

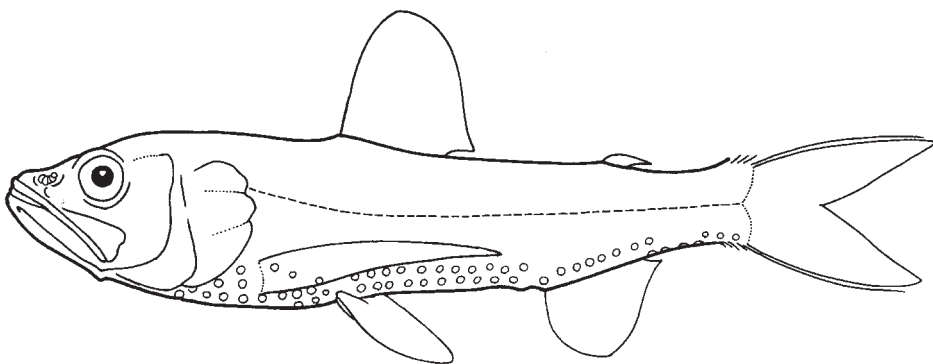
Order MYCTOPHIFORMES

NEOSCOPELIDAE

Neoscopelids

by J.R. Paxton and P.A. Hulley

Diagnostic characters: Moderate-sized (to 30 cm) myctophiform fishes, slender to oblong, compressed to robust. Eye small to medium sized; **eye diameter equal to or much less than snout length**; eye lateral. Mouth large to very large, **jaws extending to middle of eye or far beyond posterior margin of eye**; maxilla toothless and completely excluded from gape by premaxilla; **supramaxilla present as slender, elongate element**. Premaxillae, dentary, vomer, and palatines with small, closely-set teeth (inner row of jaw teeth may be enlarged); vomerine teeth in 1 or 2 patches; teeth present or absent on mesopterygoid. Branchiostegal rays 8 to 11. Gill rakers well developed, lath-like. Fins without spines, although rudimentary, paired splints sometimes present at origin of median fins and unpaired splints at uppermost pectoral and outermost pelvic fins. One dorsal fin with 11 to 14 soft rays. **Origin of anal fin far (more than 2 eye diameters) behind dorsal fin**; anal fin with 9 to 14 soft rays. Caudal fin usually with 19 principal rays. Origin of pelvic fins well behind origin of pectoral fins, under origin or middle of dorsal fin; pelvic fins with 8 rays. Pectoral fins with 12 to 19 rays. **One dorsal adipose fin**. Scales cycloid or spinose. **Large primary photophores absent (*Scopelengys*, *Solivomer*) or present (*Neoscopelus*) on body in horizontal rows and on tongue; no other luminous tissue on fin bases, caudal peduncle or head.** Total vertebrae 29 to 35. **Colour:** blackish in *Scopelengys*, pinkish in *Neoscopelus*, unknown in *Solivomer*.

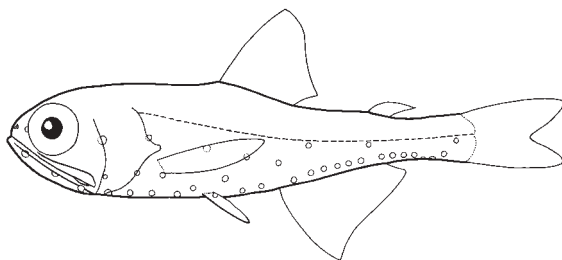


Habitat, biology, and fisheries: Meso- and bathypelagic (*Scopelengys*) or benthopelagic. Feeding modes unknown. Rare (*Solivomer*) or uncommon deep-sea fishes of no commercial importance.

Remarks: Three genera with 7 species (including 1 undescribed), throughout the world ocean in tropical and subtropical latitudes.

Similar families occurring in the area

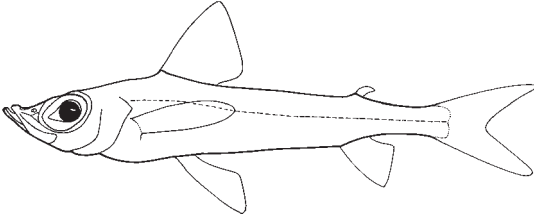
Myctophidae: eye diameter longer than snout length; origin of anal fin under or close behind dorsal fin; supramaxilla usually absent, rarely present as small, scale-like, L-shaped element; body photophores present (absent in 1 species that has luminous organs on the caudal peduncle) in distinct groups on side of body, not in horizontal rows.



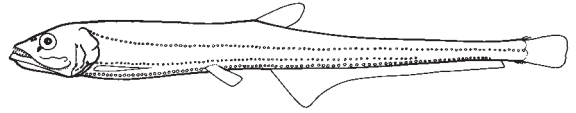
Myctophidae

Chlorophthalmidae: end of jaw not reaching level of middle of eye; photophores absent.

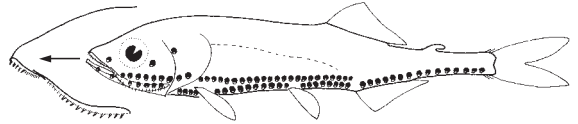
Gonostomatidae, Phosichthyidae: posterior maxilla with teeth, not totally excluded from gape by premaxilla.



Chlorophthalmidae



Gonostomatidae



maxilla with teeth
posteriorly

Phosichthyidae

List of species occurring in the area

Neoscopelus macrolepidotus Johnson, 1863

Neoscopelus microchir Matsubara, 1943

Neoscopelus porosus Arai, 1979

Scopelengys tristis Alcock, 1890

Solivomer arenidens Miller, 1947

Reference

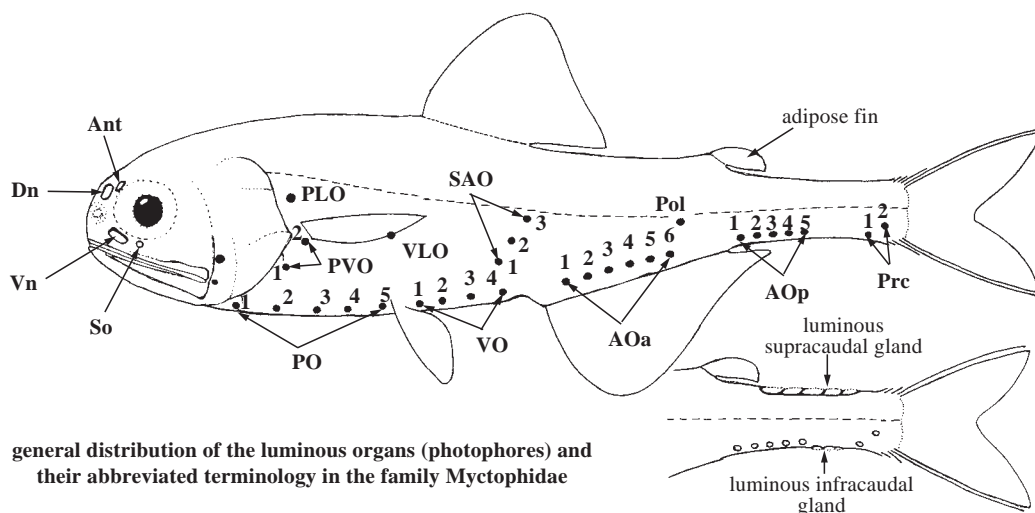
Nafpaktitis, B.G. 1977. Family Neoscopelidae. In *Fishes of the Western North Atlantic*, edited by R.H Gibbs et al. *Mem. Sears Fndn. Mar. Res.*, 1(7):1-12.

MYCTOPHIDAE

Lanternfishes

by J.R. Paxton and P.A. Hulley

Diagnostic characters: Small to moderate-sized (to 20 cm, most species in the area less than 12 cm) myctophiform fishes, slender to oblong; head and body compressed. Eye large to very large, **eye diameter longer to much longer than snout length**; eye lateral. Mouth large to very large, **jaws extending to or far beyond posterior margin of eye**; usually terminal (subterminal in *Centrobranchus*, *Gonichthys*, and *Loweina*); maxilla toothless and completely excluded from gape by premaxilla; **supramaxilla absent or rarely present as small, scale-like, L-shaped element**. Premaxilla and dentary with numerous small teeth in closely-set bands (single row in *Diogenichthys*, *Gonichthys*, *Centrobranchus*), those of inner rows sometimes enlarged, those posterior sometimes enlarged and strongly hooked forward. Teeth present on roof of mouth; each side of vomer usually with a patch of small teeth; those on palatine either small and closely-set in a narrow band or enlarged in 1 or 2 rows; mesopterygoid with a patch of small, closely-set or enlarged, widely-spaced teeth. Branchiostegal rays 6 to 12. Gill rakers well developed, lath-like (except reduced to small tooth patches in *Centrobranchus*). Fins without spines, although rudimentary, paired splints sometimes present at origin of median fins and unpaired splints at uppermost pectoral and outermost pelvic fins. One dorsal fin with 9 to 26 soft rays. **Origin of anal fin under or behind middle of dorsal fin to slightly (less than 1 eye diameter) behind dorsal fin**; anal fin with 11 to 27 soft rays. Caudal fin with 19 principal rays. Origin of pelvic fins well behind origin of pectoral fins; pelvic fins usually with 8 rays (6 in *Notolychnus*, 7 or 8 in *Gonichthys*). Pectoral fins with 0 to 22 rays. **One dorsal adipose fin**. Lateral line well or poorly developed (absent in *Notolychnus* and some *Taaningichthys*). Scales cycloid or rarely spinose, firm in shallow-water species, easily shed in deep-water species. **All species luminous; large, primary photophores present** (except *Taaningichthys paurolychnus*, obscure in *Scopelopsis*), **arranged in distinct groups on head and body**; **small, secondary photophores on head, body, and median fins in some species**; **luminous tissue of various shapes and sizes on head, caudal peduncle, and/or at bases of various fins in most species**. Total vertebrae 27 to 46. **Colour:** mainly brown or black in deep-water species, silvery in shallow-water species; some with metallic green or blue scales.



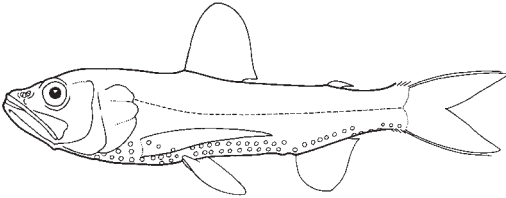
Habitat, biology, and fisheries: Mostly mesopelagic, few bathy- or benthopelagic; most species undertake vertical migration to upper 200 m at night. Feeding mode as opportunistic carnivores on crustaceans and rarely pelagic molluscs (*Centrobranchus*) and small fishes. Very common oceanic fishes, making up greatest biomass in mesopelagic zone. Few species of some economic importance in a few areas (*Electrona* in Antarctic, *Lampanyctodes* in South Africa, and *Benthosema* in the Gulf of Oman and Persian Gulf) for fish meal, oil, and silage, representing a potentially important fishery resource. Research is required to determine if lanternfishes can be utilized in the Western Central Pacific.

Remarks: Thirty-two genera with about 250 species (at least 4 new species descriptions submitted or in progress). Worldwide in all oceans and seas from Arctic to Antarctic. The western Pacific species require review.

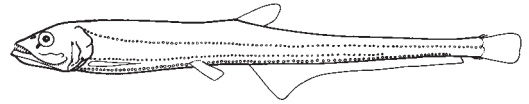
Similar families occurring in the area

Neoscopelidae: eye diameter equal to or much shorter than snout length; origin of anal fin more than 2 eye diameters behind end of dorsal fin; supramaxilla present as long, slender element; body photophores absent, or present in horizontal rows, not broken into distinct groups.

Gonostomatidae, Phosichthyidae: posterior portion of maxilla bearing teeth, not totally excluded from gape by premaxilla; body photophores in ventral, horizontal rows, not broken into distinct groups.



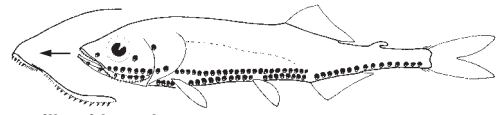
Neoscopelidae



Gonostomatidae

Key to the genera of Myctophidae occurring in the area

Remarks on key characters: the most important characters are the position and number of photophores. The head light organs can be very large in some species of *Diaphus*. Photophore terminology is shown in the figure on the previous page.



maxilla with teeth posteriorly

Phosichthyidae

- 1a. No photophores present (but luminous caudal glands present) *Taaningichthys* (in part)
- 1b. Photophores present → 2
- 2a. Body covered with secondary photophores, primary photophores indistinct (Fig.1) . . . *Scopelopsis*
- 2b. Secondary photophores, if present, always smaller and distinct from primary photophores → 3
- 3a. Three photophores (VLO, SAO₃, and Pol) above lateral line, very close to dorsal contour of body; 2 Prc, Prc₂ well above midlateral line; pelvic-fin rays 6 (Fig. 2) . . . *Notolychnus*
- 3b. No photophores above lateral line close to dorsal contour of body; 2 to 4 Prc, if 2 Prc, Prc₂ never above horizontal septum or lateral line; pelvic-fin rays 8 (rarely 7) → 4

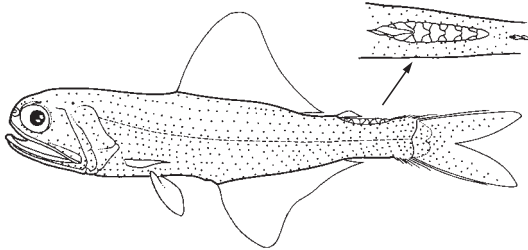


Fig. 1 Scopelopsis

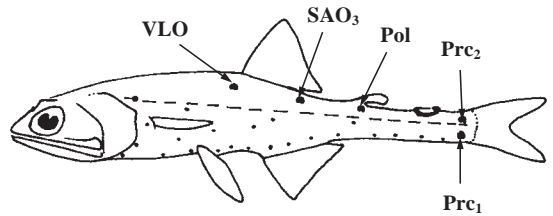


Fig. 2 Notolychnus

- 4a. Two Prc photophores always clearly separate from AOp; procurent caudal-fin rays never spines or spine-like → 5
- 4b. Three or 4 Prc photophores sometimes continuous with AOp; procurent caudal-fin rays often spines or spine-like → 13

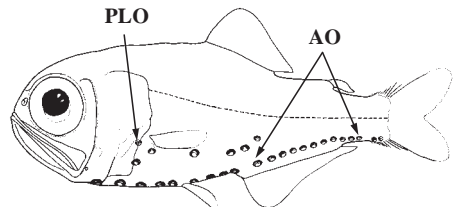


Fig. 3 Electrona

- 5a. PLO opposite middle of pectoral-fin bases or lower; AO not distinctly divided into AOa and AOp, Pol not differentiated (Fig. 3) *Electrona*
- 5b. PLO at or above level of upper end of base of pectoral fins; AO distinctly divided into AOa and AOp, Pol well differentiated → 6

- 6a. PLO more than 1 photophore diameter above upper edge of pectoral-fin bases; mouth terminal, snout not projecting → 7
- 6b. PLO opposite or just above upper edge of pectoral-fin bases; mouth subterminal, snout projecting → 11
- 7a. PVO arranged horizontally or nearly so, with PVO₁ not more than its diameter below level of PVO₂; VO₂ more or less elevated → 8
- 7b. PVO form an inclined line, with PVO₁ more than its own diameter below level of PVO₂; all VO at same level. → 9
- 8a. Prc₂ much higher than Prc₁, lying twice its own diameter or less below lateral line; small, simple teeth on premaxillae and dentaries (Fig. 4) *Benthosema*
- 8b. Prc₂ slightly higher than Prc₁; premaxillary teeth flattened, lanceolate, many with minute denticle on each edge at widest point; outer anterior teeth on dentary close-set and flattened, posterior ones broad-based and sharply hooked forward (Fig. 5) *Diogenichthys*

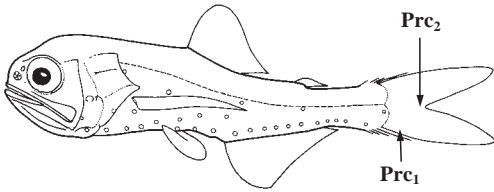


Fig. 4 *Benthosema*

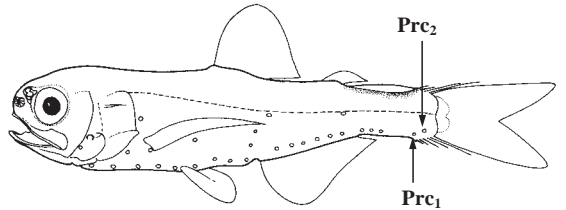


Fig. 5 *Diogenichthys*

- 9a. Two Pol photophores (Fig. 6) *Hygophum*
- 9b. One Pol photophore. → 10
- 10a. SAO on a straight or slightly angular line; SAO₁ behind VO₃ (Fig. 7) *Myctophum*
- 10b. SAO strongly angulated; SAO₁ in advance of, seldom directly over VO₃ (Fig. 8) *Symbolophorus*

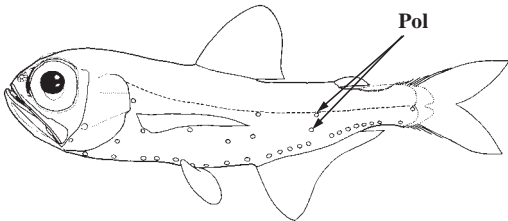


Fig. 6 *Hygophum*

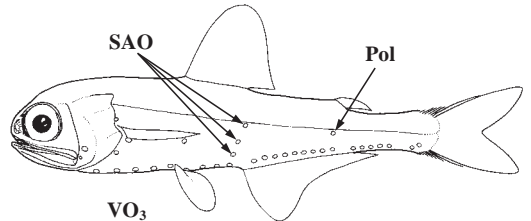


Fig. 7 *Myctophum*

- 11a. None or only 1 AOp over base of anal fin; origin of anal fin closer to level of middle of base of dorsal fin than end of base; SAO in a straight or slightly angular line, more vertical than horizontal with SAO₁ behind last VO (Fig. 9) *Loweina*
- 11b. Five to 7 AOp over base of anal fin; origin of anal fin closer to level of end of base of dorsal fin than middle; SAO more horizontal than vertical with SAO₁ before VO₃ (except *Centrobranchus andreae* with SAO₁ over VO₄). → 12

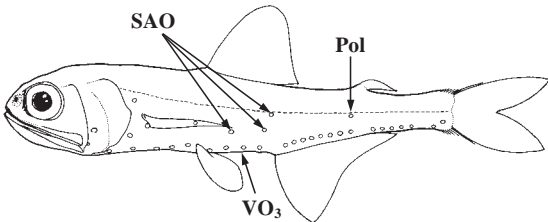


Fig. 8 *Symbolophorus*

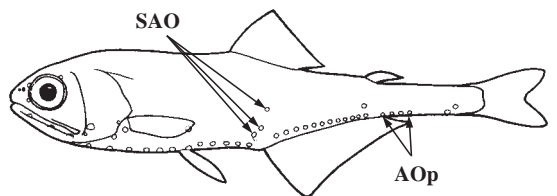


Fig. 9 *Loweina*

- 12a. Gill rakers well developed; SAO strongly angled with SAO₁ at level of VLO; perforated lateral-line scales at least to level of end of dorsal fin (Fig. 10) *Gonichthys*
- 12b. Gill rakers reduced to patches of tiny teeth; SAO weakly angled with SAO₁ below level of VLO; none or very few perforated lateral-line scales (Fig. 11) *Centrobranchus*

