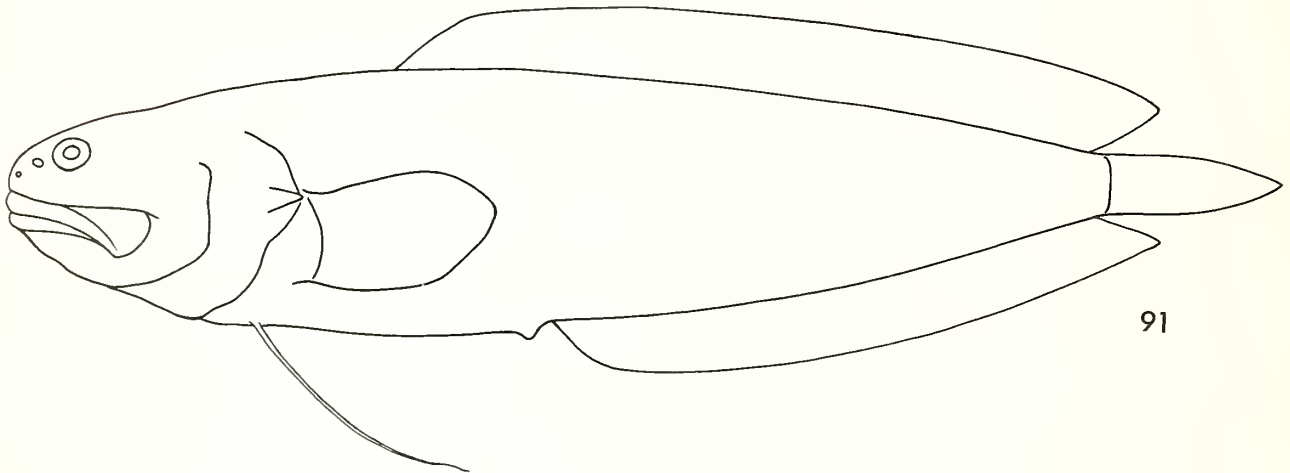


Figure 90.—Male intromittent organ (ventral view) in *Brotulina*; note that the largest pseudoclaspers are rounded prongs.

*Brotulina* Fowler  
(Fig. 91)



*Brotulina* Fowler (1946:195; type-species by original designation *Brotulina fusca* Fowler).

*Calcarbrotula* Fowler (1946:193; type-species by original designation *Calcarbrotula erythrea* Fowler).

Body scales imbricate. Head scales present on cheeks, absent from opercle. Gill membranes free from isthmus. A sharp spine present on opercle. Anterior nostril low, close to upper lip. Maxillary expanded posteriorly, its rear margin rounded. Intromittent organ of male with 2 pairs of pseudoclaspers, the largest rather rounded and pronglike (Fig. 90). Developed rakers on first gill arch 3. Branchiostegal rays 7. Caudal fin rays 12. Precaudal vertebrae 10 or 11, some neural spines bluntly rounded to truncate.

Probably widespread on Indo-Pacific reefs.

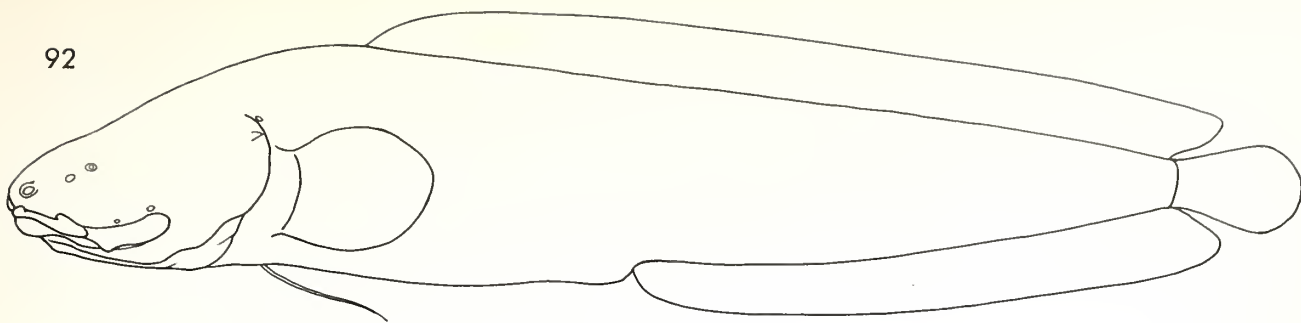
The holotypes representing the first two names listed below are different sexes (*fusca* is a male) from the same locality and may belong to the same species (there is an unknown number of undescribed species): \**B. erythrea* (Fowler 1946), \**B. fusca* Fowler 1946, and ? *B. piger* (Alcock 1890c).

