Diagnostic Features : Body and flesh relatively firm. Dorsal profile of adults longer than about 30 cm with a pronounced hump-backed appearance. Head bones and integument relatively tough; orbits of moderate size, 18 to 27% of head length, much wider than interorbital space which is 17 to 21% of head length; chin barbel long and prominent, 66 to 87% of head length; outer gillrakers on first arch long and slender, 4 to 6 on upper limb, 18 to 21 on lower limb; teeth very small, aligned in longitudinal series forming a broad band on upper jaw, a moderate to narrow band on lower jaw. First dorsal fin with a rudimentary first ray and a thin, flexible, spinous second ray, followed by 8 to 11 segmented rays; pectoral fin with 22 to 27 rays, the uppermost short, splintlike, the second slightly elongated and filamentous; pelvic fin with 8 rays, outermost two rays elongated, both about equal to or usually much more than length of head. About 30 to 40 simple, slender pyloric caeca.

Geographical Distribution : Tropical North Atlantic. Known from the Gulf of Mexico, Caribbean, and northeastern coast of South America in the western Atlantic; Morocco and the Canary Islands in the eastern Atlantic (Fig. 186).

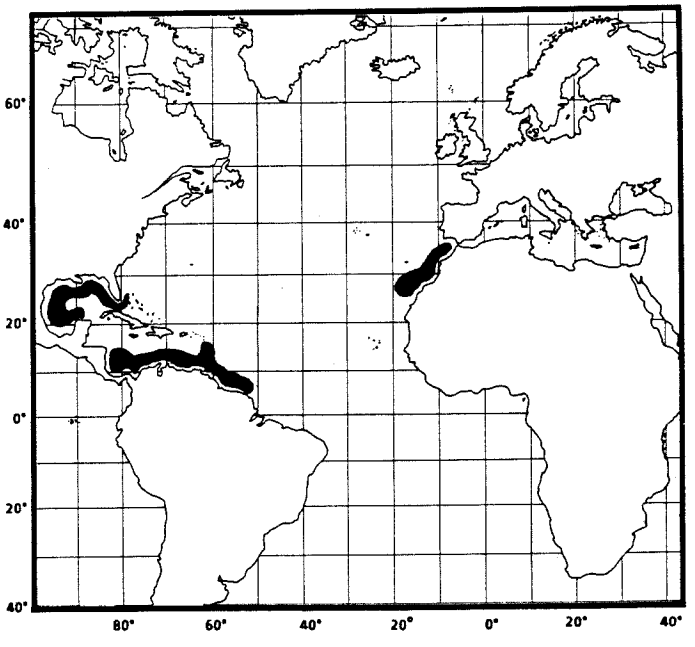


Fig. 186

Habitat and Biology : Benthopelagic in 610 to 1 370 m depth.

Size : To more than 58 cm total length.

Interest to Fisheries : Captured in small numbers in the Gulf of Mexico with the commercial royal red shrimp (***Pleoticus robustus***), but not currently utilized.

Local Names : JAPAN: Yumi-katadara.

Literature : Parr (1946); Marshall (1973).

Remarks : None of the specimens of the species examined has a prolonged dorsal ray, although Koefoed (1927) and Marshall (1973) have reported such a condition in one or two of their specimens. The closely related ***G. dispar*** can be distinguished from ***G. arcuatus*** in having only the outer pelvic ray prolonged and only 18 to 20 pectoral fin rays.

2.5.2 Subfamily MACROURINAE

Synonyms : Coryphaenoidinae

General Features : Mouth size from wide and almost terminal to small and inferior; jaws protractile; teeth highly variable, from few and fanglike to minute in villiform bands; barbel long, reduced, or absent; olfactory bulbs anterior in position, close behind olfactory organs; branchiostegal rays 6 or 7, rarely 8; first gill slit restricted by folds of skin across upper and lower extent; gillrakers tubercular, fewer than 22 on lower limb of first arch. Two dorsal fins; first dorsal short, with a spikelike first ray closely appressed to spinous second ray, followed by 7 to 12 segmented rays; second dorsal long, separated from the first by a gap longer than half the base of first dorsal, its rays usually short, and not as long as opposite rays of anal fin, which has well developed rays. Abdominal vertebrae 10 to 15. Scales with spinules in most species. Swimbladder well developed in almost all species, with 2 to 11 retia mirabilia; drumming muscles in males of most species. Anus immediately before anal fin or removed to somewhere between pelvic and anal fins. Ventral light organ developed in many species.

Habitat, Distribution and Biology : Worldwide, except in high Arctic waters. Members of this subfamily are found throughout the world's oceans, primarily at continental shelf and slope depths, but some species frequent abyssal depths to as much as 6 500 m, and a few are bathypelagic as adults. Temperature preferences range from near 0°C to more than 10ºC. Virtually nothing is known about reproductive habits, but it is speculated that eggs are broadcast near the bottom and develop as they float surfaceward. The few captures of larval stages of macrourids, despite the abundance of adults in most continental slope areas, suggest that once hatched, the larvae develop rapidly, and within a short period descend as juveniles to the bottom. Feeding habits vary widely within the group, as suggested by the varied development of jaws, teeth, snout, and associated feeding structures. At one extreme are the bathypelagic species ***Cynomacrurus piriei*** and ***Odontomacrurus murrayi*** with their terminal jaws and fanglike teeth; at the other extreme are species of ***Coelorinchus*** and ***Mataeocephalus*** with their small, inferior, protrusible jaws and padlike cardiform teeth bands. The spectrum of foods eaten range from polychaetes, clams, snails, sipunculids, and other infauna grubbed from the bottom ooze, to ophiuroids, pagurid and other crabs, holothuroids, and similar epibenthic forms plucked off the bottom, to free-swimming copepods, amphipods, siphonophores, cephalopods, natantid crustaceans, and fishes taken in the water column. Vertical feeding migrations have been documented (Haedrich & Henderson, 1974) in ***Coryphaenoides rupestris*** and may be a common phenomenon among larger members of the genus, such as ***C. acrolepis*** and **C. *filifer***, which are known from pelagic captures. Stein (1985) provided information suggesting that ***C. filifer*** occupies a specific depth stratum well offshore from the continental slope; these horizontal movements away from slope bottoms may well be tied to feeding. A light organ is developed in most genera, none is found in any of the other subfamilies. The organ appears to be most highly developed in the genus ***Coelorinchus***, although it is very complex in ***Hymenocephalus*** and ***Malacocephalus***. ***Hymenocephalus*** and ***Lepidorhynchus*** further have "ventral striae" associated with the light organ; these striae appear externally as parallel narrow black lines over a silvery ground that give a striated pattern to much of the ventral surfaces of the trunk. Similar striae are found in such diverse groups as the merlucciid ***Steindachneria***, the apogonid ***Siphamia***, the percichthyid ***Acropoma***, and the trachichthyid ***Trachichthys***.

Size : Includes the family's smallest and largest species (about 12 cm total length at maturity in some species of ***Hymenocephalus*** to more than 150 cm in ***Albatrossia pectoralis***).

