

The caudal skeleton of the Triassic actinopterygian †*Prohalecites* and its phylogenetic position

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Abstract

The caudal fin of †*Prohalecites* is hemiheterocercal, both with an epaxial and a hypaxial basal fulcra, and fringing fulcra, and with fewer than 19 principal caudal fin-rays. The caudal skeleton has irregularly shaped and expanded preural and ural neural arches that usually keep their neural spines. Individuals with complete neural arches (including their spines) do not have epurals. In contrast, individuals with incomplete preural and ural arches bear three to five epurals. Similar preural and ural neural arches are present in †caturids and in †semionotiforms, e.g. †*Dapedium* and †*Tetragonolepis*. The expanded and elongated ural neural arches produce a bony block increasing the stiffness of the tail during locomotion (a function similar to that of the calcified ural neural cartilages in †caturids and of the uroneurals in teleosts). According to the morphology of these elements and to the phylogenetic hypothesis, the last expanded preural and ural neural arches of †*Prohalecites* and †semionotiforms and the modified preural and ural neural arches (or uroneural-like elements) of †pachycormiforms are not uroneurals (paired elongated ural neural arches) like those of Teleostei. However, all of them result from modifications of the last caudal neural arches.

†*Prohalecites* possesses an interesting mosaic of primitive and advanced characters, some of which have been previously interpreted as synapomorphies of Teleostei, e.g., presence of a posteriorly expanded frontal bone of distinct shape, a mobile premaxilla, a propterygium fused to the first pectoral ray, and fewer than seven epurals. It shares with the †Macrosemiidae the presence of a ventral preopercular bone, which has been previously interpreted as a unique character of the family. Among the generalized characters, †*Prohalecites* has two vomerine tooth plates, a suprangular bone, one hypohyal, a polyural caudal skeleton, and fringing fulcra on all fins. Autapomorphies of †*Prohalecites* are the presence of large nasal bones sutured to each other and the loss of body scales. †*Prohalecites* shows different phylogenetic positions among non-teleostean fishes when the outgroups are changed, but it is still more advanced than Amiidae and more primitive than †aspidorhynchiforms, †pachycormiforms, and †pyncnodontiforms.

Introduction

†*Prohalecites*, a small, naked neopterygian (Fig. 1A, B) of about 50 mm maximum length, is known from the type locality of Perledo, and by numerous, well preserved specimens from Ca' del Frate (Viggiù, northern Italy). The Ca' del Frate site opens in the middle Kalkschieferzone as new data suggest. The only datation for this level is based on palynomorphs studied by SCHEURING (1978). Though palynomorph scale is not well correlated to the classic ammonoid one, a latest Ladinian/Middle Triassic age can be inferred.

Most of the original material used by BELLOTTI (1857), DEECKE (1889), and ALESSANDRI (1910) in their pioneering studies of †*Prohalecites* was lost or destroyed during the Second World War. New material has not been collected in Calcare di Perledo for more than half a century. All of this new material has been collected by TINTORI and by collaborators in Ca' del Frate. Part of the new material was used by TINTORI (1990) in the most comprehensive description of †*Prohalecites porroi*. This plus other collections during the last years is considered in this contribution.

TINTORI (1990) concluded that †*Prohalecites* is an intermediate taxon between †Parasemionotidae and †*Dapedium* plus †Pholidophoridae (being closer to the last two). †*Prohalecites* is similar to some †Parasemionotidae in the dermal skull, to †Macrosemiidae in the presence of a ventral preopercular bone that

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