

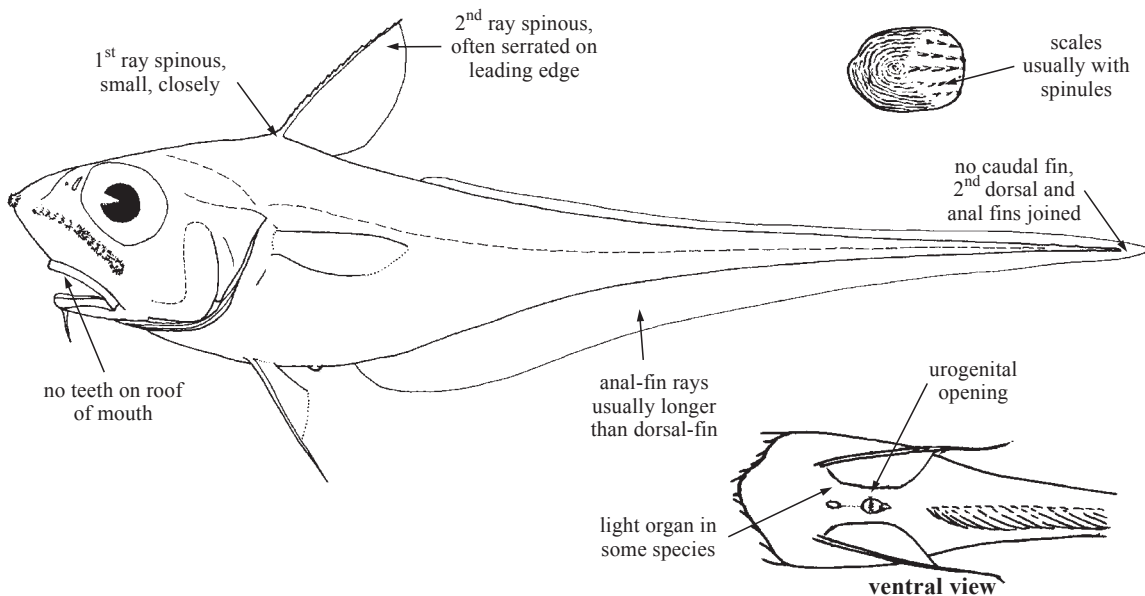
Order GADIFORMES

MACROURIDAE

Grenadiers (rattails)

by T. Iwamoto, California Academy of Sciences, USA

Diagnostic characters: Small to medium-sized (to about 110 cm in Area 31, commonly between 20 and 60 cm) with laterally compressed body and long, strap-like tail tapering to a slender point. Eye large, 20 to 40% or more of head length; snout in most species prominent, protruding; mouth small to moderately large, jaws subterminal to inferior. Jaw teeth well developed, of variable size and arrangement; **no teeth on roof of mouth**. Branchiostegal rays 6 or 7. **Gill rakers tubercular; outer gill slit greatly restricted by opercular membrane** connected to upper and lower reaches of gill arch. **Two dorsal fins, the first short-based and high, with second ray spinous; second dorsal fin long-based, confluent with anal fin at end of tail; anal fin usually with much longer rays than second dorsal fin; no caudal fin;** pelvic fin usually situated forward of pectoral-fin origin, 7 to 14 rays in species from Area 31. Exposed field of scales in almost all species covered with spinules; many with modified, thick, spiny scales at tip of snout and over ridges of head. **Colour:** variably brown, black, grey, bluish, often silvery along sides of head and body.

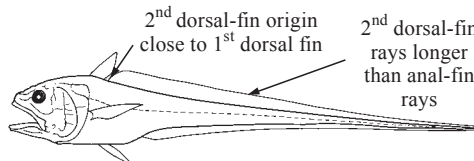


Habitat, biology, and fisheries: Benthopelagic fishes of continental slope and rise, in about 250 to more than 4 000 m (a few species pelagic, but none in the area). Food predominantly bottom invertebrates, free-swimming crustaceans, fish, and cephalopods. Spawning probably prolonged in most species, eggs often of multiple sizes in ovaries; eggs and larvae pelagic, young develop rapidly and descend to bottom. Biology of Area 31 species virtually unknown. A few species in cold-temperate waters attain large size and form important commercial fisheries, but in Area 31 none commercially utilized, although some species taken in quantity as bycatch of deep-water shrimp trawlers.

Remarks: Family often treated as including 4 subfamilies: Macrourinae, Macrouroidinae, Bathygadinae, and Trachyrincinae.

Similar families occurring in the area

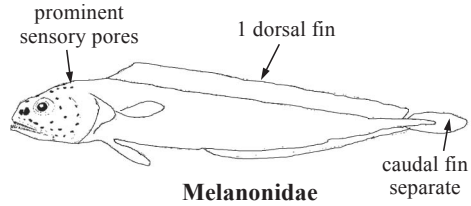
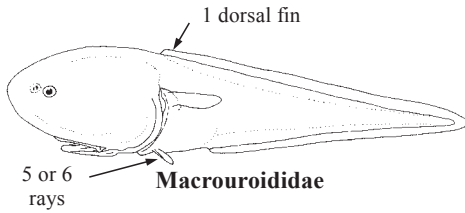
Bathygadidae: mouth large, essentially terminal; first and second dorsal fins closely approximated, without a distinct gap between; second dorsal fin with much longer rays than anal fin.



Bathygadidae

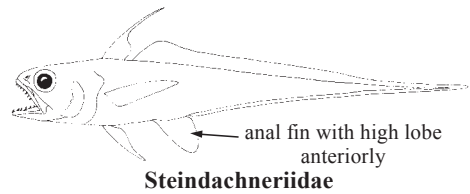
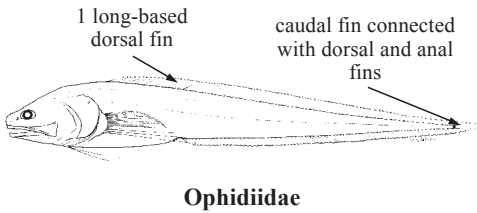
Macrouroididae: mucous chambers of head enormously developed, giving inflated, rounded shape to head; outer gill arch not restricted by opercular membrane; chin barbel absent; outer gill rakers long, slender; 1 long-based, short-rayed dorsal fin; pelvic fin small, of 5 or 6 rays (absent in 1 species not found in area).

Melanonidae: 1 long-based dorsal fin (anterior section sometimes appearing as separate fin), 1 long-based anal fin, each separated from caudal fin; prominent sensory pores and ridge-like rows of free neuromasts on head; teeth on vomer and palatines.



Ophidiidae: 1 long-based dorsal fin; caudal fin connected with dorsal and anal fins; bases of pelvic fins close together, without a broad scaled space between.

Steindachneriidae: anal fin with high lobe anteriorly, rays weak and short over remainder of fin; anus and urogenital opening widely separated; vomerine teeth present.



Key to the species of Macrouroidae occurring in the area

- 1a. Anus not surrounded by a broad margin of naked black skin (Fig. 1a), located immediately anterior to anal fin (separated by 1 or 2 rows of scales at most); branchiostegal rays 6 or 7 → 2
- 1b. Anus surrounded by a broad margin of naked skin (Fig. 1b) or far removed from anal fin (Fig. 1c); branchiostegal rays 7 → 18

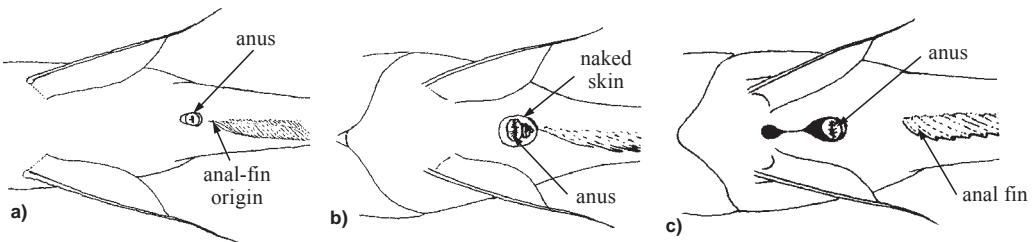


Fig. 1 ventral view

- 2a. Spinous second ray of first dorsal fin smooth (Fig. 2); snout pointed with spiny terminal scute and coarsely scaled head ridges; branchiostegal rays 6; pelvic-fin rays 7 . . . (*Caelorinchus*) → 4
- 2b. Spinous second ray of first dorsal fin serrated (Fig. 3) or smooth, if smooth, head mostly naked and lacking spinulated scales; branchiostegal rays 6 or 7; pelvic-fin rays 8 to 14 (rarely 7) → 3

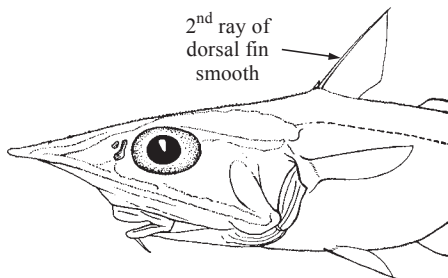


Fig. 2 lateral view of head (*Caelorinchus*)

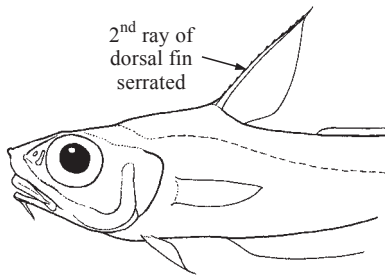


Fig. 3 lateral view of head

- 3a. Head covering membranous (Fig. 4), mostly without scales; small lens-like structures on chest and in front of anus; spinous second ray of dorsal fin smooth except in one species; striations on gular membrane (Fig. 5); branchiostegal rays 7 (Fig. 6) (*Hymenocephalus*) → 7
- 3b. Head covering tough, opaque, mostly covered with spinulated scales; no lens on chest or in front of anus; spinous second ray of dorsal fin serrated; no gular striations; branchiostegal rays 6 (*Coryphaenoides*) → 10

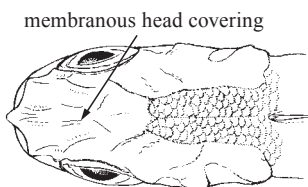


Fig. 4 dorsal view of head

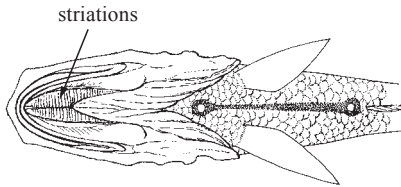


Fig. 5 ventral view of body

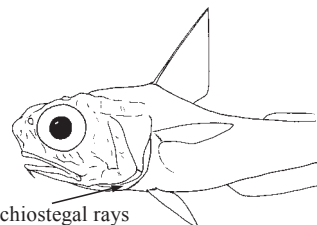


Fig. 6 lateral view of body

- 4a. Underside of head almost completely naked; no black naked fossa on chest; body scales with stout, enlarged median keel (Fig. 7) *Caelorinchus occa*
- 4b. Underside of head almost entirely scaled except for median swath on underside of snout; a prominent black naked fossa on chest; body scales covered with short, fine spinules, none enlarged (Fig. 8) → 5

