

Basal clupeomorphs and ellimmichthyiform phylogeny

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Abstract

The Ellimmichthyiformes is a fossil group of clupeomorphs (Teleostei). They include the genus *Paraclupea*, *Diplomystus*, and *Ellimmichthys*. *Paraclupea* contains one species, *P. chetungensis* from the Lower Cretaceous Chawan Formation of eastern China; *Diplomystus* contains four species, *D. dentatus* from the lower Eocene freshwater deposits of the Green River Formation, Wyoming, U.S.A., *D. shengliensis* from the middle Eocene freshwater deposits of eastern China, *D. birdi* from the Cenomanian (Upper Cretaceous) marine deposits of Hakel and Hjoula, Lebanon, *D. dubertreti* from the Santonian (Upper Cretaceous) marine deposits of Sahel Alma, Lebanon; *Ellimmichthys* contains at least three species, *E. longicostatus*, from the Lower Cretaceous of Bahia, Brazil, *E. goodi* from the Lower Cretaceous deposits of Equatorial Guinea and at least one undescribed species from the Lower Cretaceous marine deposits of the Morelos Formation, Tepexi de Rodriguez, Puebla, Mexico. A phylogenetic analysis comprising 56 characters for 15 taxa has been made. It is shown that *Diplomystus* is not monophyletic, and *D. dubertreti* is more closely related to other Ellimmichthyiformes than to other *Diplomystus* species; *Sorbinichthys elusivo* is an ellimmichthyiform. “*Diplomystus*” *solignaci* is also included in the Ellimmichthyiformes. The position of *Ezikutuberezi carmeni* from the freshwater deposits of the Lower Cretaceous of the Basque Country (Spain) and the undescribed *Ellimmichthys* from the marine deposits of the Lower Cretaceous of Puebla, Mexico, is analyzed under the proposed hypothesis. The implications of these features regarding clupeomorph phylogeny are discussed. The puzzling biogeographic consequences of the phylogenetic hypothesis proposed are interpreted under the hypothesis of a scarce fossil record concerning basal clupeomorphs. This hypothesis is corroborated by the low correlation between stratigraphic data and phylogenetic hypothesis.

Introduction

Amongst the well recognized and easily identifiable basal teleocephalan groups (Elopomorpha, Osteoglossomorpha, Clupeomorpha and basal euteleosts), clupeomorphs have been the least studied and a single work (GRANDE 1985) has proposed a phylogenetic framework for this group. Until recently (GAYET 1989), clupeomorphs had been identified only by primitive characters and the group was considered as a “wastebasket group”, containing almost every fish that could not be assigned to a well defined, natural group. GRANDE (1982) defined the Clupeomorpha as a taxon and tried to identify monophyletic subgroups within it. Even if the methodological approach used by GRANDE (1982, 1985), was not parsimony analysis but a cladogram drawn by hand (thus using chosen characters in order to support predefined groups), most of the huge number of fossil species assigned to the Clupeomorpha were surveyed and tentatively classified (GRANDE 1985). He found that much of them did not even belong to the Clupeomorpha, offering the opportunity for phylogenetic studies, mainly to test the monophyly and the interrelationships of the clupeomorph groups he proposed.

Basal clupeomorphs

GRANDE (1982) defined two divisions inside the Clupeomorpha. His Division 1 contained one species, *Ornatogulum sardinoides* considered as the sister group of all the other clupeomorphs, based mainly on the structure of the caudal skeleton and the presence of a supratemporal commissural canal enclosed in the parietals. GRANDE (1985) removed *O. sardinoides* from Clupeomorpha Division 1 and substituted it by

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