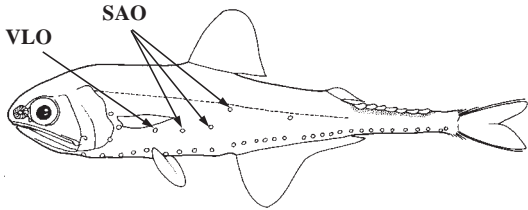


Fig. 10 *Gonichthys*

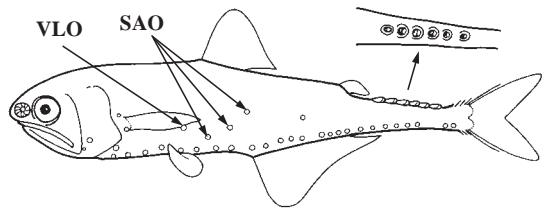


Fig. 11 *Centrobranchus*

- 13a. Caudal luminous glands large, undivided, bordered by black pigment (Fig. 12); 1 Pol or none; 3 Prc. → 14
- 13b. Caudal luminous glands consisting of a series of overlapping scale-like structures not bordered by black pigment, or no caudal glands; 1 or 2 (rarely 3) Pol; 3 to 4 Prc → 15

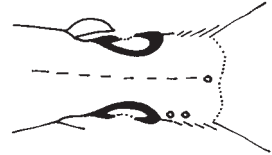


Fig. 12 caudal peduncle

- 14a. Origin of dorsal fin directly over or somewhat in front of base of pelvic fins; photophores well developed; 3 SAO; lateral line well developed; no large crescent of whitish tissue on posterior half of iris (Fig. 13) *Lampadena*
- 14b. Origin of dorsal fin behind base of pelvic fins; photophores poorly developed; 1 SAO; lateral line very poorly developed; a large crescent of whitish tissue on posterior half of iris (best seen in preserved specimens) (Fig. 14) *Taaningichthys* (in part)

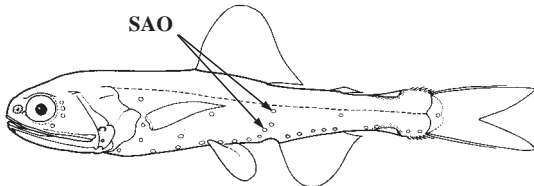


Fig. 13 *Lampadena*

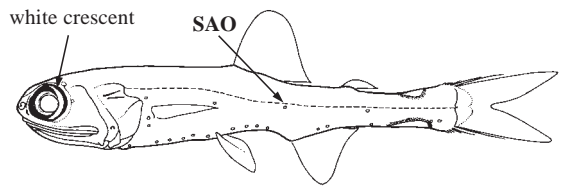


Fig. 14 *Taaningichthys*

- 15a. PVO₂ well above level of upper end of pectoral-fin bases; 2 (sometimes 3) Pol horizontally arranged (Fig. 15) *Notoscopelus*
- 15b. PVO₂ at or below level of upper end of base of pectoral fins; 1 or 2 Pol, not horizontally arranged → 16

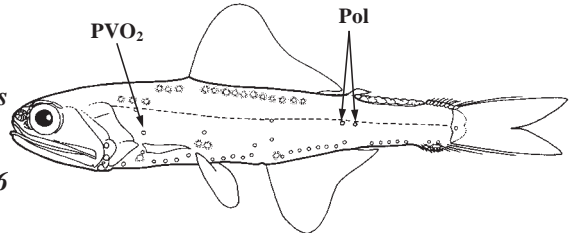


Fig. 15 *Notoscopelus*

- 16a. VO₂ and VO₃ elevated (only slightly elevated in *Diaphus drachmanni*); PO₁, PVO₁, and PVO₂ on straight ascending line; Dn present → 17
- 16b. VO level, weakly arched or VO₂ only elevated; PO₁, PVO₁, and PVO₂ not on a straight ascending line; Dn absent → 19

17a. No supra- or infracaudal organs present; Vn usually present, often well developed; luminous "scale" at pectoral-fin base usually present (Fig. 16) *Diaphus*

17b. Males with supracaudal organs, females with infracaudal organs; no Vn; no luminous "scale" near pectoral-fin base. → 18

18a. VO₂ and VO₃ elevated to same level; 2 SAO; PLO, VLO, and Pol very close to lateral line (Fig. 17) *Idiolychnus*

18b. VO₁₋₃ progressively elevated, forming a straight, ascending line; 3 SAO; PLO, VLO, and Pol well below lateral line (Fig. 18) *Lobianchia*

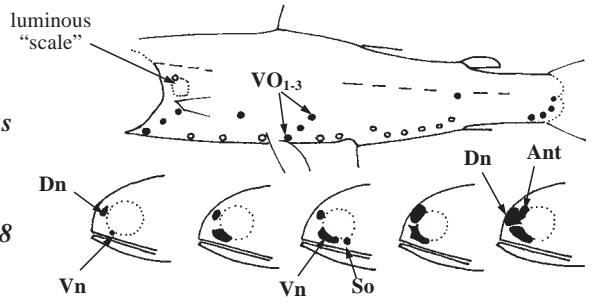


Fig. 16 *Diaphus*

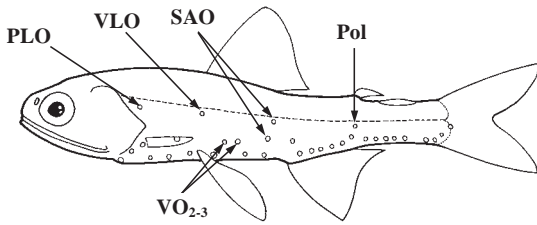


Fig. 17 *Idiolychnus*

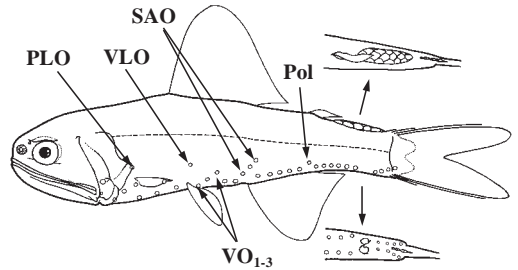


Fig. 18 *Lobianchia*

19a. PO₄ not elevated; midventral luminous tissue between pelvic-fin bases and anus (Fig. 19) *Ceratoscopelus*

19b. PO₄ elevated; no luminous tissue between pelvic-fin bases and anus → 20

20a. Crescent of white tissue on posterior rim of eye iris; margin of operculum with distinct dorsoposterior lobe; SAO weakly angled, SAO₁ over or behind VO₅ (Fig. 20) *Bolinichthys*

20b. No white tissue on posterior rim of eye iris; no dorsoposterior lobe on opercular margin; SAO strongly angled, SAO₁ well before last VO → 21

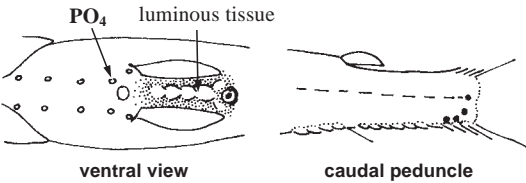


Fig. 19 *Ceratoscopelus*

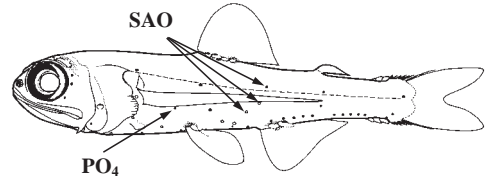


Fig. 20 *Bolinichthys*

21a. Four VO, level, arched, or with VO₂ elevated and advanced; 4 Prc, distance between Prc₃ and Prc₄ wider than distance between Prc₁ and Prc₂ (Fig. 21) *Lampanyctus*

21b. Five VO, VO₂, or VO₂ and VO₃ elevated; 3 Prc evenly spaced or nearly so (Fig. 22) *Triphoturus*

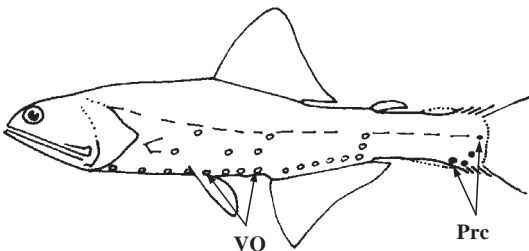


Fig. 21 *Lampanyctus*

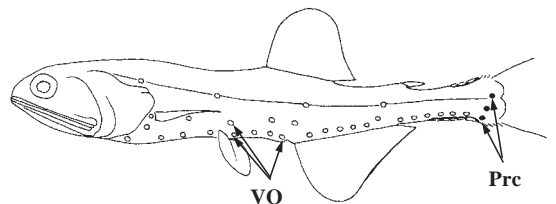



Fig. 22 *Triphoturus*


Key to the species of *Benthoosema* occurring in the area

- 1a.** SO photophore present beneath eye; SAO₃ before vertical through AOa₁; first gill arch with 3 gill rakers on upper limb, 10 or 11 on lower limb. *Benthoosema suborbitale*
- 1b.** SO photophore absent; SAO₃ on or behind vertical through AOa₁; first gill arch with 6 to 9 gill rakers on upper limb, 13 to 20 on lower limb → 2
- 2a.** SAO₁ on line connecting VLO and SAO₂; OP₂ well above level of ventral margin of orbit; PLO at or below midway point between base of pectoral fins and lateral line; caudal luminous organs poorly developed, supracaudal in males, infracaudal in females, or absent. *Benthoosema pterotum*
- 2b.** SAO₁ well below line connecting VLO and SAO₂; OP₂ at level of ventral margin of orbit; PLO closer to lateral line than base of pectoral fins; both supra- and infracaudal organs well developed and present in males and females over 3 cm long *Benthoosema fibulatum*

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Benthoosema fibulatum* (Gilbert and Cramer, 1897)

 *Benthoosema pterotum* (Alcock, 1891)

 *Benthoosema suborbitale* (Gilbert, 1913)

Bolinichthys distofax Johnson, 1975

Bolinichthys indicus Nafpaktitis and Nafpaktitis, 1969

Bolinichthys longipes (Brauer, 1906)

Bolinichthys nikolayi Bekker, 1978

Bolinichthys photothorax (Parr, 1928)

Bolinichthys pyrsobolus (Alcock, 1891)

Centrobranchus andreae (Lütken, 1892)

Centrobranchus nigroocellatus (Günther, 1873)

Ceratoscopelus warmingii (Lütken, 1892)

Diaphus agassizii Gilbert, 1908

Diaphus aliciae Fowler, 1934

Diaphus anderseni Täning, 1932

Diaphus bertelseni Nafpaktitis, 1966

Diaphus brachycephalus Täning, 1928

Diaphus burtoni Fowler, 1934

Diaphus chrysorhynchus (Gilbert and Cramer, 1897)

Diaphus caeruleus (Klunzinger, 1871)

Diaphus dahlgreni Fowler, 1934

Diaphus dehaveni Fowler, 1934

Diaphus diadematus Täning, 1932

Diaphus diademophilus Nafpaktitis, 1978

Diaphus drachmanni Täning, 1932

Diaphus dumerilii (Bleeker, 1856)

Diaphus erhorni Fowler, 1934

Diaphus faustinoi Fowler, 1934

Diaphus fragilis Täning, 1928

Diaphus fulgens (Brauer, 1904)

Diaphus garmani Gilbert, 1906

Diaphus handi Fowler, 1934

Diaphus impostor Nafpaktitis, Robertson, and Paxton, 1995

Diaphus jenseni Täning, 1932

Diaphus lucidus (Goode and Bean, 1896)

Diaphus lucifrons Fowler, 1934

Diaphus luetkeni (Brauer, 1904)

Diaphus malayanus Weber, 1913

Diaphus megalops Nafpaktitis, 1978

- Diaphus metopoclampus* (Cocco, 1829)
Diaphus mollis Tåning, 1928
Diaphus nielseni Nafpaktitis, 1978
Diaphus ostenfeldi Tåning, 1932
Diaphus parri Tåning, 1932
Diaphus perspicillatus (Ogilby, 1898)
Diaphus phillipsi Fowler, 1934
Diaphus problematicus Parr, 1928
Diaphus regani Tåning, 1932
Diaphus richardsoni Tåning, 1932
Diaphus schmidti Tåning, 1932
Diaphus signatus Gilbert, 1908
Diaphus splendidus (Brauer, 1904)
Diaphus suborbitalis Weber, 1913
Diaphus termophilus Tåning, 1928
Diaphus thiollierei Fowler, 1934
Diaphus umbroculus Fowler, 1934
Diaphus watasei Jordan and Starks, 1904
Diaphus whitleyi Fowler, 1934
Diaphus wisneri Nafpaktitis, Robertson, and Paxton, 1995
- Diogenichthys atlanticus* (Tåning, 1928)
Diogenichthys laternatus (Garman, 1899)
Diogenichthys panurgus Bolin, 1946
- Electrona risso* (Cocco, 1829)
Gonichthys venetus Bekker, 1964
- Hygophum hygomii* (Lütken, 1892)
Hygophum proximum Bekker, 1965
Hygophum reinhardtii (Lütken, 1892)
- Idiolychnus urolampus* (Gilbert and Cramer, 1897)
- Lampadena anomala* Parr, 1928
Lampadena luminosa (Garman, 1899)
Lampadena urophaos Paxton, 1963
- Lampanyctus alatus* Goode and Bean, 1896
Lampanyctus ater Tåning, 1928
Lampanyctus festivus Tåning, 1928
Lampanyctus hubbsi Wisner, 1963
Lampanyctus intricarius Tåning, 1928
Lampanyctus lineatus Tåning, 1928
Lampanyctus macropterus Brauer, 1904
Lampanyctus niger (Günther, 1887)
Lampanyctus nobilis Tåning, 1928
Lampanyctus photonotus Parr, 1928
Lampanyctus steinbecki Bolin, 1939
Lampanyctus tenuiformis Brauer, 1906
Lampanyctus turneri (Fowler, 1934)
"Lampanyctus" sp. nov. a Zahuranec, ms
- Lobianchia gemellarii* (Cocco, 1838)
- Loweina rara* (Lütken, 1892)
- Myctophum asperum* Richardson, 1845
Myctophum aurolaternatum Garman, 1899
Myctophum brachygnathum (Bleeker, 1856)
Myctophum fissunovi Bekker and Borodulina, 1971
Myctophum lunatum Bekker and Borodulina, 1971
Myctophum nitidulum Garman, 1899
Myctophum obtusirostre Tåning, 1928

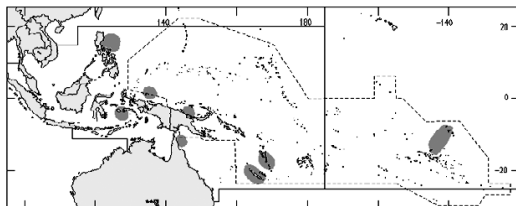
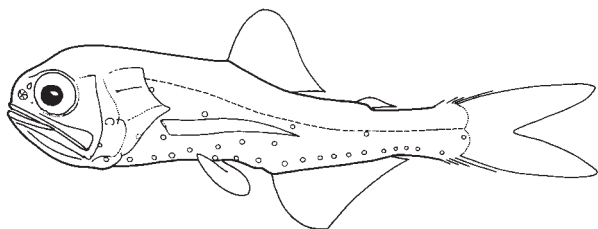
Myctophum selenops Tåning, 1928
Myctophum spinosum (Steindachner, 1867)
Notolychnus valdiviae (Brauer, 1904)
Notoscopelus caudispinosus (Johnson, 1863)
Notoscopelus resplendens (Richardson, 1845)
Scopelopsis multipunctatus Brauer, 1906
Symbolophorus evermanni (Gilbert, 1905)
Taaningichthys bathyphilus (Tåning, 1928)
Taaningichthys minimus (Tåning, 1928)
Taaningichthys paurolychnus Davy, 1972
Triphoturus nigrescens (Brauer, 1904)

Reference

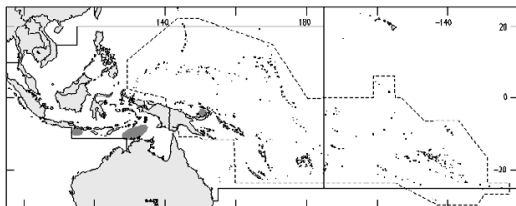
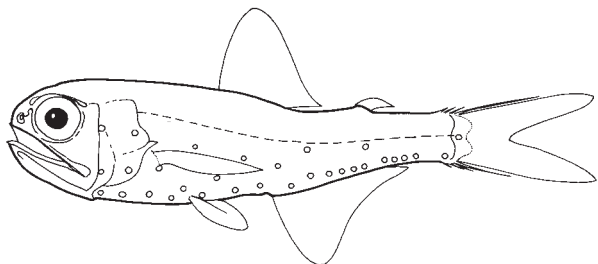
Hulley, P.A. 1986. Family Myctophidae. In *Smiths' sea fishes*, edited by M.M. Smith and P.C. Heemstra. Johannesburg, Macmillan South Africa, pp. 282-321.

Benthoosema fibulatum (Gilbert and Cramer, 1897)**En** - Spinycheek lanternfish.

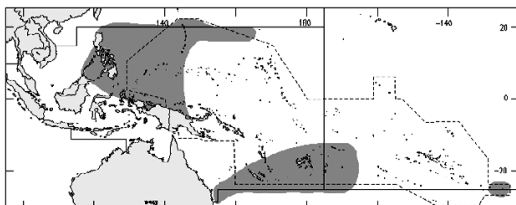
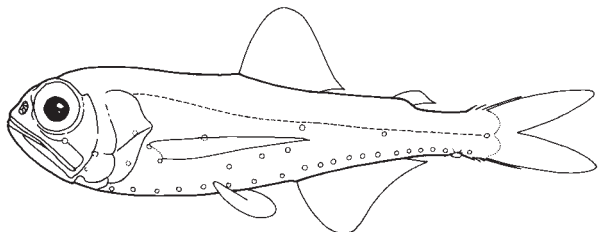
Maximum total length about 10 cm. Benthopelagic and mesopelagic in slope waters and oceanic waters, but usually not high oceanic. Unimportant as a commercial species, but sometimes taken with *Benthoosema pterotum*. Tropical in Indian and Pacific oceans, previous records confused with next species. Map shows only confirmed records in the area.

***Benthoosema pterotum*** (Alcock, 1891)**En** - Skinnycheek lanternfish.

Maximum total length about 7 cm. Benthopelagic and mesopelagic in slope and near continental/island waters; one of the shallowest dwelling species in the family, with day captures as shallow as 100 m. A potentially important commercial species in the Gulf of Oman and Persian Gulf, where large quantities have been discovered. Tropical at least in the Indian and far West Pacific Oceans; due to confusion with previous species, other older Pacific records require confirmation.

***Benthoosema suborbitale*** (Gilbert, 1913)**En** - Smallfin lanternfish.

Maximum total length about 4 cm. Oceanic, mesopelagic, vertical migrator. Feeds on zooplankton. Unimportant as a commercial fish. Circumglobal in tropical and temperate waters, but with a distinct equatorial gap in the Pacific.



