

Using the extant *Amia calva* to test the monophyly of Mesozoic groups of fishes

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Abstract

Since 1982, four phylogenies for Amiidae have been proposed, based mostly on examination of Mesozoic taxa, and apparently without detailed examination of the living amiid, *Amia calva*. One proposed phylogeny was based on a phenogram and provided little resolution to family interrelationships. The other three proposed phylogenies were based on cladograms. When data for *Amia* is corrected for the three cladograms based on examination of *A. calva*, the cladograms all change substantially. It is clear that the interrelationships within Amiidae are still very poorly understood.

Introduction

The interrelationships of amiid fishes (Family Amiidae) have recently been reviewed by a number of authors (e. g., SCHULTZE & WILEY 1984, CHALIFA & TCHERNOV 1982, BRYANT 1987, PATTERSON & LONGBOTTOM 1989, and MAISEY 1991), yet the precise interrelationships of these taxa remain very poorly understood. Many of the well-preserved fossil taxa have never been described in detail, and the group has never undergone a rigorous and comprehensive phylogenetic study, in part because of a lack of fully prepared, well-preserved specimens. In the words of PATTERSON & LONGBOTTOM (1989: 835), “any scheme of amiid relationships is premature”. GRANDE & BEMIS are currently examining the morphology and interrelationships of fossil and living amiid fishes in detail, and will clarify a number of morphological details for this group, but in this paper I use *Amia calva* to demonstrate the importance of including extant taxa in studies of fossil fishes, even when the fossils are relatively old.

All taxonomic names with daggers (†) preceding them in this paper are for completely extinct groups. Abbreviations are as follows: AMNH, The American Museum of Natural History, New York. BMNH, The Natural History Museum, London. CM, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania. DMNH, Denver Museum of Natural History, Colorado. FMNH, Field Museum of Natural History, Chicago, Illinois. HUJ, The Hebrew University, Jerusalem. HLMD, Hessisches Landesmuseum, Darmstadt. SMF, Forschungsinstitut, Senckenberg, Frankfurt. SL = standard length. Anatomical abbreviations are given in figure captions.

Amiidae have long been of interest to fish systematists and comparative anatomists. They represent a taxon thought by many to form the sister group to the Teleostei (a group containing about 96 % of all living fish species). Amiid fishes are known to be at least as old as Late Jurassic, and the family contains a single living species, *Amia calva*, commonly referred to as the “bowfin”. The living species is occasionally referred to as an example of a “living fossil” (e.g., SCHULTZE & WILEY 1984). The true bowfins of the family (those amiid fishes with a long bow-shaped dorsal fin, from fresh water or freshwater deposits) date back at least to the Late Cretaceous but are particularly abundant during the Eocene. They are all included in the genus *Amia* by some authors (e.g., JANOT 1967, ESTES & BERBERIAN 1969, BORESKE 1974), or divided into *Amia* and †*Cyclurus* (= †*Kindleia*) by others (e.g., WILSON 1982, MICKLICH 1988, GAUDANT 1992). The use of the name †*Cyclurus* is problematic because at least some of the characters used to diagnose

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