*Dermatopsis* Ogilby  
(Fig. 92)

*Dermatopsis* Ogilby (1896:138; type-species by monotypy *Dermatopsis macrodon* Ogilby).

Scales on body nonimbricate, absent from head. Gill membranes joined to isthmus anteriorly. Ventral fins falling far short of vent. Opercle with a sharp spine. Anterior nostril low, close to upper lip. Maxillary relatively narrow pos-

92



teriorly, not greatly expanded. Intromittent organ of male with one pair of flattened, pronglike pseudoclaspers, directed laterally at their distal ends. Developed rakers on first gill arch 2 to 4. Branchiostegal rays 7 (incorrectly given as 6 by Cohen 1966). Caudal fin rays 16 or more. Pectoral fin rays 17 to 24.

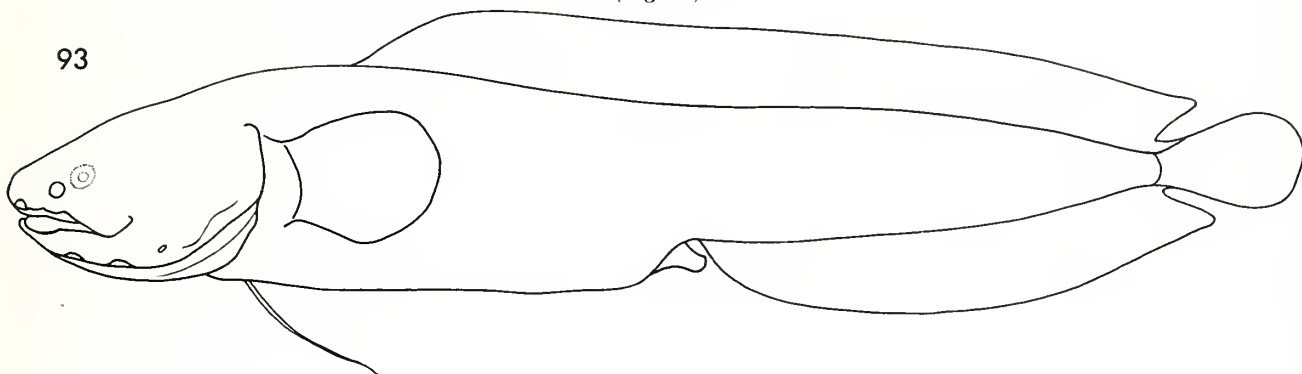
Temperate and subtropical shallow waters of Australia and New Zealand.

Two species were recognized by Cohen (1966), who reviewed the genus: \**D. macrodon* Ogilby 1896, and \**D. multi-radiatus* McCulloch and Waite 1918.

***Dermatopsoides* Smith**

(Fig. 93)

93



*Dermatopsoides* Smith (1947:361; type-species by original designation *Dermatopsis kasougae* Smith).

Scales absent or nonimbricate on body, absent or widely scattered on head. Eye minute, 11 or more times in head length. Gill membranes attached anteriorly to isthmus. Ventral fins falling short of anus. Opercular spine absent. Anterior nostril low, directly above upper lip. Maxillary narrow posteriorly, not expanded. Intromittent organ of male with a single pair of rounded, recurved pseudoclaspers, directed dorsally at their distal ends. Developed rakers on first arch 3. Branchiostegal rays 6. Pectoral fin rays 17 to 24. Caudal fin rays 16 or more. Precaudal vertebrae 11 to 14.

Apparently related to *Dermatopsis*.

Shallow waters of South Africa. Distribution is discussed by Smith (1966).

Two species were recognized by Cohen (1966): \**D. kasougae* (Smith 1943), and \**D. talboti* Cohen 1966.

***Diancistrus* Ogilby**

*Diancistrus* Ogilby (1898:743; type-species by monotypy *Diancistrus longifilis* Ogilby).

Body scales present. Head naked. Ventral fins reaching vent. Opercle with a small spine. Maxillary spatulate. Intromittent organ of male with a single pair of curved pseudoclaspers. Branchiostegal rays 6. Pectoral fin rays 20.

Apparently related to *Dermatopsis*.