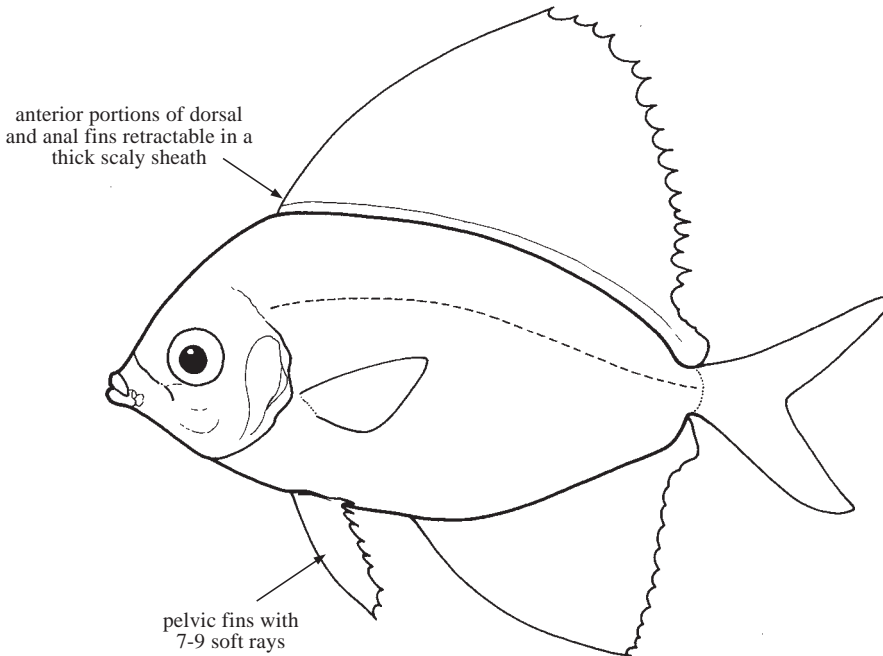
Order LAMPRIDIFORMES

VELIFERIDAE

Velifers

by J.E. Olney

Diagnostic characters: Small to moderate-sized lampridiform fishes (usually under 40 cm); body deep, strongly compressed. Eye moderately large, its diameter exceeding snout length or approximately equal to depth of caudal peduncle. Upper jaw highly protrusible; teeth absent. **Anterior dorsal- and anal-fin elements retractable in a thick, scaly sheath of skin located at base of fin portions. Dorsal and anal fins long, with anterior elements moderately to conspicuously elongate; both fins shaped like large fans in 1 species** (sailfin velifer, *Velifer hypselopterus*); total dorsal-fin elements 33 to 44; total anal-fin elements 25 to 35; anterior elements of both fins are spines; total dorsal-fin spines I to XXII; total anal-fin spines I to XXVIII, with first spine small and difficult to see. Caudal fin deeply forked, with 19 principal rays in a pattern I, 9, 8, I (i.e. outermost rays unbranched, 9 branched rays in upper fin lobe, 8 in lower fin lobe). Pectoral fins with 15 or 16 rays; fin base obliquely rotated. **Pelvic fins with 7 to 9 rays and no spines.** Total vertebrae 33 or 34 (16 thoracic, 17 or 18 abdominal). In veliferids (and all lampridiforms), the anterior palatamaxillary ligament and the palatine prong are absent; as a result, the maxilla is free to extend, along with the premaxilla, well away from the ethmo-vomerine region during jaw protrusion. Other anatomical features of veliferids (and all lampridiforms): first dorsal-fin pterygiophore inserts anterior to first neural spine; elongate ascending processes of premaxilla and a large rostral cartilage insert into a frontal vault or cradle; mesethmoid posterior to lateral ethmoids. **Colour:** adults of *V. hypselopterus* iridescent blue-green with 5 to 7 dark vertical bars between nape and caudal peduncle; dorsal and anal fins with blue and bright yellow bands, giving the appearance of yellow spots against a blue background; a black blotch of pigment on posterior portion of dorsal fin.



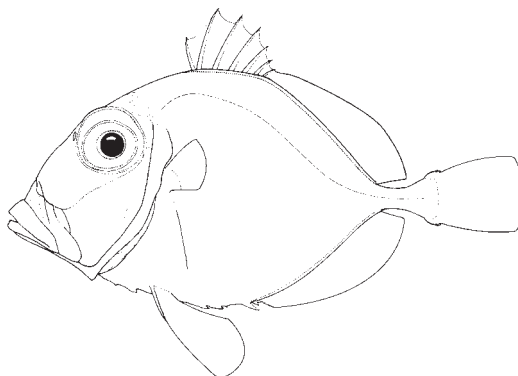
Habitat, biology, and fisheries: Velifers are rare fishes that are taken in shallow to moderate depths down to 110 m. Two widely-distributed species are described, but little is known of their habits or reproduction. There is no commercial or recreational fishery for them.

Remarks: Some authors believe that the recognition of 2 monotypic genera (*Velifer* and *Metavelifer*) is unjustified, and use the senior name *Velifer* for both species. The family is in need of revision.

Similar families occurring in the area

Zeidae (especially *Zeus* and *Zenopsis*): also have relatively large eyes, elongate anterior dorsal- and pelvic-fin elements, no pelvic-fin spines, and compressed, deep bodies, but are distinguished by the following characteristics: large, bony plates along anal-fin base; anterior dorsal- and anal-fin elements not retractable in a scaly sheath of skin.

Many other acanthomorph families are deep-bodied and compressed (e.g. Caproidae, Caristiidae, Siganidae, Ehippidae, Acanthuridae) and may superficially resemble velifers, but all these families are easily distinguished by having I spine and 5 soft rays in the pelvic fins.



Zeidae

Key to the species of Veliferidae occurring in the area

- 1a. Dorsal and anal fins with XV to XXVIII spines *Metavelifer multiradiatus*
- 1b. Dorsal and anal fins with I or II spines *Velifer hypselopterus*

List of species occurring in the area

- Metavelifer multiradiatus* (Regan, 1907)
- Velifer hypselopterus* Bleeker, 1879

References

Olney, J.E. 1984. Lampridiformes: development and relationships. In *Ontogeny and systematics of fishes*, edited by H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr, and S.L. Richardson. American Society of Ichthyologists and herpetologists, Publication 1, pp. 368-379.

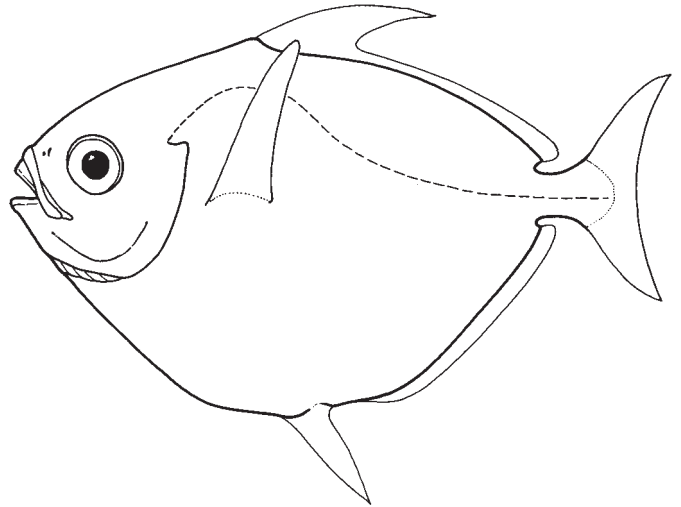
Olney, J.E., G.D. Johnson, and C.C. Baldwin. 1993. Phylogeny of lampridiform fishes. *Bull. Mar. Sci.*, 52:137-169.

LAMPRIDIDAE

Opahs

by J.E. Olney

Diagnostic characters: Large-sized lampridiform fishes (to about 1.8 m, weight up to 270 kg); body robust, deep, and somewhat compressed; **body oval or elliptical**. Upper jaw highly protrusible; teeth absent (except in small individuals). Dorsal- and anal-fin bases long; anterior portion of dorsal fin elongate; dorsal-fin rays 48 to 56; anal-fin rays 33 to 42. Caudal fin forked, with 19 principal rays. Pectoral fins elongate, placed high on side and horizontally inserted (pectoral fins are the primary swimming fins, and lamprids "flap" their strong pectoral fins in a manner similar to the motion of a bird's wing); pectoral-fin rays 21 to 25. Pelvic fins elongate, with 13 to 17 rays and no spines. Total vertebrae 43 to 50 (21 thoracic, 22 to 29 abdominal). In lampridids (and all lampridiforms), the anterior palatamaxillary ligament and the palatine prong are absent; as a result, the maxilla is free to extend, along with the premaxilla, well away from the ethmo-vomerine region during jaw protrusion. Other anatomical features of lampridids (and all lampridiforms): first dorsal-fin pterygiophore inserts anterior to first neural spine; elongate ascending processes of premaxilla and a large rostral cartilage insert into a frontal vault or cradle; mesethmoid posterior to lateral ethmoids. In lamprids, the foramen magnum is bounded laterally by the exoccipital condyles. **Colour: brightly coloured;** body of *Lampris guttatus* pink, blue, or purple, and covered in white spots; jaws and fins bright red; dorsal and anal fins with scattered white spots; *L. immaculatus* lacks spots but is otherwise similarly coloured; in lamprids (and other lampridiforms except velifers and tube-eyes), the dorsal, pectoral, pelvic, and caudal fins are bright red.



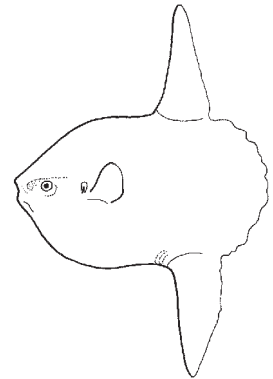
Habitat, biology, and fisheries: Lampridids are uncommon, epipelagic fishes that are rarely encountered near shore; principal food are squids and small fishes. Of the 2 known species, the spotted opah (*Lampris guttatus*) is found in all oceans. The southern opah (*L. immaculatus*) is restricted to southern seas below 30°S, and does not occur in the Western Central Pacific. Lampridids produce large, pelagic eggs with outer shells that are tinted amber or red. They are often taken by long line and are prized as a food fish; the large pectoral-fin muscle is red, and likened to beef-steak in texture and flavor. Lampridids are commonly marketed in Japan, Hawaii, and California.

Similar families occurring in the area

Molidae (sunfishes): may be similar in body size and general shape, but never brightly coloured and lack a caudal fin.

A single species occurring in the area

Lampris guttatus (Brünnich, 1788)



Molidae

References

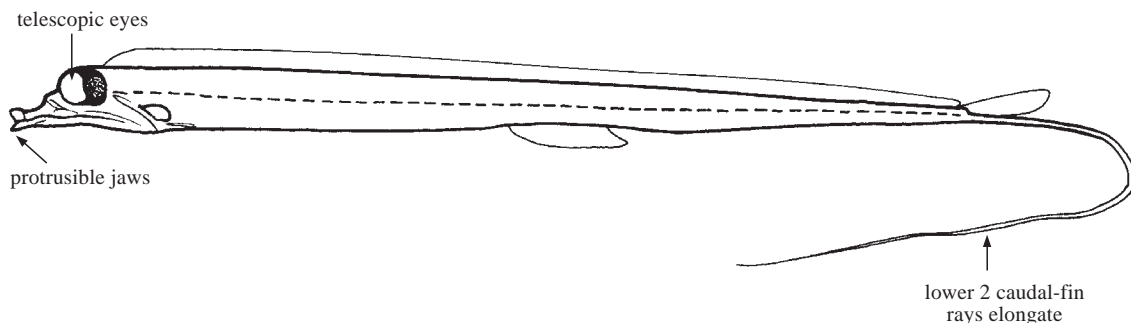
- Olney, J.E. 1984. Lampridiformes: development and relationships. In *Ontogeny and systematics of fishes*, edited by H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr, and S.L. Richardson. American Society of Ichthyologists and herpetologists, Publication 1, pp. 368-379.
- Olney, J.E., G.D. Johnson, and C.C. Baldwin. 1993. Phylogeny of lampridiform fishes. *Bull. Mar. Sci.*, 52:137-169.
- Robins, C.R., G.C. Ray, and J. Douglas. 1986. *A field guide to Atlantic coast fishes North America*. Boston, Massachusetts, Houghton Mifflin Co., 354 p.

STYLEPHORIDAE

Tube-eyes

by J.E. Olney

Diagnostic characters: Small to moderate-sized lampridiform fishes (usually under 30 cm); body slender, elongate, somewhat compressed. **Eyes conspicuous, telescopic, directed forward and somewhat upward. Jaws highly protrusible, mouth small and tubular** (head tilted backward when jaws protruded, with a membranous pouch stretching from head to mouth, and volume of mouth cavity increasing dramatically); teeth absent. Dorsal-fin base long, extending from nape to caudal fin; first 2 dorsal-fin elements elongate, especially in small specimens; total dorsal-fin rays 115 to 124. Anal-fin base short, inserted at midbody; total anal-fin rays 14 to 17. **Caudal fin highly modified into 2 separate parts; first 2 ventral caudal-fin rays extremely elongate, forming a projection that equals or exceeds body length in undamaged specimens;** upper caudal-fin lobe with 5 or 6 short rays. Pectoral fins with 10 or 11 rays; fin base obliquely rotated. Pelvic fins inserted below pectoral-fin base, with 1 ray, often broken and inconspicuous. Total vertebrae about 53; first 2 vertebrae highly reduced; second vertebra without neural spine and with neural arch m-shaped. **Colour:** body silver; head darkly pigmented; dorsal fin, anal fin, and upper caudal-fin lobe may be tinted red.



Habitat, biology, and fisheries: The only known species in this family, *Stylephorus chordatus*, is meso- or bathypelagic (captured at depths of 300 to 800 m) and rare, but with a worldwide distribution. It feeds on small crustaceans, and is thought to capture prey while swimming in a vertical, head-up position. Little is known of its habits or reproduction, and there is no fishery for the species.

Similar families occurring in the area

None. *S. chordatus* is easily distinguished by the conspicuous telescopic eyes, protrusible jaws, and the highly modified caudal fin with extremely elongate lower fin rays.

A single species in this family

Stylephorus chordatus Shaw, 1791

References

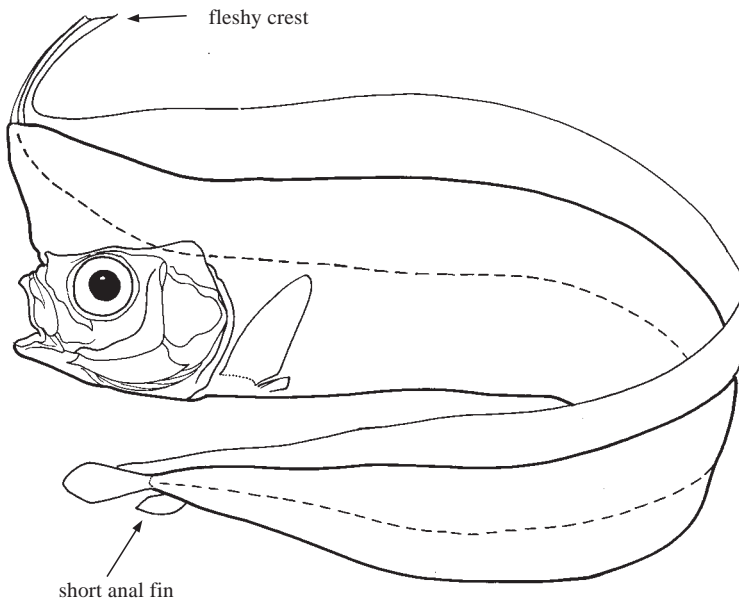
- Olney, J.E. 1984. Lampridiformes: development and relationships. In *Ontogeny and systematics of fishes*, edited by H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr, and S.L. Richardson. American Society of Ichthyologists and herpetologists, Publication 1, pp. 368-379.
- Olney, J.E., G.D. Johnson, and C.C. Baldwin. 1993. Phylogeny of lampridiform fishes. *Bull. Mar. Sci.*, 52:137-169.
- Robins, C.R., G.C. Ray, and J. Douglas. 1986. *A field guide to Atlantic coast fishes North America*. Boston, Massachusetts, Houghton Mifflin Co., 354 p.

LOPHOTIDAE

Crestfishes (unicornfish)

by J.E. Olney

Diagnostic characters: Large-sized, ribbon-like lampridiform fishes (to 2 m); body elongate and compressed. **Head bears a large, fleshy crest or horn that extends to tip of jaw in *Lophotus*, and protrudes far forward of jaw in *Eumecichthys*; crest or horn bears an elongate spine and supports multiple dorsal-fin rays.** Upper jaw protrusible; small conical teeth present on jaws and vomer. Dorsal fin long, with 11 spines (first spine short, second spine elongate) inserting well forward of eye; total dorsal-fin rays 204 to 390. Anal fin short, posteriorly placed; total anal-fin rays 5 to 20. Caudal fin somewhat reduced, with 12 to 17 rays. Pectoral fins with 13 to 17 rays, its base almost horizontal. Pelvic fins absent or small, with 3 to 6 rays, inserted posterior to pectoral-fin base. **Scales absent, except for tubular lateral-line scales.** Total vertebrae, 124 to 200 (56 thoracic in *Eumecichthys*). In lophotids (and all lampridiforms), the anterior palatamaxillary ligament and the palatine prong are absent; as a result, the maxilla is free to extend, along with the premaxilla, well away from the ethmo-vomerine region during jaw protrusion. Other anatomical features of lophotids (and all lampridiforms): first dorsal-fin pterygiophore inserts anterior to first neural spine; elongate ascending processes of premaxilla and a large rostral cartilage insert into a frontal vault or cradle; mesethmoid posterior to lateral ethmoids. In lophotids (and radiicephalids), the supraoccipital bears an anteriorly directed process that is well developed and stout in lophotids, projects over the frontal arch, and supports the fleshy crest on head). **Colour:** body silver with multiple dark vertical bands in *Eumecichthys*; body blue dorsally, grading to silver ventrally in *Lophotus*, lacking vertical bands, and having multiple white or silver spots; dorsal fin, pectoral fins, pelvic fins (when present), and caudal fin red-coloured in lophotids (and most other lampridiforms).



Habitat, biology, and fisheries: Lophotids are rare, mesopelagic fishes that occur in most oceans. *Lophotus* consumes squid and small fishes. Eggs and larvae have been described, but little else is known of their habits and reproductive ecology. As in the Radiicephalidae, lophotids possess a tubular gland that overlies the hind gut, and discharges a black ink-like fluid through a vent near the anus when alarmed. No fishery exists for them.

Remarks: There may be only 2 species in this family, *Lophotus lacepede* (crestfishes) and *Eumecichthys fiski* (unicornfish), although some authors recognize additional species that are not treated here. The family is in need of revision.

Similar families occurring in the area

Radiicephalidae: less dorsal-fin elements (152 to 160 versus 206 to 392); lack a conspicuous lophotid crest or horn; anus situated near caudal fin (situated at midbody in lophotids).



Radiicephalidae

Key to the species of Lophotidae occurring in the area

- 1a. Crest at top of head extends to tip of jaw; dorsal fin with less than 300 rays . . . *Lophotus lacepede*
- 1b. Crest at top of head protrudes far forward of jaw; dorsal fin with more than 300 rays
 *Eumecichthys fiski*

List of species occurring in the area

Eumecichthys fiski Günther, 1890

Lophotus lacepede Bosc, 1817

References

Charter, S.R. and H.G. Moser. 1996. Lampridiformes, Lophotidae, Radiicephalidae, Trachipteridae. In *The early stages of fishes in the California current region*. California Cooperative Oceanic Fisheries Investigations Atlas No. 33, pp. 659-677.

Olney, J.E. 1984. Lampridiformes: development and relationships. In *Ontogeny and systematics of fishes*, edited by H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr, and S.L. Richardson. American Society of Ichthyologists and herpetologists, Publication 1, pp. 368-379.

Olney, J.E., G.D. Johnson, and C.C. Baldwin. 1993. Phylogeny of lampridiform fishes. *Bull. Mar. Sci.*, 52:137-169.

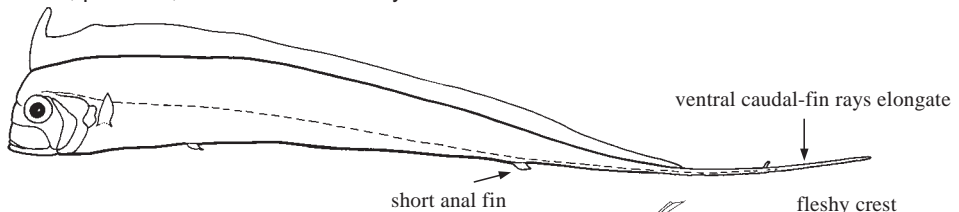
Robins, C.R., G.C. Ray, and J. Douglas. 1986. *A field guide to Atlantic coast fishes North America*. Boston, Massachusetts, Houghton Mifflin Co., 354 p.

