

# Lower jaw character transitions among major sarcopterygian groups – a survey based on new materials from Yunnan, China

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## Abstract

The lower jaw materials of stem-group sarcopterygian *Achoania* and an indeterminable form with certain onychodont features are described for the first time from the Lower Devonian of Yunnan, China. In addition, new observations on lower jaw features in *Psarolepis* and *Styloichthys* from Yunnan are reported to expand or amend previous descriptions. The lower jaw features of *Achoania* corroborate the phylogenetic position of *Achoania* originally derived from features of the anterior cranial portion. Comparison with available onychodont lower jaws suggests that the indeterminable form from Yunnan and *Langdenia* from northern Vietnam may represent lower jaw materials of basal onychodonts in the Lockhovian fauna of South China. The lower jaw features of basal sarcopterygian groups, when mapped onto our previous cladogram (ZHU & YU 2002), suggest two major changes in lower jaw character transitions leading from the condition in basal actinopterygians to the condition in dipnomorphs and tetrapodomorphs. The first major change is represented by the occurrence in *Psarolepis* of a parasymphysial dental plate bearing a tooth whorl with fangs, five coronoids with precoronoid and intercoronoid fossae, and a prearticular extending forward and covering the area mesial to the coronoid series. The second major change is the occurrence of the 3-coronoid condition in *Styloichthys*, dipnomorphs and tetrapodomorphs. When the precoronoid and intercoronoid fossae are used as landmarks for detecting possible homology among the coronoids, coronoids 2-4 in *Psarolepis* (and *Achoania*) probably correspond to the anterior, middle and posterior coronoids found in basal dipnomorphs/tetrapodomorphs while coronoids 1 and 5 may have been lost in the transition from the 5-coronoid condition to the 3-coronoid condition. Functionally, this transition probably involved a shift of emphasis in the bite, with the major biting force moving from the anteriorly positioned parasymphysial whorls (as in *Psarolepis*, *Achoania* and onychodonts) to the more posteriorly positioned fangs carried by coronoids and opposing palatal bones (as in *Styloichthys* and basal dipnomorphs/tetrapodomorphs).

## Introduction

As pointed out by CLOUTIER & AHLBERG (1996), a new chapter in sarcopterygian systematics was opened by Hans-Peter SCHULTZE in 1970 when he reviewed sarcopterygian tooth structure and explicitly used the distribution of derived characters to delineate monophyletic groups (SCHULTZE 1970). More than 30 years afterward, the impact of Schultze's pioneering work has extended to all areas of study on the origin and radiation of early vertebrates. Among other important discoveries, new fossil findings from China have filled up many previously barren sectors in the phylogeny of early vertebrates. From the Early Cambrian vertebrates *Myllokunmingia* and *Haikouichthys* (SHU et al. 1999), to stem-group sarcopterygians *Psarolepis* (ZHU et al. 1999) and *Achoania* (ZHU et al. 2001), to the newly reported Devonian tetrapod *Sinostega* (ZHU et al. 2002), basal taxa from China present both new opportunities and new challenges for studying the origin and radiation of early vertebrates. In this paper, we plan to use recent findings on sarcopterygian lower jaw materials from China to address questions akin to the spirit of SCHULTZE 1970, i.e. what lower jaw features characterize major sarcopterygian groups, and what may have been the sequence of lower jaw character acquisition involved in the origin and early diversification of sarcopterygian fishes?

Although previous studies on the lower jaw features of the various sarcopterygian groups (GROSS

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