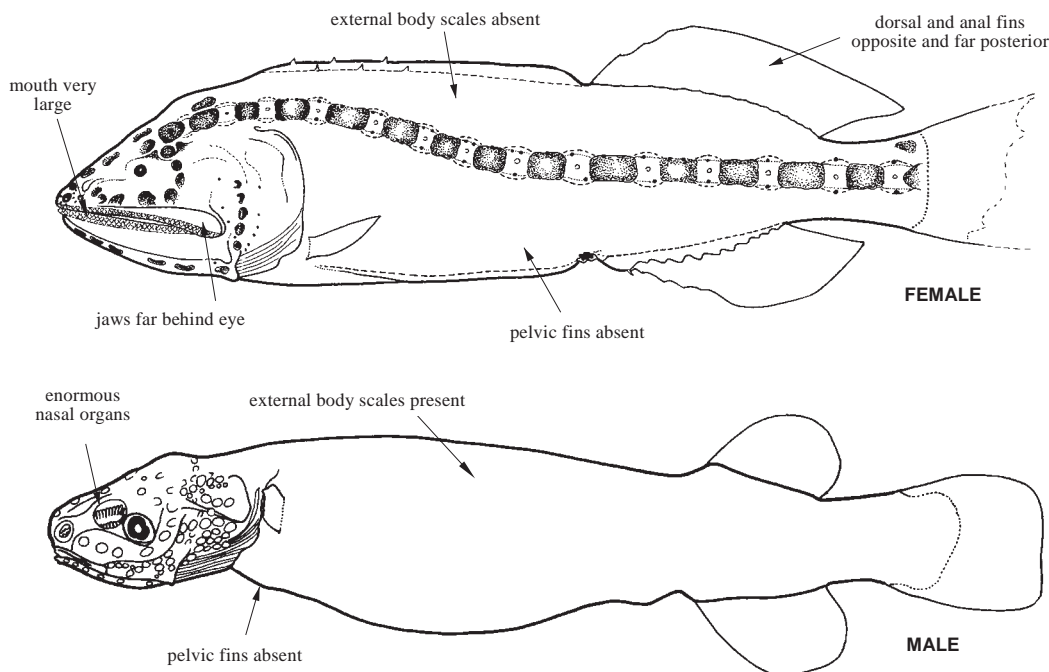


## CETOMIMIDAE

### Flabby whalefishes

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G.D. Johnson, Smithsonian Institution, Washington, DC, USA

**D** **Diagnostic characters:** **Body soft and flabby**, slender to robust, **whale-shaped in females, elongate in males, with median fins opposite and far posterior. Head large to very large (few moderate) in females, small in males;** no bone-bordered mucous cavities on top of head. Eye degenerate, tiny in females, small in males (small and developed in female *Procetichthys*). Snout very long; nasal organ poorly developed in females (except *Procetichthys*), **enormous, covering most of snout in males**, no skin flap on posterior nostril. **Mouth very large**, horizontal in females, moderate, horizontal in males, **jaws extending far behind eye in females**, not extending behind eye in males. **Jaw teeth** either tiny and closely set, small and widely spaced, or elongate in well defined, closely set rows in females, **absent in males**; jaws, pharyngobranchials, and **basihyal/basibranchials (copula/tongue) always toothed**; vomer, palatine, and ectopterygoid usually toothed in females, only pharyngobranchial 4 always toothed, vomer toothed or toothless, jaws and all other oral bones toothless in males. **Gill rakers club-shaped, or as tooth patches, tooth plates or individual teeth, never lath-like in females, absent in males. Branchiostegal membranes unfused in females, fused across isthmus in males.** Fins without spines; 1 dorsal fin with 13 to 37 soft rays in females, 15 to 31 in males; anal fin with 11 to 34 soft rays in females, 13 to 29 in males; pectoral fins with 15 to 24 rays in females (14?), 18 to 23 in males; **pelvic fins absent in adults, present, jugular in larvae with 4 to 10 soft rays, fewer in transforming larvae; caudal fin with 10 to 19 principal rays** (usually damaged) in females, 16 or 17 principal rays in males (apparent sexual dimorphism presumably due to small sample size of males), larval tail streamer absent in adults. **Lateral line very well developed, supported by internal scales; in most as a broad tube pierced by large pores** (*Procetichthys* with long vertical rows of lateral-line papillae; *Rhamphocetichthys* with rows of 1 to 3 papillae) **in females, short vertical rows of lateral-line papillae on paired lateral-line scales** (usually damaged or lost) in males. **External body scales absent in females, small to moderate, non-imbricate, and cycloid** (often lost from net damage) **in males.** Photophores or apparent luminous tissue absent. **Unique cavernous tissue around anus in most species, over base of anal fin and other areas in many species in females, absent in males. Ribs absent. Total vertebrae 38 to 59 in females, 41 to 57 in males. Colour:** brown or black; in fresh specimens fin rays and inside mouth reddish orange in females, brown, black or unknown in males; live females (2 videos) red-orange.