RADIICEPHALIDAE

Taper tails

by J.E. Olney

Diagnostic characters: Moderate-sized lampridiform fishes (usually under 80 cm); body slender, elongate, compressed, its depth gradually decreasing from head to caudal peduncle. Upper jaw highly protrusible; jaw teeth absent; 1 to several teeth on roof of mouth. Dorsal fin long, its first rays inserting over eye; anterior dorsal-fin rays somewhat elongate; total dorsal-fin rays 150 to 160. Anal fin short, inconspicuous, posteriorly placed near caudal peduncle; total anal-fin rays 6 or 7. Caudal fin highly modified into 2 separate parts; **ventral caudal-fin rays (these total approximately 6 or 7) elongate, forming a caudal projection that may equal body length in undamaged specimens;** upper caudal-fin lobe with 4 or 5 short rays. Pectoral fins with 9 or 10 rays; fin base obliquely rotated. Pelvic fins with 9 rays in small specimens, often damaged or inconspicuous in adults; pelvic fins inserted well posterior to pectoral-fin base. **Scales absent, except for tubular lateral-line scales.** Total vertebrae 114 to 121 (36 to 39 thoracic, 77 to 79 abdominal); **fourth, fifth, and sixth preural centra with haemal spines elongate, pierce through margin of body, and form ventral portion of caudal fin** (unique among fishes). In radiicephalids (and all lampridiforms), the anterior palatamaxillary ligament and the palatine prong are absent; as a result, the maxilla is free to extend, along with the premaxilla, well away from the ethmo-vomerine region during jaw protrusion. Other anatomical features of radiicephalids (and all lampridiforms): first dorsal-fin pterygiophore inserts anterior to first neural spine; elongate ascending processes of premaxilla and a large rostral cartilage insert into a frontal vault or cradle; mesethmoid posterior to lateral ethmoids. In radiicephalids (and lophotids), the supraoccipital bears an anteriorly directed process (a weak spine in radiicephalids, but broader and well developed in lophotids). **Colour:** body silver; dorsal, pectoral, and caudal fins may be tinted red.



Habitat, biology, and fisheries: A single, very rare species, *Radiicephalus elongatus*, is known from a few specimens. Meso- or bathypelagic; little is known of its habits or reproduction, and there is no fishery for the species. As the Lophotidae, it possesses a gland that overlies the hind gut, and discharges a black, ink-like fluid through a vent near the anus when alarmed.

Similar families occurring in the area

Lophotidae: more dorsal-fin elements (206 to 392 versus 152 to 160); head with conspicuous fleshy crest or horn; anus situated near caudal fin (situated at midbody in Radiicephalidae).

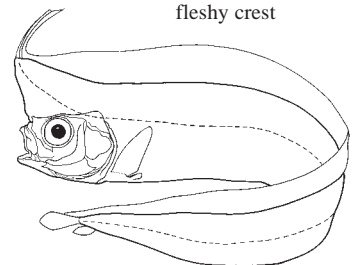
Trachipteridae: anal fin absent.

A single species in this family

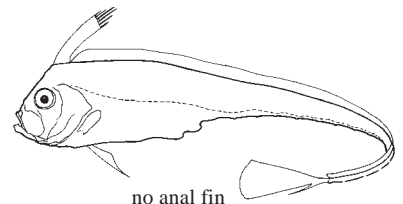
Radiicephalus elongatus Osório, 1917

References

- Charter, S.R. and H.G. Moser. 1996. Lampridiformes, Lophotidae, Radiicephalidae, Trachipteridae. In *The early stages of fishes in the California current region*. California Cooperative Oceanic Fisheries Investigations Atlas No. 33, pp. 659-677.
- Heemstra, P.C. and S.X. Kannemeyer. 1984. The families Trachipteridae and Radiicephalidae (Pisces, Lampriformes) and a new species of *Zu* from South Africa. *Ann. S. Afr. Mus.*, 94:13-39.
- Olney, J.E. 1984. Lampridiformes: development and relationships. In *Ontogeny and systematics of fishes*, edited by H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr, and S.L. Richardson. American Society of Ichthyologists and herpetologists, Publication 1, pp. 368-379.
- Olney, J.E., G.D. Johnson, and C.C. Baldwin. 1993. Phylogeny of lampridiform fishes. *Bull. Mar. Sci.*, 52:137-169.



Lophotidae



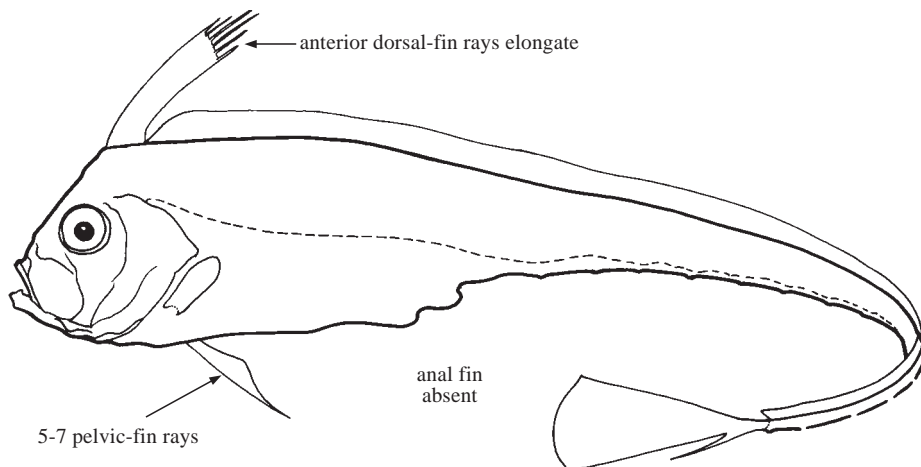
Trachipteridae

TRACHIPTERIDAE

Ribbonfishes (dealfishes)

by J.E. Olney

Diagnostic characters: Large-sized lampridiform fishes (to 2 m); body elongate, ribbon-like, compressed. In most species, body depth gradually decreasing from head to caudal peduncle. Upper jaw highly protrusible, maxilla broad; usually recurved, pointed teeth on jaws, vomer, and palatines; bones of head and jaws thin and fragile. Dorsal fin very long, extending along entire body length to tail; **anterior dorsal-fin elements consisting of 4 to 8 elongate, flexible spines that insert above eye**; total dorsal-fin elements 120 to 197; dorsal-fin rays bear strong lateral spinules that tend to interlock and strengthen the fin. **Anal fin absent.** Caudal fin with 2 lobes; upper lobe sometimes upturned, conspicuous, and fan-like; total caudal-fin rays usually 13 to 18; usually 5 to 9 rays in lower fin lobe, some of which are elongate; usually 5 to 7 rays in the upper fin lobe, all of which are elongate in *Zu*. **Pelvic fins with 5 to 7 rays; often elongate in juveniles**; sometimes lost at metamorphosis. **Skin usually covered with bony, raised, bump-like tubercles. Scales absent, except for lateral-line scales that are tubular and bear sharp spines.** (Scalloped ribbonfish, *Zu cristatus*, with distinctive scalloped or wavy ventral margin, and possessing small deciduous scales.) Total vertebrae, 62 to 102; thoracic vertebrae, 18 to 40. In trachipterids (and all lampridiforms), the anterior palatamaxillary ligament and the palatine prong are absent; as a result, the maxilla is free to extend, along with the premaxilla, well away from the ethmo-vomerine region during jaw protrusion. Other anatomical features of trachipterids (and all lampridiforms): first dorsal-fin pterygiophore inserts anterior to first neural spine; elongate ascending processes of premaxilla and a large rostral cartilage insert into a frontal vault or cradle; mesethmoid posterior to lateral ethmoids. In trachipterids (and regalecids), the dorsal-, caudal-, and pelvic-fin rays bear spinules that project laterally; in trachipterids, the parapophyses of each thoracic vertebra are well developed, but ribs are lacking. **Colour:** head and body usually silver with oblique dusky bars or with dark spots; fins deep, crimson red.



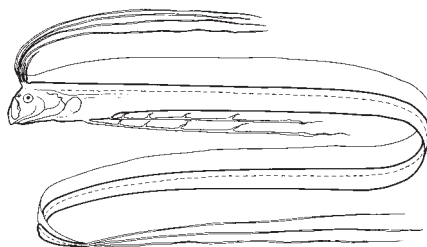
Habitat, biology, and fisheries: Trachipterids are rare, mesopelagic fishes that occur in all oceans. They consume pelagic crustaceans, small fishes, and squid. The eggs are free-floating, large, and red. Very little is known of their habits and reproductive ecology. There is no fishery for them.

Remarks: Altogether, there are approximately 10 species in 3 genera (*Trachipterus*, *Zu*, and *Desmodema*), 5 of which are known from the area. There are also a number of other nominal species that are not widely recognized. In addition, there may be undescribed species. The family is currently in revision.

Similar families occurring in the area

Regalecidae: also lacking anal fin, but with more dorsal-fin rays (260 to 412 versus 166 to 197), and attain a far larger size.

All other lampridiform families possess an anal fin.



Regalecidae

Key to the species of Trachipteridae occurring in the area

- 1a.** Caudal fin without 2 lobes and not sharply upturned; no long spines or bony tubercles along ventral edge of tail; dorsal fin with 120 to 124 elements *Desmodema polystictum*
- 1b.** Caudal fin with 2 lobes, the upper lobe sharply upturned; ventral edge of tail bears long spiny plates or bony tubercles; dorsal fin usually with more than 124 elements. → 2
- 2a.** Posterior portion of lateral line runs along the ventral edge of tail as a series of sharp spines which point in alternating directions; wavy or scalloped ventral body margin; dorsal fin with less than 150 elements → 3
- 2b.** Posterior portion of lateral line runs well above the ventral edge of tail; lateral line spines project laterally, and do not point in alternating directions; ventral body margin not scalloped but gently tapers to tail; dorsal fin usually with more than 150 rays. → 4
- 3a.** Body depth 12 to 16% of standard length; lateral line consists of 126 to 130 spiny scales or plates; 84 to 87 total vertebrae *Zu elongatus*
- 3b.** Body depth 20 to 26% of standard length; lateral line consists of 99 to 106 spiny scales or plates; 62 to 69 total vertebrae *Zu cristatus*
- 4a.** Pectoral-fin rays 9 to 11; total vertebrae 84 to 96 *Trachipterus trachypterus*
- 4b.** Pectoral-fin rays 13 or 14; total vertebrae 81 to 83. *Trachipterus jacksonensis*

List of species occurring in the area

- Desmodema polystictum* (Ogilby, 1898)
- Trachipterus trachypterus* (Gmelin, 1789)
- Trachipterus jacksonensis* (Ramsay, 1881)
- Zu cristatus* (Bonelli, 1819)
- Zu elongatus* Heemstra and Kannemeyer, 1984

References

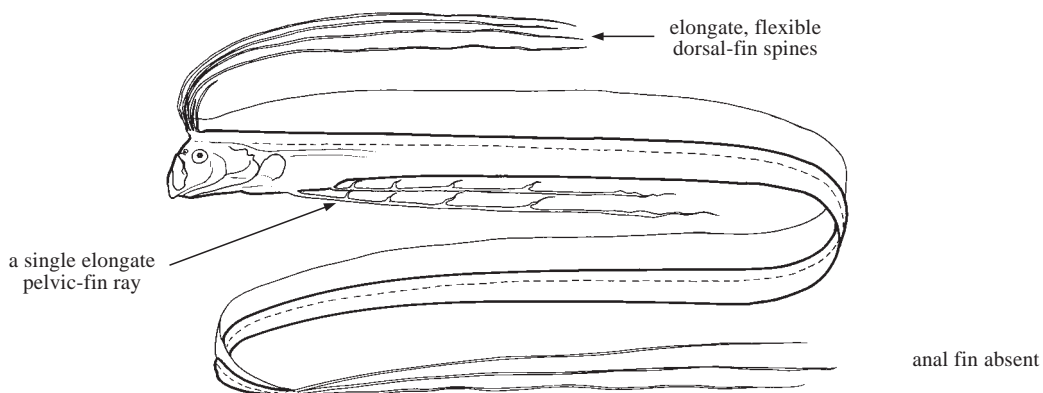
- Charter, S.R. and H.G. Moser. 1996. Lampridiformes, Lophotidae, Radiicephalidae, Trachipteridae. In *The early stages of fishes in the California current region*. California Cooperative Oceanic Fisheries Investigations Atlas No. 33, pp. 659-677.
- Heemstra, P.C. and S.X. Kannemeyer. 1984. The families Trachipteridae and Radiicephalidae (Pisces, Lampriformes) and a new species of *Zu* from South Africa. *Ann. S. Afr. Mus.*, 94:13-39.
- Olney, J.E. 1984. Lampridiformes: development and relationships. In *Ontogeny and systematics of fishes*, edited by H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr, and S.L. Richardson. American Society of Ichthyologists and herpetologists, Publication 1, pp. 368-379.
- Olney, J.E., G.D. Johnson, and C.C. Baldwin. 1993. Phylogeny of lampridiform fishes. *Bull. Mar. Sci.*, 52:137-169.
- Robins, C.R., G.C. Ray, and J. Douglas. 1986. *A field guide to Atlantic coast fishes North America*. Boston, Massachusetts, Houghton Mifflin Co., 354 p.

REGALECIDAE

Oarfishes

by J.E. Olney

Diagnostic characters: Generally **very large-sized, ribbon-like** lampridiform fishes (to 7 or 8 m, reportedly up to 17 m); body extremely elongate, compressed. Upper jaw highly protrusible, maxilla broad; teeth minute in both jaws; bones of head and jaws thin and fragile. Dorsal fin very long, extending along entire body length to tail; **first 8 to 10 dorsal-fin elements (and the single pelvic-fin ray) extremely elongate**, consisting of 4 to 6 elongate, flexible spines, inserting above eye; total dorsal-fin elements 260 to 412. **Anal fin absent. Caudal fin usually absent in large specimens;** usually with 5 rays in small specimens, the middle 3 rays stout and elongate. **Pelvic fins with 1 stout ray**, and 1 small splint-like element. Pelvic-fin rays have specialized sensory capability, with cells that resemble taste-buds on their fleshy tabs. **Scales absent, except for tubular lateral-line scales.** Total vertebrae 143 to 170. In oarfishes (and all lampridiforms), the anterior palatamaxillary ligament and the palatine prong are absent; as a result, the maxilla is free to extend, along with the premaxilla, well away from the ethmo-vomerine region during jaw protrusion. Other anatomical features of oarfishes (and all lampridiforms): first dorsal-fin pterygiophore inserts anterior to first neural spine; elongate ascending processes of premaxilla and a large rostral cartilage insert into a frontal vault or cradle; mesethmoid posterior to lateral ethmoids. In regalecids (and trachipterids), the dorsal-, caudal-, and pelvic-fin rays bear spinules that project laterally; in oarfishes, the spinules are very weakly developed, and reduced to nubbins. **Colour: body brilliant silver** with oblique dusky bars; head blue; fins deep, crimson-red; **elongate dorsal-fin elements (and the single pelvic-fin ray) ornamented with fleshy tabs, and crimson red.**



Habitat, biology, and fisheries: Regalecids are rare, mesopelagic fishes that occur in all oceans. Sightings at the surface, or strandings on the shore are usually related to storm events. There are 2 monotypic genera (*Regalecus* and *Agrostichthys*) but only *R. glesne* occurs in the area. *R. glesne* is the longest of all bony fishes, and is thought to be responsible for many historical sightings of sea monsters. Regalecids feed on deep-sea shrimps (euphausiids), small fish, and squid. The eggs are free-floating, large, and red. Very little is known of their habits and reproductive ecology. There is no fishery for regalecids.

Similar families occurring in the area

Trachipteridae: also lacking anal fin, but with less dorsal-fin rays (166 to 197 versus 260 to 412), and grow much smaller.

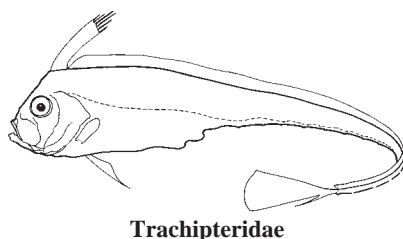
All other lampridiform families possess an anal fin.

A single species occurring in the area

Regalecus glesne Ascanius, 1772

References

- Olney, J.E. 1984. Lampridiformes: development and relationships. In *Ontogeny and systematics of fishes*, edited by H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr, and S.L. Richardson. American Society of Ichthyologists and herpetologists, Publication 1, pp. 368-379.
- Olney, J.E., G.D. Johnson, and C.C. Baldwin. 1993. Phylogeny of lampridiform fishes. *Bull. Mar. Sci.*, 52:137-169.
- Robins, C.R., G.C. Ray, and J. Douglas. 1986. *A field guide to Atlantic coast fishes North America*. Boston, Massachusetts, Houghton Mifflin Co., 354 p.



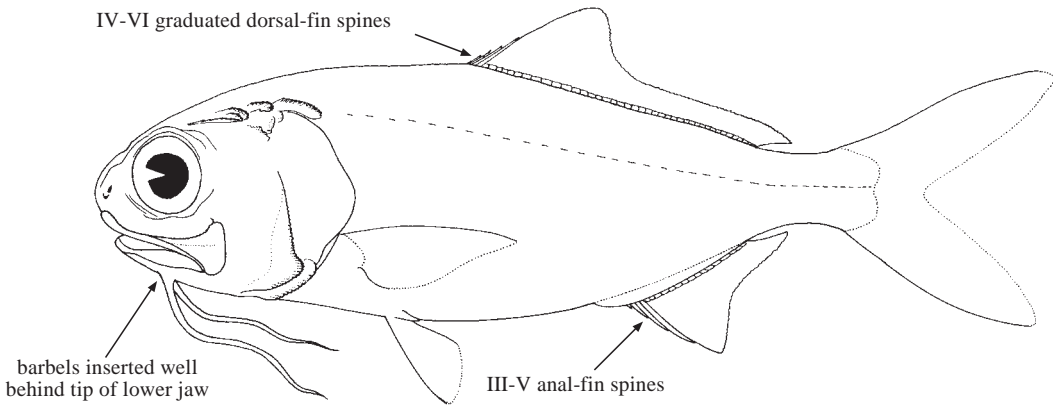
Order POLYMIXIIFORMES

POLYMIXIIDAE

Beardfishes

J.R. Paxton

Diagnostic characters: Moderate-sized (to 50 cm) polymixiiform fishes, body oblong and moderately compressed. Head moderately large; **no distinct mucous cavities separated by bony ridges on top of head**; **2 long barbels from hyoid below middle of lower jaw**. Eyes moderately large. Snout high, shorter than eye. Mouth large, **jaws extending to or slightly beyond rear margin of eye**; **2 supramaxillae**. Villiform teeth on jaws, vomer, palatine, pterygoid, and tongue. Gill rakers lath-like. **Dorsal-fin origin in anterior half of body, anal-fin origin far posterior in posterior half of body**; 1 dorsal fin with IV to VI spines and 26 to 37 soft rays; anal fin with III to V spines and 13 to 18 soft rays; pectoral fins with 14 to 19 rays; pelvic-fin insertion behind pectoral-fin insertion and before dorsal-fin origin; pelvic fins with no spines and 7 soft rays. Caudal fin forked, with 18 principle rays. **Scales spinoid**, extending forward onto opercle, cheek, and lower jaw. No photophores or luminous tissue. **Total vertebrae 28 to 30**. **Colour:** dusky above, silvery below.



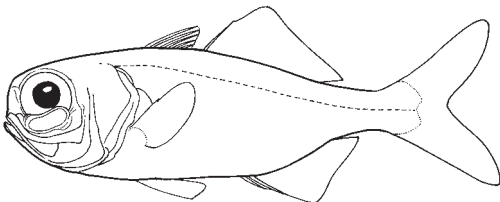
Habitat, biology, and fisheries: Benthic fishes of outer shelf and slope to 800 m. Feed as carnivores, including crustaceans, fishes, and squids. Sometimes locally common bottom fishes; the largest species, *Polymixia busakhini*, may have commercial potential.

Remarks: One genus with 10 species, throughout the world ocean in tropical and temperate latitudes, except the Mediterranean Sea and northeastern Pacific. More species may be found with further trawling in the area.