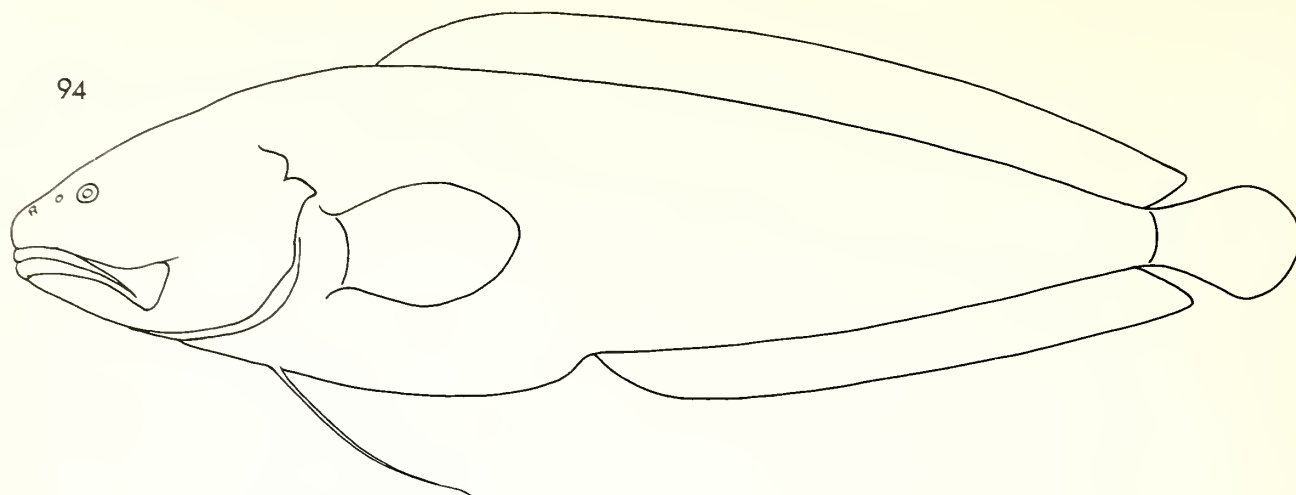
Lord Howe Island.

A single species, *D. longifilis* Ogilby 1898.

***Dinematichthys* Bleeker**

(Fig. 94)

*Dinematichthys* Bleeker (1855:295; type-species by monotypy *Dinematichthys iluocoeteoides* Bleeker).



Body scales imbricate. Head squamation variable, ranging from the cheeks only to nearly the entire head. Some species with densely distributed papillae on the snout. A sharp spine present on opercle, sometimes buried. Anterior nostril relatively high, about midway between posterior nostril and upper lip. Maxillary expanded vertically at its posterior end. Intromittent organ of male with two or more pairs of pseudoclaspers, the largest a compressed ear-shaped lobe. Branchiostegal rays 7. Some precaudal neural spines truncate.

*Dinematichthys* is the earliest named genus of its tribe; hence, its definition is essential to achieving nomenclatural stability. *Dinematichthys iluocoeteoides* was described from a single specimen that apparently is no longer extant. A dozen of Bleeker's specimens identified as *D. iluocoeteoides* were present at the Rijksmuseum van Natuurlijke Historie in Leiden but deteriorated and were discarded (M. Boeseman, pers. commun.). A Bleeker specimen identified as *D. iluocoeteoides* was mentioned by Günther (1862) and is present in the British Museum (Natural History). We have examined the specimen, no. 1868.2.28.65, and find that considering its shriveled condition it agrees reasonably well with Bleeker's description with regard to squamation and size. Bleeker gave a length of 70 mm; BMNH 1868.2.28.65 standard length = 62 mm. Counts also are in close agreement; Bleeker: D=83, A=69, pectoral=22 or 23; BMNH: D=84, A=68, pectoral=22. There is, however, one important difference between the original description and the BMNH specimen. Bleeker noted a rather large eye, slightly more than 5 times in head length and slightly more than once in the interorbital width. The BMNH specimen has a small eye that enters the head 7.2 times and the interorbital 1.8 times. Furthermore, the BMNH specimen is a male with a prominent intromittent organ (2 pairs of ossified clasps, the larger a compressed lobe); no mention is made of this structure in Bleeker's original description. It seems unlikely that the British Museum specimen is the holotype.

Among a series of unpublished Bleeker plates in Leiden is a picture of a fish labeled *Dinematichthys iluocoeteoides* (Tab. CCCXL. VI, fig. 9; a copy of this drawing has been published by DeBeaufort and Chapman 1951, fig. 79). The illustrated fish has a very small eye that enters the head 7.8 times; perhaps it shows a species that is conspecific with the British Museum specimen but different from the species originally described by Bleeker from a single specimen as *D. iluocoeteoides*. How then should the name *Dinematichthys* be assigned?

Among the dinematichthyine genera with imbricate body scales and an expanded maxillary are a number of species that have the anterior nostril placed high on the snout. Bleeker mentioned in his description of *D. iluocoeteoides* that the nostrils were close before the eye. He noted also the presence of head scales on the nape, preopercle, and opercle. Although some species with a high anterior nostril have scales only on the cheek, others have scales covering nearly the entire head, or coverage intermediate between the two extremes. Furthermore all males that we have seen, which have a high placed anterior nostril and head scales, have 2 or more ossified pseudoclaspers, the largest of which is a compressed, ear-shaped lobe. It seems reasonable therefore, to restrict usage of the name *Dinematichthys* to fishes that fall within the definition given above. The possibility should be investigated that a high anterior nostril has evolved independently in Old and New world *Dinematichthys*.