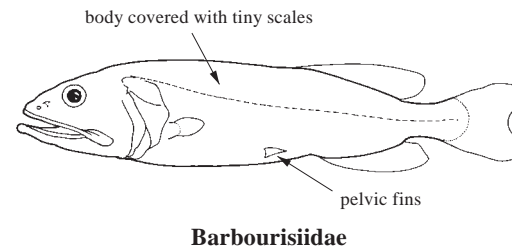
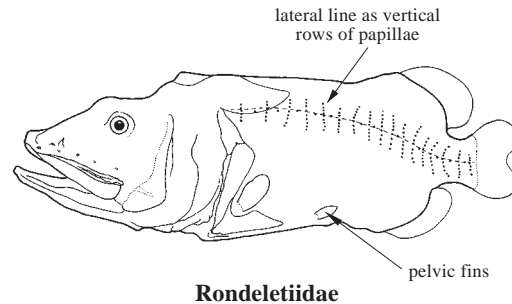
**Habitat, biology, and fisheries:** Bathypelagic as adults, some females apparently benthopelagic, some juveniles mesopelagic; males previously considered separate family Megalomycteridae; larvae previously considered separate family Mirapinnidae. Females feed on crustaceans; males non-feeding after transformation, larvae feed on copepods. Rare to uncommon deep-sea fishes of no commercial importance.

**Remarks:** Nine genera with about 15 to 20 species throughout the world's oceans from boreal latitudes to the Antarctic; 6 genera and 9 species of females in the area; 8 possible species of males recognised, only 3 linked with females, 2 in the area. Revision of *Gyrinomimus* (Paxton, in preparation) nearing completion; review of *Cetomimus* in early stages with distributions incomplete.

#### Similar families occurring in the area

Rondeletiidae: pelvic fins present, abdominal; lateral line as vertical rows of papillae; jaws not extending beyond posterior margin of eye; ribs present.

Barbourisiidae: pelvic fins present, abdominal; head and body covered with tiny scales, central spine of scales giving velvet-like texture; ribs present; live colour bright red-orange.



#### Key to the species of Cetomimidae females occurring in the area

Notes for identification: Cavernous tissue is a white and brown tissue unique to cetomimid females, where it is found in rows, bundles and/or tubules around or above the anus of most genera and species. Its distribution on other areas of the body is an important character for identifying different species within *Gyrinomimus* and *Cetomimus*. Cavernous tissue, of undetermined function but possibly pheromone production, is more fully described and figured in Paxton (1989). The first pore of the lateral line is just above the top of the gill opening. The number of pores is one more than the number of supporting scales at the bottom of the lateral-line canal that can be used for the count when the skin of the canal is damaged.