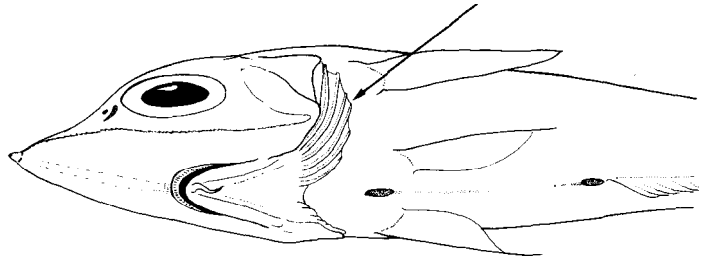
Interest to Fisheries : This subfamily includes the species with the greatest potential for commercial exploitation. A few species already form important fisheries in mid- to high-latitude waters. Many species form a significant part of the bycatch of other targeted fish species and, as such, are used for fish meal, fish paste, and fish oil. Numerous others are found in large enough quantities to warrant further fishery investigation. Many of the smaller forms, though not in themselves of commercial interest, are important forage fish for more valuable species. For example, the abundance of the valuable stockfish (***Merluccius capensis***) of South Africa is directly linked to the abundance of their major prey item, the barred grenadier ***Coelorinchus fasciatus***. The javelin fish (***Lepidorhynchus denticulatus***) of Australia is an important prey for the hoki or blue grenadier (***Macrouronus novaezelandiae***).

Literature : Okamura (1970a); Marshall (1973).

Key to Genera :

1a. Six branchiostegal rays (Fig. 187)

2a. No chin barbel; jaws terminal; lower jaw bearing few large canine teeth (Fig. 188). Swimbladder regressed. Bathypelagic

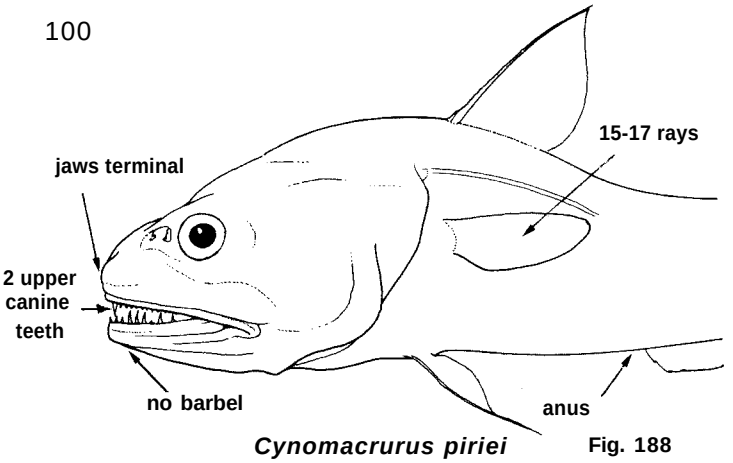


ventrolateral view **Fig. 187**

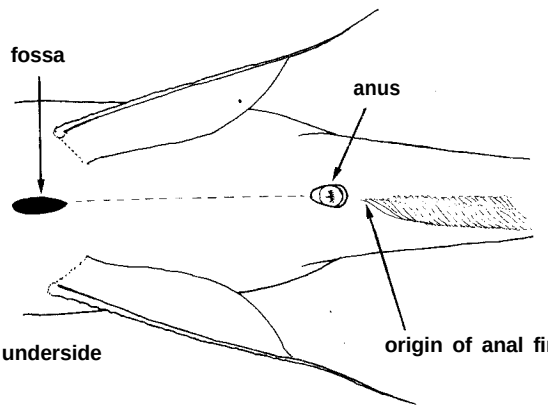
3a. Anus immediately before anal fin origin (Fig. 189). Upper jaw with a pair of large canines near symphysis and a narrow band of small pointed teeth (Fig. 188). Pectoral fins with 15 to 17 rays. . . . . ***.Cynomacrurus*** (Fig. 188)

3b. Anus about midway between pelvic and anal fins (Fig. 190). Upper jaw with a single row of pointed retrorse teeth, none especially enlarged (Fig. 191). Pectoral fins with 8 to 11 rays***.....Odontomacrurus*** (Fig.191)

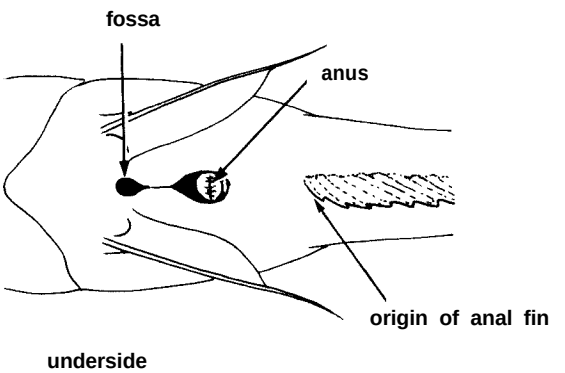
2b. Chin barbel present (except ***Mesobius***); jaws subterminal to inferior (Fig. 192); lower jaw teeth not composed of a few large canines. Swimbladder well developed. Benthopelagic



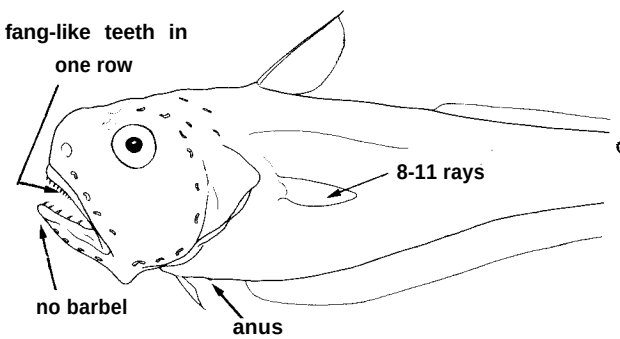
Cynomacrurus piriei **Fig. 188**



Coelorinchus **Fig. 189**



Nezumia **Fig. 190**



Odontomacrurus **Fig. 191**
(after Iwamoto, 1970)

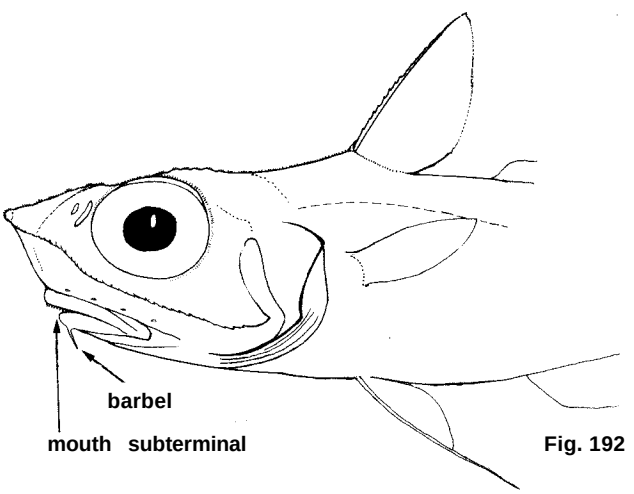


Fig. 192

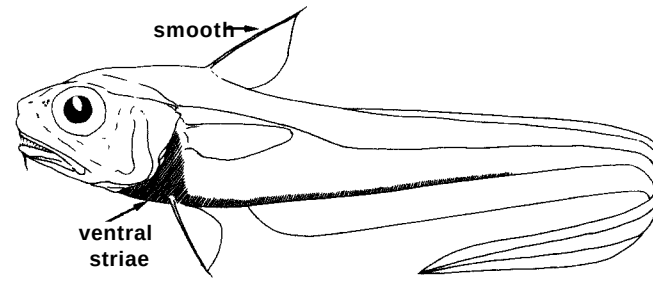
4a. Ventral striae consisting of alternating stripes of black and silvery pigment (associated with luminescent organ) on shoulders, isthmus, ventral surface of abdomen, and along ventral anterior half of tail (Fig. 193). Swimbladder with 9 retia mirabilia ..... ***Lepidorhynchus*** (Fig. 193)