Low placement of the nostril is typical of the Bythitidae. One exception is *Thalassobathia*, for which we have suggested an explanation. In the present instance we can offer no explanation related to function but note that the occurrence of this character state is highly serendipitous for the taxonomist.

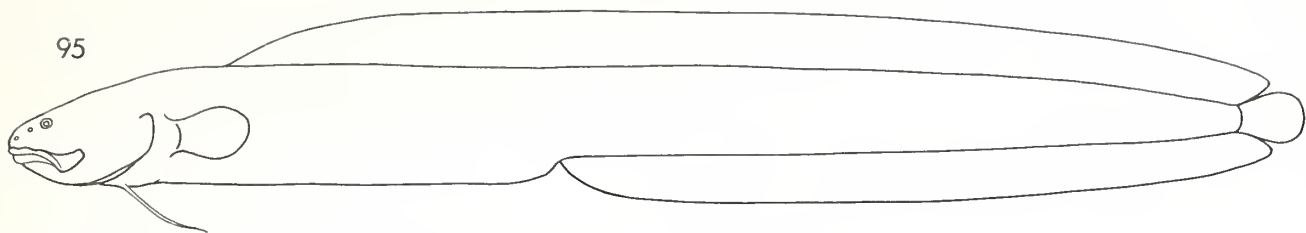
Indo-Pacific and tropical western Atlantic reefs.

Probably numerous species, of which apparently only one has been described. *Dinematichthys iluocoeteoides* Bleeker 1855 has been widely recorded in the literature; however, most occurrences are probably other species or genera. Reproductive biology has been discussed by Wourms and Bayne (1973). The genus is being studied by B. Walker.



*Dipulus* Waite  
(Fig. 95)

95



*Dipulus* Waite (1905:78; type-species by monotypy *Dipulus caecus* Waite).

Body elongate, head 6.5 or more times in standard length. Head and body without scales. Gill membranes joined to each other and to isthmus anteriorly. Ventral fins falling far short of vent. Opercle with a sharp spine. Anterior nostril low, close to upper lip. Maxillary relatively narrow posteriorly. Intromittent organ of male with a single pair of broad, convoluted pseudoclaspers. Branchiostegal rays 6. Pectoral fin rays about 20. Caudal fin rays 16. Precaudal vertebrae 22.

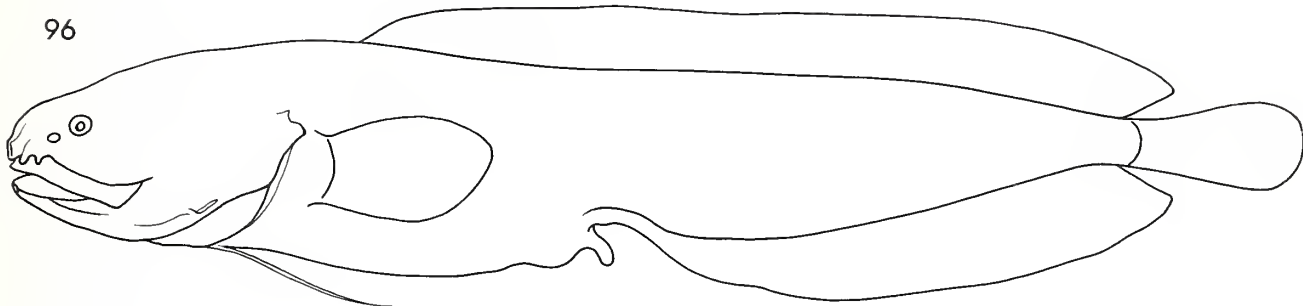
Probably derived from *Dermatopsis*.

Temperate and subtropical Western Australia in shallow water.

A single species, \**D. caecus* Waite 1905, discussed by Cohen (1966).

*Gunterichthys* Dawson  
(Fig. 96)

96



*Gunterichthys* Dawson (1966:205; type-species by original designation *Gunterichthys longipenis* Dawson).