- 1a.** Nasal organ long, filling both nostrils with more than 30 lamellae; lateral line without canal and pores, of vertical rows of papillae with at least 8 per row posteriorly; jaw teeth small, sharply pointed, and widely spaced; pseudobranch present; pectoral fin at midbody level with 15 rays (not recorded from the area but only 3 records from eastern Atlantic at 41°N and 37°S; manuscript in preparation by Paxton justifying *Mirapinna esau* Bertelsen & Marshall, 1956 as a senior synonym) . . . . . ***Procetichthys krefftii***
- 1b.** Nasal organ small and short, mostly in anterior nostril, with 0 to 10 lamellae; lateral line of canal and pores or vertical rows of 1 to 3 papillae; jaw teeth tiny and triangular or elongate in closely spaced rows; pseudobranch absent; pectoral fin below midbody level with 17 to 24 rays . . . . . → **2**


- 2a. Dorsal-fin rays 29 to 37; anal-fin rays 24 to 26; dorsal and anal fins abruptly elevated on bases higher than body; slit of fourth gill arch tiny and tubular, at angle of arch; 3 separate copular tooth plates . . . . . ***Cetostoma regani***
- 2b. Dorsal- and anal-fin rays 13 to 22; dorsal- and anal-fin bases not abruptly elevated above body; slit behind ventral arm of fourth gill arch elongate or absent; 1 copular tooth plate . . . . . → 3
- 3a. Snout elongate and beak-like, 5.1 to 6.2 in standard length; no lateral-line canal with pores, but vertical rows of 1 to 3 papillae; no lateralis canals on head, only sensory papillae; gill arches 2 and 3 without tooth knobs or plates . . . . . ***Rhamphocetichthys savagei***
- 3b. Snout not elongate and beak-like, rounded, 7 to 12.7 in standard length (except *Cetomimus* sp. nov. P with large, deep snout 6 in standard length but not beak-like); lateral line a canal with 11 to 25 pores, no vertical rows of papillae; lateralis canals and pores on head; gill arches 2 and 3 with tooth plates or knobs . . . . . → 4
- 4a. Free gill arches 4, with elongate slit behind ventral arm of fourth arch present; gill rakers/tooth plates separate and raised, domed to club-shaped; lateral-line scales round to rectangular and flat, without dorsal and ventral projections; vertebrae 38 to 46 . . . . . → 5
- 4b. Free gill arches 3, with slit behind ventral arm of fourth arch absent; gill tooth plates contiguous, fusing with age, and flat; lateral-line scales elongate and curved with dorsal and ventral projections supporting lateral-line canal; vertebrae 44 to 59 . . . . . → 6
- 5a. Dorsal-fin rays 19 to 22; vertebrae 38 to 42; lateral-line pores 11 to 14; jaw teeth tiny in irregular diagonal rows; gill rakers club-shaped; ventral pharyngeal tooth plate absent . . . . . ***Ditropichthys storeri***
- 5b. Dorsal-fin rays 14 to 16; vertebrae 43 to 46; lateral-line pores 17 to 19; jaw teeth elongate in well-defined longitudinal rows; gill tooth plates round to ellipsoidal, slightly raised; ventral pharyngeal tooth plate present on fifth gill arch . . . . . ***Danacetichthys galathenus***
- 6a. Jaw teeth in distinct longitudinal rows, all but newest teeth elongate with length more than 3 times basal width; vomerine tooth plate flat and rectangular or oval; cavernous tissue behind pectoral-fin base under fin rays, as well as other areas; vertebrae 52 to 56 . . . . . ***Gyrinomimus myersi***
- 6b. Jaw teeth in indistinct diagonal rows, all teeth short with length less than 2 times basal width; vomerine tooth plate domed and round or rarely oval; cavernous tissue around anus and other areas, but never behind pectoral-fin base; vertebrae 48 to 53. . . . . → 7
- 7a. Lateral-line pores 11 to 14 with large, tent-like flaps wider than lateral-line canal posteriorly between pores; small cavernous tissue visible externally between anus and anal-fin origin, but extensive internally around anus in 'pseudo-cloaca', none elsewhere; head very large, 2.4 to 2.5 in standard length . . . . . ***Cetomimus* sp. nov. P**
- 7b. Lateral-line pores 15 to 28 with small to moderate posterior flaps between pores, narrower than lateral-line canal; cavernous tissue visible externally around anus and often over or on and between anal-fin rays, sometimes predorsally and under or on and between dorsal-fin rays and/or on caudal peduncle; head moderate in length, more than 3 in standard length. . . . . → 8
- 8a. Cavernous tissue around anus, predorsally, on isthmus, and on dorsal area of caudal peduncle behind dorsal fin and sometimes on ventral surface behind anal fin; lateral-line pores 23 to 28 . . . . . ***Cetomimus compunctus***
- 8b. No cavernous tissue on caudal peduncle or isthmus, although present at least around anus, and predorsally in some; lateral-line pores 15 to 23 . . . . . → 9