4b. No ventral striae. Swimbladder with 2,4, 5, 6, or 7 (rarely more) retia mirabilia (Fig. 194)

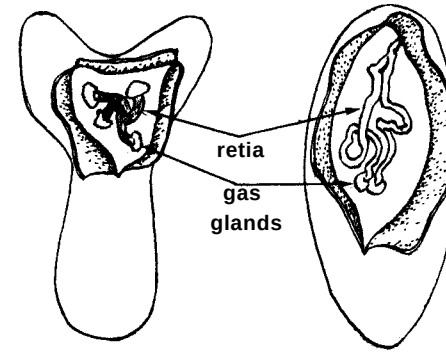
5a. Rakers absent on lateral side of first gill arch (Fig. 195)

6a. Spinous ray of first dorsal fin rounded, with a smooth leading edge (rarely with a few small denticles distally). Pelvic fins with 7 rays (6 in one species). A prominent luminescent organ usually developed .... ***Coelorinchus*** (Fig. 196)

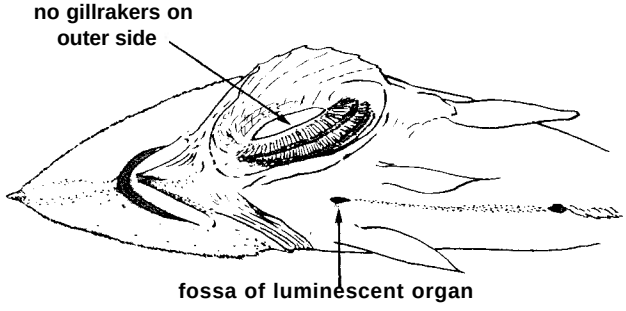
6b. Spinous ray of first dorsal fin truncated in cross-section, with a serrated leading edge (Fig. 197) (serrations sometimes obsolescent). Pelvic fins with 8 to 10 rays. Luminescent organ not readily apparent ..... ***Macrourus*** (Fig. 198)



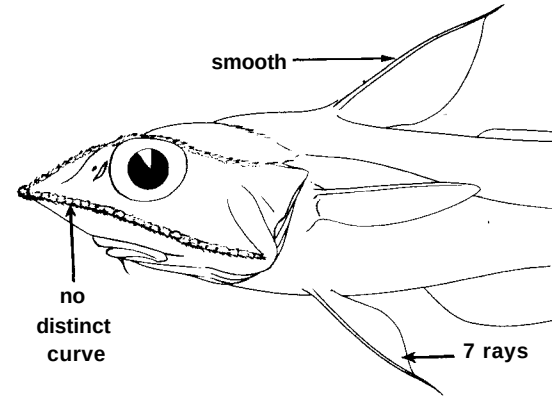
Lepidorhynchus **Fig. 193**
(after Last, Scott & Talbot, 1983)



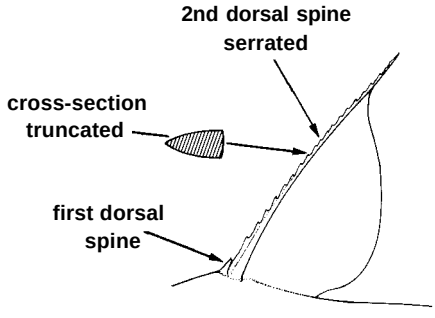
swimbladders **Fig. 194**



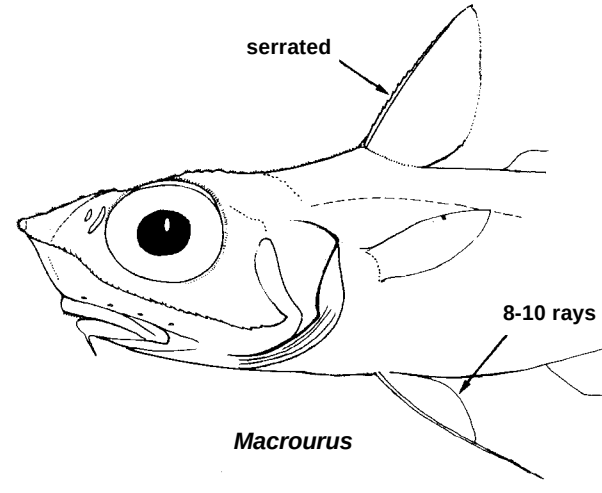
underside ***Coelorinchus*** **Fig. 195**



Coelorinchus **Fig. 196**



dorsal fin **Fig. 197**



Macrourus **Fig. 198**

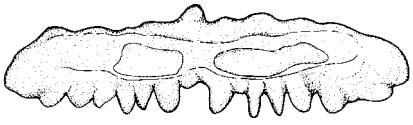
5b. Rakers present on lateral side of first gill arch (Fig. 199)

7a. Anus midway between pelvic and anal fins. Two retia mirabilia in swimbladder ..... ***Hyomacrurus*** (Fig.200)

7b. Anus just before origin of anal fin. Two or 4 to 7 retia

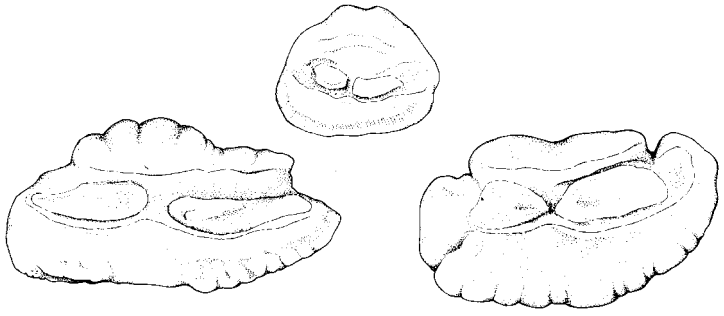
8a. Pelvic fins with 6 to 8 (usually 7) rays. Swimbladder small, two retia mirabilia. Large otolith (sagitta) elongated, comblike in smaller fish (Fig. 201). Scales small, 10 or 11 below midbase of first dorsal ..... ***Albatrossia*** (Fig.202)

8b. Pelvic fins with 7 to 14 rays. Swimbladder large, well developed; 2 or 4 to 7 retia. Sagitta relatively short to rounded, not comblike (Fig. 203). Scales small to large, usually fewer than 10 below midbase of first dorsal fin (***C. altipinnis*** and ***C. camurus*** may have more than 10) ... ***Coryphaenoides*** (Fig.204)