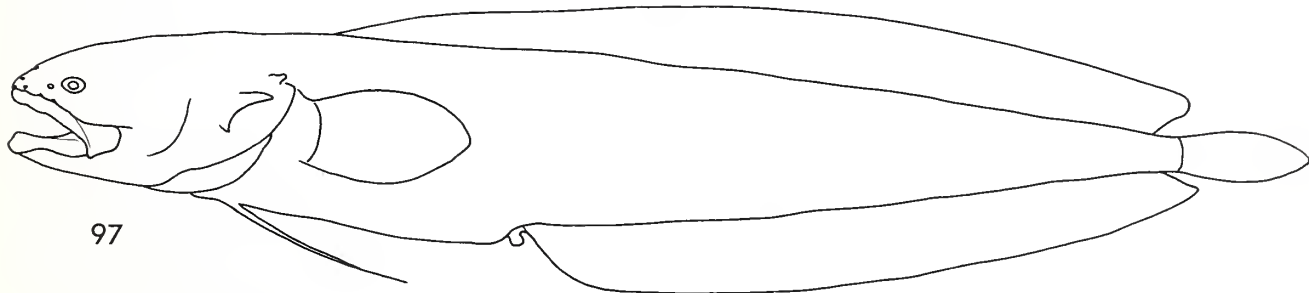
Scales on body barely overlapping, absent from head. Eyes minute. Gill membranes free from isthmus. Opercular spine slender and weak. Anterior nostril low, directly above upper lip. Maxillary somewhat expanded posteriorly. Male intromittent organ with one pair of broad pseudoclaspers, each of which contains two ossified supports. Ventral fin rays falling short of vent. Developed rakers on first gill arch 5 to 7. Branchiostegal rays 8. Pectoral fin rays 17 to 22. Caudal fin rays 12 to 15. Precaudal vertebrae 11 or 12.

Northeastern Gulf of Mexico in shallow-water mud. The ecology of *Gunterichthys* has been discussed by Dawson (1971).

A single species, \**G. longipenis* Dawson 1966.

*Monothrix* Ogilby  
(Fig. 97)

97



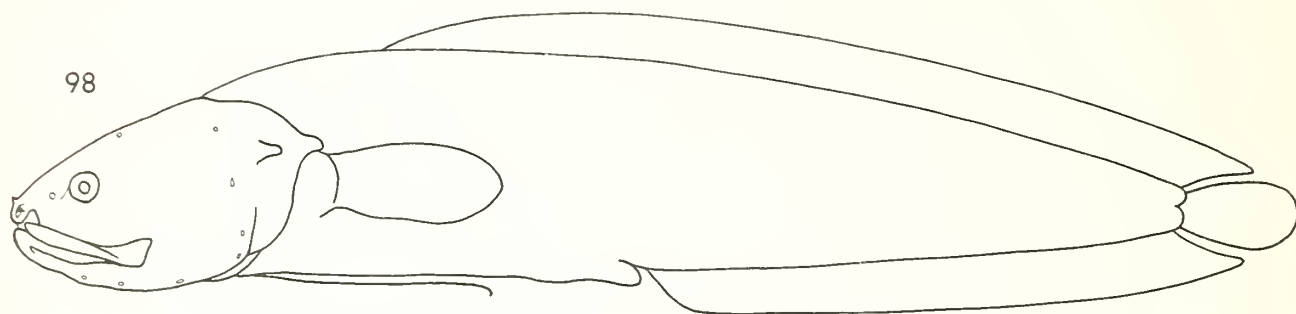
*Monothrix* Ogilby (1897:87; type-species by monotypy *Monothrix polylepis* Ogilby).

Body scales imbricate. Head scales absent. Gill membranes free. Opercular spine present. Anterior nostril low, immediately above upper lip. Maxillary vertically expanded posteriorly. Male intromittent organ with a single pair of broad, compressed pseudoclaspers. Branchiostegal rays 7. Pectoral fin rays 22. Caudal fin rays 14. Precaudal vertebrae 13 or 14, with pointed neural spines.

Australia and ? New Zealand; possibly more widely distributed.

Possibly 3 described species: ? *M. consobrinus* (Hutton 1875), ? \**M. mizolepis* (Günther 1867), and \**M. polylepis* Ogilby 1897.

***Ogilbia* Jordan and Evermann  
(Fig. 98)**



*Ogilbia* Jordan and Evermann in Evermann and Kendall (1898:132; type-species by original designation *Ogilbia cayorum* Evermann and Kendall).

*Typhlias* Hubbs (1938:132; type-species by original designation *Typhlias pearsei* Hubbs; preoccupied by *Typhlias* Bryce 1910 in rotifers).

*Typhliasina* Whitley (1951:67; replacement name for *Typhlias* Hubbs, takes the same type-species).

*Caecogilbia* Poll and Leleup (1965:466; type-species by monotypy *Caecogilbia galapagosensis* Poll and Leleup).

Body scales imbricate. Head scales present or absent on cheek, absent from opercle. A sharp spine present on opercle, sometimes buried. Anterior nostril generally placed low on snout. Maxillary expanded vertically at its posterior end. Intromittent organ of male with 2 pseudoclaspers, the largest a compressed, ear-shaped lobe. Branchiostegal rays 7. Precaudal neural spines pointed.