- 9a. Cavernous tissue around anus and over anal-fin rays 3 or 4, predorsally and under dorsal-fin rays 4 or 5; lateral-line pores 18 to 23 . . . . . ***Cetomimus hempeli***
- 9b. Cavernous tissue only around anus and over anal-fin rays 0 to 12, never predorsally or under dorsal-fin rays; lateral-line pores 15 to 20 . . . . . ***Cetomimus gillii***

#### Key to the known males of the species of Cetomimidae occurring in the area

- 1a. Dorsal-fin rays 29 to 31; anal-fin rays (20) 25 to 29; anal-fin origin under dorsal-fin ray 4 to 6 . . . . . ***Cetostoma regani***
- 1b. Dorsal-fin rays 16 to 18; anal-fin rays 16 to 19; anal-fin origin under dorsal-fin ray 0 to 4 . . . . . ***Cetomimus/Gyrinomimus* spp.**

#### List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Cetomimus compunctus* Abe, Marumo and Kawaguchi, 1965.
-  *Cetomimus gillii* Goode and Bean, 1895.
-  *Cetomimus hempeli* Maul, 1969.
-  *Cetomimus* sp. nov. P Paxton and Trnski, ms.
-  *Cetostoma regani* Zugmayer, 1914.
-  *Danacetichthys galathenus* Paxton, 1989.
-  *Ditropichthys storeri* (Goode and Bean, 1895).
-  *Gyrinomimus myersi* Parr, 1934.
-  *Rhamphocetichthys savagei* Paxton, 1989.
- Procetichthys krefftii* Paxton, 1989

#### References

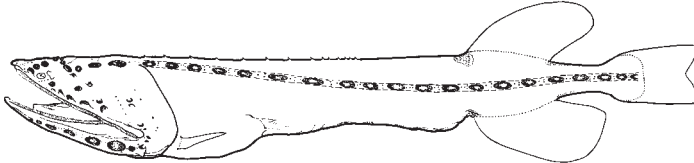
- Bertelsen, E.** 1986. Mirapinnidae. In M.M. Smith & P.C. Heemstra, eds. *Smith's sea fishes*. Johannesburg, Macmillan South Africa, pp. 406-407.
- Bertelsen, E. & Marshall, N.B.** 1984. Mirapinnatoidei: development and relationships. In H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr & S.L. Richardson, eds. *Ontogeny and systematics of fishes. American Society of Ichthyologists and Herpetologists Special Publication*, (1): 380–383.
- Johnson, G.D., Paxton, J.R., Sutton, T.T., Satoh, T.P., Sado, T., Nishida, M. & Miya, M.** 2009. Deep-sea mystery solved: astonishing larval transformations and extreme sexual dimorphism unite three fish families. *Biology Letters*, 5: 235–239; supplemental material, doi: 10.1098/rsbl.2008.0722.
- Maul, G.E.** 1969. On the genus *Cetomimus* (Cetomimidae) with the description of a new species. *Bocagiana, Funchal*, 18: 1–12.