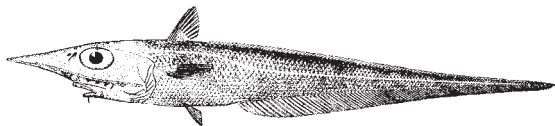


Fig. 7 *Caelorinchus occa*

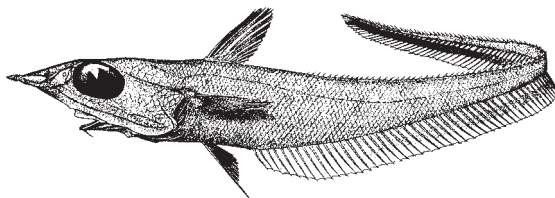
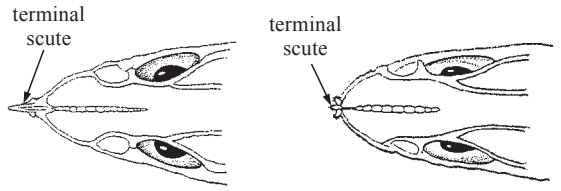


Fig. 8 *Caelorinchus ventrilux*

- 5a. First dorsal fin with a distinct black membrane between spinous second ray and first branched ray; a prominent black stripe posteriorly on anal fin; narrow black median line between first and second dorsal fins *Caelorinchus ventrilux*
- 5b. First dorsal fin uniformly blackish; no stripe on anal fin; no black line between dorsal fins → 6

- 6a. Terminal scute of snout lanceolate, projecting far beyond lateral scutes (Fig. 9a) *Caelorinchus caribbaeus*
- 6b. Terminal scute of snout short and stubby, projecting little beyond lateral scutes. (Fig. 9b) *Caelorinchus caelorhincus*



a) *Caelorinchus caribbaeus* b) *Caelorinchus caelorhincus*

- 7a. Pelvic-fin rays 7 to 9 (usually 8); spinous ray of dorsal fin with weakly serrated leading edge; gill rakers on lower limb of first arch 12 to 15 (Fig. 10) *Hymenocephalus gracilis*
- 7b. Pelvic-fin rays 10 to 14; spinous ray of dorsal fin smooth; gill rakers on lower limb of first arch 16 to 25 → 8

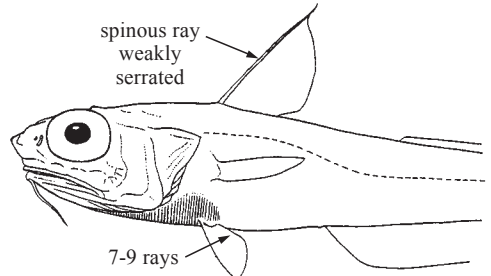


Fig. 9 dorsal view of head

Fig. 10 *Hymenocephalus gracilis*

- 8a. Barbel on chin about 10 to 15% of head length; pelvic-fin rays 10 or 11 (rarely 12) (Fig. 11) . . . *Hymenocephalus italicus*
- 8b. Barbel absent or rudimentary, less than 10% of head length; pelvic-fin rays 13 or 14 (rarely 12) → 9

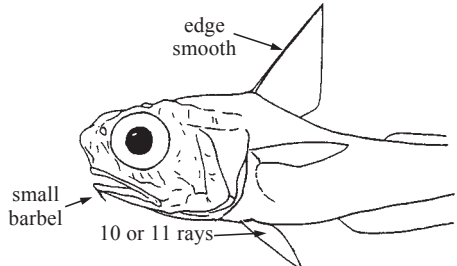


Fig. 11 *Hymenocephalus italicus*

- 9a. Horizontal diameter of orbit 4 or 5 times into head; interorbital width 1/3 or more of head length (Fig. 12) *Hymenocephalus aterrimus*
- 9b. Horizontal diameter of orbit less than 4 times into head; interorbital width 1/3 or less of head length (Fig. 13) *Hymenocephalus billsamorum*

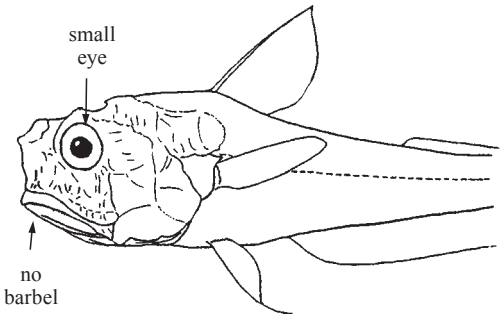


Fig. 12 *Hymenocephalus aterrimus*

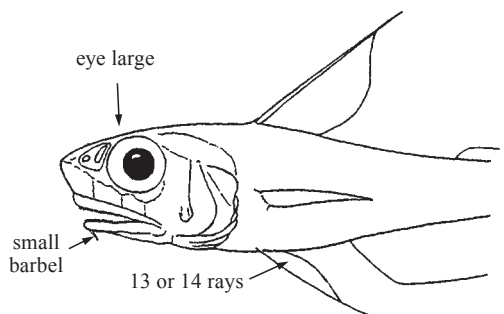


Fig. 13 *Hymenocephalus billsamorum*

- 10a. Underside of snout fully scaled → 11
- 10b. Underside of snout mostly naked → 15

- 11a. Pelvic-fin rays 7 or 8 → 12
- 11b. Pelvic-fin rays 9 to 11 → 13

- 12a. Head broad, rounded; snout high; interorbital space broad, more than 1/3 of head length; inner gill rakers on first arch 19 to 20 total; grooved lateral line present (Fig. 14)
 *Coryphaenoides rupestris*
- 12b. Head more compressed, not rounded; snout low; interorbital space less than 1/3 of head length; inner gill rakers on first arch 8 or 9 total; no grooved lateral line (Fig. 15)
 *Coryphaenoides alateralis*

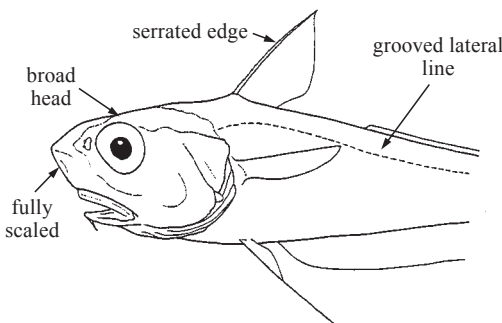


Fig. 14 *Coryphaenoides rupestris*

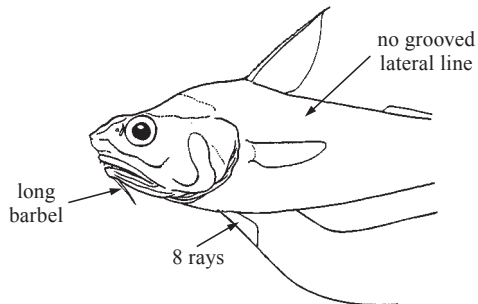


Fig. 15 *Coryphaenoides alateralis*

- 13a. Interorbital space less than 1/5 of head length; barbel thick and fleshy (Fig. 16) . *Coryphaenoides zaniophorus*
- 13b. Interorbital space more than 1/5 of head length; barbel slender. → 14

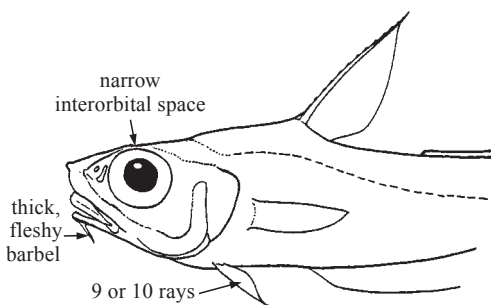


Fig. 16 *Coryphaenoides zaniophorus*

- 14a. Upper jaw extends to below posterior 1/3 of orbit; orbital rim black; barbel short, 5 to 9% of head length; terminal snout scute large, prominent (Fig. 17)
 *Coryphaenoides mexicanus*
- 14b. Upper jaw extends to vertical through posterior end of orbit or beyond; orbital rim not marked; barbel 10 to 23% of head length; terminal snout scute moderately developed, not prominent (Fig. 18)
 *Coryphaenoides rudis*

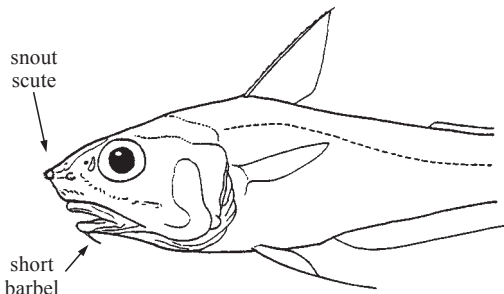


Fig. 17 *Coryphaenoides mexicanus*

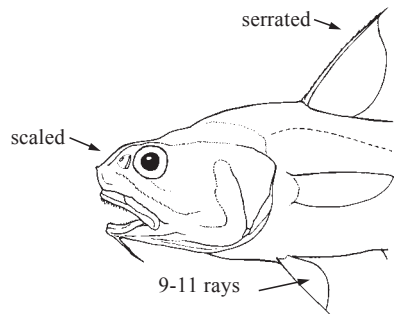


Fig. 18 *Coryphaenoides rudis*

- 15a. Pelvic-fin rays 12 to 14; inner gill rakers of first arch 15 or 16 total (Fig. 19) *Coryphaenoides mediterraneus*
- 15b. Pelvic-fin rays 9 to 11; inner gill rakers of first arch 9 to 16 total → 16

- 16a. Premaxillary teeth in 1 or 2 rows (Fig. 20) *Coryphaenoides armatus*
- 16b. Premaxillary teeth in a narrow to broad band → 17

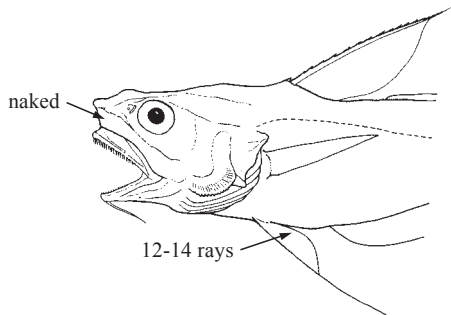


Fig. 19 *Coryphaenoides mediterraneus*

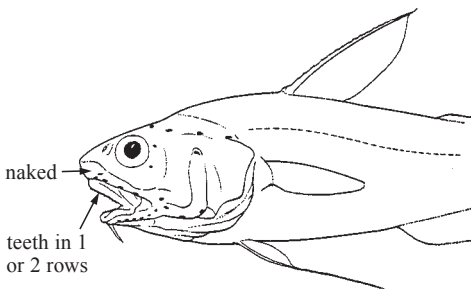


Fig. 20 *Coryphaenoides armatus*

- 17a. Lower jaw with 1 row of teeth; snout low and blunt, barely protruding (Fig. 21) *Coryphaenoides leptolepis*
- 17b. Lower jaw with 2 or 3 rows of teeth; snout relatively high, pointed, and protruding (Fig. 22) *Coryphaenoides carapinus*