Found in tropical American reefs, in freshwater Yucatan caves, and in brackish water in the Galapagos. Probably occurring in the Indo-Pacific as well.

Six described species may be ascribed to this genus. There are numerous undescribed ones. Reproductive biology has been described by Suarez (1975) and the comparative ecology of 2 Galapagos species has been discussed by van Mol (1967). The genus is being studied by B. Walker. The species are: \**O. cayorum* Evermann and Kendall 1898, \**O. deroyi* (Poll and van Mol 1966), \**O. galapagosensis* (Poll and Leleup 1965), \**O. pearsei* (Hubbs 1938), \**O. ventralis* (Gill 1863a), and *O. verrillii* (Garman 1900).

**Aphyonidae Jordan and Evermann 1898**

Precaudal vertebrae 26 to 48. Swim bladder absent. Anterior neural spine equal in length to those following. Scales absent, body in freshly caught specimens enveloped in a thick, gelatinous layer. Vertical fins confluent. Eyes poorly developed. Palatine lacking teeth (except in *Barathronus*). Basibranchial tooth patches absent. Opercular spine weak or absent. Ventral fins with a single ray in each or absent. Musculus infracarinalis medialis distinct. Pyloric caeca absent.

The aphyonid genera are notable for a number of neotenic characters, and convergence has been suggested. The problem of how best to classify these curious fishes has been discussed by Nielsen (1969) in a revision of the family.

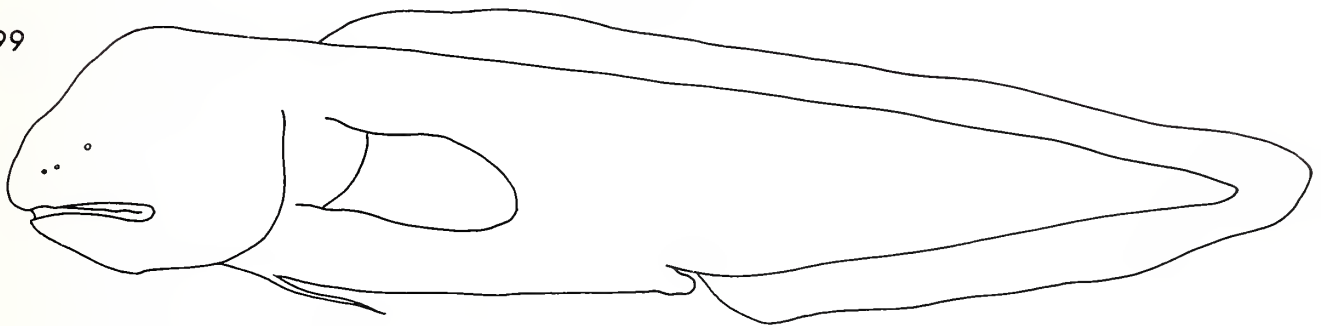
Two genera among the aphyonids, *Aphyonus* and *Barathronus*, have the anterior nostril rather high above the upper lip, a character state that is typical of most oviparous rather than viviparous ophidiiform fishes. It is probable that the early stages of these two genera are pelagic, and although adults are caught in bottom trawls, they also are probably pelagic, although living close to the bottom. Either they never developed low placed nostrils, which would be a neotenic condition for a typical bythitoid, or the nostrils have moved up secondarily, which is a possibility, as the other genera in the family, apparently all of which are deep pelagic, have low placed nostrils.

Key to Genera of Aphyonidae

- 1a. Long rakers on anterior gill arch 24-33. Caudal fin rays 9 or 10. Palatine teeth present . . . . . *Barathronus*
- 1b. Long rakers on anterior gill arch 0-14. Caudal fin rays 6-8. Palatine teeth absent . . . . . 2
  
- 2a. Pectoral fin rays 23-27. Anterior gill arch with a total of 23-26 gill rakers, 6 or 7 relatively long . . . *Nybelinella*
- 2b. Pectoral fin rays 9-19. Anterior gill arch with a total of 8-18 gill rakers, 0-14 relatively long . . . . . 3
  
- 3a. Long gill rakers 3-14. Precaudal vertebrae 26-33 . . . . . *Aphyonus*
- 3b. Long gill rakers 0. Precaudal vertebrae 39-48 . . . . . 4
  
- 4a. Pectoral peduncle normal. Caudal fin rays 8. Dorsal fin rays 48-50. Gill rakers 8 or 9 . . . . . *Meteorina*
- 4b. Pectoral peduncle elongate. Caudal fin rays 6 or 7. Dorsal fin rays 68-104. Gill rakers 11-15 . . . . . *Sciadonus*

***Aphyonus* Günther  
(Fig. 99)**

99



*Aphyonus* Günther (1878:22; type-species by monotypy *Aphyonus gelatinosus* Günther).