- Myers, G.S. & Freihof, W.** 1966. Megalomycteridae, a previously unrecognized family of deep-sea cetomimiform fishes based on two new genera from the North Atlantic. *Stanford Ichthyological Bulletin*, 8(3): 193–206.
- Parr, A.E.** 1934. Report on experimental use of a triangular trawl for bathypelagic collecting, with an account of the fishes obtained and a revision of the family Cetomimidae. *Bulletin of the Bingham Oceanographic Collection*, 4: 1–59.
- Paxton, J.R.** 1989. Synopsis of the whalefishes (family Cetomimidae) with descriptions of four new genera. *Records of the Australian Museum*, 41(2): 135–206.
- Paxton, J.R.** 2003. Cetomimidae. In K. Carpenter, ed. The living marine resources of the Western Central Atlantic, Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). *FAO species identification guide for fishery purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5*. Rome, FAO, p. 1171–1173.
- Shiganova, T.A.** 1989. A new species of the genus *Parataeniophorus* (Osteichthyes, Mirapinnidae) from the northern-eastern part of the Atlantic Ocean. *Zoologicheskii Zhurnal*, 68(3): 147–150. (In Russian).
- Swinney, G.N.** 1991. The first record of the rare deep-sea family Megalomycteridae (Lampriformes) from the north-eastern Atlantic. *Journal of Fish Biology*, 38: 839–843.
- Tolley, S.G., Gartner, J.V. & Lancraft, T.M.** 1989. Whalefishes (Beryciformes: Cetomimoidei) of the Gulf of Mexico. *Bulletin of Marine Science*, 45(3): 671–677.

***Cetomimus punctatus* Abe, Marumo, and Kawaguchi, 1965**

**En** – Cavernous-peduncled flabby whalefish.

Maximum size for females to 160 mm standard length, common to 125 mm; 8 female specimens known, males unknown. Bathypelagic from open nets from 1 000 to 2 000 m. In the area, 2 oceanic records; also from western South Atlantic and tropical eastern, tropical western, and western North Pacific.



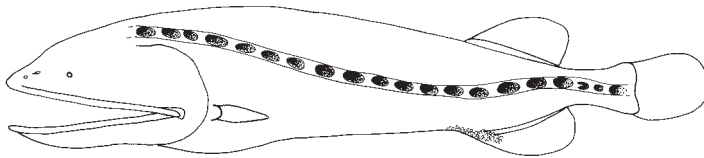
(after Paxton, 1989)



***Cetomimus gillii* Goode and Bean, 1895**

**En** – Gill's flabby whalefish.

Maximum size for females to 110 mm standard length, possibly to 140 mm, most under 90 mm; probably most common species of genus, with more than 20 female specimens known, males unknown. Bathypelagic to more than 1 000 m, some of smallest specimens less than 50 mm from upper 800 m. In the area, 7 oceanic records in northern half; also from western Atlantic and Gulf of Mexico, possibly circumglobal between 40°N and S.



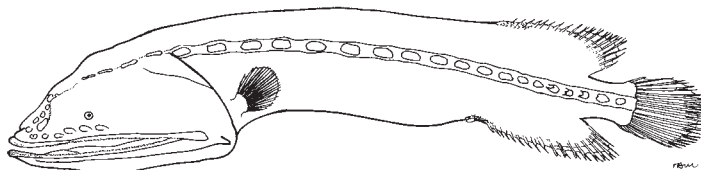
(illustration: T. Trnski)