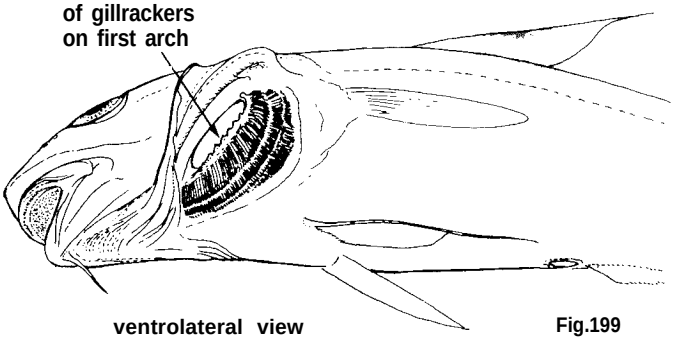
saccular otolith

Albatrossia **Fig. 201**
(after Schwarzhans, 1979)

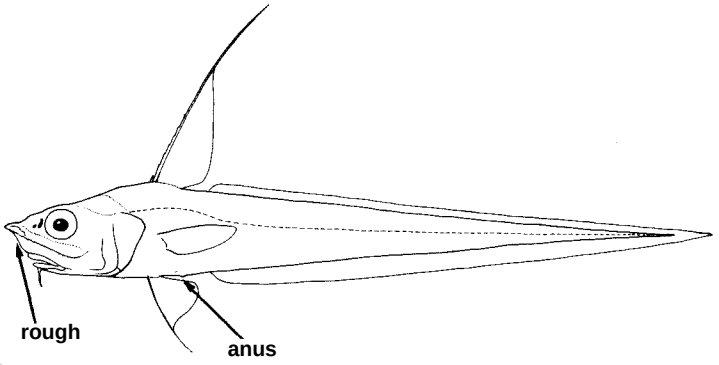


otoliths

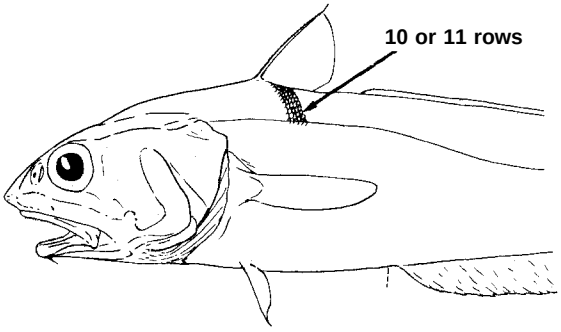
Coryphaenoides **Fig. 203**
(after Schwarzhans, 1979)



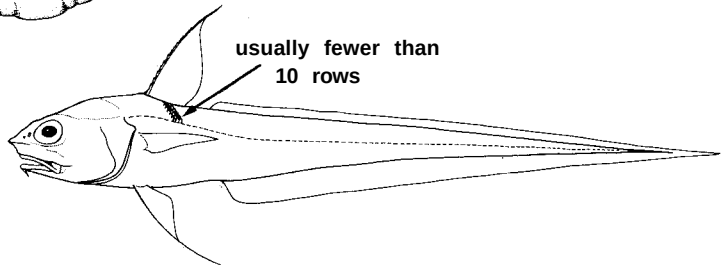
ventrolateral view **Fig.199**



Hyomacrurus **Fig. 200**
(after Radcliffe, 1912)



Albatrossia **Fig. 202**



Coryphaenoides (after Gilbert & Burke, 1912) **Fig. 204**

1b. Seven or eight branchiostegal rays (Fig. 205)

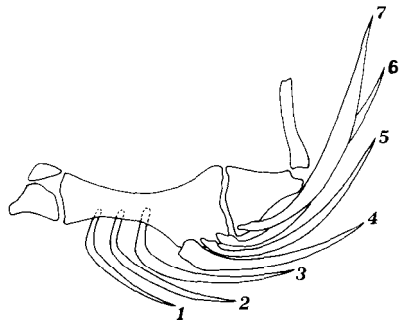
9a. Ventral striae (alternating black and silvery lines) on gular membrane, sides of isthmus, over shoulder girdle, and in a triangular patch above pelvic fins (Fig. 206); integument of head membranous, essentially transparent; head bones thin, fragile

10a. Spinous dorsal ray smooth; more than 15 inner gill-rakers on lower limb of first arch ..... ***Hymenocephalus*** (Fig. 207)

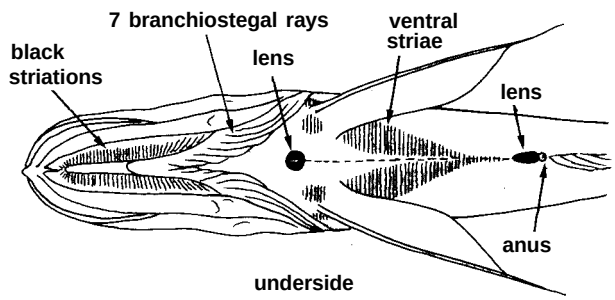
10b. Spinous dorsal ray serrated; fewer than 15 inner gill-rakers on lower limb of first arch .....***Hymenocephalus*** (subgenus ***Hymenogadus***) (Fig. 208)

9b. No ventral striae; head integument thin to thick, translucent to opaque; head bones not especially fragile

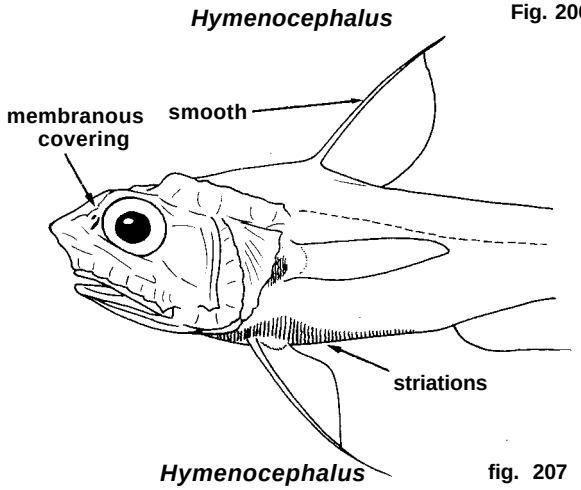
11a. Anus and urogenital opening surrounded by a narrow to broad margin of naked skin, the entire region (the periproct) closely abutting or separated by 1 to 4 scale rows from origin of anal fin, closer to anal fin than to pelvic fins (Fig. 209); no accessory fossa of light organ anterior to anus



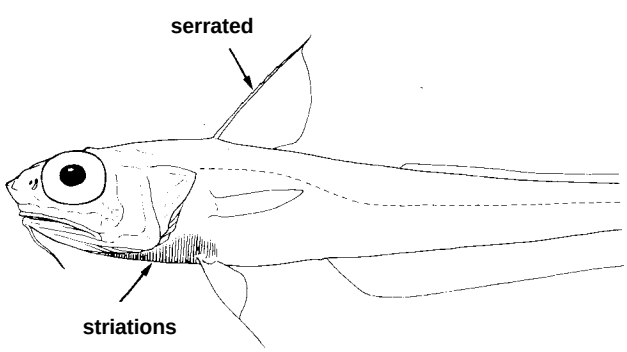
branchiostegal rays **Fig. 205**
(after Okamura, 1970b)