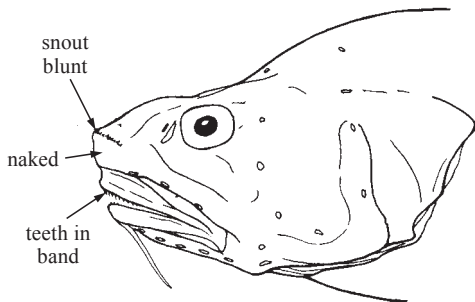


Fig. 21 *Coryphaenoides leptolepis*

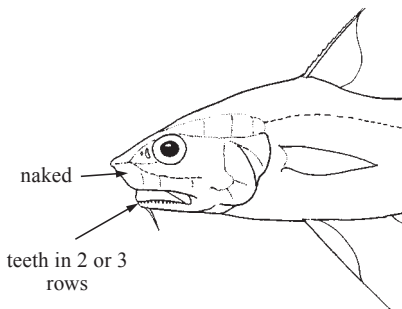


Fig. 22 *Coryphaenoides carapinus*

- 18a. Anus surrounded by a broad margin of black naked skin, the entire (periproct) region closely abutting origin of anal fin; no naked fossa anterior to periproct → 19
- 18b. Periproct region distinctly separated from anal-fin origin, usually closer to pelvic-fin insertion; small to moderate-size black naked fossa often present before periproct → 21

- 19a. Head globose, expanded and soft (Fig. 23); chin barbel minute; 8 to 10 pelvic-fin rays *Cetonurus globiceps*
- 19b. Head not expanded, generally firm; chin barbel moderate in size; 7 or 11 to 12 pelvic-fin rays → 20

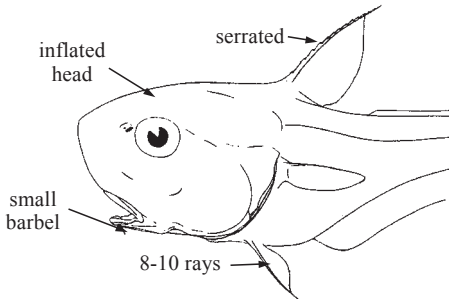


Fig. 23 *Cetonurus globiceps*

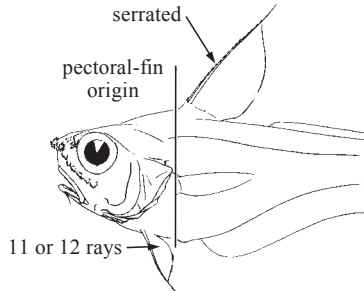


Fig. 24 *Sphagemacrurus grenadae*

- 20a. Spinous dorsal-fin ray serrated along leading edge; pelvic fins far forward, anterior to vertical through pectoral-fin base; 11 or 12 pelvic-fin rays (Fig. 24) *Sphagemacrurus grenadae*
- 20b. Spinous dorsal-fin ray smooth along leading edge; pelvic fins well behind vertical through pectoral-fin base; 7 pelvic-fin rays (Fig. 25) *Trachonurus sulcatus*

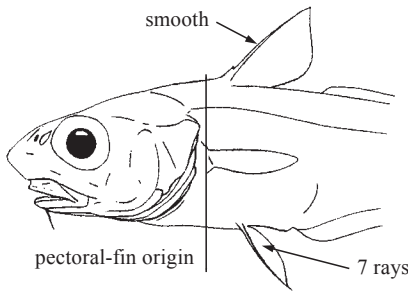


Fig. 25 *Trachonurus sulcatus*

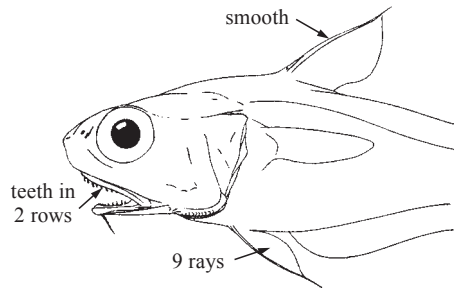


Fig. 26 *Malacocephalus*

- 21a. Teeth in lower jaw enlarged, in 1 row; a large, bean-shaped fossa between bases of pelvic fins; scale rows present over lower branchiostegal rays (Fig. 26) (*Malacocephalus*) → 22
- 21b. Teeth in lower jaw in a 2 or more rows or in a broad band; fossa between bases of pelvic fins present or absent, not bean-shaped; few or no scales on branchiostegal rays → 24
- 22a. Pelvic-fin rays 8; premaxillary teeth in more than 2 rows; spinous dorsal-fin ray serrated; tip and leading edge of snout blackish → 23
- 22b. Pelvic-fin rays 9; premaxillary teeth in 2 distinct rows; spinous dorsal-fin ray smooth; no black margins on snout *Malacocephalus laevis*

23a. Interorbital space narrow, 20 to 24% of head length; orbital rim black; no enlarged median spinules on scales of dorsum in adults (Fig. 27) *Malacocephalus occidentalis*

23b. Interorbital space broad, 27 to 34% of head length; no black orbital rim; enlarged median spinules on scales of dorsum in adults (Fig. 28) *Malacocephalus okamurai*

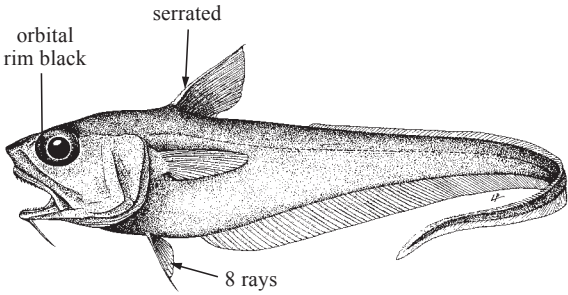


Fig. 27 *Malacocephalus occidentalis*

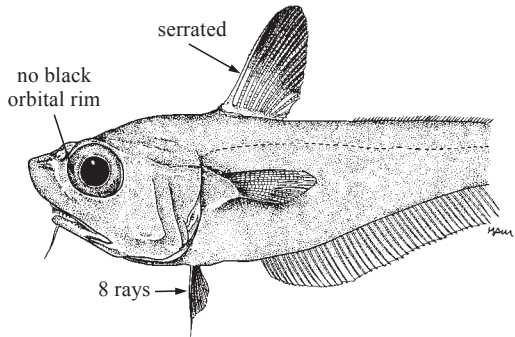


Fig. 28 *Malacocephalus okamurai*

24a. Almost entire dorsal and ventral surfaces of snout naked; no terminal snout scute (Fig. 29) . . . *Kumba* sp. A

24b. Dorsal surface of snout scaled, ventral surface variously naked to fully scaled → 25

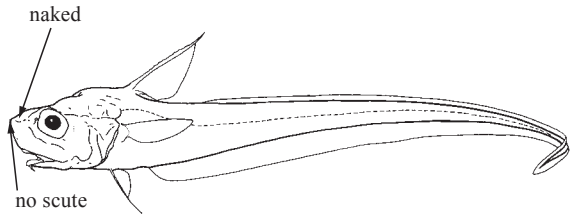


Fig. 29 *Kumba* sp. A

25a. All of snout and head surfaces uniformly covered with finely spinulated scales, with no thick, spiny, or tubercular scales at tip of snout or along head ridges; total gill rakers on inner side of first arch 12 to 16; leading edge of snout blackish (Fig. 30) (*Ventrifossa*) → 26

25b. Underside of snout usually with broad to narrow naked area above upper lip; snout with or without a tubercular scale at tip, ridges of head with or without enlarged, coarsely spined scales; total gill rakers on inner side of first arch 8 to 11, rarely 12; leading edge of snout not distinctly marked in black (Fig. 31) → 27

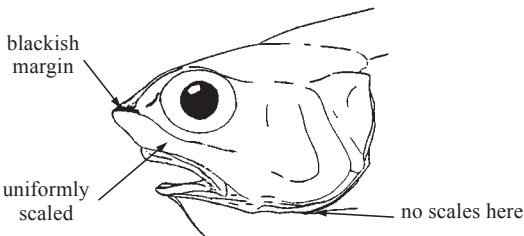


Fig. 30 *Ventrifossa*

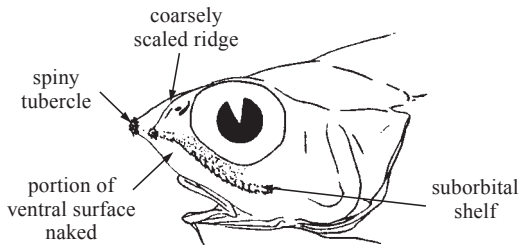


Fig. 31 *Nezumia*

- 26a. Length of chin barbel about equal to or much longer than orbit diameter; median nasal ridge blackish; pelvic-fin rays 9 or 10 (Fig. 32) *Ventrifossa macropogon*
- 26b. Length of chin barbel less than orbit diameter; median nasal ridge pale; pelvic-fin rays 8, rarely 9 (Fig. 33) *Ventrifossa mucocephalus*

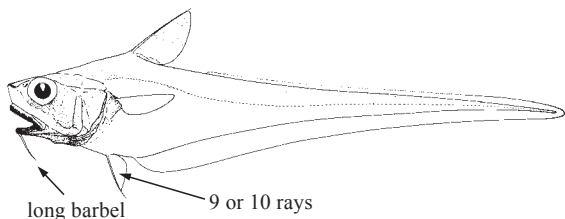


Fig. 32 *Ventrifossa macropogon*

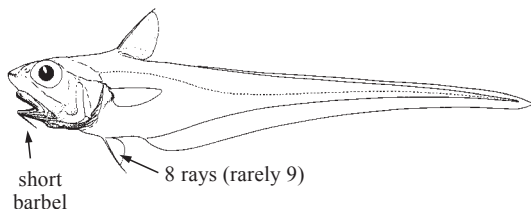


Fig. 33 *Ventrifossa mucocephalus*

- 27a. Scales of head and body small, 12 to 15 rows below origin of second dorsal fin to lateral line; scales on suborbital all small (Fig. 34) *Kuronezumia bubonis*
- 27b. Scales of head and body moderate to large, fewer than 10 rows below origin of second dorsal fin to lateral line; suborbital with 2 rows of stout, coarsely modified scales (*Nezumia*) → 28