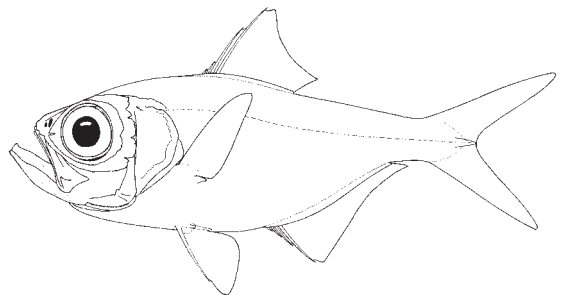
Similar families occurring in the area

Anomalopidae: no hyoid barbels; light organ present under eye.

Berycidae: no hyoid barbels; pelvic fins with I spine and 7 to 12 soft rays; colour red, with or without additional pink, silver, white, golden, and/or yellow.



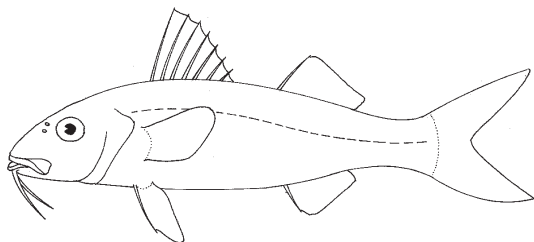
Anomalopidae



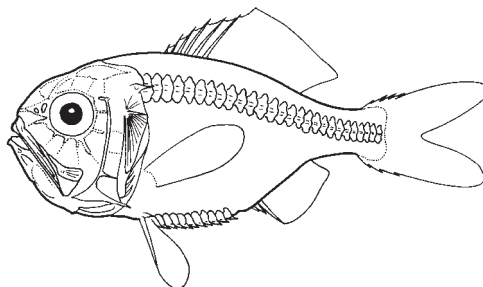
Berycidae

Mullidae: barbels near tip of lower jaw far before eye; 2 dorsal fins.

Trachichthyidae: no hyoid barbels; well-developed mucous cavities on head; abdominal scutes present.



Mullidae



Trachichthyidae

List of species occurring in the area

Polymixia berndti Gilbert, 1905

Polymixia busakhini Kotlyar, 1992

References

Kotlyar, A.N. 1992. A new species of the genus *Polymixia* from the submarine Kyushu-Palau Ridge, and notes on other representatives of the genus. *Vopr. Ikhtiol.*, 32(6):11-26. [in Russian, English transl. *J. Ichthyol.*, 33(3)]

Kotlyar, A.N. 1996. *Beryciform fishes of the world ocean*. Moscow, VNIRO Publishing, 368 p. [In Russian]

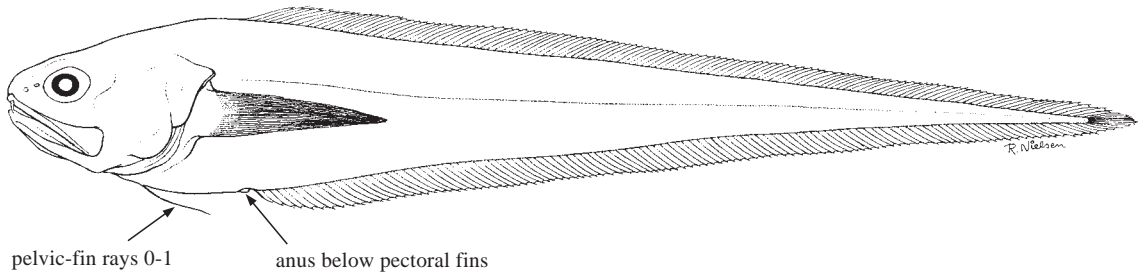
Order OPHIDIIFORMES

CARAPIDAE

Pearlfishes

by J.G. Nielsen

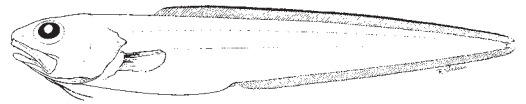
Diagnostic characters: Long and slender ophidiiform fishes (rarely reaching 50 cm in length). Eye almost as long as snout in adults, longer than snout in larvae. Mouth terminal, often with strong teeth. Supramaxilla absent. No spines on opercular bones. **Dorsal and anal fins long, joined to caudal fin.** Dorsal-fin rays shorter than opposing anal-fin rays. **Pelvic-fin rays 0 to 1.** Scales absent. **Anus placed below pectoral fins.** **Colour:** brownish.



Habitat, biology, and fisheries: Larval stage pelagic, adults benthic. Very special biology as adults of most species live or hide inside invertebrates, such as sea cucumbers (see Volume 2 of this field guide, pages 1172 and 1189), sea squirts, starfishes, and clams. Oviparous, with a special pelagic larval stage (vexillifer) where anterior dorsal-fin ray is much prolonged. No importance to fisheries.

Similar families occurring in the area

Ophidiidae: certain genera such as *Ophidion* and *Hypopleuron* are difficult to distinguish from pearlfishes, but have scales, longer dorsal-fin rays than opposing anal-fin rays, and the anus placed behind the pectoral fins.



Ophidiidae

List of species occurring in the area**Subfamily PYRAMODONTINAE**

- Pyramodon lindas* Markle and Olney, 1990
- Pyramodon punctatus* (Regan, 1914)
- Pyramodon ventralis* Smith and Radcliffe, 1913
- Snyderidia canina* Gilbert, 1905

Subfamily CARAPINAE

- Carapus mourlani* (Petit, 1934)
- Echiodon coheni* Williams, 1984
- Encheliophis boraborensis* (Kaup, 1856)
- Encheliophis gracilis* (Bleeker, 1856)
- Encheliophis homei* (Richardson, 1844)
- Encheliophis vermicularis* (Müller, 1842)
- Encheliophis vermiops* Markle and Olney, 1990
- Eurypleuron owasianum* (Matsubara, 1953)
- Onuxodon fowleri* (Smith, 1955)
- Onuxodon parvibrachium* (Fowler, 1927)

Reference

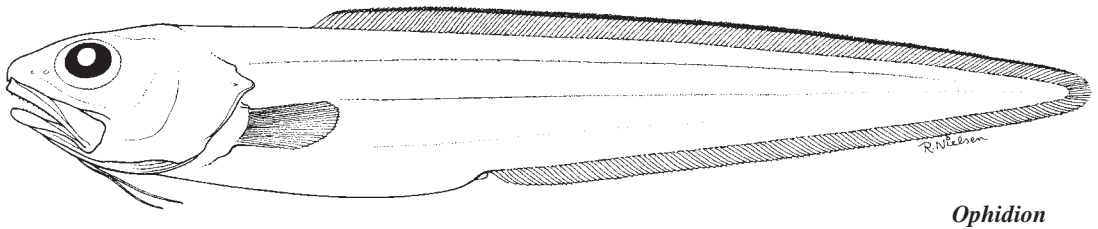
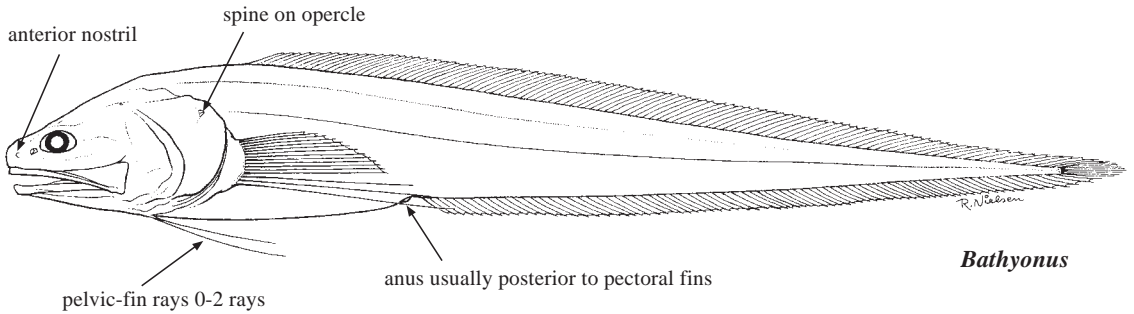
Markle, D.F. and J.E. Olney. 1990. Systematics of the pearlfishes (Pisces, Carapidae). *Bull. Mar. Sci.*, 47:269-410.

OPHIDIIDAE

Cusk eels

by J.G. Nielsen

Diagnostic characters: Moderately **elongate ophidiiform fishes** (size from about 10 to 200 cm). **Anterior nostril placed midway between upper lip and posterior nostril.** Teeth usually small, densely distributed, and blunt-tipped. Supramaxilla present. **Very seldom less than 7 long gill rakers on anterior gill arch.** **A well-developed spine on opercle usually present.** **Dorsal and anal fins long, joined to caudal fin.** Dorsal-fin rays normally longer than opposing anal-fin rays. Pelvic-fin rays 0 to 2. Scales present. **Anus placed posterior to pectoral fins** except in species with prolonged pectoral fins. **Colour:** very variable, some with horizontal or vertical bars and eye-spots.

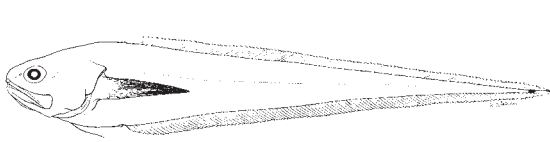


Habitat, biology, and fisheries: With exception of a few species which occur pelagically at great depths, cusk eels are bottom-living, found from shallow waters to a depth of 8 370 m (the depth record for fishes). Oviparous with pelagic larvae. No special larval stage. A single species from the area commercially important.

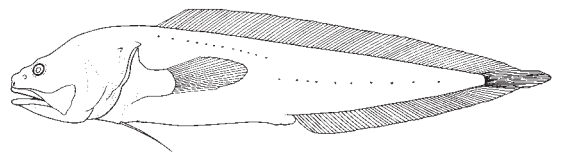
Similar families occurring in the area

Carapidae: scales absent; anal-fin rays longer than opposing dorsal-fin rays; anus placed below pectoral fins.

Bythitidae: anterior nostril placed immediately above upper lip; very seldom more than 7 long gill rakers on anterior gill arch.



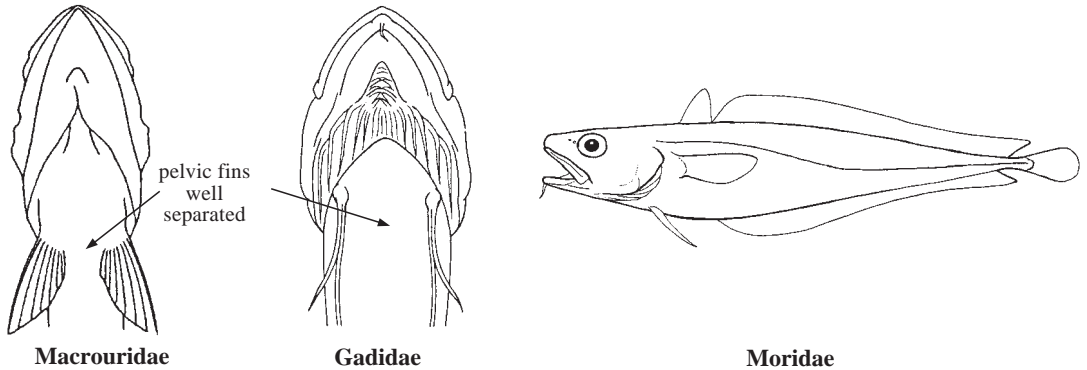
Carapidae




Bythitidae

Macrouridae: pelvic fins well separated from each other, with more than 2 rays.

Gadidae and Moridae: pelvic fins well separated from each other; dorsal and anal fins not joined to caudal fin.



List of species occurring in the area

The symbol  is given when species accounts are included.

Subfamily BROTULINAE

 *Brotula multibarbata* Temminck and Schlegel, 1846

Subfamily BROTULOTAENIINAE

Brotulotaenia nielseni Cohen, 1974

Subfamily OPHIDIINAE

Ophidion genyopus Ogilby, 1897

Ophidion muraenolepis (Günther, 1880)

Subfamily NEOBYTHITINAE

Abyssobrotula galathea Nielsen, 1977

Acanthonus armatus Günther, 1878

Alcockia rostratus (Günther, 1887)

Barathrodemus nasutus Smith and Radcliffe, 1913

Bassozetus compressus (Günther, 1878)

Bassozetus elongatus Smith and Radcliffe, 1913

Bassozetus glutinosus (Alcock, 1890)

Bassozetus robustus Smith and Radcliffe, 1913

Bassozetus n.sp. (from Vanuatu)

Bathyonus caudalis (Garman, 1899)

Dicrolene hubrechtii Weber, 1913

Dicrolene longimana Smith and Radcliffe, 1913

Dicrolene multifilis (Alcock, 1889)

Dicrolene tristis Smith and Radcliffe, 1913

Enchelybrotula paucidens Smith and Radcliffe, 1913

Epetriodus freddy Cohen and Nielsen, 1978

Eretmichthys remifer Smith and Radcliffe, 1913

Glyptophidium argenteum Alcock, 1889

Glyptophidium japonicum Kamohara, 1936

Glyptophidium lucidum Smith and Radcliffe, 1913

Glyptophidium macropus Alcock, 1894

Glyptophidium oceanium Smith and Radcliffe, 1913

Holcomycteronus aequatoris (Smith and Radcliffe, 1913)
Homostolus acer Smith and Radcliffe, 1913
Hoplobrotula armata (Temminck and Schlegel, 1846)
Hypopleuron caninum Smith and Radcliffe, 1913
Lamprogrammus brunswigi (Brauer, 1906)
Lamprogrammus niger Alcock, 1891
Luciobrotula bartschi Smith and Radcliffe, 1913
Mastigopterus imperator Smith and Radcliffe, 1913
Mastigopterus praetor Smith and Radcliffe, 1913
Monomitopus garmani (Smith and Radcliffe, 1913)
Monomitopus longiceps Smith and Radcliffe, 1913
Monomitopus microlepis Smith and Radcliffe, 1913
Monomitopus pallidus Smith and Radcliffe, 1913
Neobythites bimaculatus Nielsen, 1997
Neobythites bimariginatus Fourmanoir and Rivaton, 1979
Neobythites fasciatus Smith and Radcliffe, 1913
Neobythites longiceps Smith and Radcliffe, 1913
Neobythites longiventralis Nielsen, 1997
Neobythites macrops Günther, 1887
Neobythites malayanus Weber, 1913
Neobythites neocaledoniensis Nielsen, 1997
Neobythites pallidus Nielsen, 1997
Neobythites purus Smith and Radcliffe, 1913
Neobythites unimaculatus Smith and Radcliffe, 1913
Neobythites zonatus Nielsen, 1997
Neobythites n.sp. 1 (from Vanuatu)
Neobythites n.sp. 2 (from Vanuatu)
Porogadus melampeplus (Alcock, 1896)
Porogadus miles Good and Bean, 1896
Pycnocraspedum squamipinne Alcock, 1889
Sirembo imberbis (Temminck and Schlegel, 1846)
Sirembo jerdoni (Day, 1888)
Sirembo metachroma Cohen and Robins, 1986
Spottobrotula amaculata Cohen and Nielsen, 1982
Tauredophidium hextii Alcock, 1890
Typhlonus nasus Günther, 1878
Xyelacyba myersi Cohen, 1961

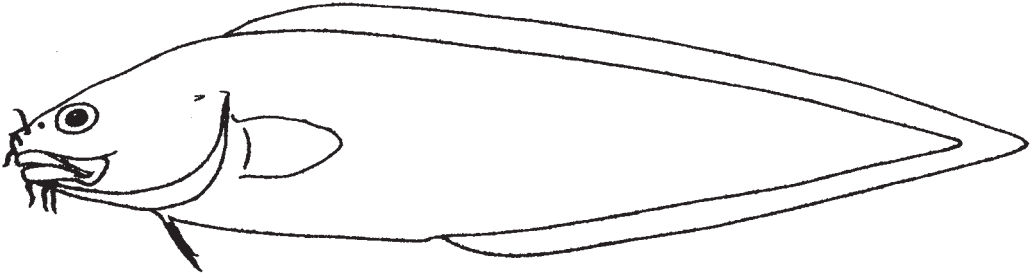
Reference

Cohen, D.M. and J.G. Nielsen. 1978. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. *NOAA Technical Report NMFS Circular*, (417):72 p.

Brotula multibarbata (Temminck and Schlegel, 1846)

Frequent synonyms / misidentifications: None / None.

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

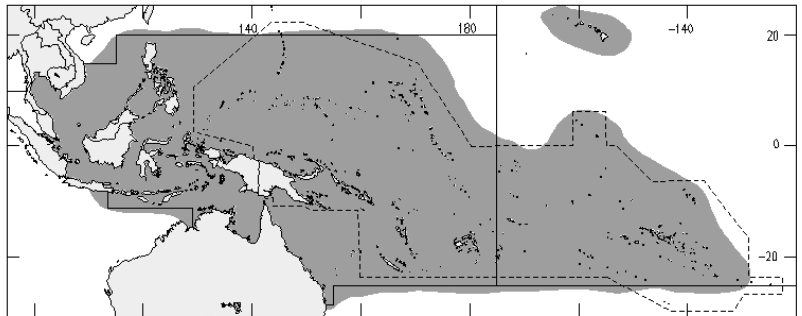


Diagnostic characters: Body elongate with tapering caudal part. **Snout and chin with 12 barbels.** Fine teeth present on jaws and palate (roof of mouth). Four or fewer well-developed gill rakers on anterior gill arch. Dorsal and anal fins joined to caudal fin; **pelvic fins each with 2 rays, placed below gill cover.** Body completely covered with small, cycloid (smooth) scales. **Colour:** uniform silvery dusky to brown.

Size: Maximum length about 1 m.

Habitat, biology, and fisheries: A benthic species from coastal areas. The larvae occur pelagically sometimes far offshore. Caught on lines and in traps. Not commonly seen in fish markets.

Distribution: Widespread in the Indo-Pacific, from the east coast of Africa eastward to Hawaii.

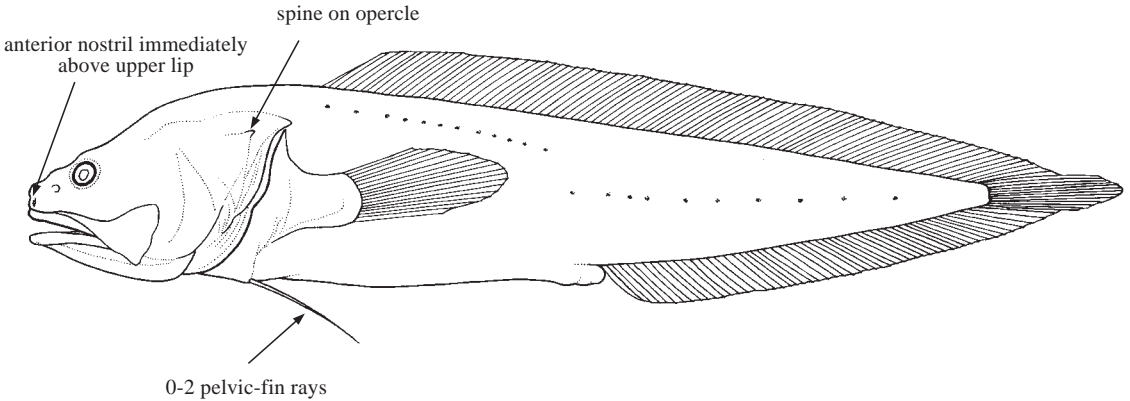


BYTHITIDAE

Brotulas

by J.G. Nielsen

Diagnostic characters: Body of various shape (size from 5 to about 100 cm). **Anterior nostril immediately above upper lip.** Well-developed spine on opercle. **Very seldom more than 7 long gill rakers on anterior gill arch.** Dorsal and anal fins long, joined to (subfamily Bythitinae), or free from (subfamily Brosmophicinae), caudal fin. Dorsal-fin rays normally longer than opposing anal-fin rays. **Pelvic-fin rays 0 to 2.** Scales normally present. **Males with intromittent organ.** **Colour:** brownish.