Hymenocephalus **Fig. 206**

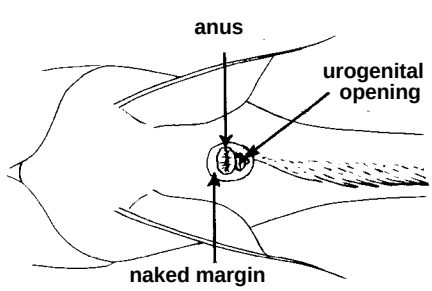


Hymenocephalus **fig. 207**
(after Iwamoto, 1970)



subgenus *Hymenogadus*
(after Gilbert & Hubbs, 1920)

Fig. 208



underside

Fig. 209

12a. Spinous ray of first dorsal fin smooth; pelvic fin origins below base of first dorsal, far behind level of pectoral fin origins ..... ***Trachonurus*** (Fig. 210)

12b. Spinous ray of first dorsal fin weakly to strongly serrated; pelvic fin origin below or anterior to pectoral fin bases

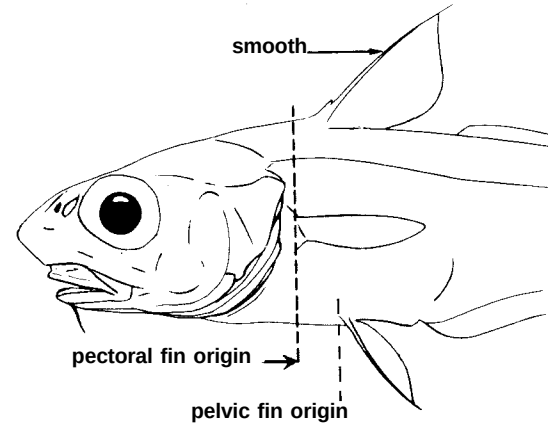
13a. Snout long, pointed, dorsoventrally depressed, armed with a bifid terminal scute and a row of stout scales along leading edge; suborbital ridge strongly developed, demarcated by stout, scutelike scales. No outer series of rakers on first gill arch (Fig. 195)..... ***Mataeocephalus*** (Fig. 211)

13b. Snout short to moderately long, rounded to pointed, but not dorsoventrally depressed; terminal and lateral scutes may or may not be developed; ,suborbital ridge weak or relatively strong. An outer series of rakers on first gill arch (Fig. 199)

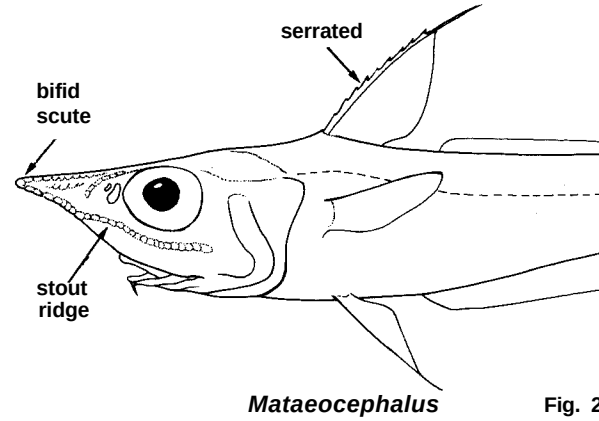
14a. Barbel absent; head scales elongated, with spinules in 1 to 3 ridgelike rows that give a characteristic striated pattern to head surfaces..... ***Mesobius*** (Fig. 212)

14b. Barbel small to large; head scales not elongated, spinule arrangement various but not as for ***Mesobius***

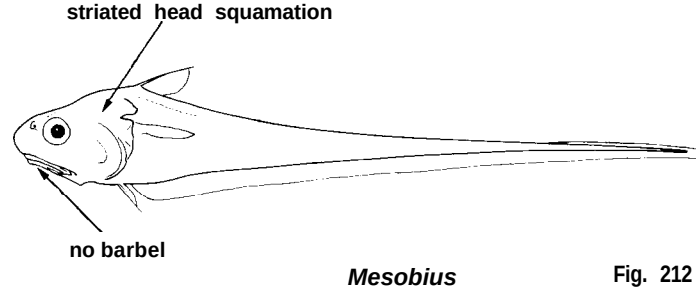
15a. Head massive, broad, deep, swollen by the expansive cephalic lateral line canals (Fig. 213); almost entirely scaled, without broad naked areas



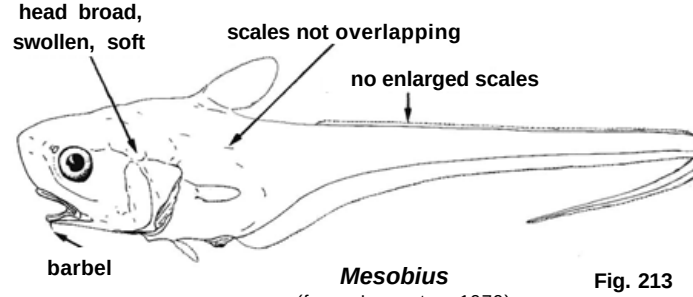
Trachonurus **Fig. 210**



Mataeocephalus **Fig. 211**



Mesobius **Fig. 212**
(after Iwamoto, 1979)



Mesobius **Fig. 213**
(from Iwamoto, 1979)

16a. No enlarged scales along first or second dorsal fin. Scales on belly large, almost platelike. Swimbladder regressed or absent ..... ***Echinomacrurus*** (Fig. 213)

16b. A series of enlarged scales along first and second dorsal fins (Fig. 214). Scales on belly of normal size. Swimbladder well developed .....***Cetonurus*** (Fig. 215)

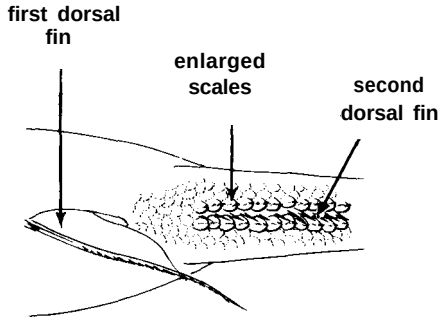
15b. Head not especially inflated; mostly scaled or with broad naked areas

17a. Jaws set at an oblique angle. Snout blunt, shorter than orbit diameter; armed with a stout scute at tip and lateral angles; suborbital ridge stout, scutelike scales developed ..... ***Sphagemacrurus*** (Fig. 216)