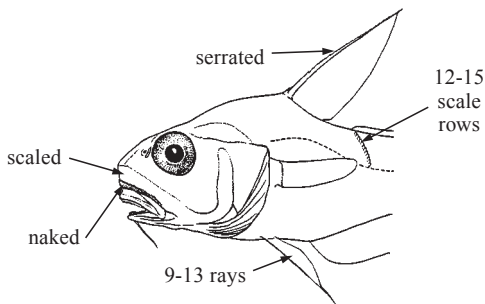


Fig. 34 *Kuronezumia bubonis*

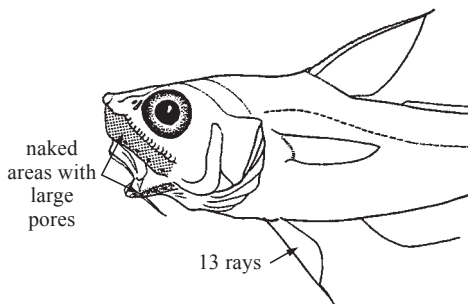


Fig. 35 *Nezumia longebarbata*

- 28a. Pelvic-fin rays 7 to 10 → 29
- 28a. Pelvic-fin rays 13 (Fig. 35) *Nezumia longebarbata*
- 29a. First dorsal fin with a prominent black tip or membrane between serrated spinous ray and first branched ray; pelvic-fin rays usually 7 to 9, rarely 10 → 30
- 29b. First dorsal fin uniformly dusky or dark; pelvic-fin rays 7 to 10 → 31

- 30a. First dorsal fin with a prominent black tip; pelvic-fin rays 7 to 9, rarely 10 (Fig. 36) *Nezumia aequalis*
- 30b. First dorsal fin with a black membrane between serrated spinous dorsal ray and first branched ray; pelvic-fin rays 7 (Fig. 37) *Nezumia bairdi*

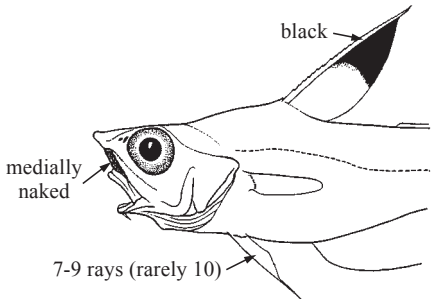


Fig. 36 *Nezumia aequalis*

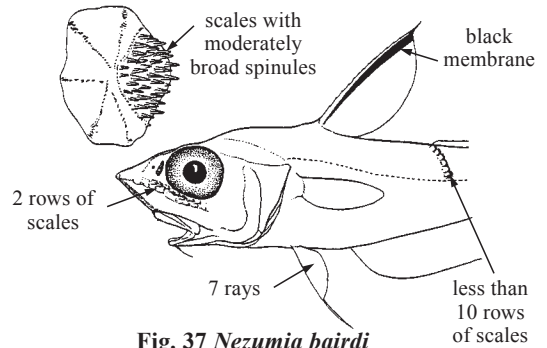


Fig. 37 *Nezumia bairdi*

- 31a. Snout pointed, relatively broad across lateral angles; upper jaw short, 20 to 32% of head length. → 32
- 31b. Snout bluntly rounded, narrow; upper jaw long, 40 to 45% of head length (Fig. 38) . *Nezumia atlantica*

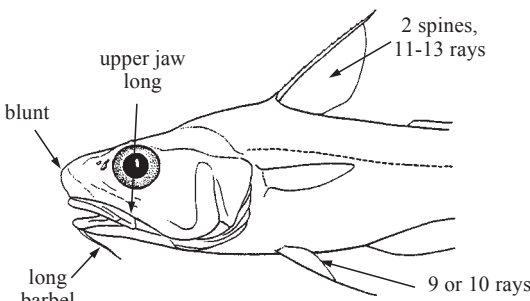


Fig. 38 *Nezumia atlantica*

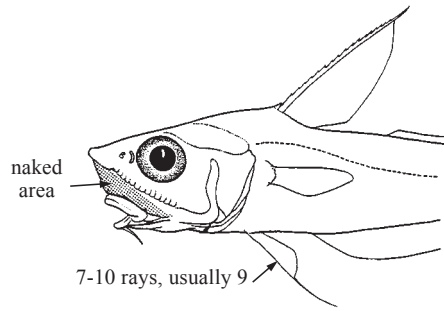


Fig. 39 *Nezumia sclerorhynchus*

- 32a. Entire underside of snout, anterior part of suborbital below ridge, and most of lower jaw naked; spinules on body scales needle-like, in parallel to slightly convergent rows, middle row often somewhat enlarged; pelvic-fin rays 7 to 10, usually 9 (Fig. 39) *Nezumia sclerorhynchus*
- 32b. Most of underside of head scaled, although median swath under snout often naked; spinules on body scales broadly lanceolate to shield-shaped; pelvic-fin rays 7 to 10, usually 7 or 9. → 33

- 33a.** Pelvic-fin rays 7; snout length 28 to 32%, chin barbel 8 to 21% head length (Fig. 40). . . *Nezumia suilla*
33b. Pelvic-fin rays 8 to 10, usually 9; snout length 32 to 36%, chin barbel 6 to 8% head length (Fig. 41) *Nezumia cyrano*

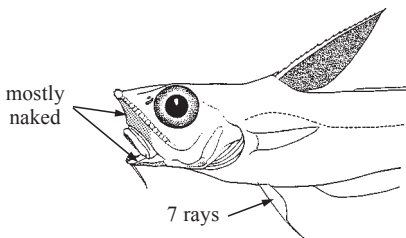


Fig. 40 *Nezumia suilla*

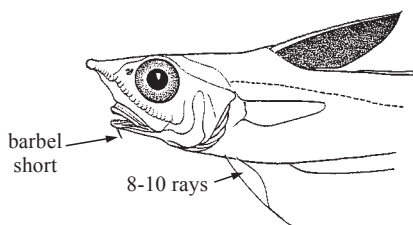


Fig. 41 *Nezumia cyrano*

List of species occurring in the area

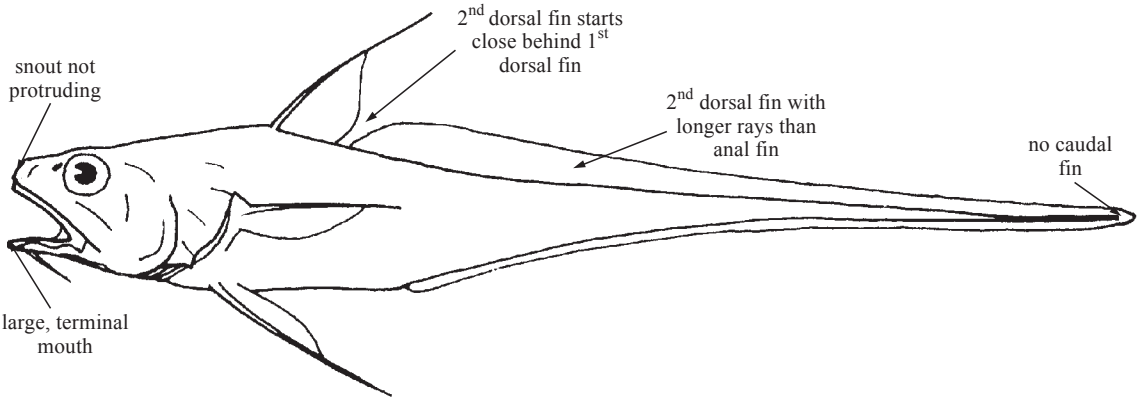
- Caelorinchus caelorincus* (Risso, 1810). To >30 cm. North Carolina to Suriname, SW21, SE27.
Caelorinchus caribbaeus (Goode and Bean, 1885). To 30 cm. North Carolina to Caribbean.
Caelorinchus occa (Goode and Bean, 1885). To >50 cm. Bahamas to Suriname.
Caelorinchus ventrilux Marshall and Iwamoto, 1973. To 30 cm. West Indies.
Cetonus globiceps (Vaillant in Filhol, 1883). To 40 cm. Tropical circumglobal.
Coryphaenoides alateralis Marshall and Iwamoto, 1973. To >30 cm. Gulf of Mexico.
Coryphaenoides armatus (Hector, 1875). To 90 cm. Circumglobal.
Coryphaenoides carapinus Goode and Bean, 1883. To 35 cm. North Atlantic.
Coryphaenoides leptolepis Günther, 1877. To >60 cm. North and South Atlantic, E North Pacific.
Coryphaenoides mediterraneus (Giglioli, 1893). To about 75 cm. Gulf of Mexico, SE27.
Coryphaenoides mexicanus (Parr, 1946). To >40 cm. Gulf of Mexico, Caribbean.
Coryphaenoides rudis Günther, 1878. To 125 cm. Circumglobal.
Coryphaenoides rupestris (Gunnerus, 1765). To >90 cm. N31 (N of 31°N), 27.
Coryphaenoides zaniophorus (Vaillant, 1888). To >40 cm. Gulf of Mexico, Caribbean, SE34.
Hymenocephalus aterrimus Gilbert, 1905. To about 20 cm. Probably tropical circumglobal.
Hymenocephalus billsamorum Marshall and Iwamoto, 1973. To 15 cm. Florida Straits, W Indies, Caribbean, Rio de Janeiro.
Hymenocephalus gracilis Gilbert and Hubbs, 1920. To 13 cm. Circumglobal.
Hymenocephalus italicus Giglioli, 1884. To 20 cm. N and Central Atlantic, W Indian Ocean.
Kumba sp. Iwamoto and Sazonov, 1992. Known from one juvenile. W Gulf of Mexico.
Kuronezumia bubonis (Iwamoto, 1974). To 55 cm. Gulf of Mexico to Suriname, Hawaii, W81.
Malacocephalus laevis (Lowe, 1843). To 65 cm. Tropical and temperate circumglobal.
Malacocephalus occidentalis Goode and Bean, 1885. To >45 cm. Tropical and temperate Atlantic.
Malacocephalus okamurai Iwamoto and Arai, 1987. To 30 cm. French Guiana, Brazil.
Nezumia aequalis (Günther, 1878). To 30 cm. Widespread N Atlantic.
Nezumia atlantica (Parr, 1946). To >45 cm. Gulf of Mexico, Caribbean, to N Brazil.
Nezumia bairdii (Goode and Bean, 1877). To 40 cm. Florida Straits to Grand Banks, NE34.
Nezumia cyrano Marshall and Iwamoto, 1973. To 30 cm. Gulf of Mexico, Caribbean, Suriname.
Nezumia longebarbata (Roule and Angel, 1933). To 41 cm. N Gulf of Mexico, E coast US at 39°N, Madeira.
Nezumia sclerorhynchus (Valenciennes, 1838). To 27 cm. Cape Cod S to Florida Straits, NE34, SE27.
Nezumia suilla Marshall and Iwamoto, 1973. To about 30 cm. Gulf of Mexico, Caribbean, Suriname.
Sphagemacrurus grenadae (Parr, 1946). To about 22 cm. Gulf of Mexico, Caribbean, E coast US at 39°N.
Trachonurus sulcatus (Goode and Bean, 1885). To about 50 cm. Widespread N Atlantic.
Ventrifossa macropogon Marshall, 1973. To about 45 cm. E coast Florida, Gulf of Mexico, Caribbean.
Ventrifossa mucocephalus Marshall, 1973. To about 40 cm. E coast Florida, Gulf of Mexico, Caribbean.

