

# The structure of the early chimaeroid dentition

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## Abstract

The discovery, early in the chimaeroid fossil record, of palatine tooth plates of a distinctive structure once referred to the genus *Ganodus* and now recognized as part of the dentition of *Elasmodectes* has raised the possibility that the elasmodectid chimaeroids may be ancestral to the diverse groups of chimaeroids that flourished in later Jurassic and Cretaceous time. Although this hypothesis is not consonant with the assumption that the callorhynchids with tooth plates bearing massive tritons are the most primitive chimaeroids, it cannot be dismissed as untenable. Until additional fossil evidence clarifies the origin and diversification of the chimaeroids, that the first chimaeroids had less robust tooth plates armed with tritoral rods rather than large pads should be considered a possibility.

## Introduction

The chimaeroid fishes appear in the fossil record first in the Early Jurassic, already in some variety in shallow marine waters. Known primarily from isolated tooth plates and a few holomorphic specimens, the chimaeroids can be traced through the Mesozoic as they flourished and became geographically widespread. After the end of the era, they were reduced as a group and survive today in only six genera assigned to three families.

Two questions are uppermost in the minds of those who study the chimaeroids: from which holocephalian precursors did these fishes arise and how did they diversify throughout their long history? The first has proven intractable because there is too little fossil evidence to connect the chimaeroids with earlier holocephalian forms. Despite the resemblance of the chimaeroids to the slightly older myriacanthoid fishes, holocephalians with frontal claspers, elongated snouts and dorsal fin spines, a fundamental difference in tooth plate structure precludes the derivation of the chimaeroids from that group. Although one may speculate about phylogenetic connections to Paleozoic fishes with tooth plates (PATTERSON 1992), there are no known transitional forms that link any of these earlier holocephalians to the chimaeroids. The origin of the chimaeroid fishes, it seems, cannot be ascertained until more relevant fossil material is found.

The second question has been little explored, although an effort has been made to assign the known tooth plates to separate families and so to distinguish one chimaeroid lineage from another. There has been an underlying assumption that the heavy, crushing tooth plates armed with tritoral pads are the most primitive and that the gracile, sectorial plates characterize the more advanced fishes – an assumption supported by DIDIER's (1995) systematic analysis of the Recent chimaeroids; however, investigators recognize that their classification of the isolated tooth plates is tentative and subject to revision.

If the origin of the chimaeroids is currently impenetrable, discoveries of tooth plates made within the past decade have made it possible to look again at the diversification of the group in Mesozoic time. One structural design of the tooth plates making up the chimaeroid dentition appears in several variants among the oldest known chimaeroids and may well be the primitive condition from which later Mesozoic forms evolved.

## The “*Ganodus*”-form or elasmodectid palatine tooth plate

The oldest known chimaeroid tooth plate, described by WARD & DUFFIN (1989) as *Eomanodon simmsi*, is a palatine (Fig. 4A, see below), the larger of the two upper tooth plates that occludes with the single

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