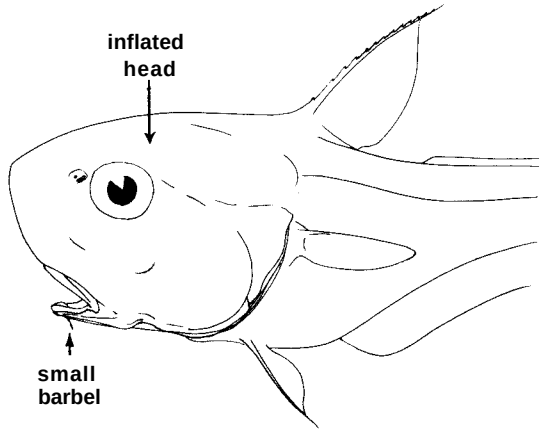
17b. Jaws more horizontal; snout rather blunt to moderately pointed, not armed with stout tubercular scutes; suborbital ridge without scutelike scales

18a. Olfactory organ massive, almost equal to orbit diameter (Fig. 217). Scales absent on snout... ***Macrosmia*** (Fig. 218)

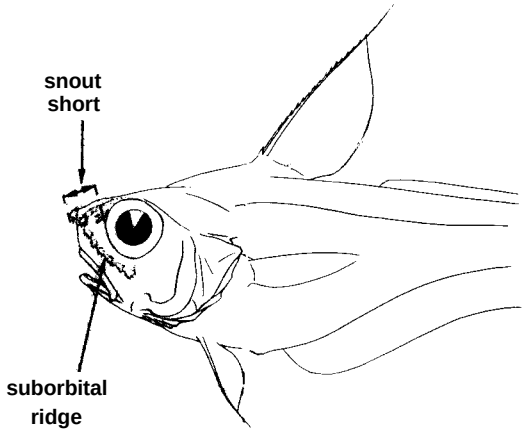
18b. Olfactory organ not especially large, much less than half of orbit diameter. Scales present or absent on snout



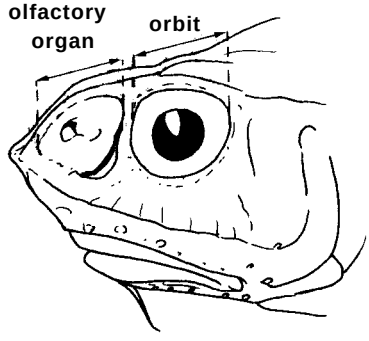
upper side ***Cetonurus*** **Fig. 214**



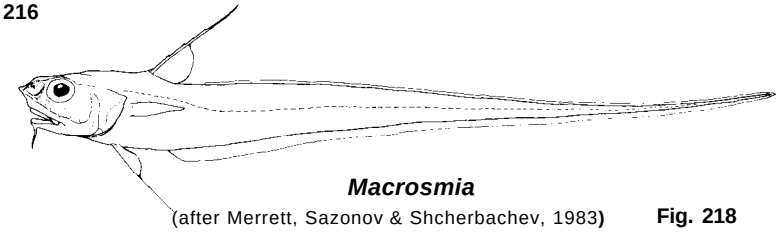
Cetonurus **Fig. 215**



Sphagemacrurus **Fig. 216**



Macrosmia **Fig. 217**
(after Merrett et al., 1983)



Macrosmia
(after Merrett, Sazonov & Shcherbachev, 1983) **Fig. 218**

19a. Snout and suborbital area completely scaled .....***Paracetonurus*** (Fig. 219)

19b. Underside and anterodorsal parts of snout, and underside of suborbital area naked .....***Asthenomacrurus*** (Fig. 220)

11b. Periproct distinctly separated from anal fin origin, usually closer to pelvic fin insertions (Fig. 221); a small to moderate-sized black fossa often present before periproct

20a. No gillrakers on outer side of first arch (Fig. 195) .....***Mataeocephalus*** (Fig. 211)

20b. Outer gillrakers present on first arch (Fig. 199)

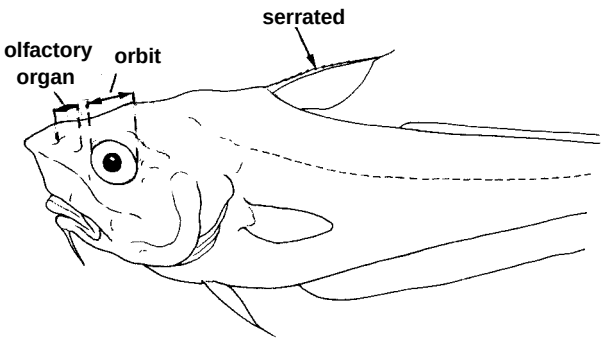
21a. Jaws almost terminal; upper jaws extend posteriorly to vertical through anterior margin of orbits. Snout and ventral parts of head naked; head scales and anterior body scales without spinules. Pectoral fins with 26 to 29 rays ..... ***Haplomacrurus*** (Fig. 222)

21b. Jaws subterminal to inferior; upper jaws extend well beyond anterior margin of orbits. Naked areas on snout and head variously developed; scales all with spinules, except near fin bases or under gill cover. Pectoral fins with 26 or fewer rays

22a First dorsal spine smooth

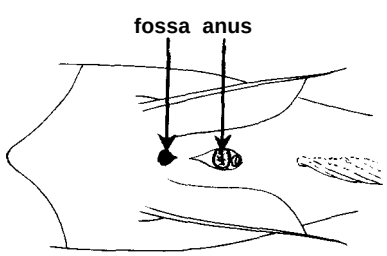
23a. Upper jaw less than 30% of head length; barbel very small. No separate naked fossa anterior to periproct ..... ***Kumba*** (Fig. 223)

23b. Upper jaw more than 40% of head length; barbel moderate to large. A naked fossa anterior to periproct (Fig. 221)

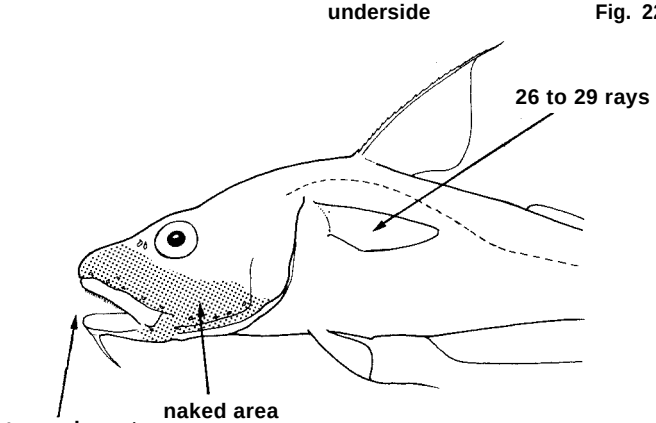


Paracetonurus **Fig. 219**

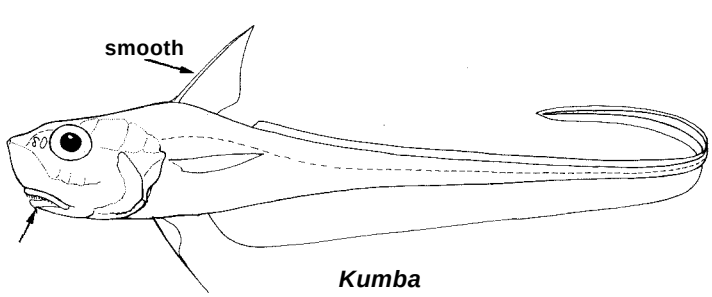
Asthenomacrurus **Fig. 220**
(from Iwamoto, 1979)



underside **Fig. 221**



Haplomacrurus **Fig. 222**
(after Trunov, 1980)