BATHYGADIDAE

Bathygadids

by T. Iwamoto, California Academy of Sciences, USA

Diagnostic characters: Medium-sized to about 60 cm, commonly 30 to 40 cm, with elongated, laterally flattened body that tapers to a point. **Snout not protruding.** Mouth large, essentially terminal. Jaw teeth all small, in bands; no teeth on roof of mouth. Chin barbel absent, rudimentary, or long. Seven branchiostegal rays. **Outer gill rakers on first arch long, slender; outer gill arch not restricted dorsally and ventrally by opercular membrane. Two dorsal fins; first dorsal fin short-based, long-rayed, with slightly to greatly elongated flexible spinous ray, second dorsal fin long, long-rayed, extending to tip of tail, confluent with long-based, short-rayed anal fin; no caudal fin;** pelvic fins well developed, with 8 to 10 soft rays. Scales deciduous, lacking spinules on exposed field. No light organ. Retia mirabilia and gas glands in swimbladder 2 or 4 each. **Colour:** variously dark to pale; belly usually dark.



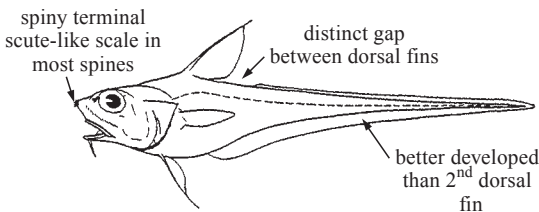
Habitat, biology, and fisheries: Benthopelagic over continental slope in 300 to more than 2 700 m. Almost nothing known of life history. Feeds primarily on swimming crustaceans, fish, and cephalopods. Some species taken in fairly large quantities in bycatch of bottom trawlers fishing for deep-water shrimp, but none currently utilized.

Remarks: Family often treated as subfamily of Macrouridae. Current treatment follows Howes and Crimmen (1990).

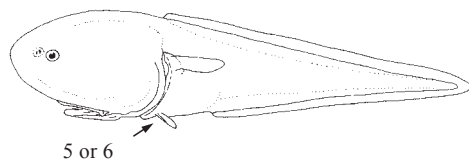
Similar families occurring in the area

Macrouridae: 2 dorsal fins separated by a distinct gap; anal-fin rays generally much longer than second dorsal-fin rays; outer gill rakers on first arch short, tubercular; first gill arch restricted dorsally and ventrally by opercular membrane; snout slightly to greatly protruding, tipped in most with a stout, spiny, modified scale; scales in most species covered with spinules.

Macrouroididae: 1 long-based, short-rayed dorsal fin extending to end of tail; anal fin similarly long-based and short-rayed; no caudal fin; pelvic fin small, short, weakly developed, with 5 or 6 soft rays; head inflated, rounded; mouth greatly underslung; scales covered with small, needle-like spinules.



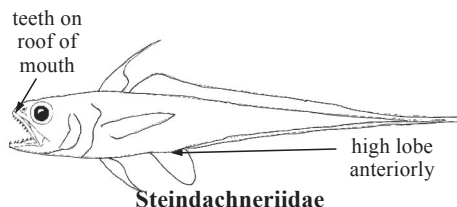
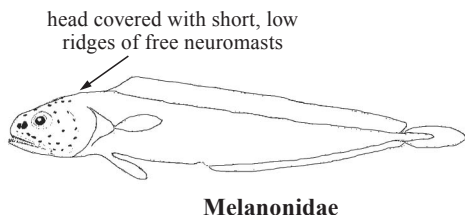
Macrouridae



Macrouroididae

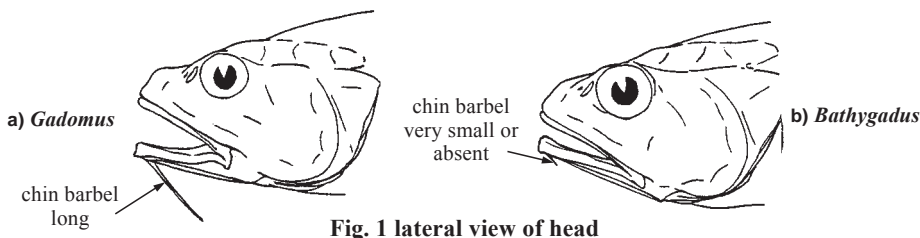
Melanonidae: dorsal and anal fins separated from caudal fin; head covered with short, low ridges of free neuromasts; head pores large, prominent.

Steindachneriidae: anal fin with high lobe anteriorly, remainder of fin rudimentary to poorly developed; teeth present on roof of mouth (vomer); abdominal light organ well developed. Anus and urogenital opening widely separated.



Key to the species of Bathygadidae occurring in the area

- 1a. Chin barbel long (Fig. 1a); an elongated ray in pectoral and pelvic fins (*Gadomus*) → 2
- 1b. Chin barbel very small or absent (Fig. 1b); no elongated ray in pectoral and pelvic fins (*Bathygadus*) → 4

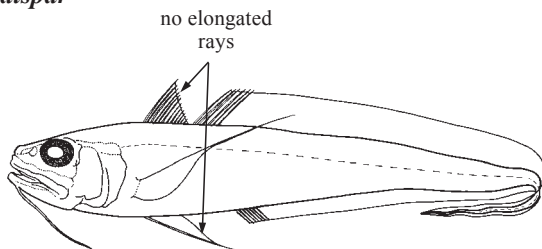
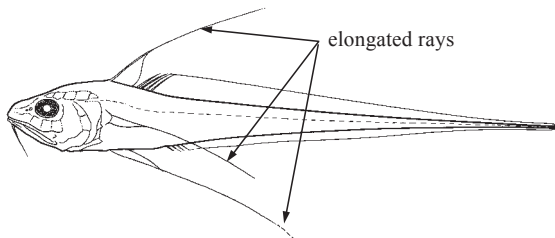
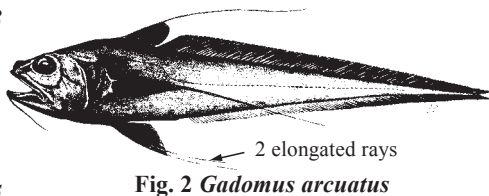


2a. Two elongated rays in pelvic fin; pectoral-fin soft rays 22 to 25 (Fig. 2) . . . *Gadomus arcuatus*

2b. One elongated ray in pelvic fin; pectoral-fin soft rays 14 to 20 → 3

3a. First dorsal and pelvic fins with a greatly elongated ray, each much longer than head length; gill rakers on lower limb of first arch 27 to 31; pectoral-fin soft rays 14 to 16 (Fig. 3) *Gadomus longifilis*

3b. No greatly elongated ray in first dorsal and pelvic fins; gill rakers on lower limb of first arch 20 to 21; pectoral-fin soft rays 18 to 20 (Fig. 4) *Gadomus dispar*



- 4a. A very small barbel present on chin; body integument relatively tough, not readily torn; head bones strong; gill filaments pale (Fig. 5) *Bathygadus macrops*
- 4b. No barbel on chin; body integument weak, easily torn; head bones weak, easily broken; gill filaments dusky or pale. → 5
- 5a. Pelvic-fin rays 8; gill filaments dusky; orbit 4 or fewer times into head length, 0.9 to 1.3 times into interorbital width (Fig. 6) *Bathygadus melanobranchus*
- 5b. Pelvic-fin rays 9; gill filaments pale; orbit 4 or more times into head length, 1.3 to 2.9 times into interorbital width (Fig. 7) *Bathygadus favosus*

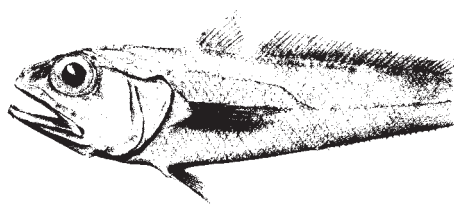


Fig. 5 *Bathygadus macrops*

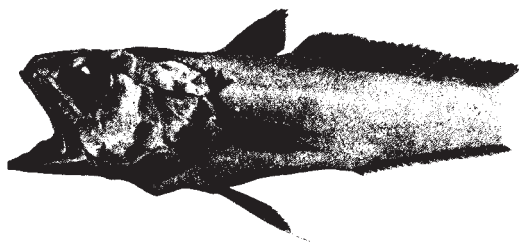


Fig. 6 *Bathygadus melanobranchus*

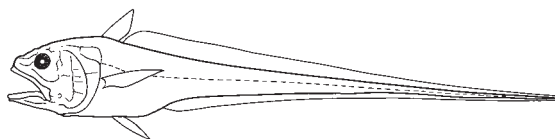


Fig. 7 *Bathygadus favosus*

List of species occurring in the area

- Bathygadus favosus* Goode and Bean, 1886. To 45 cm. Gulf of Mexico, Caribbean Sea, NE South America, Area 34; depths 750 to 2 750 m.
- Bathygadus macrops* Goode and Bean, 1885. To 45 cm. Gulf of Mexico, Caribbean Sea, SE34; depths about 250 to 750 m.
- Bathygadus melanobranchus* Vaillant, 1888. To 60 cm. Gulf of Mexico, Caribbean Sea, SE27, 34, NE47; depths about 650 to 1 600 m.
- Gadomus arcuatus* (Goode and Bean, 1886). To more than 58 cm. Gulf of Mexico, Caribbean Sea, NE South America, NE34; depths 600 to 1 400 m.
- Gadomus dispar* (Vaillant, 1888). To at least 30 cm. Caribbean Sea, NE34; depths 550 to 1 100 m.
- Gadomus longifilis* (Goode and Bean, 1885). To 30 cm. Gulf of Mexico, Caribbean Sea, SE27, 34; depths 650 to more than 1 600 m).

References

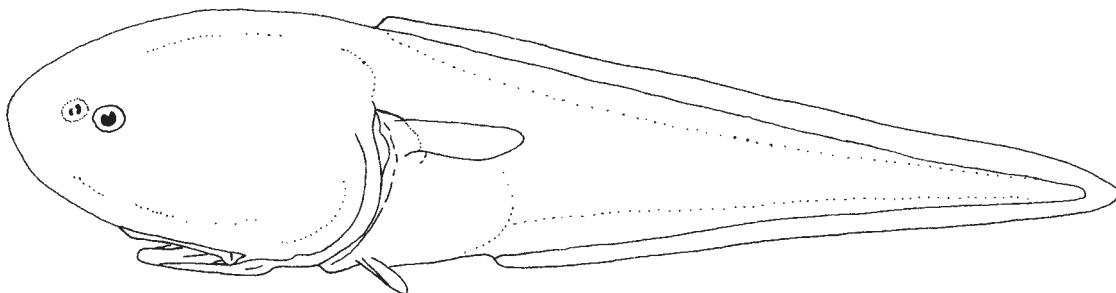
- Cohen, D.M., T. Inada, T. Iwamoto, and N. Scialabba. 1990. FAO species catalogue. Vol. 10. Gadiform fishes of the world (order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. *FAO Fish. Synop.*, (125)Vol.10:442 p.
- Marshall, N.B. 1973. Family Macrouridae. In *Fishes of the western North Atlantic*, edited by D.M. Cohen. *Mem. Sears Found. Mar. Res.*, (1)Pt.6:698 p.
- Parr, A.E. 1946. The Macrouridae of the western North Atlantic and Central American seas. *Bull. Bingham Oceanogr. Coll.*, 10(1):1-99.