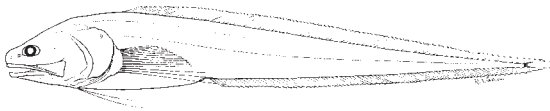
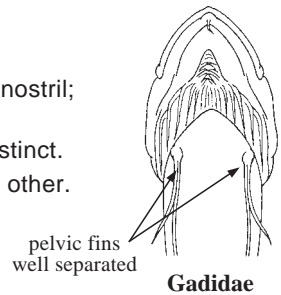
Habitat, biology, and fisheries: Occur in fresh-water caves and in marine waters from a few to about 2 000 m. Viviparous. In some species the newly born larva lives near the bottom while in others they occur epipelagically.

Similar families occurring in the area

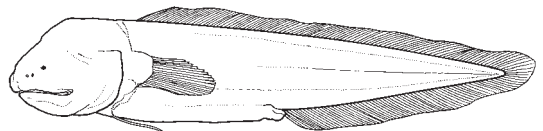
Ophidiidae: anterior nostril placed midway between upper lip and posterior nostril; rarely less than 7 long gill rakers on anterior gill arch.

Aphyonidae: no scales; skin loose and gelatinous; eyes very small or indistinct.

Gadidae, Macrouridae, and Moridae: pelvic fins well separated from each other.



Ophidiidae



Aphyonidae

List of species occurring in the area**Subfamily BYTHITINAE**

- Bellottia armiger* Smith and Radcliffe, 1913
Bythites lepidogenys Smith and Radcliffe, 1913
Cataetyx sp.
Diplacanthopoma brunnea Smith and Radcliffe, 1913
Hastatobythites arafurensis Machida, 1997
Hepthocara crassiceps Smith and Radcliffe, 1913
Microbrotula randalli Cohen and Wourms, 1976
Oligopus robustus Smith and Radcliffe, 1913
Pseudonus platycephalus (Smith and Radcliffe, 1913)
Saccogaster tuberculata (Chan, 1966)

Subfamily BROSMOPHYCINAE

- Beaglichthys macrophthalmus* Machida, 1993
Brosmolus longicaudus Machida, 1993
Brosmophyciops pautzkei Schultz, 1960
Brotulina sp.
Dermatopsis macrodon Ogilby, 1896
Diancistrus longifilis Ogilby, 1898
Dinematichthys megasoma Machida, 1994
Dinematichthys randalli Machida, 1994
Monothrix mizolepis (Günther, 1867)
Monothrix polylepis Ogilby, 1897
Parabrosmolus novaeguinae Machida, 1996

Reference

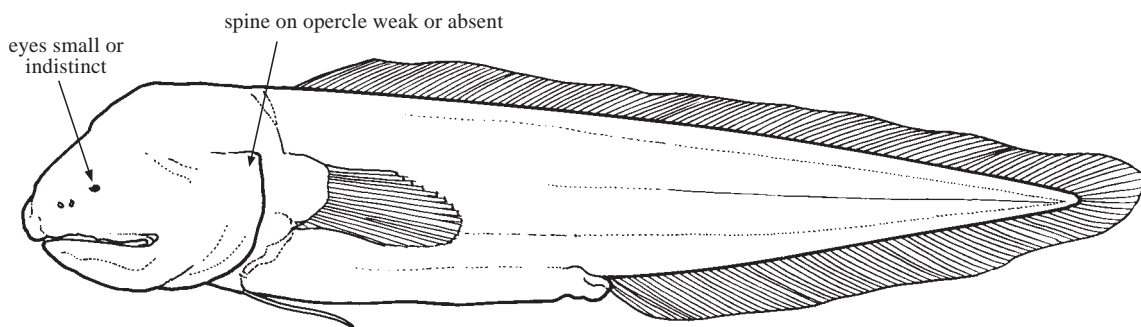
- Cohen, D.M. and J.G. Nielsen. 1978. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. *NOAA Technical Report NMFS Circular*, (417):72 p.

APHYONIDAE

Aphyonids

by J.G. Nielsen

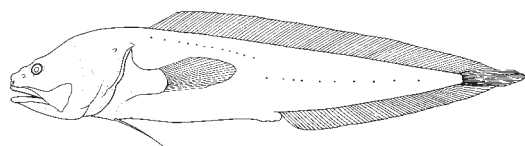
Diagnostic characters: Elongate ophidiiform fishes (size from about 5 to 20 cm). **Skin loose, transparent, and gelatinous.** **Eyes small or indistinct.** Teeth small; palatines edentate (except for *Barathronus*). Basibranchial tooth patches absent. Opercular spine weak or absent. **Dorsal-fin insertion well behind head.** **Dorsal and anal fins joined to caudal fin.** **Males with intromittent organ.** Often fleshy appendages around genital opening in females. Except for *Barathronus*, adult aphyonids have retained many larval characters such as cylindrical shaped vertebral centra, slightly ossified bones, and poorly developed musculature, gill rakers, and gill filaments. **Colour:** brownish to whitish.



Habitat, biology, and fisheries: Rarely caught fishes which occur near the bottom between depths of about 800 and 6 000 m. Viviparous. The size of the newly born larve indicates that they stay near the bottom. No importance to fisheries. See Nielsen (1984) for a key to genera.

Similar families occurring in the area

Bythitidae: scales present, eyes well developed; skin not loose and gelatinous.



Bythitidae

List of species occurring in the area

- Aphyonus bolini* Nielsen, 1974
- Aphyonus gelatinosus* Günther, 1878
- Barathronus diaphanus* Brauer, 1906
- Parasciadonus pauciradiatus* Nielsen, 1997

References

- Nielsen, J.G. 1969. Systematics and biology of the Aphyonidae (Pisces, Ophidioidea). *Galathea Rept.*, (10):90 p.
- Nielsen, J.G. 1984. *Parasciadonus brevibrachium* n. gen. et sp. - an abyssal aphyonid from the Central Atlantic (Pisces, Ophidiiformes). *Cybium*, 8:39-44.

Order GADIFORMES

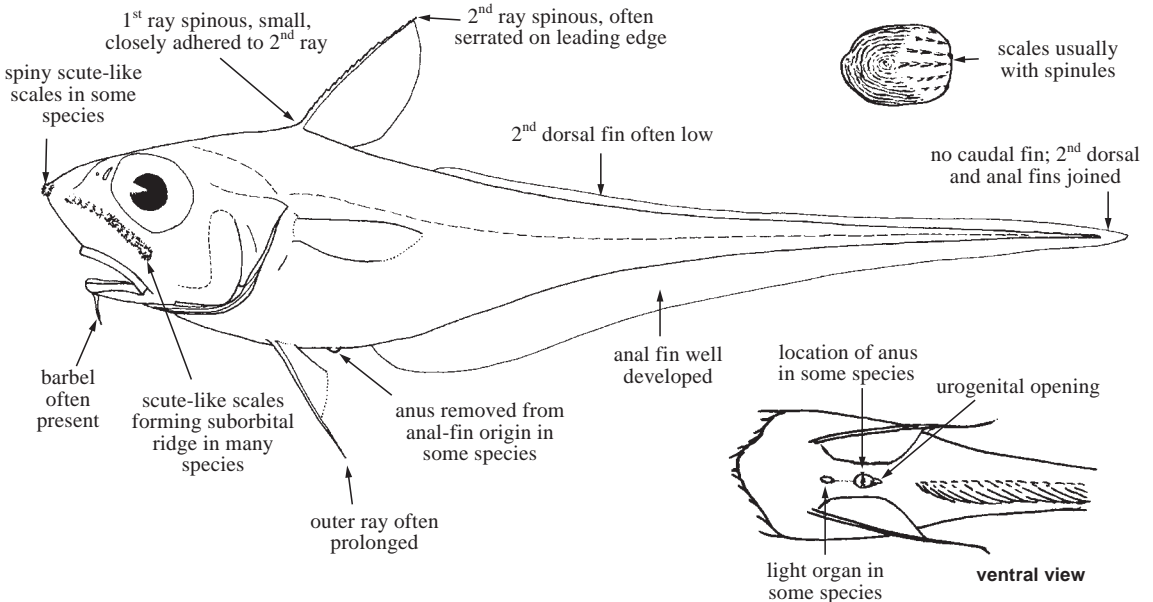
MACROURIDAE

(sometimes Coryphaenoididae, Bathygadidae, Macrouroididae, Trachyrincidae, in part, in literature)

Grenadiers

by T. Iwamoto

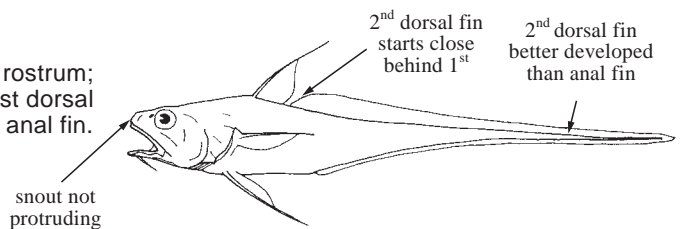
Diagnostic characters: Trunk short, moderately compressed (size to more than 1.5 m, but species in the area less than 50 cm); **tail greatly elongated, tapering to a point that lacks a caudal fin.** Head shape compressed, rounded or cylindrical, with a bluntly rounded to sharply pointed, protruding snout. **Chin barbel usually present.** Eyes moderate to very large in most. Mouth subinferior to inferior, small to moderate in size. Anterior and posterior nostrils close before orbit. **Teeth on premaxilla and dentary only, none on roof of mouth;** outer premaxillary series of teeth sometimes enlarged. Gill rakers tubercular in most, long and slender in subfamily Macrouroidinae. Branchiostegal rays 6 or 7 (rarely 8). **Dorsal fins 2,** except 1 in Macrouroidinae; **first dorsal fin with anteriormost 2 rays spinous,** except in Macrouroidinae; **second dorsal fin and anal fins long, both fins meet at tip of tail;** pelvic fins narrow-based (absent in *Macrouroides*), thoracic to almost jugular in position, with 5 to 18 soft rays, outer ray often prolonged. Anus closer to pelvic fins than to anal fin in some species; an internal light organ sometimes visible on ventral midline of abdomen. **Exposed field of scales usually covered with spinules;** in some species, a stout, terminal, scute-like scale at tip of snout and ridge-like rows of coarsely modified scales on head. No connection between swimbladder and back of skull. Males without external intromittent organ. **Colour:** usually grey, brown, or blackish, sometimes with a blue or violet tinge; some silvery along sides.



Habitat, biology, and fisheries: Deep-sea fishes, almost all benthopelagic in habit, found primarily at upper continental slope depths of 250 to 2 000 m, but a few species recorded from below 5 000 m. Distribution of family worldwide; species most numerous in tropics.

Similar families occurring in the area

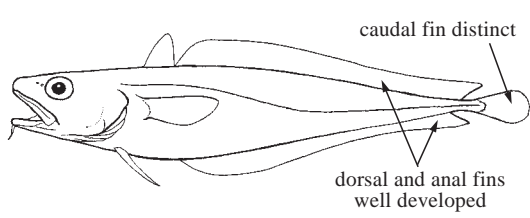
Bathygadidae: snout without protruding rostrum; origin of second dorsal fin close behind first dorsal fin, its rays much longer than opposites of anal fin.



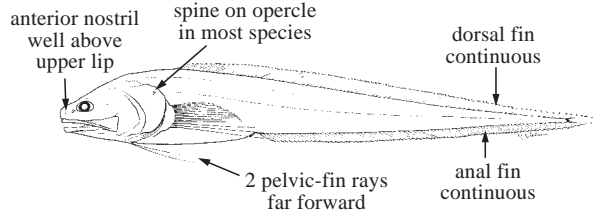
Bathygadidae

Moridae: a small but distinct caudal fin; both anal and second dorsal fins well developed, not confluent around tip of tail; a well-developed connection between swimbladder and back of skull.

Ophidiidae: a small caudal fin joint to dorsal and anal fins; a single continuous dorsal fin, its rays equal to or longer than opposites of anal fin; no spinous dorsal-fin rays; pelvic fins, if present, placed close together; supramaxilla present; anterior nostril well above upper lip.



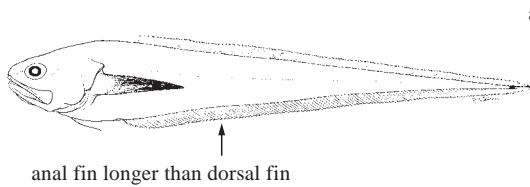
Moridae



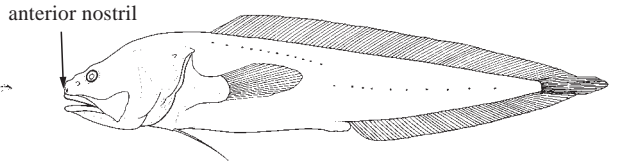
Ophidiidae

Carapidae: anal fin longer than the single dorsal fin, its origin far forward, usually under pectoral fins; no scales; teeth on palate.

Bythitidae: anterior nostril immediately above upper lip in most species; viviparous, males with an external intromittent organ; species in the area with caudal fin continuous with dorsal and anal fins.



Carapidae



Bythitidae

Key to the genera of Macrouridae occurring in the area

- 1a. One continuous dorsal fin, anterior portion not elevated; head enormously inflated; pelvic fins small, with 5 rays (Fig. 1), or absent (subfamily Macrouroidinae) → 2
- 1b. Two dorsal fins, the first elevated; pelvic fins with 6 to 18 rays . . . (subfamily Macrourinae) → 3
- 2a. Pelvic fins present *Squalogadus*
- 2b. Pelvic fins absent *Macrouroides*
- 3a. Rakers absent on lateral side of first gill arch; a continuous ridge of stout scales from tip of snout to angle of preopercle, ending in a sharp point (Fig. 2); pelvic-fin rays 7 (a single species with 6); spinous dorsal-fin ray usually smooth (rarely with few denticles near tip) *Caelorinchus*
- 3b. Rakers usually present (sometimes very small) on lateral side of first gill arch; scaly ridge running from tip of snout to angle of preopercle present or absent, but never ending in a sharp point; pelvic-fin rays 6 to 18; spinous dorsal-fin ray smooth or serrated → 4

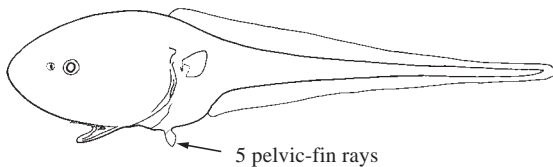


Fig. 1 *Squalogadus*

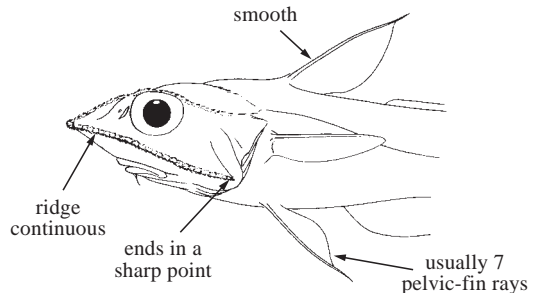


Fig. 2 *Caelorinchus*

- 4a. Anus immediately anterior to anal fin, not separated from fin by a broad margin of naked black skin or numerous scale rows (Fig. 3a) → 5
- 4b. Anus separated from anal fin by a broad margin of naked skin (Fig. 3b) or by several scale rows (Fig. 3c) → 6

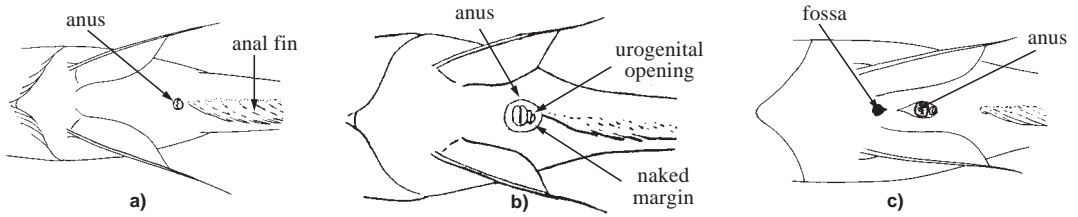


Fig. 4 ventral view

- 5a. Head covering membranous, almost transparent (Fig. 4a); a lens-like structure before anus and on chest; abdomen and isthmus with patches of fine black striations (Fig. 4a, b); branchiostegal rays 7; spinous dorsal-fin ray smooth or serrated *Hymenocephalus*
- 5b. Head covering usually rather thick and opaque; no black striations on body; branchiostegal rays 6; spinous dorsal-fin ray serrated (sometimes weakly) (Fig. 5) *Coryphaenoides*

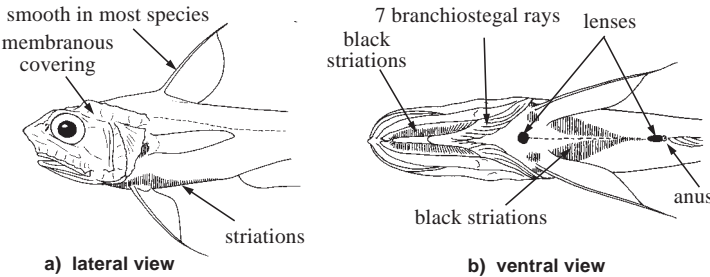


Fig. 5 *Hymenocephalus*

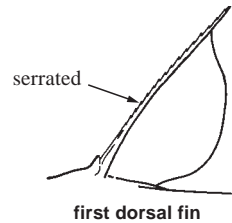


Fig. 6 *Coryphaenoides*

- 6a. Anus surrounded by a broad margin of naked skin, the entire region closely abutting origin of anal fin (Fig. 3b); no accessory fossa anterior to region surrounding anus. → 7
- 6b. Anus distinctly separated from anal-fin origin by several scale rows, usually closer to insertion of pelvic fins than to origin of anal fin; a small fossa usually present before anus region (Fig. 3c). → 12

- 7a. Chin barbel absent; species bathypelagic (Fig. 6) *Mesobius* (not yet recorded from the area, but might be expected)
- 7b. Chin barbel present; species benthopelagic. → 8

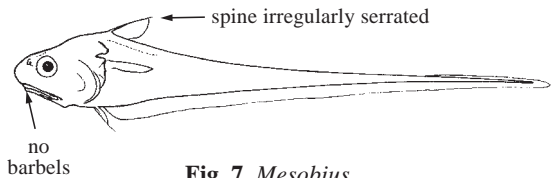


Fig. 7 *Mesobius*

- 8a. Spinous ray of first dorsal fin smooth (Fig. 7); pelvic-fin rays 6 or 7 *Trachonurus*
- 8b. Spinous ray of first dorsal fin serrated (Fig. 8a); pelvic-fin rays 5 to 14 → 9

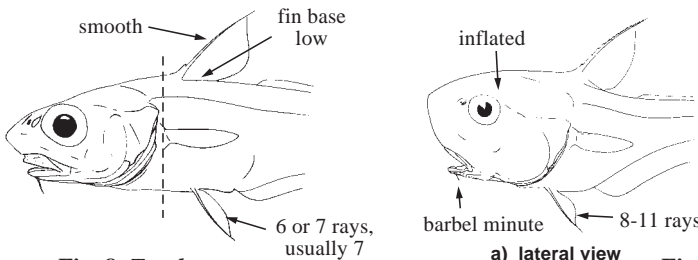


Fig. 8 *Trachonurus*

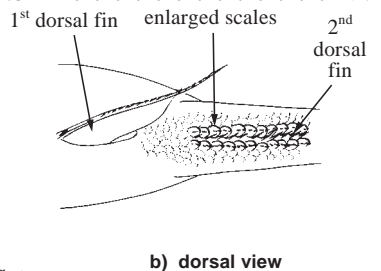


Fig. 3 *Cetonurus*

- 9a. Head greatly inflated by expanded mucous canals (Fig. 8a); a series of enlarged scales along anterior section of second dorsal fin (Fig. 8b); pelvic-fin rays 8 to 11 *Cetonurus*
(not yet recorded from the area but might be expected)
- 9b. Head moderately or not inflated; no series of enlarged scales along second dorsal fin; pelvic-fin rays 5 to 14 → 10