Kumba
(after Marshall, 1973) **Fig. 223**

24a. Lower jaw teeth large, widely spaced, in 1 row; a large, broad, naked fossa anterior to periproct. Scales present on lowermost branchiostegal rays ..... ***Malacocephahs*** (Fig.224)

24b. Lower jaw teeth moderate to small, closely spaced, in 1 or more rows; naked fossa small to moderate-sized. No branchiostegal scales ..... ***Ventrifossa*** (Fig.225)

22b. Spinous first dorsal ray weakly to strongly serrated

25a. Lower jaw teeth large, widely spaced, in 1row ..... ***Malacocephalus*** (Fig.224)

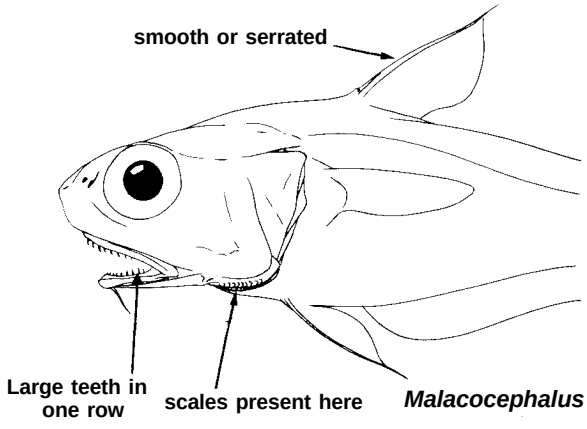
25b. Lower jaw teeth small to moderate-sized, closely spaced, in 1 or more rows

26a. Enlarged scales along dorsal fins. A large bifid terminal snout scute present (Fig. 226a). No anterior fossa of light organ. Head fully scaled, including branchiostegal and gular membranes ..... ***Cetonurichthys*** (Fig.226)

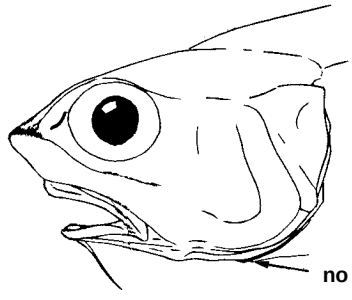
26b. No enlarged scales along dorsal fins. Terminal snout scute present or absent. Head variously scaled

27a. No external sign of luminescent organ. Pelvic fins with 6 rays...***Pseudonezumia*** (Fig.227)

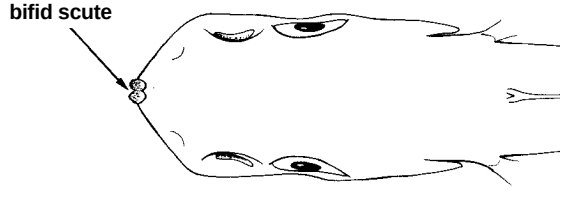
27b. Luminescent organ well developed, usually with a naked fossa anterior to periproct (Fig. 221). Pelvic fins with 7 to 17 rays



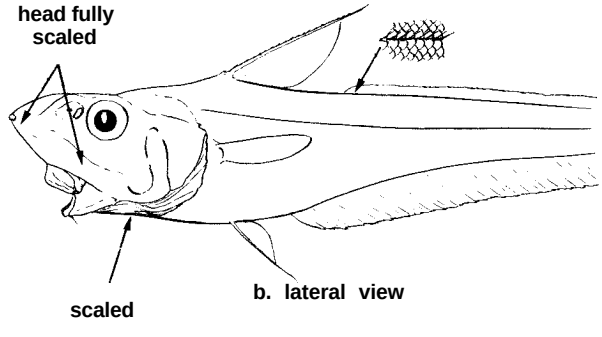
Malacocephalus **Fig. 224**



Ventrifossa **Fig. 225**

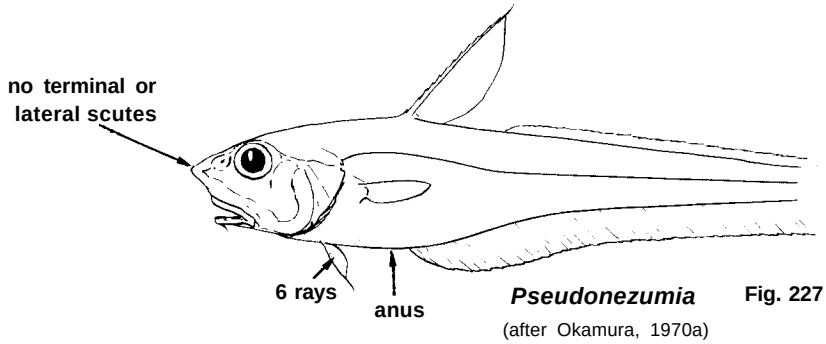


a. top of head



Cetonurichthys **Fig. 226**

(after Sazonov & Shcherbachev, 1982)



Pseudonezumia **Fig. 227**

(after Okamura, 1970a)

28a. Head large, broad, deep; interorbital width greater than orbit diameter, about 35 to 40% of head length; chin barbel very short to rudimentary, less than 10% of head length, 3.5 or more times into orbit diameter

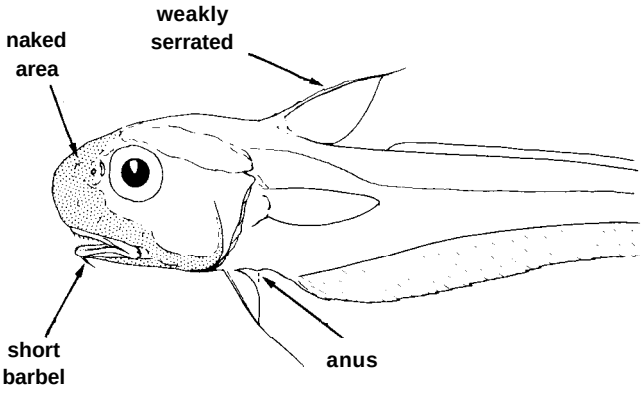
29a. Snout and ventral parts of head naked ..... ***Parakumba*** (Fig.228)

29b. Almost all of head uniformly scaled.....***Pseudocetonurus*** (Fig.229)

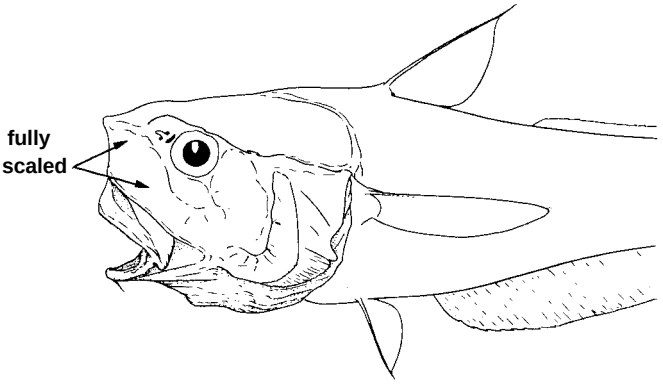
28b. Head not especially large and broad, laterally compressed if deep, or dorsoventrally somewhat depressed if broad; interorbital space about equal to or (usually) less than orbit diameter; chin barbel short to long, more than 5% of head length

