

Synopsis of the Whalefishes (Family Cetomimidae) with Descriptions of Four New Genera

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ABSTRACT. This study of more than 500 specimens recognises two cetomimid subfamilies (one newly described), nine genera (four newly described) and about 35 species (four newly described). Characters of the gill arches, head laterosensory canals, lateral line scales, cavernous tissue, anal lappets and subpectoral organ (the last three of unknown function) are used to distinguish taxa. A cladistic analysis of 39 characters utilised *Rondeletia* and *Barbourisia* as outgroups to polarise character states within the family and the beryciform families to polarise family characters. Three synapomorphies, the presence of gill rakers in some form other than elongate and flattened and the absence of pelvic fins and pleural ribs, support the monophyly of the family. The monotypic Procetichthyinae, defined by four autapomorphies, is the primitive sister group of all other cetomimids. It retains such pleisiomorphic features as a fully developed nasal organ, a fully developed eye with lens, a pseudobranch and 19 principal caudal rays. *Ditropichthys* is the primitive sister group of the remaining seven genera, with the next line including the related *Cetichthys* and *Notocetichthys*. The relationships of the remaining five genera are equivocal, except that *Cetomimus* and *Gyrinomimus* are sister taxa defined by lateral line scale shape. A working hypothesis of relationships is presented that places *Danacetichthys* and *Cetostoma* as sister groups of the remaining three genera. Multistate characters of gill raker-tooth plate shape and extent of the fourth gill slit support the hypothesis. *Cetostoma* and *Rhamphocetichthys* are highly derivative forms, with each monotypic genus defined by three or four autapomorphies. The genera *Gyrinomimus* and *Cetomimus* each have more than ten species, which will be reviewed in later papers. The other genera each have one or two species that are fully detailed here. All examined specimens with recognisable gonads are females, confirmed by histology of eight specimens representing four genera. Egg sizes of at least 2.0, 1.3 and 0.6 mm diameter are attained by the genera *Procetichthys*, *Gyrinomimus* and *Cetostoma* respectively. The vast majority of examined specimens had eggs 0.1 mm diameter or less. The few specimens with larger eggs had bimodal egg sizes. Males and individuals less than 25 mm are unknown. Maximum size is at least 390 mm in one species of *Gyrinomimus*, while *Ditropichthys* and *Cetostoma* apparently do not exceed 140 mm and 250 mm, respectively. Crustaceans are the primary food of whalefishes. The family is distributed in all oceans, from 52°N to 72°S. At the species level, two distribution patterns are apparent. The two commonest species, *Cetostoma regani* and *Ditropichthys storeri*, have cosmopolitan distributions between 50°N and 40°S. The two most frequently captured species of *Gyrinomimus* are restricted to the north Pacific between 39° and 52°N and circumglobally in the Southern Ocean between 32° and 72°S. There are too few collections of the other species to ascertain distributional limits, but some have been taken in all three oceans and others only in a part of one ocean. The centres

of vertical distribution for all species are below 1000 m. Only smaller specimens of *C. regani* and *D. storeri* have been taken above 1000 m, where some nocturnal vertical migration is indicated. Closing net captures confirm large specimens of both species live between 1200 and 1500 m. Four separate closing net captures of *Cetichthys parini* between 2700 and 3200 m demonstrate this to be the deepest living known whalefish. At least some cetomimids are more abundant than previously thought, with 55% of the ISH midwater trawls in the Atlantic fishing to 1800 m or deeper catching whalefishes. Up to 11 specimens and six different species of whalefishes were taken in a single deep trawl. With about 35 species, cetomimids are second only to the anglerfish family Oneirodidae as the most speciose bathypelagic fish family and may be the most abundant below 1800 m. As four of the eight species considered in this paper are represented by less than five specimens, it seems probable that additional species of cetomimids will be captured.

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Whalefishes of the family Cetomimidae inhabit the meso- and bathypelagic waters of all oceans. Although 18 species have been described since 1895 (Table 1), the cetomimids remain one of the most poorly known fish families, with fewer than 100 specimens recorded in the literature. Parr (1934) and Harry (1952) summarised what was known of the family. Since 1952 nine additional species have been described, but little synthetic work has been done; Maul (1969) included a key to the known species of *Cetomimus*.

All but two species in the family were originally described from a single specimen and few additional specimens have been described in detail. Characters such as the numbers of fin rays, lateral line pores and rows of teeth in the jaws and vomer have been used to diagnose new species, but the range of variation within a single species has not been recorded, due until relatively recently to the paucity of specimens in collections. Most of the described specimens have been less than 100 mm standard length (SL); the largest specimen recorded to date was 174 mm. As many species exceed 200 mm SL and the largest specimen collected is 390 mm SL, it appears that most previous descriptions have been based on juveniles. Little information has been published concerning whalefish

biology and no data are available on reproduction or food. With all previously recorded specimens caught in open nets, the vertical distribution of the family has not been detailed. However most were caught with nets fishing at least to 1000 metres, and the family has long been considered bathypelagic.

The systematic placement of the Cetomimidae has been the subject of controversy. Parr (1929), on the basis of osteological features, included the family within the order Iniomi (= Myctophiformes *sensu lato*), while removing the family Rondeletiidae to the order Xenoberycytes (= Stephanoberyciformes). Parr (1945, 1946) and Myers (1946) indicated the Cetomimidae and Barbourisiidae were closely related, but disagreed as to whether the latter should be recognised at the familial or subfamilial level. All subsequent authors have considered all three families closely related, differing in their ordinal placements: as a separate suborder of Myctophiformes (Harry, 1952); as a distinct order Cetomimiformes with or without other families included (Greenwood *et al.*, 1966; McAllister, 1968; Gosline, 1971; Ebeling & Weed, 1973); in the order Beryciformes (Rosen & Patterson, 1969) or with other families in a "stephanoberycoid group" (Rosen, 1973).