MACROUROIDIDAE

Macrouroids

by T. Iwamoto, California Academy of Sciences, USA

Diagnostic characters: Head enormous, soft, rounded; trunk short, body tapering posteriorly to long, slender tail. Orbit tiny, 10 or more times into head length; mouth underslung; no chin barbel. Outer gill rakers long and slender. **One long-based, short-rayed dorsal fin extending to end of tail; anal fin similarly long-based and short-rayed; no caudal fin; pelvic fin small**, short, weakly developed, with 5 or 6 soft rays (*Squalogadus*) or absent (*Macrouroides*). Scales covered with small, needle-like spinules. **Colour:** overall dark brown to black; fins black.

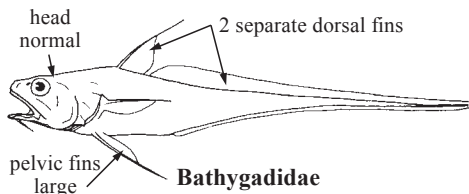


Habitat, biology, and fisheries: Benthopelagic to bathypelagic in middle- to deep-slope waters. Probably circumglobal in tropical to warm-temperate waters, but not off eastern Pacific or eastern Atlantic coasts. Little known of biology. No fisheries, although sometimes taken in large quantities in deep water trawl hauls.

Remarks: Macrouroids often treated as subfamily of Macrouridae. Family includes 2 species in 2 genera.

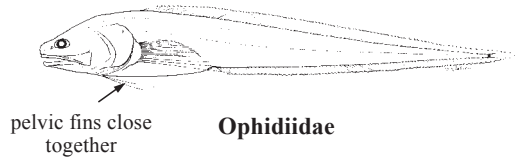
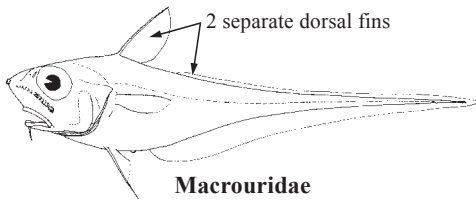
Similar families occurring in the area

Bathygadidae: head normal, codlike; 2 separate dorsal fins, second ray of first dorsal fin a flexible spine and slightly to extremely prolonged; pelvic fins large, with 8 to 10 rays.



Macrouridae: 2 separate dorsal fins, second ray of first dorsal fin a flexible spine; anal fin usually with much longer rays than second dorsal fin; gill rakers all tubercular.

Ophidiidae: pelvic fins close together, each with 1 or 2 slender rays; 2 or more tooth patches usually present on floor of mouth (basibranchial teeth).



List of species occurring in the area

Macrouroides inflaticeps Smith and Radcliffe, 1912. To 35 cm, common to 25 cm. Recorded only from waters off Suriname and French Guiana.

Squalogadus modificatus Gilbert and Hubbs, 1916. To 35 cm, common to 25 cm. Probably widespread in area; records are incomplete.

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.
- Marshall, N.B. 1973. Family Macrouridae. In *Fishes of the western North Atlantic*, edited by D.M. Cohen. *Mem. Sears Found. Mar. Res.*, (1)Pt. 6:698 p.
- Uyeno, T., K. Matsuura, and E. Fujii (eds). 1983. Fishes trawled off Suriname and French Guiana. *Japan Mar. Fish. Resource Res. Center.*, Tokyo, 519 p.

STEINDACHNERIIDAE

Luminous hake

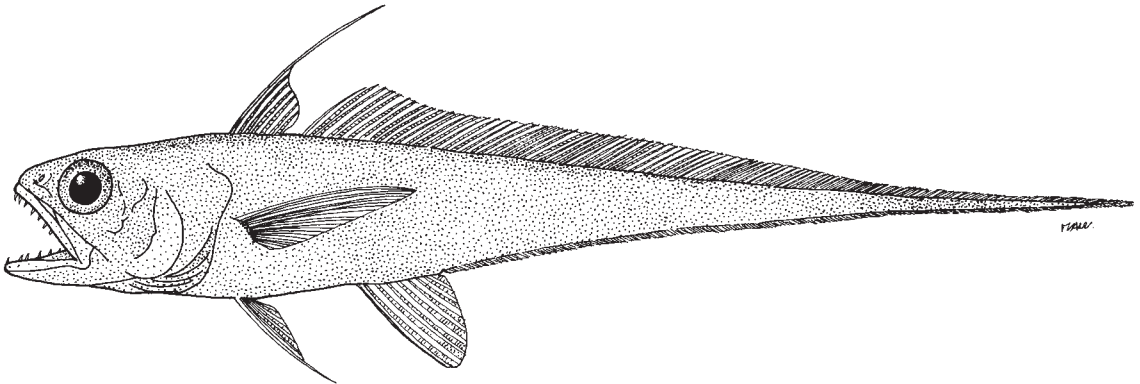
by T. Iwamoto, California Academy of Sciences, USA and D. M. Cohen, Bodega Bay, California, USA

A single species occurring in the area.

Steindachneria argentea Goode and Bean, 1896

Frequent synonyms / misidentifications: None / None.

FAO names: **En** - Luminous hake; **Fr** - Merlu lumineux; **Sp** - Merluza luminosa.

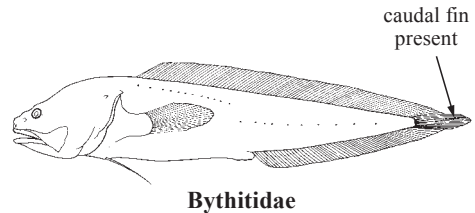
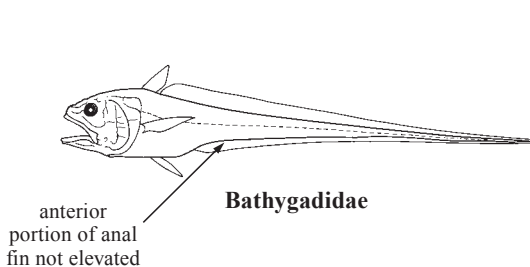


Diagnostic characters: Medium-sized fish to at least 35 cm (commonly 20 to 30 cm), with **elongated body that tapers to a point**. Mouth terminal, large; teeth in 1 or 2 series in each jaw, outer series large, sharp, widely spaced, inner teeth small, irregular in lower jaw, in close-set row in upper jaw, and widely separated from outer series; small teeth on vomer; no chin barbel. **Two dorsal fins**, the first high, short-based, with first ray spinous and slightly prolonged as thin filament, second dorsal fin long-based, extending to end of tail; **anal fin with high, short-based anterior portion followed by long-based, short-rayed posterior portion** that extends to end of tail; **caudal fin absent**; length of pectoral fin about equal to head length; pelvic fins with 8 soft rays, outermost ray slightly prolonged. **Anus between pelvic fins, well separated from urogenital opening** situated a short distance from anal fin. **Luminescent tissue along entire ventral length of body**, on pectoral bases, and entire underside and opercular areas of head; luminescent areas demarcated by striated appearance of skin. **Colour:** silvery overall, blackish over abdominal region.

Similar families occurring in the area

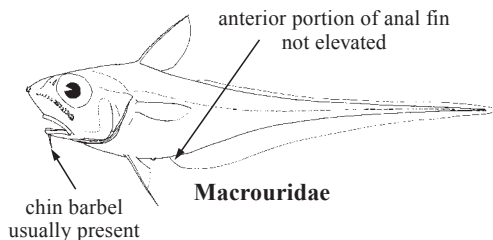
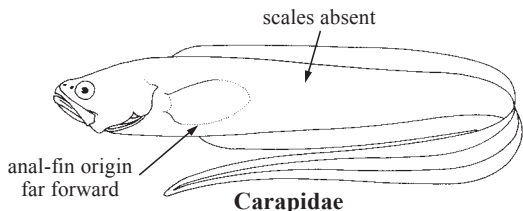
Bathygadidae: anal fin lacking elevated anterior portion; anus and urogenital opening close together, immediately before anal-fin origin; no teeth on roof of mouth; jaw teeth all small.

Bythitidae: caudal fin present, connected with long-based dorsal and anal fins or free; pelvic fins of 1 or 2 slender rays; viviparous, males with external intromittent organ; anterior nostril immediately above upper lip in most.



Carapidae: anal-fin origin far forward, usually beneath pectoral fin and usually anterior to origin of long-based, short-rayed dorsal fin; dorsal and anal fins without elevated portions; anus and urogenital opening close together; scales absent.

Macrouridae: anal-fin rays longer than rays of second dorsal fin, anterior portion not elevated; chin barbel usually present; spinules on scales in most species; anus and urogenital opening close together.



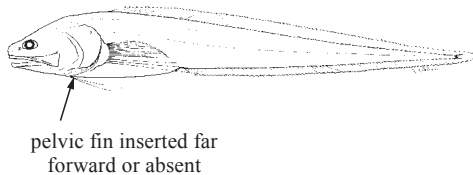
Ophidiidae: dorsal and anal fins single, long-based, and relatively short-rayed, each fin continuous with small caudal fin; pelvic fin inserted far forward, under head in some, with 1 or 2 slender rays, or fin absent.

Size: To about 30 cm, commonly 20 to 25 cm.

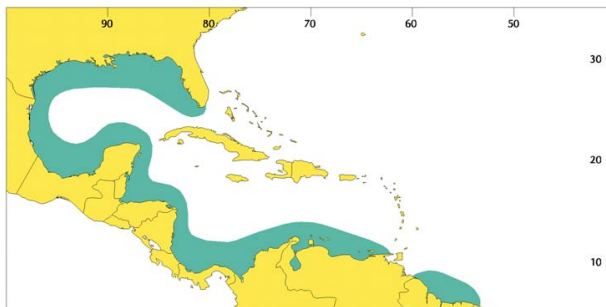
Habitat, biology, and fisheries: Benthopelagic, inhabiting depths of about 350 to 550 m at continental-shelf break and on upper slope over soft bottoms. Of no commercial value, although sometimes taken in fairly large numbers by bottom trawlers.

Distribution: Found throughout Gulf of Mexico, Caribbean Sea (including West Indies) south, and east to French Guiana.

Remarks: One species, treated by some as a subfamily of Macrouridae or Merlucciidae.



