

The systematic position of the Cretaceous sclerorhynchid sawfishes (Elasmobranchii, Pristiorajea)

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Abstract

Articulated and isolated material of fossil sclerorhynchid sawfishes is re-evaluated to present a hypothesis of the phylogenetic relationships of †Sclerorhynchidae within batoids using cladistic principles. †Sclerorhynchidae is a monophyletic group of fossil batoid fishes, which are restricted to the Cretaceous. A phylogenetic analysis, including the fossil sclerorhynchids and †*Iansan* from the Lower Cretaceous of Brazil is presented. According to this analysis, a monophyletic clade Pristiorajea is confirmed with pristiophoriforms being the most basal batoid clade. †Sclerorhynchidae represents the sister group to pristiiforms and all remaining pristiiorajean. Consequently, a new order, †Sclerorhynchiformes, is introduced. A hypertrophied rostral cartilage with lateral rostral spines was developed independently within several closely related clades according to the present hypotheses. The systematic position of †*Iansan* within pristiiorajean remains unresolved.

Introduction

Recent attempts in selachian phylogeny have provided much new information on the interrelationships of extant batoids (e.g., CARVALHO 1996, LOVEJOY 1996, McEACHRAN et al. 1996, SHIRAI 1992a,b, 1996). However, fossil taxa were almost never considered in cladistic analyses so far. Recently, UNDERWOOD et al. (1999) provided a framework of fossil and Recent neoselachian phylogeny regarding the origin of the different clades. But this hypothesis is not based on parsimony analyses. Nevertheless, the authors were able to show that the fossil record of batoids “appears to be far from complete”. So far, only few phylogenetic analyses using cladistic methods and including fossil taxa have been presented (e.g., CARVALHO & MAISEY 1996: †*Protospinax*, BRITO & SÉRET 1996: †*Belemnobatis*, †*Iansan*, †*Spathobatis*). The lack of phylogenetic studies including fossil selachians results from the lack of preserved skeletal parts. Most fossil selachians are only known by oral teeth. Although selachians can be recognised by their tooth morphology, this character is not helpful in resolving the phylogenetic relationships among batoids, because similar tooth morphologies were achieved in several clades convergently (e.g., ‘rhinobatoids’). Subsequently, the phylogenetic relationships of most if not all fossil batoids are still obscure. The present paper will focus on the systematic position of sclerorhynchid sawfishes from the Cretaceous within batoids and will provide a working hypothesis for further studies. The diagnosis provided will consider only characters that can be found in fossil forms.

Sclerorhynchid sawfishes resemble extant pristiophorid sawsharks and pristid sawfishes by having a long and slender body with a hypertrophied rostrum forming a rostral blade, which is armed with lateral rows of rostral spines (Fig. 1). The main character for identifying sclerorhynchid taxa is the morphology of the rostral spines (Fig. 2). Sclerorhynchids are considered a monophyletic group of fossil batoids (e.g., CAPPETTA 1987). At least 21 genera ranging from the Early to uppermost Late Cretaceous are included in this group. The oldest sclerorhynchid remains (isolated oral teeth) are from the lower Barremian of Spain (KRIWET 1999a, KRIWET & KUSSIUS 2001), Albian of northern Africa (HAUG 1905, STROMER 1927), Aptian-Albian boundary of Texas (THURMOND 1971, BRANCH & MOSLEY 1997), and upper Albian of England (UNDERWOOD & MITCHELL 1999). The most common Early Cretaceous sclerorhynchid sawfish

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