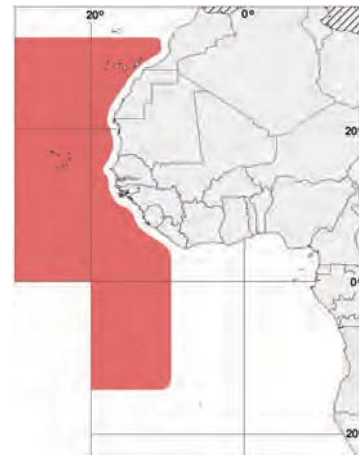
***Cetomimus hempeli* Maul, 1969**

**En** – Hempel's flabby whalefish.

Maximum size for females to 150 mm standard length, common to 80 mm, smallest 57 mm; 11 female specimens known, males unknown. Meso- and bathypelagic, 4 from closing nets 500 to 610 m to 1 250 to 1 500 m, smallest (68 mm) specimen also shallowest. In the area, 7 oceanic records; also from Gulf of Mexico and possibly eastern North and western North Pacific.



(after Maul, 1969)

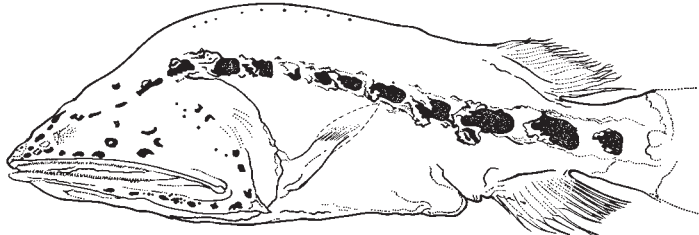




***Cetomimus* sp. nov.** P Paxton and Trnski, in preparation

**En** – Butterfly flabby whalefish.

Maximum size for females to 85 mm standard length, others 44 to 83 mm; only 7 female specimens known, males unknown. Bathypelagic, from 1 000 to probably around 3 300 m. In the area 1 oceanic record; also from western North and western South Pacific.



(illustration: D. Bürkel)

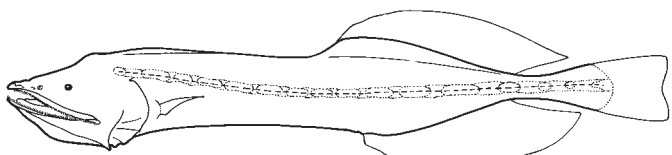


***Cetostoma regani*** Zugmayer, 1914

**Frequent synonyms / misidentifications:** *Cetomimoides parri* Koefoed, 1955 (male), *Parataeniophorus gulosus* Bertelsen and Marshall, 1956 (larva) / None.

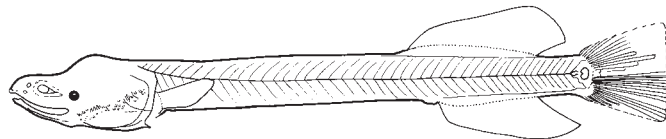
**En** – Longfin flabby whalefish.

Maximum size for females to 250 mm standard length, common to 190 mm, smallest 40 mm; most common whalefish with more than 150 female specimens recorded; 7 males from 34 to 41 mm standard length. Females meso- and bathypelagic, from 100 to probably around 3700 m, with smaller specimens usually less than 120 mm mesopelagic, often nocturnally; males bathypelagic, 1 closing net capture at 1 500 to 2 000 m. In the area females recorded throughout where bottom more than 1 000 m, plus 1 transforming juvenile female and 1 male; also circumglobal from 50°N to 40°S except the eastern South Pacific.