Ophidiidae



References

Inada, T. 1990. Steindachneriidae. In *FAO species catalogue*, edited by D.M. Cohen, T. Inada, T. Iwamoto, and N. Scialabba. 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.10:442p.

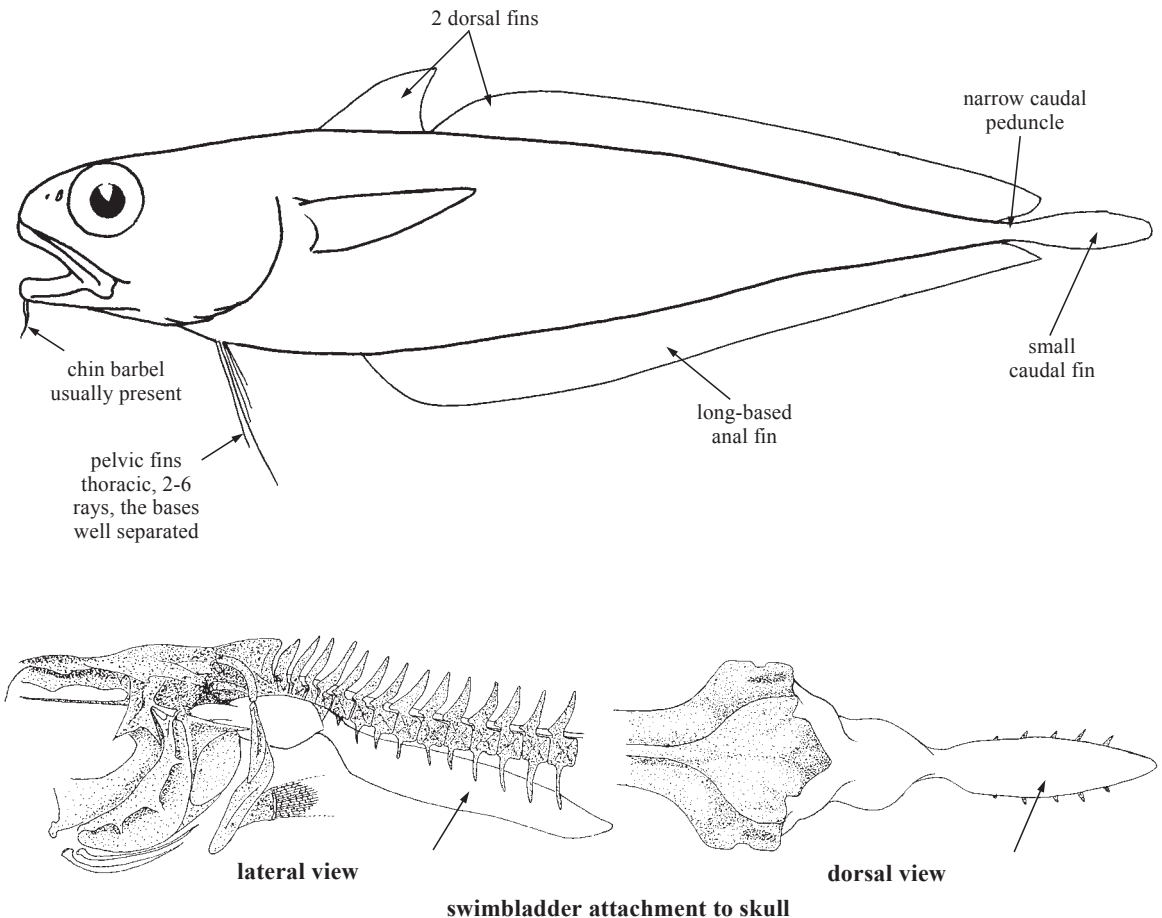
Parr, Albert E. 1946. The Macrouridae of the western North Atlantic and Central American seas. *Bull. Bingham Oceanogr. Coll.* 10(1):1-99.

MORIDAE

Moras (morid cods)

by T. Iwamoto, California Academy of Sciences, USA and D. M. Cohen, Bodega Bay, California, USA

Diagnostic characters: Small to medium-sized (to about 65 cm, usually 20 to 30 cm), mostly deep-water, continental slope fishes in 40 to 1 500 m, commonly between 100 to 600 m. Body elongated, rounded in front of abdomen, more laterally flattened behind, tapering to a **narrow caudal peduncle**. Top of head lacking V-shaped ridge. Mouth large, jaws extending to below midorbit or beyond, slightly to moderately inferior; eye large, about 3 or 4 times in head; **teeth few or lacking on roof of mouth**. **Two dorsal fins**, the first short-based and triangular, the second long-based, its length more than half total length; anal fin long-based, its length 1/2 of, or longer than, that of second dorsal fin; **pelvic fins thoracic, small, with 2 to 6 rays, the bases well separated**; **caudal fin small, margin rounded to slightly forked, separated from dorsal and anal fins**. Spine on top of first vertebra tightly connected to a narrow crest at rear of skull. **Swimbladder with two anterior projections that attach to back of skull**. **Abdominal light organ in some species**, seen externally as small, black naked fossa anterior to vent. **Colour:** brown, black, to pinkish, with violet, bluish, or blackish abdomen and underside of head; some with silvery over sides of head and body.

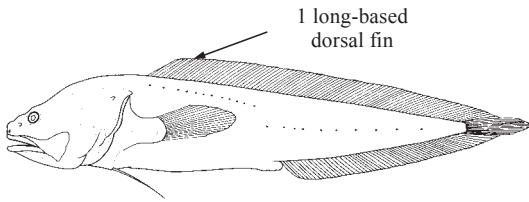


Habitat, biology, and fisheries: Species in area benthopelagic in deep waters of continental shelf and slope. Little known of life history of most species. Food includes bottom invertebrates, swimming crustaceans, small cephalopods, and small fish. Most morids in area too small, occur too deep, or found in too small of concentrations to be of commercial interest, but a few species in other parts of world commercially exploited by trawl and longline gear.

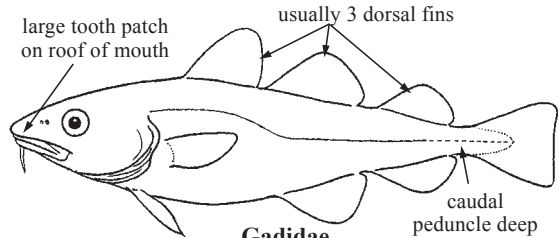
Similar families occurring in the area

Bythitidae: 1 long-based dorsal fin; anterior nostril immediately above upper lip in most; viviparous, males with an external intromittent organ.

Gadidae: usually 3 dorsal fins and 2 anal fins, caudal fin large, truncate to forked, caudal peduncle deep; large tooth patch on roof of mouth (vomer); no light organ.



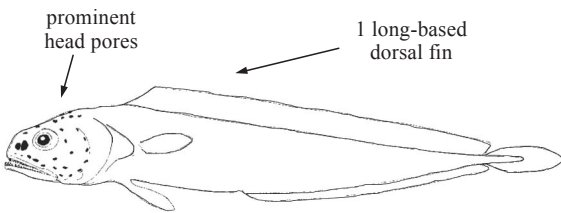
Bythitidae



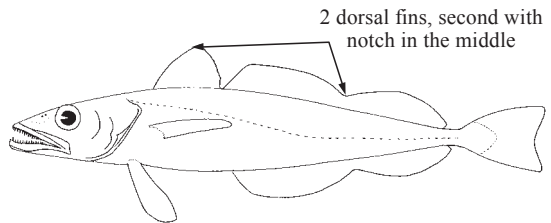
Gadidae

Melanonidae: 1 long-based dorsal fin; mesopelagic or bathypelagic; large, prominent head pores; free neuromasts in short longitudinal ridges cover extensive surfaces of head; no chin barbel; no light organ.

Merlucciidae: 2 dorsal fins, 1 anal fin, the second dorsal and anal fins similar in size and shape, with notch in middle; V-shaped crest on top of head; no chin barbel.



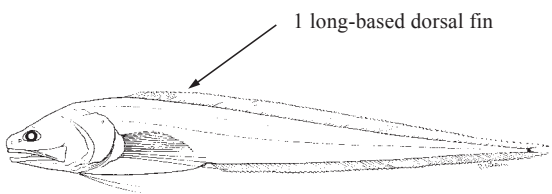
Melanonidae



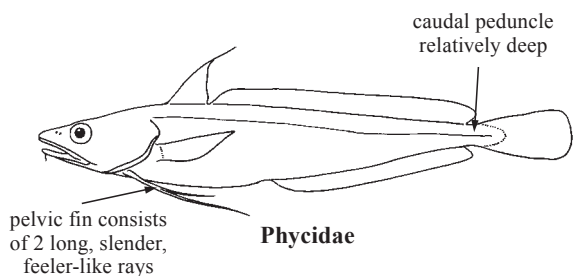
Merlucciidae

Ophidiidae: 1 long-based dorsal fin; caudal fin connected with dorsal and anal fins; bases of pelvic fins close together, without a broad scaled space between.

Phycidae: teeth on vomer well developed; no connection of swimbladder to back of skull; caudal peduncle relatively deep; pelvic fin consists of 2 long, slender, feeler-like rays, the longest extending close to or beyond vent; no light organ.



Ophidiidae



Phycidae

Key to the species of Moridae occurring in the area

- 1a. Snout spade-shaped when viewed from above (Fig. 1) *Antimora rostrata*
- 1b. Snout rounded. → 2

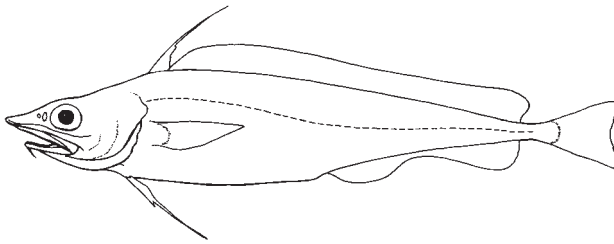


Fig. 1 *Antimora*

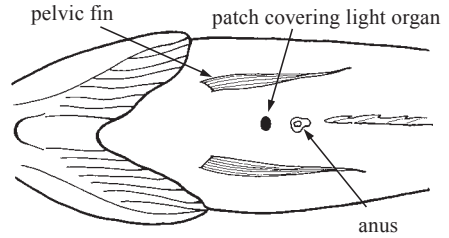


Fig. 2 ventral view of body

- 2a. A small black fossa of light organ on abdomen anterior to anus (Fig. 2) → 3
- 2b. No black fossa on abdomen → 6
- 3a. Chin barbel absent; fossa of light organ very small; black anchor-shaped patch on tongue and roof of mouth (Fig. 3) *Gadella imberbis*
- 3b. Chin barbel present; fossa of light organ moderate sized; no prominent pigment patches on tongue and roof of mouth → 4