30a. Snout and suborbital region completely and uniformly covered with small, finely spinulated scales; a tubercular scute at tip of snout present in some; length of upper jaw more than 1/3 of head length

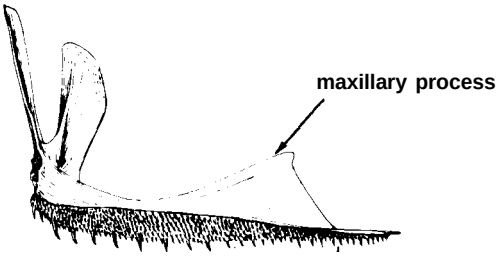
31a. Premaxillary teeth in a narrow band that extends posteriorly beyond maxillary process (Fig. 230); mandibular teeth in 1 to 3 irregular series. Snout with blackish tip, or entire leading edge blackish (Fig. 231). Inner gillrakers on first arch 13 to 20. Mouth large; upper jaws 35 to 53% of head length. Pores of cephalic lateral line system small and inconspicuous ... ***Ventrifossa*** (Fig.231)



Parakumba **Fig. 228**
(after Trunov, 1981)

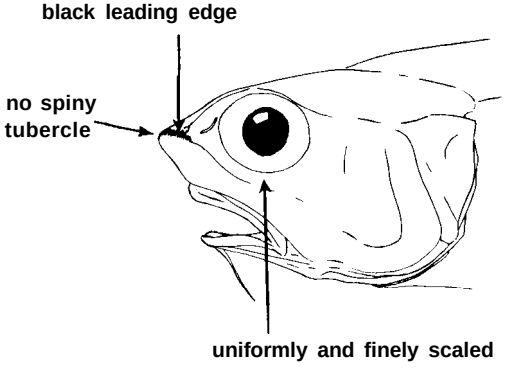


Pseudocetonurus **Fig. 229**



teeth extend beyond maxillary process

right premaxillary (medial view) **Fig. 230**
Ventrifossa



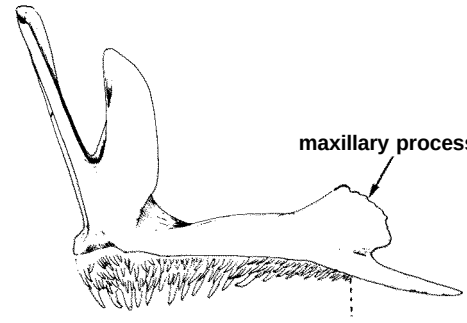
Ventrifossa **Fig. 231**

31b. Premaxillary teeth in narrow to broad short band that falls short of posterior margin of maxillary process (Fig. 232). Mandibular teeth in a narrow to broad band. Snout tip and leading edge not darkly marked. Inner gillrakers on first arch 7 to 16 (total). Mouth moderate in size, upper jaws 33 to 45% of head length. Pores of cephalic lateral line system conspicuous or inconspicuous

32a. Colour pale brown to blackish; no silvery pigmentation; fins uniformly blackish. Inner gillrakers 8 to 11 (total) on first arch. Lowermost branchiostegal rays scaled in some species. Lips thick, papillaceous. Teeth in short broad bands that taper rapidly posterioly.....***Nezumia*** subgenus ***Koronezumia*** (Fig. 233)

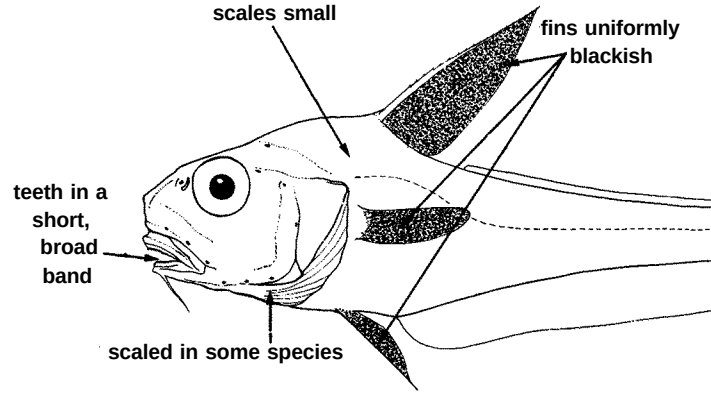
32b Colour pale brownish to greyish; silver pigmentation ventrally in fresh specimens; fins often with black blotches or streaks. Inner gillrakers of first arch 7 to 16 (total). Lowermost branchiostegal rays usually with some scale patches. Lips not especially thick and papillaceous. Teeth in relatively narrow bands **...** ***Ventrifossa*** subgenus ***Lucigadus*** (Fig. 234)

30b. Naked areas usually present on snout, especially ventrally, often extending into ventral suborbital region, mandible and lower margin of preopercle. Upper jaws usually less than l/3 of head length. Suborbital shelf usually strongly developed, with a double row of deeply embedded scutelike scales ..... ***Nezumia*** (Fig. 235)



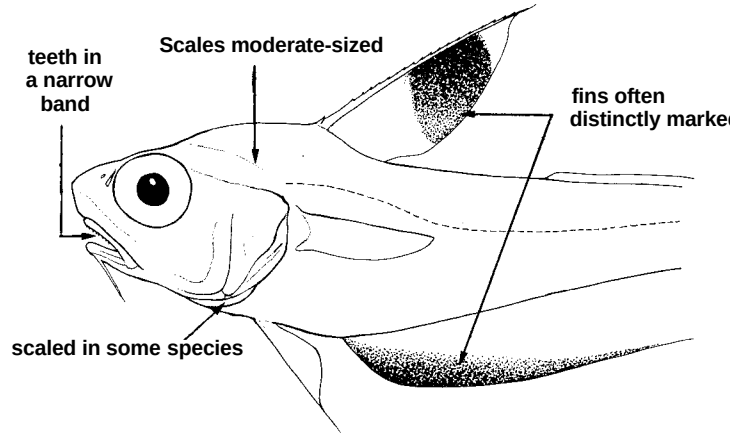
right premaxillary (medial view)

Nezumia **Fig. 232**

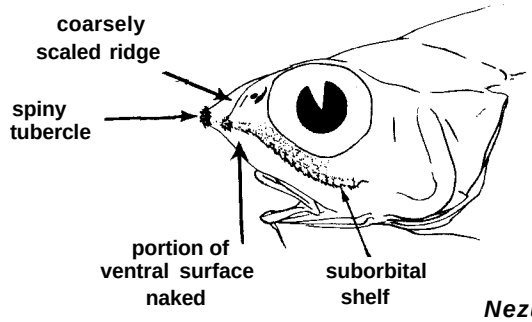


subgenus ***Kuronezumia*** **Fig. 233**

(after Iwamoto, 1974)



subgenus ***Lucigadus*** **Fig. 234**



Nezumia **Fig. 235**