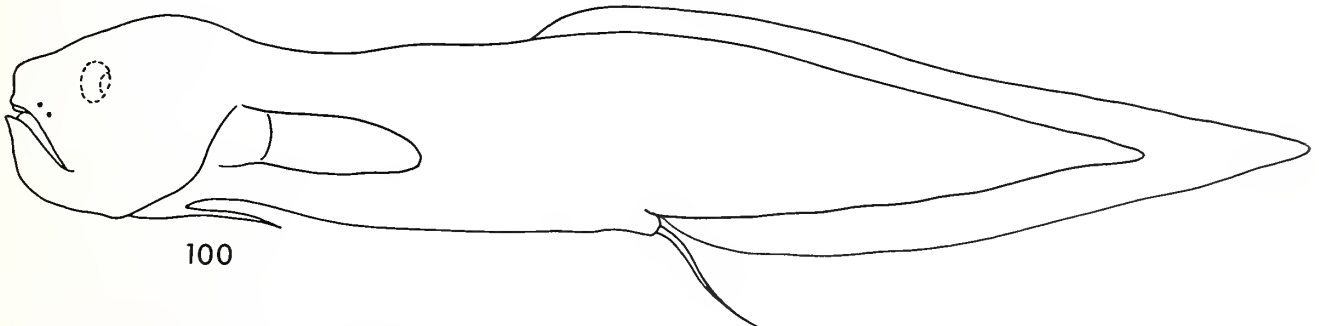
Mouth almost horizontal. Eyes small or not externally visible. Palatines lacking teeth. Long rakers on anterior gill arch 3 to 14. Vertebral centra in adults rectangular or nearly so. Ventral fins present. Caudal fin rays 7 or 8. Pectoral peduncle as long as broad, bearing 13 to 19 rays. Peritoneum dark blue, visible through body wall.

Worldwide at depths ranging from about 900 to 4,360 m on or near the bottom.

Four species: \**A. bolini* Nielsen 1974, \**A. brevidorsalis* Nielsen 1969, \**A. gelatinosus* Günther 1878 (\**A. mollis* Goode and Bean 1886 is a synonym), and \**A. rassi* Nielsen 1975b.

***Barathronus* Goode and Bean  
(Fig. 100)**

100



*Barathronus* Goode and Bean (1886:164; type-species by monotypy *Barathronus bicolor* Goode and Bean).

*Alexeterion* Vaillant (1888:282; type-species by monotypy *Alexeterion parfaiti* Vaillant).

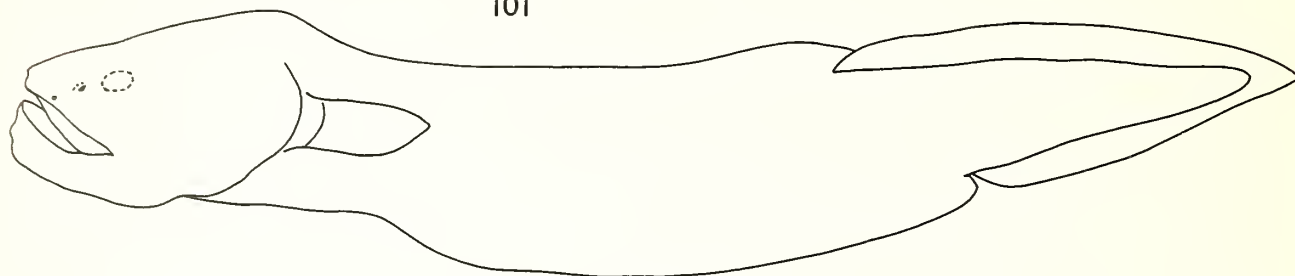
Mouth oblique. Eyes deep-set. Palatine teeth present. Long rakers on anterior gill arch 24 to 33. Vertebral centra spindle-shaped in adults. Caudal fin rays 9 to 10. Ventral fins present. Pectoral peduncle as long as broad, with 21 to 26 rays.

Worldwide at depths ranging from 500 to 3,500 m.

Seven species have been described (another, from the northwest Atlantic, is being described by J. G. Nielsen): \**B. affinis* Brauer 1906, \**B. bicolor* Goode and Bean 1886, \**B. bruuni* Nielsen 1969, \**B. diaphanus* Brauer 1906, \**B. maculatus* Shcherbachev 1976, \**B. pacificus* Nielsen and Eagle 1974, and \**B. parfaiti* (Vaillant 1888).

**Meteoria Nielsen**  
(Fig. 101)

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*Meteoria* Nielsen (1969:69; type-species by monotypy *Meteoria erythroptis* Nielsen).