- 10a. Pelvic-fin rays 5 to 7, usually 6; underside of snout completely or nearly completely covered with scales, no stoutly modified scales on head ridges or at angles of snout (Fig. 9) . . . *Pseudonezumia*
- 10b. Pelvic-fin rays 7 to 14; underside of snout partially to entirely naked; stout, coarse scales at tip and lateral angles of snout and along suborbital ridge → 11

- 11a. Snout blunt, shorter than orbit diameter; origin of pelvic fins below opercles (Fig. 10) *Sphagemacrus*
- 11b. Snout pointed, longer than orbit diameter; origin of pelvic fins below first dorsal fin (Fig. 11) *Mataeocephalus*^{1/}

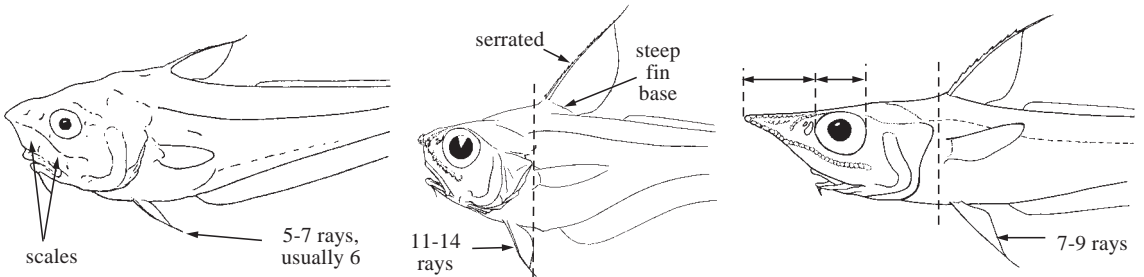


Fig. 9 *Pseudonezumia*

Fig. 10 *Sphagemacrus*

Fig. 11 *Mataeocephalus*

- 12a. Snout scarcely protruding, entirely naked (posteriorly to over ventral surfaces of head); head without ridges or modified scales; mouth almost terminal, upper jaw terminates below anterior margin of orbit; suborbital region wider than orbit diameter (Fig. 12) *Haplomacrus*
- 12b. Snout moderately protruding, completely covered with scales or variously naked; head with distinct ridges, reinforced with stout, modified scales in some; mouth subinferior, upper jaw terminates behind anterior margin of orbit; orbit wider than suborbital region → 13

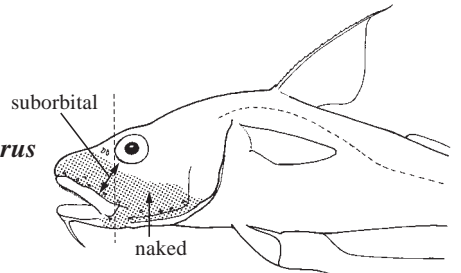


Fig. 12 *Haplomacrus*

- 13a. Most of dorsal surface and almost entire ventral surface of snout naked; no terminal or lateral snout scutes present (Fig. 13) *Kumba*
- 13b. Dorsal surface of snout entirely or mostly covered with scales, ventral surfaces variously naked; terminal and lateral snout scutes variously present → 14

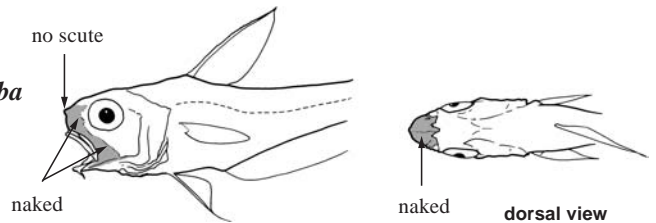


Fig. 13 *Kumba*

(after Iwamoto and Sazonov, 1994)

1/ Genus keyed out twice.

- 14a. Terminal and lateral snout scutes present; suborbital ridge marked by row of coarsely modified scales; underside of snout with narrow to broad swath of naked skin, rarely fully covered with scales (Fig 14) → 15
- 14b. Head smoothly covered with finely spinulated scales; no lateral snout scutes nor coarsely modified scales along suborbital ridge; completely covered with scales (most species) or a midventral naked swath → 16
- 15a. Gill rakers present on lateral side of first arch (Fig. 15) *Nezumia*
- 15b. No gill rakers on lateral side of first arch *Mataeocephalus*
- 16a. Scales usually present along lower branchiostegal rays; underside of snout completely covered with scales; lower jaw with enlarged, often fang-like teeth in 1 or 2 rows laterally (Fig. 16) *Malacocephalus*
- 16b. Scales present or absent on branchiostegals; underside of snout with scales or naked; lower jaw lacking notably enlarged teeth, in 2 or more rows laterally. → 17

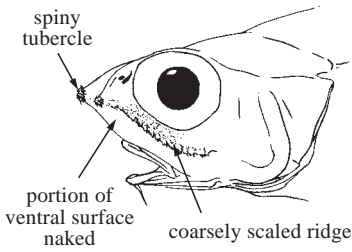


Fig. 15 *Nezumia*

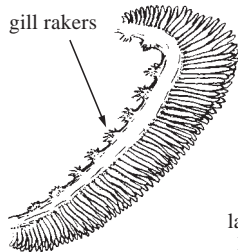


Fig. 14 *Nezumia*

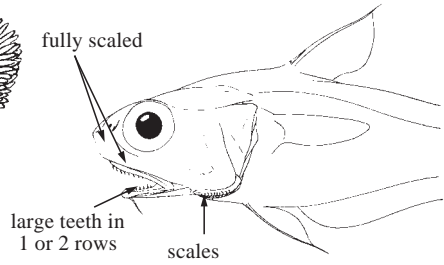


Fig. 16 *Malacocephalus*

- 17a. Snout short, high, bluntly rounded (Fig. 17); scales present in most species on branchiostegals and sometimes gular membrane; underside of snout with naked swath in some; premaxillary teeth do not extend beyond posterior process (Fig. 18a) *Lucigadus*

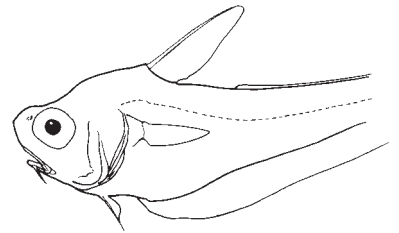
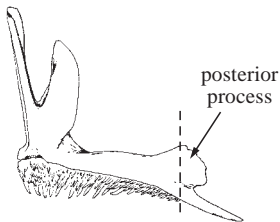
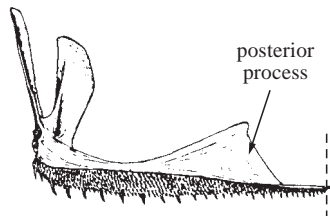


Fig. 17 *Lucigadus*

- 17b. Snout moderate length, low, pointed (Fig. 19); no scales on branchiostegals or gular membrane; underside of snout completely covered with scales; premaxillary teeth extend beyond posterior process (Fig. 18b) *Ventrifossa*



a) *Lucigadus*



b) *Ventrifossa*

Fig. 18 premaxilla

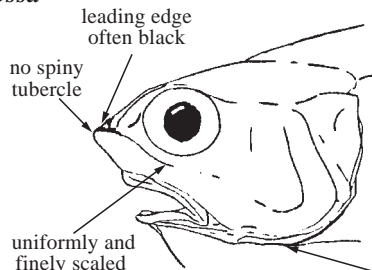


Fig. 19 *Ventrifossa*

no scales on branchiostegals

List of species occurring in the area

Subfamily MACROUROIDINAE

Macrouroides inflaticeps Smith and Radcliffe, 1912

Squalogadus modificatus Gilbert and Hubbs, 1916

Subfamily MACROURINAE

Caelorinchus acantholepis Gilbert and Hubbs, 1920

Caelorinchus acutirostris Smith and Radcliffe, 1912

- Caelorinchus anatirostris* Jordan and Gilbert, 1904
Caelorinchus argentatus Smith and Radcliffe, 1912
Caelorinchus argus Weber, 1913
Caelorinchus carinifer Gilbert and Hubbs, 1920
Caelorinchus celaenostomus McMillan and Paulin, 1993
Caelorinchus cingulatus Gilbert and Hubbs, 1920
Caelorinchus commutabilis Smith and Radcliffe, 1912
Caelorinchus cylindricus Iwamoto and Merrett, 1997
Caelorinchus dorsalis Smith and Radcliffe, 1912
Caelorinchus kamoharai Matsubara, 1943
Caelorinchus kermadecus Jordan and Gilbert, 1904
Caelorinchus macrolepis Gilbert and Hubbs, 1920
Caelorinchus macrorhynchus Smith and Radcliffe, 1912
Caelorinchus maculatus Gilbert and Hubbs, 1920
Caelorinchus melanobranchus Iwamoto and Merrett, 1997
Caelorinchus parallelus (Günther, 1877)
Caelorinchus platorhynchus Smith and Radcliffe, 1912
Caelorinchus quincunciatus Gilbert and Hubbs, 1920
Caelorinchus radcliffei Gilbert and Hubbs, 1920
Caelorinchus semaphoreus Iwamoto and Merrett, 1997
Caelorinchus sereti Iwamoto and Merrett, 1997
Caelorinchus sexradiatus Gilbert and Hubbs, 1920
Caelorinchus shcherbachevi Iwamoto and Merrett, 1997
Caelorinchus smithi Gilbert and Hubbs, 1920
Caelorinchus spathulatus McMillan and Paulin, 1993
Caelorinchus spinifere Gilbert and Hubbs, 1920
Caelorinchus thompsoni Gilbert and Hubbs, 1920
Caelorinchus triocellatus Gilbert and Hubbs, 1920
Caelorinchus velifer Gilbert and Hubbs, 1920
Caelorinchus weberi Gilbert and Hubbs, 1920
- Cetonurus globiceps* (Vaillant in Filhol, 1884)
- Coryphaenoides aequatoris* (Smith and Radcliffe, 1912)
Coryphaenoides asprellus (Smith and Radcliffe, 1912)
Coryphaenoides camarus (Smith and Radcliffe, 1912)
Coryphaenoides dubius (Smith and Radcliffe, 1912)
Coryphaenoides macrolophus (Alcock, 1889)
Coryphaenoides microps (Smith and Radcliffe, 1912)
Coryphaenoides orthogrammum (Smith and Radcliffe, 1912)
Coryphaenoides paradoxus (Smith and Radcliffe, 1912)
Coryphaenoides semiscaber Gilbert and Hubbs, 1920
Coryphaenoides striaturus Barnard, 1925
Coryphaenoides tydemani (Weber, 1913)
- Haplomacrourus nudirostris* Trunov, 1980
- Hymenocephalus adelscottii* Iwamoto and Merrett, 1997
Hymenocephalus aterrimus Gilbert, 1905
Hymenocephalus barbatulus Gilbert and Hubbs, 1920
Hymenocephalus gracilis Gilbert and Hubbs, 1920
Hymenocephalus grimaldii Weber, 1913
Hymenocephalus kuronumai Kamohara, 1938
Hymenocephalus longibarbis (Günther, 1887)
Hymenocephalus longipes Smith and Radcliffe, 1912
Hymenocephalus megalops Iwamoto and Merrett, 1997
Hymenocephalus nascens Gilbert and Hubbs, 1920
Hymenocephalus striatissimus aeger Gilbert and Hubbs, 1920
Hymenocephalus s. striatissimus Jordan and Gilbert, 1904
Hymenocephalus s. torvus Gilbert and Hubbs, 1920
- Kumba punctulata* Iwamoto and Sazonov, 1994

- Kuronezumia macronema* (Smith and Radcliffe, 1912)
Lucigadus lucifer (Smith and Radcliffe, 1912)
Lucigadus microlepis (Günther, 1887)
Lucigadus nigromarginata (Smith and Radcliffe, 1912)
Lucigadus vittatus (Weber, 1913)
Lucigadus acrolophus Iwamoto and Merrett, 1997
Malacocephalus laevis (Lowe, 1943)
? *Malacocephalus luzonensis* Gilbert and Hubbs, 1920
Mataeocephalus adustus Smith and Radcliffe, 1912
Mataeocephalus hyostomus (Smith and Radcliffe, 1912)
Mataeocephalus nigrescens Smith and Radcliffe, 1912
Mataeocephalus sp. 1 [Sazonov, Shcherbachev, and Iwamoto]
Nezumia aspidentatus Iwamoto and Merrett, 1997
Nezumia oliveri Iwamoto and Merrett, 1997
Nezumia coheni Iwamoto and Merrett, 1997
Nezumia evides (Gilbert and Hubbs, 1916)
Nezumia infranudis (Gilbert and Hubbs, 1916)
Nezumia propinqua (Gilbert and Cramer, 1897)
Nezumia proxima (Smith and Radcliffe, 1912)
Nezumia spinosa (Gilbert and Hubbs, 1916)
Pseudonezumia parvipes (Smith and Radcliffe, 1912)
Pseudonezumia pusillus (Sazonov and Shcherbachev, 1982)
Sphagemacrurus decimalis (Gilbert and Hubbs, 1920)
Sphagemacrurus pumiliceps (Alcock, 1894)
Sphagemacrurus richardi (Weber, 1913)
Trachonurus sentipellis (Gilbert, 1905)
Trachonurus gagates Iwamoto and McMillan, 1995
Ventrifossa atherodon (Gilbert and Cramer, 1897)
Ventrifossa divergens Gilbert and Hubbs, 1920
Ventrifossa johnboborum Iwamoto, 1983
Ventrifossa macropogon Marshall, 1973
Ventrifossa nigrodorsalis Gilbert and Hubbs, 1920
Ventrifossa vinolenta Iwamoto and Merrett, 1997

References

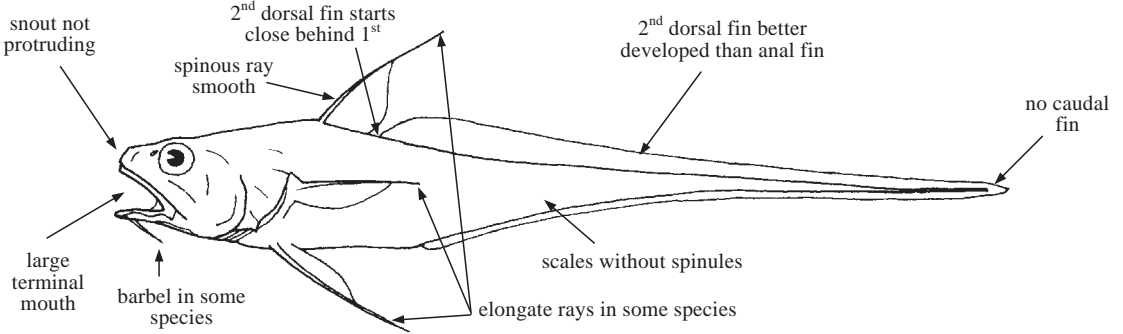
- Cohen, D.M., T. Inada, T. Iwamoto, and N. Scialabba. 1990. FAO Species Catalogue. Vol. 10. Gadiform fishes of the world (order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. *FAO Fish. Synop.*, (125)Vol.10:442 p.
- Gilbert, C.H. and C.L. Hubbs. 1916. Report on the Japanese macrouroid fishes collected by the United States fisheries steamer "Albatross" in 1906, with a synopsis of the genera. *Proc. U.S. Natl. Mus.*, 51(2149):135-214.
- Gilbert, C.H. and C.L. Hubbs. 1920. The macrouroid fishes of the Philippine Islands and the East Indies. *U.S. Natl. Mus. Bull.*, 100, 1(7):369-588.
- Iwamoto, T. and N.R. Merrett. 1997. Pisces Gadiformes: taxonomy of grenadiers of the New Caledonia region, southwest Pacific Ocean. In *Résultats des Campagnes MUSORSTOM*, vol. 18, edited by A. Crosnier. *Rés. Mus. natn. Hist. nat.*, 176:473-570.
- Okamura, O. 1970. *Fauna Japonica. Macrourina (Pisces)*. Tokyo, Academic Press, 216 p.
- Okamura, O. and T. Kitajima (eds). 1984. *Fishes of the Okinawa trough and the adjacent waters. I. The intensive research of unexploited fishery resources on continental slopes*. Tokyo, Japan Fish. Res. Cons. Assoc., 414 p.
- Okamura, O., K. Amaoka, and F. Mitani (eds). 1982. *Fishes of the Kyushu-Palau Ridge and Tosa Bay*. Tokyo, Japan Fish. Res. Cons. Assoc., 435 p.

BATHYGADIDAE

Bathygadids

by T. Iwamoto

Diagnostic characters: Trunk short, moderately compressed (size to about 55 cm); **tail greatly elongated, tapering to a point that lacks a caudal fin.** Head compressed with a rounded non-protruding snout. Eyes small to moderate, 1/5 to 1/3 head length. Mouth large, essentially terminal; **teeth small, in moderate to broad bands, on premaxilla and dentary only, none on roof of mouth.** Gill rakers long and slender; outer gill arch not restricted by membranous attachment to operculum. Branchiostegal rays 7. **Dorsal fins 2; second dorsal fin close behind first, without a gap; second dorsal and anal fins long, both fins meet at tip of tail; second dorsal fin better developed than anal fin.** Pelvic fins thoracic in position, with 8 to 10 (rarely 11) rays. Pectoral fins with 11 to 20 rays. Anus at or close to anal-fin origin, far behind pelvic-fin base; no light organ. Scales without spinules. No connection between swimbladder and back of skull. **Colour:** pale creamish, grey, or blackish.



Habitat, biology, and fisheries: Benthopelagic deep-sea fishes of upper to middle continental-slope depths of 250 to 2 000 m. Distribution of family worldwide in tropical to subtropical seas, but absent along Pacific coast of New World.

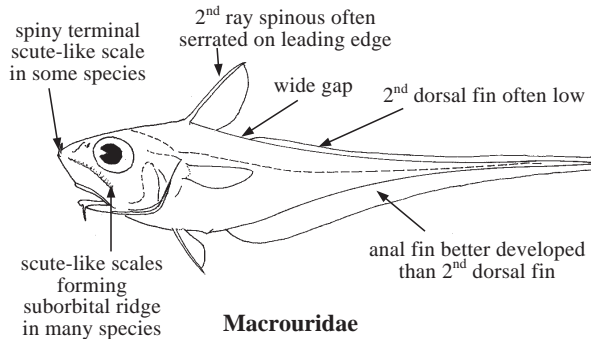
Remarks: The Bathygadidae were formerly included within the Macrouridae, but Howes (1988, 1989) has established the distant separation of the family and has suggested alignment with the suborder Gadoidei, not the Macrouroidei. Howes and Crimmen (1990) recently reviewed the family, but they left many taxonomic problems unresolved and incorrectly synonymized or placed several species. The lack of adequate study specimens remains a problem. The species list below is therefore very tentative.

Similar families occurring in the area

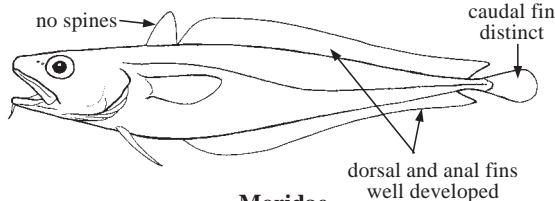
Macrouridae: first and second dorsal fins separated by a distinct gap; anal fin better developed than second dorsal fin (Macrouroidinae have a single dorsal fin about equal in height to anal fin); spinules usually present on scales; snout slightly to greatly protruding; mouth subinferior to inferior.

Moridae: a small but distinct caudal fin; both anal and second dorsal fins well developed, not confluent around tip of tail; a well-developed connection between swimbladder and back of skull.