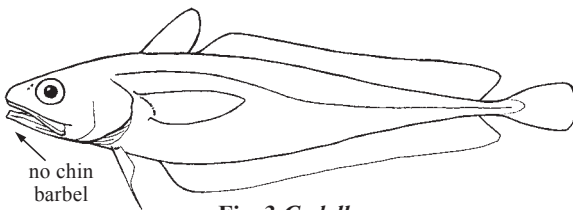


Fig. 3 *Gadella*

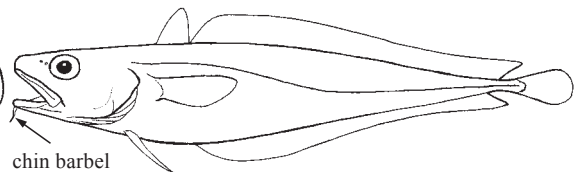





Fig. 4 *Physiculus*

- 4a. Scales between base of first dorsal fin and lateral line 6 or 7; pectoral-fin rays 21 to 26 (Fig. 4) *Physiculus fulvus*
- 4b. Scales between base of first dorsal fin and lateral line 12 to 20; pectoral-fin rays 26 to 31 → 5
- 5a. Scales between base of first dorsal fin and lateral line 14 to 20; pectoral-fin rays 26 or 27; no scales on gular membrane or on vertical fin membranes; gill rakers moderately long, slender *Physiculus karrerae*
- 5b. Scales between base of first dorsal fin and lateral line 12 to 14; pectoral-fin rays 28 to 31; scales usually present on gular membrane and vertical fin membranes; gill rakers short, blunt *Physiculus kaupi*
- 6a. Dorsal-fin rays 6+66 to 73; anal-fin rays 65 to 71 *Laemonema goodebeanorum*
- 6b. Dorsal-fin rays 6 or 7+53 to 63; anal-fin rays 52 to 63 → 7
- 7a. Distal 2/3 of caudal fin and triangular-shaped areas at posterior end of second dorsal and anal fins prominently black with thin white outer margins; no prolonged spine on first dorsal fin; dorsal-fin rays 7+53 to 61; pectoral-fin rays 25 to 27, anal-fin rays 52 to 59 *Laemonema melanurum*
- 7b. Distal end of caudal fin blackish, but not sharply defined, no triangular black blotches on second dorsal and anal fins; a prolonged black spine on first dorsal fin; dorsal-fin rays 6 or 7+57 to 63; pectoral-fin rays 19 to 23; anal-fin rays 54 to 63 *Laemonema barbatulum*

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Antimora rostrata* (Günther, 1878).

 *Gadella imberbis* (Vaillant, 1888).

 *Laemonema barbatulum* Goode and Bean, 1883.

 *Laemonema goodebeanorum* Meléndez and Markle, 1997.

 *Laemonema melanurum* Goode and Bean, 1896.

 *Physiculus fulvus* Bean, 1884.

Physiculus karrerae Paulin, 1989. To about 30 cm. Caribbean, S Brazil, St. Helena.

Physiculus kaupi Poey, 1865. To about 23 cm. Caribbean, N and S Brazil.

References

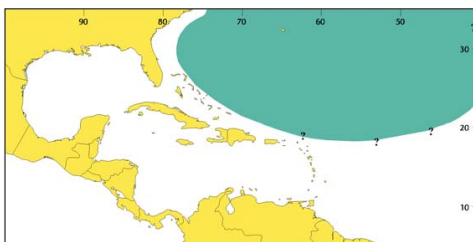
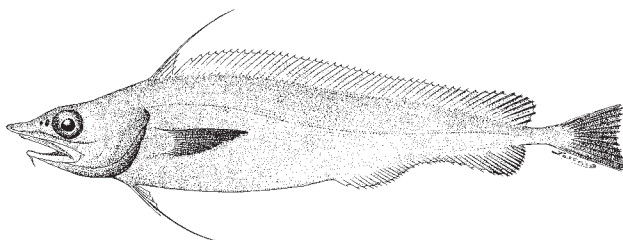
- Cohen, D. M., T. Inada, T. Iwamoto, and N. Scialabba. 1990. FAO species catalogue. Vol. 10. Gadiform fishes of the world (Order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. *FAO Fish. Synop.*, (125)Vol.10:442 p.
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- Paulin, C.D. 1983. A revision of the family *Moridae* (Pisces: Anacanthini) within the New Zealand region. *Rec. Natl. Mus. New Zealand*, 2(9):81-126.
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***Antimora rostrata* (Günther, 1878)**

ANT

En - Blue antimora; **Fr** - Antimora bleu; **Sp** - Mollera azul.

Maximum size at least 65 cm, commonly to 50 cm; males smaller than females. Benthopelagic over continental slope in about 350 to 3 000 m. Little known of life history; females probably reach maturity at more than 50 cm and occur at greater depths than males. Off USA Atlantic coast, and perhaps elsewhere, a dominant fish species at middle- to lower-slope depths. Distribution worldwide except in North Pacific, where it is replaced by a related species, *A. microlepis*; absent in Gulf of Mexico and Caribbean Sea, and so far not known from northern coast of South America. Of no commercial importance, but sometimes taken in bycatch of trawlers fishing deep waters.

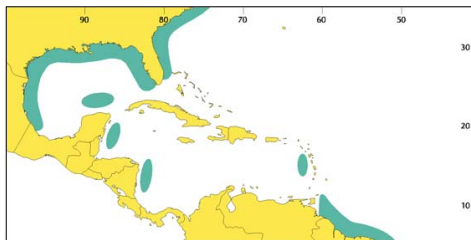
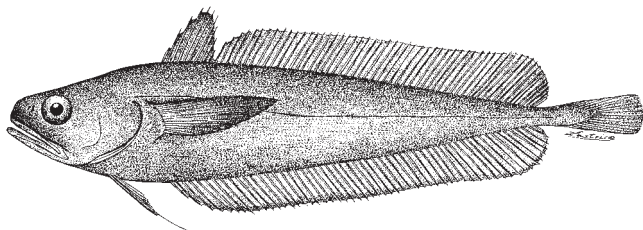


***Gadella imberbis* (Vaillant, 1888)**

GDI

En - Beardless codling; **Fr** - Moro imberbe; **Sp** - Bacaladilla imberbe.

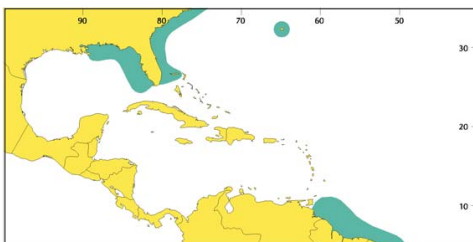
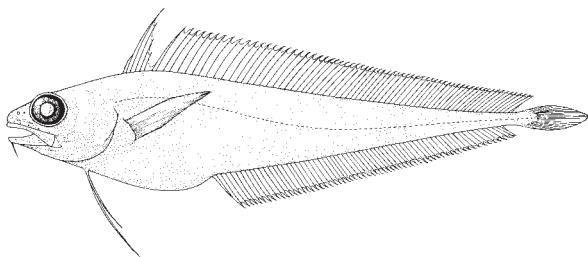
Maximum size about 23 cm, commonly to 15 cm. Benthopelagic over continental slope in about 350 to 800 m. Little known of life history; often abundant. Distribution temperate and tropical Atlantic, from Cape Cod to southern Brazil in western Atlantic, from Cape Verde Islands to Angola in eastern Atlantic. Taken as bycatch by deep-water shrimp trawlers in western Atlantic, but not utilized.



***Laemonema barbatulum* Goode and Bean, 1883**

En - Shortbeard codling.

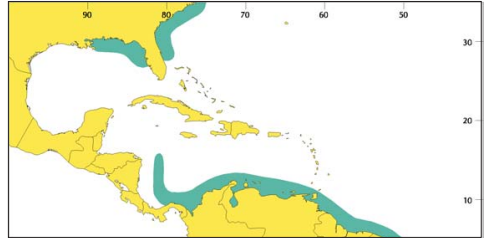
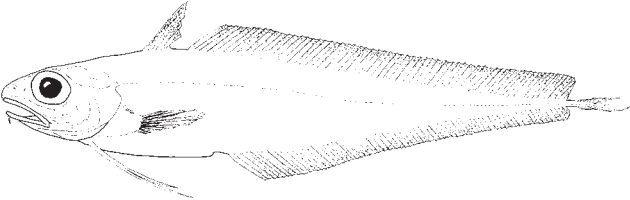
Maximum size about 40 cm, commonly to 30 cm. Benthopelagic over continental slope in 50 to 1 620 m, usually from 300 to 400 m. Little known of life history. Distribution temperate and tropical Atlantic, from south of Nova Scotia to northern Brazil, including northeastern Gulf of Mexico, northern Bahamas, and Bermuda.



***Laemonema goodebeanorum* Meléndez and Markle, 1997**

En - American codling.

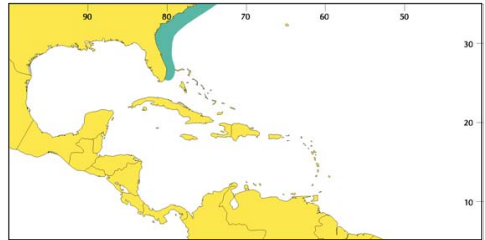
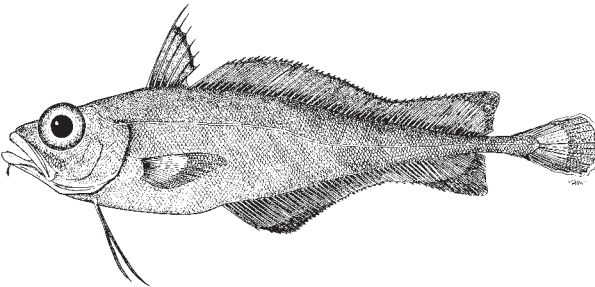
Maximum size about 30 cm, commonly to 25 cm. Benthopelagic over continental slope in about 180 to 800 m, usually 400 to 600 m. Little known of life history. Distribution from Canada (south of Nova Scotia) to southern Brazil, including Gulf of Mexico, Caribbean, Suriname, French Guiana. Taken as bycatch by deep-water shrimp trawlers, but not utilized for food.



***Laemonema melanurum* Goode and Bean, 1896**

En - Blackfin codling.

Maximum size about 30 cm, commonly to 20 cm. Benthopelagic over continental slope in 452 to 644 m. Little known of life history. Distribution in western Atlantic from off New York to Florida. Taken as bycatch by deep-water shrimp trawlers, but not utilized for food.



***Physiculus fulvus* Bean, 1884**

En - Metallic codling.

Maximum size about 14 cm. Benthopelagic over continental slope in about 100 to 475 m. Little known of life history. Distribution temperate and tropical western Atlantic, from Cape Cod (about 40°N) to mouth of Amazon, including Gulf of Mexico and Caribbean Sea. Taken as bycatch by deep-water shrimp trawlers in western Atlantic, but not utilized.