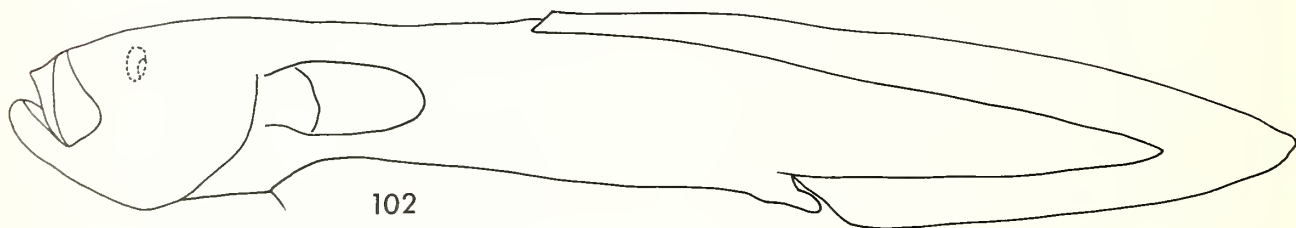
Mouth oblique. Caudal part of body less than one-third of standard length. Eyes minute. Palatines lacking teeth. Anterior gill arch with only 8 or 9 vestigial rakers. Vertebral centra rectangular in adults. Dorsal fin rays 48 to 50. Anal fin rays 34 to 40. Caudal fin rays 8. Ventral fins absent. Pectoral peduncle as long as broad, with 13 to 15 rays.

Taken in the eastern North Atlantic at bathypelagic or abyssopelagic depths.

A single species, \**M. erythroptis* Nielsen 1969.

**Nybelinella Nielsen**  
(Fig. 102)

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*Nybelinia* Nielsen (1969:22; type-species by original designation *Barathronus erikssoni* Nybelin; preoccupied by *Nybelinia* Poche 1926 in tapeworms).

*Nybelinella* Nielsen (1972:53; replacement name for *Nybelinia* Nielsen 1969, taking the same type-species).

Mouth oblique. Eyes indistinct. Palatines lacking teeth. Anterior gill arch with 6 or 7 somewhat enlarged rakers, and about 18 short rakers. Vertebral centra rectangular in adults. Ventral fins present. Caudal fin rays 8. Pectoral peduncle as long as broad, with 23 to 27 rays.

Eastern Atlantic and western Indian Oceans, probably deep pelagic.

Two species: \**N. brevidorsalis* Shcherbachev 1976, and \**N. erikssoni* (Nybelin 1957).

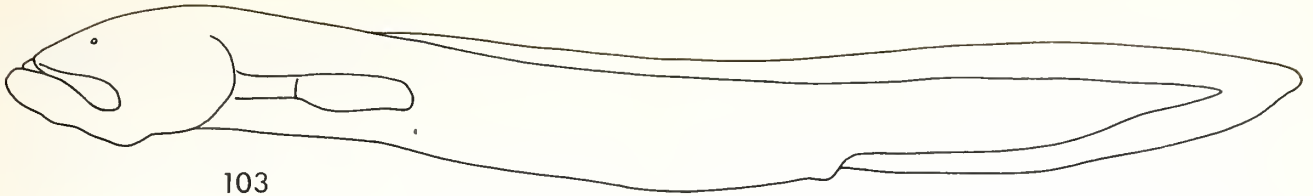
**Sciadonus Garman**  
(Fig. 103)

*Sciadonus* Garman (1899:171; type-species by monotypy *Sciadonus pedicellaris* Garman).

*Leucochlamys* Zugmayer (1911:11; type-species by monotypy *Leucochlamys cryptophthalmus* Zugmayer).

Mouth almost horizontal. Eyes small, sometimes not externally visible. Palatines lacking teeth. Anterior gill arch with only 11 to 15 short rakers. Vertebral centra rectangular in adults. Caudal fin rays 6 or 7. Ventral fin present or absent. Pectoral peduncle considerably longer than broad, with 9 to 14 rays.





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Atlantic and Pacific Oceans, probably deep pelagic.

*Sciadonus* and *Leucochlamys* have been considered separate genera based on differences in 3 characters: ventral fins small or absent; anterior nostril tubular or with a low rim; 0 or 2 fangs on vomer. However, a recently examined specimen is intermediate between the two nominal genera. The differences between them are now so insignificant that they cannot be maintained as distinct.

Four valid species: \**S. cryptophthalmus* (Zugmayer 1911), \**S. galathea* (Nielsen 1969), \**S. jonassoni* (Nybelin 1957), and \**S. pedicellaris* Garman 1899 (\**S. kullenbergi* Nybelin 1957 is a synonym).

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