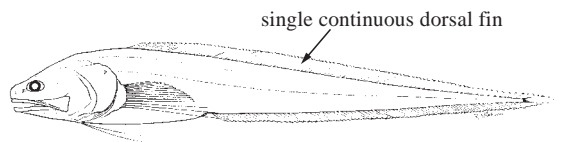
Ophidiidae: a small caudal fin joined to dorsal and anal fins; a single continuous dorsal fin, its rays usually longer than opposites of anal fin; no spinous dorsal-fin rays; pelvic fins, if present, with few rays, located under head as far forward as throat in some species.



Macrouridae



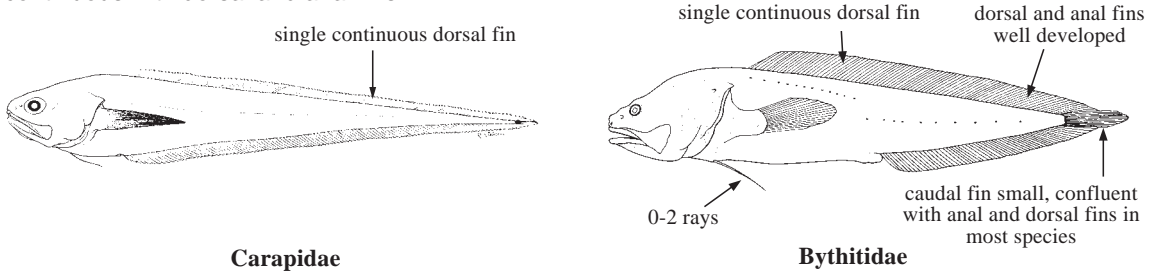
Moridae



Ophidiidae

Carapidae: anal fin longer than the single dorsal fin, its origin far forward, usually under pectoral fins; no scales; teeth on palate.

Bythitidae: viviparous, males with an external intromittent organ; species in the area with caudal fin continuous with dorsal and anal fins.



Key to the genera of Bathygadidae occurring in the area

- 1a. Elongated rays in pelvic, pectoral, and sometimes first dorsal fins (Fig. 1); retia mirabilia in swimbladder 4; (chin barbel usually well developed, absent or rudimentary in some species) *Gadomus*
- 1b. No greatly prolonged rays in dorsal and pectoral fins (Fig. 2); retia mirabilia in swimbladder 2; (chin barbel usually absent, rudimentary in a few species) *Bathygadus*

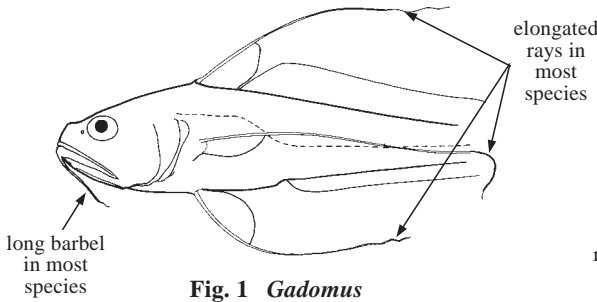


Fig. 1 *Gadomus*

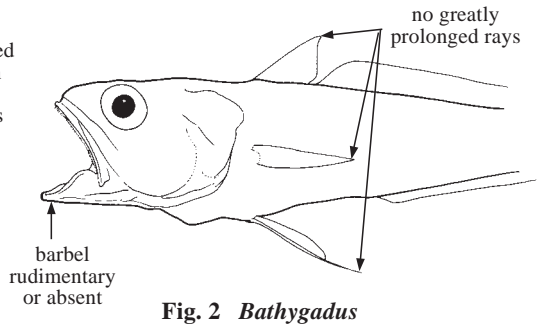


Fig. 2 *Bathygadus*

List of species occurring in the area

- Bathygadus cottoides* Günther, 1878
- Bathygadus dubiosus* Weber, 1913
- Bathygadus entomelas* Gilbert and Hubbs, 1920
- Bathygadus spongiceps* Gilbert and Hubbs, 1920
- Bathygadus sulcatus* (Smith and Radcliffe, 1912)
- Gadomus denticulatus* Gilbert and Hubbs, 1920
- Gadomus filamentosus* (Smith and Radcliffe, 1912)
- Gadomus furvescens* (Alcock, 1894)
- Gadomus introniger* Gilbert and Hubbs, 1920
- Gadomus magnifilis* Gilbert and Hubbs, 1920
- Gadomus multifilis* (Günther, 1887)

References

Cohen, D.M., T. Inada, T. Iwamoto, and N. Scialabba. 1990. FAO Species Catalogue. Vol. 10. Gadiform fishes of the world (order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. *FAO Fish. Synop.*, (125)Vol.10:442 p.

Howes, G.J. 1988. The cranial muscles and ligaments of macrouroid fishes (Teleostei: Gadiformes); functional, ecological and phylogenetic influences. *Bull. Brit. Mus. (Nat.Hist) (Zool.)*, 54(1):1-62.

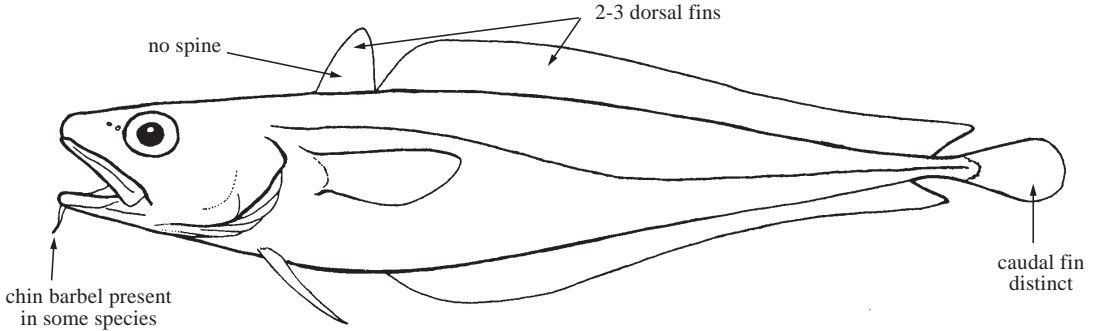
Howes, G.J. 1989. Phylogenetic relationships of macrouroid and gadoid fishes based on cranial myology and arthrology. In *Papers on the systematics of gadiform fishes*, edited by D.M. Cohen. Sciences series No. 32, Nat. Hist Mus. L.A. County, pp. 113-128.

Howes, G.J. and O.A. Crimmen. 1990. A review of the Bathygadidae (Teleostei: Gadiformes). *Bull. Brit. Mus. Nat. Hist. (Zool.)*, 56(2):155-203.

MORIDAE**Moras**

by T. Iwamoto

DDiagnostic characters: Body relatively elongate (size to about 80 cm), tapering to a narrow caudal peduncle. Chin barbel present in some species. Mouth terminal or inferior; teeth few or lacking on roof of mouth. **No spines in fins. Two or 3 dorsal fins; first dorsal fin short**, with 2 to 14 soft rays; **second dorsal fin (or third in species with 3 dorsal fins) long**, with 27 to 77 soft rays. Middle rays of second dorsal fin and anal fin sometimes short, dividing fins into 2 lobes. Anal fin long, with 35 to 112 soft rays, its origin behind pectoral fins. **Caudal fin separate from dorsal and anal fins.** Pelvic fins thoracic, never very close together. Small cycloid scales on head and body. Swimbladder attached to membranous area at rear of cranium. Ventral light organ present or absent. **Colour:** variable, black or grey to light brown, violet to bluish, pinkish to reddish; some species have iridescent areas.

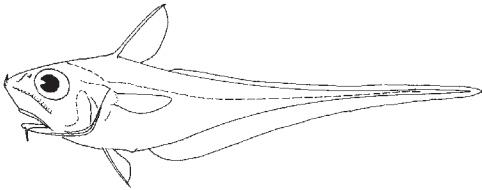
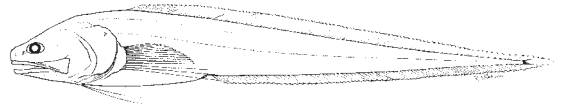


Habitat, biology, and fisheries: Shallow reefs to deep sea, a few species bathypelagic but most benthopelagic. Distribution of family worldwide; a few species very broadly distributed. A few species of commercial importance in temperate southern-hemisphere waters.

Similar families occurring in the area

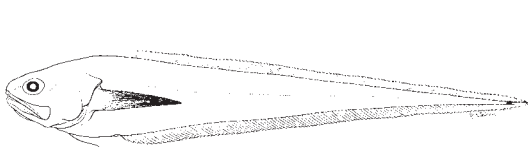
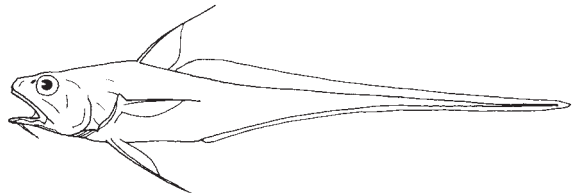
Macrouridae: no caudal fin; body scales usually spinulose.

Ophidiidae and Bythitidae: pelvic fins close together; dorsal, caudal, and anal fins joined in most.

**Macrouridae****Ophidiidae**

Carapidae: anal fin usually longer than the single dorsal fin, its origin far forward, usually under pectoral fins; no scales.

Bathygadidae: no caudal fin; second dorsal fin much better developed than anal fin.

**Carapidae****Bathygadidae**

Key to the genera of Moridae occurring in the area

- 1a.** Mouth inferior, beneath a prominent, flattened, pointed, bony snout (Fig. 1) *Antimora*
1b. Mouth terminal to slightly inferior; snout normal → 2

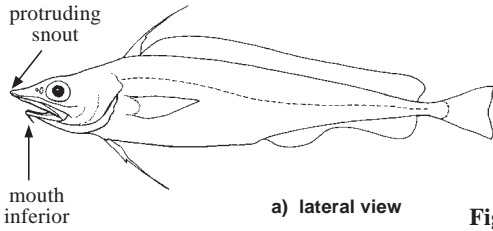
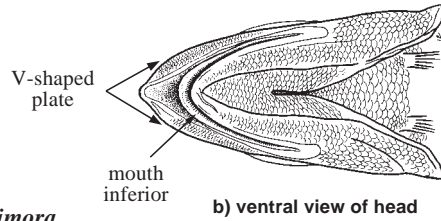


Fig. 1 *Antimora*



- 2a.** No dark scaleless patch on belly (Fig. 2) *Laemonema*
2b. A small, dark, scaleless patch (ventral light organ) on belly (Fig. 3) → 3

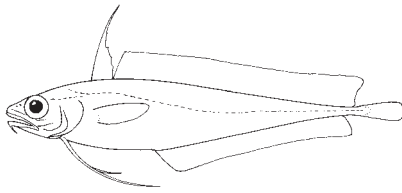


Fig. 2 *Laemonema*

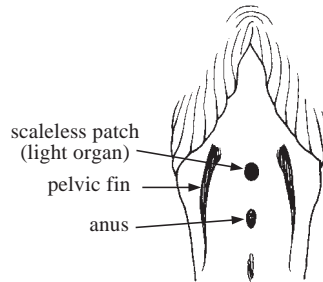


Fig. 3 ventral view

- 3a.** Chin barbel present, ventral light organ prominent, relatively large (Fig. 4) *Physiculus*
3b. Chin barbel absent, ventral light organ very small (Fig. 5) *Gadella*

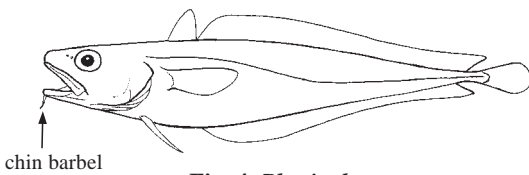


Fig. 4 *Physiculus*

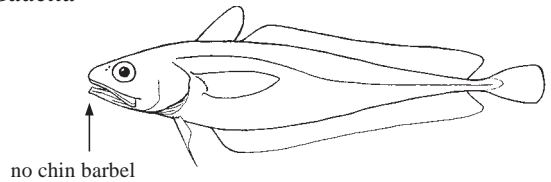


Fig. 5 *Gadella*

List of species occurring in the area

- Antimora rostrata* (Günther, 1878)
- Gadella norops* Paulin, 1987
- Laemonema rhodochir* Günther, 1878
- Physiculus longifilis* Weber, 1913
- Physiculus luminosa* Paulin, 1983
- Physiculus nigrescens* Smith and Radcliffe, 1912
- Physiculus peregrinus* (Günther, 1871)
- Physiculus roseum* Alcock, 1891
- Physiculus therosideros* Paulin, 1987

References

Cohen, D.M., T. Inada, T. Iwamoto, and N. Scialabba. 1990. FAO Species Catalogue. Vol. 10. Gadiform fishes of the world (order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. *FAO Fish. Synop.*, (125)Vol.10:442 p.

Okamura, O., K. Amaoka and F. Mitani (eds.). 1982. Fishes of the Kyushu-Palau Ridge and Tosa Bay. *Japan Fish. Res. Cons. Assoc. Tokyo*, 435 pp.

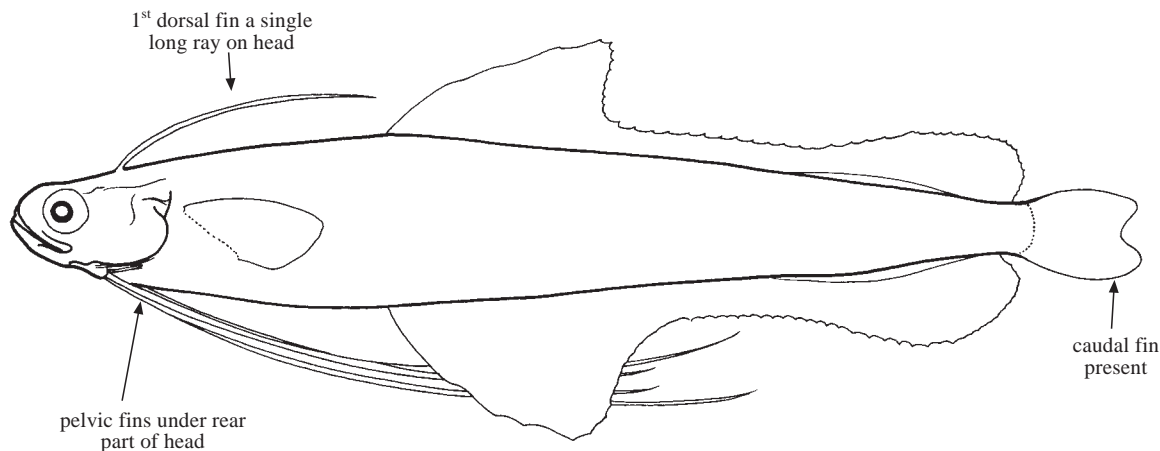
Paulin, C.D. 1983. A revision of the family Moridae (Pisces: Anacanthini) within the New Zealand region. *Rec. Natl. Mus. New Zeal.*, 2(9):81-126.

Paulin, C.D. 1989. Review of the morid genera *Gadella*, *Physiculus*, and *Salilota* (Teleostei: Gadiformes) with descriptions of seven new species. *New Zeal. J. Zool.*, 16:93-133.

BREGMACEROTIDAE**Codlets (codlings)**

by T. Iwamoto

Diagnostic characters: Body elongate, head relatively short. Two dorsal fins, the first a **single long ray on top of rear part of head**, the second with a long base, middle rays much shorter; a single long-based anal fin with middle rays much shorter; **pelvic fins** inserted under rear part of head, **with long, thick rays that extend far beyond beginning of anal fin**. **Colour:** variable, ranging from overall dark to pale or silvery.



Habitat, biology, and fisheries: Small fishes, rarely exceeding 10 cm in length, pelagic in coastal and oceanic waters, mostly restricted to the upper 300 m of the water column. One species commercially exploited, but others of little or no importance to the fisheries of the area. The family is currently being revised by A.S. Harold, who has kindly provided information on the species occurring in the area.

Similar families occurring in the area

None. The Bregmacerotidae is distinct by the elongate single dorsal-fin ray on the top of head, and the long, thick pelvic-fin rays inserted under the head.

List of species occurring in the area^{1/}

The symbol  is given when species accounts are included.

Bregmaceros japonicus Tanaka, 1908

Bregmaceros lanceolatus Shen, 1960

 *Bregmaceros mccllellandi* Thompson, 1840

Bregmaceros nectabanus Whitley, 1941

Bregmaceros neonectabanus Masuda, Ozawa, and Tabeta, 1986

Bregmaceros pescadorus Shen, 1960

Bregmaceros rarisquamosus Munro, 1950

References

Belianina, T.N. 1974. Development, taxonomy and distribution of fishes of the family Bregmacerotidae. *Tr. Inst. Okeanol.*, 96:143-188. (Engl. transl. TT 77-53143, *Natl. Mar. Fish. Serv.* NOAA.)

Cohen, D.M., T. Inada, T. Iwamoto, and N. Scialabba. 1990. FAO Species Catalogue. Vol. 10. Gadiform fishes of the world (order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. *FAO Fish. Synop.*, (125)Vol.10:442 p.

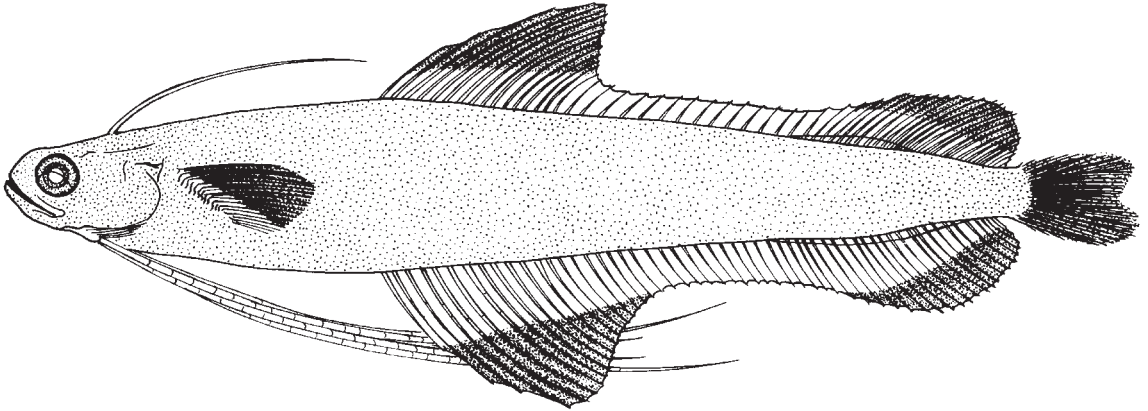
^{1/} List provided by A.S. Harold, March 1995.

Bregmaceros maclellandi Thompson, 1840

UNC

Frequent synonyms / misidentifications: see **Remarks**.

FAO names: **En** - Unicorn cod; **Fr** - Bregmacère de l'océan Indien; **Sp** - Bregmacero.



Diagnostic characters: Head relatively short, 6 or more times in total length. Origin of anal fin under origin of second dorsal fin. Second dorsal fin with 57 to 65 soft rays. Anal fin with 58 to 68 soft rays. Lateral-line scales less than 78. **Colour:** back and upper part of sides light brown, middle and lower sides and belly pale to silvery; **upper part of pectoral fins black or rather dark**; dark pigment usually present on caudal fin, anterior and posterior lobes of second dorsal fin, and sometimes anterior and posterior lobes of anal fin (pigments often faint or absent, especially in young).

Size: Maximum length about 10 cm; commonly to 7 cm.

Habitat, biology, and fisheries: Caught in bag nets and trawls. Marketed fresh. Separate statistics are not reported for this species from the Western Central Pacific.

Distribution: Coastal waters from the west coast of India to the Gulf of Thailand; probably widespread in Southeast Asia and Indonesia, but taxonomically confused and distribution records must be verified.

Remarks: Taxonomically confused; possible 1 or more junior synonyms exists. So far known, other *Bregmaceros* species are distinguished from *B. maclellandi* by lacking the combination of pigment pattern, counts of scales, and counts of fin rays.

