

# New teleostome fishes and acanthodian systematics

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## Abstract

Specimens of two new fish species were collected from the Lower Devonian ichthyofauna of the Mackenzie Mountains, Northwest Territories, Canada. These two species are interesting in that they have monodontoid scales, lack teeth, and have an unossified axial, visceral, and appendicular endoskeleton. These characteristics have been suggested to be primitive for jawed fishes. However, the new taxa have combinations of median and paired fin spines which are similar to those of acanthodian fishes. The new taxa show no obvious characteristics to suggest relationship to any particular group of acanthodians, and for the moment, we will not try to determine their relationships, but to use them as outgroups in an analyses of relationships within the class Acanthodii. Our cladistic analysis results suggest that climatiiform fishes are basal relative to acanthodiform and ischnacanthiform taxa. However, in contrast to previously published analyses, the order Climatiiformes appears paraphyletic relative to the other two acanthodian orders. *Lupopsyrus pygmaeus* is placed as the basal-most acanthodian species, *Brochoadmones milesi*, *Euthacanthus macnicoli*, and diplacanthids are relatively derived “climatiiform” fishes, and the heavily armored condition in *Climatius reticulatus* and *Brachyacanthus scutiger* appears as a uniquely derived state and not primitive for all acanthodians. In addition, *Cassidiceps vermiculatus* and *Paucicanthus vanelsti* seem to be related to acanthodiform fishes based on fin spine structures. *Cassidiceps vermiculatus* originally was placed with climatiiform fishes in the original description. Given our character coding, we identified several primitive characteristics which were retained in relatively derived acanthodian taxa.

## Introduction

The earliest known gnathostomes include representatives of the classes Placodermi, Chondrichthyes, Acanthodii, Actinopterygii, and Sarcopterygii. These early jawed fishes have been studied in detail, but new, better-preserved specimens, putative intermediate forms (ZHU et al. 1999), and older, presumably more primitive representatives of recognized groups continue to be discovered and change our perceptions of the relationships and evolution of early fishes.

The fossil record of acanthodian fishes is limited to microremains from the latest Ordovician (JANVIER 1996) and Silurian, but articulated remains are known from Devonian to Permian aged rocks. Until recently (LONG 1983, GAGNIER & WILSON 1996a,b), acanthodians were thought to be an easily-defined clade of early gnathostomes showing little diversity in body plan (DENISON 1979). There currently are three orders of acanthodians (Climatiiformes, Ischnacanthiformes, and Acanthodiformes) based on historical classifications, although additional orders were proposed to account for patterns of diversity (see MILES 1966 for a detailed summary of previous acanthodian classification schemes). JANVIER (1996) provided the most recent summary of acanthodian anatomy and diversity and maintained the traditional thought that at least some climatiiforms represent the primitive body plan for acanthodians. JANVIER (1996) and GAGNIER & WILSON (1996a) hinted that the order Climatiiformes as presently defined may be paraphyletic, and this hypothesis was supported by a cladistic analysis presented by HANKE (2001) and HANKE & WILSON (2002).

There is consensus among researchers that climatiiform acanthodians are primitive relative to ischnacanthiforms and acanthodiforms (NOVITSKAYA & OBRUCHEV 1964, MOY-THOMAS & MILES 1971, MILES 1966, 1973a, DENISON 1979, JANVIER 1996, HANKE 2001, HANKE & WILSON 2002). However, LONG (1986a) suggested that ischnacanthiforms were basal to both climatiiform and acanthodiform fishes.

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