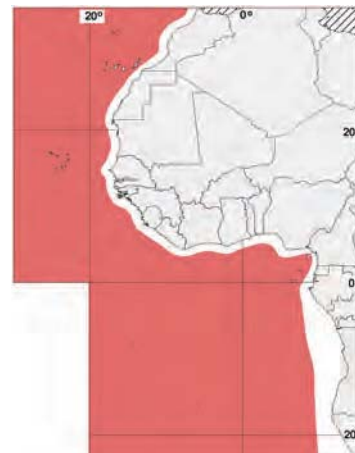
(after Paxton, 1989)

**FEMALE**



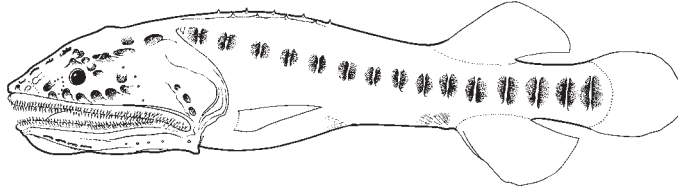
(after Koefoed, 1955)

**MALE**



***Danacetichthys galathenus* Paxton, 1989****En** – Young flabby whalefish.

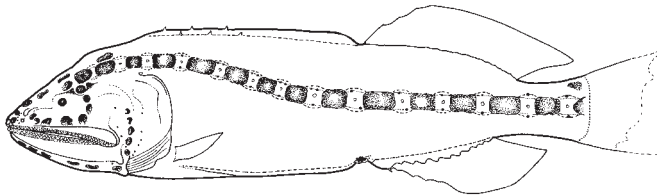
Maximum size for females to 54 mm standard length, others 34 to 53 mm; only 6 female specimens recorded, males unknown. Bathypelagic 1 300 to 2 000 m. In the area, 1 oceanic record; also from Caribbean Sea, tropical western Indian Ocean, and western Pacific from 30° to 20°N.



(after Paxton, 1989)

***Ditropichthys storeri* (Goode and Bean, 1895)****Frequent synonyms / misidentifications:** *Parataeniophorus bertelseni* Shiganova, 1989 (larva) / None.**En** – Doublekeel flabby whalefish.

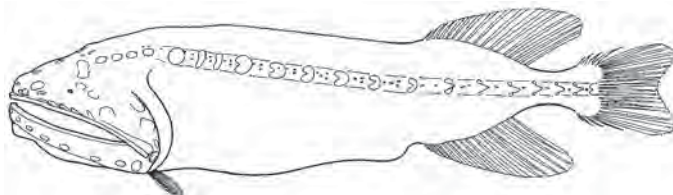
Maximum size for females to 130 mm standard length, common to 100 mm, smallest 25 mm; about 100 female specimens recorded, males unknown. Specimens less than 40 mm sometimes mesopelagic 650 to 1 000 m, specimens greater than 60 mm bathypelagic from 1 000 to about 5 000 m. In the area, 7 oceanic records, potentially throughout where bottom greater than 1 000 m; elsewhere circumglobal between 45° N and S.



(after Paxton, 1989)

***Gyrinomimus myersi* Parr, 1934****En** – Myers' flabby whalefish.

Maximum size for females to 300 mm standard length, common to 165 mm; 20 female specimens known, males unknown. Bathypelagic, 1 closing net capture at 2 200 to 2 350 m. In area, 4 oceanic records; also circumglobal, 55° N to 20° S in Atlantic, tropical in central Indian Ocean, 40° to 20° N in Pacific.



(after Parr, 1934)

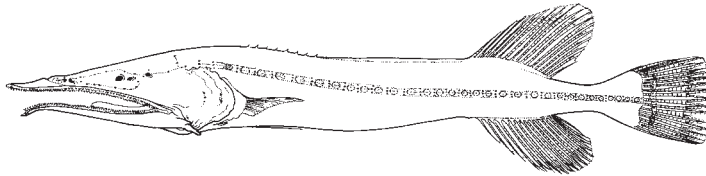




***Rhamphocetichthys savagei* Paxton, 1989**

**En** – Birdsnout flabby whalefish.

Maximum size of females to 125 mm standard length, others 90 mm to 115 mm; only 5 female specimens recorded, males unknown. Bathypelagic from 1 000 to 2 100 m. In area, 1 oceanic record; also from the western North Atlantic, eastern and western tropical Pacific.



(after Paxton, 1989)

