THE MIXOSAURID ICTHYOSAUR PHALARODON CF. P. FRAASI FROM THE MIDDLE TRIASSIC OF GUIZHOU PROVINCE, CHINA

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INTRODUCTION

The family Mixosauridae Baur, 1887 is a dominant group of Middle Triassic ichthyosaurs. Its generic composition has been controversial, but recent findings from southern China enabled Jiang et al. (2006) to recognize two monophyletic taxa within the clade, suggesting the presence of two genera within the family, namely Mixosaurus Baur, 1887 and Phalarodon Merriam, 1910. The latter genus, which was invalidated at one point (Nicholls et al., 1999; McGowan and Motani, 2003), was recently resurrected by Schmitz (2005) by validating its type species. Mixosaurus is Tethyan in distribution, whereas Phalarodon had been known mostly from North America and Spitsbergen, apart from a possible juvenile from Switzerland (Brinkmann, 1997, 1998). More recently, Jiang et al. (2005) reported a largely complete, yet poorly preserved skeleton as the first record of the genus Phalarodon from Asia and referred it to Phalarodon sp. However, important synapomorphies were not clearly identified, and evidence has since emerged that the specimen had been tampered with by farmers after it was collected. In the light of the cladistic analysis by Jiang et al. (2006), the referral of the specimen to the genus Phalarodon is questionable.

A new specimen was excavated in Panxian County, near the western border of Guizhou Province, by the Geological Museum and Department of Geology of Peking University. The new material, the authenticity of which is unquestionable, is from the same stratigraphic horizon as the specimen of Jiang et al. (2003). It contains a well-preserved skull and some postcranial bones, and for the first time firmly establishes the presence of the genus Phalarodon in the western Pacific. Also, the skull is preserved in a very unusual condition: it had been split near the sagittal plane, enabling examination of the poorly known interior suture pattern. This illustrates that mixosaurids had extensive overlap of dermal skull elements, as in other ichthyosaurs (compare Sollas, 1916; McGowan and Motani, 2003).

SYSTEMATIC PALEONTOLOGY

Order Ichthyosauria de Blainville, 1835
Family Mixosauridae Baur, 1887

Diagnosis (modified from Motani, 1999a).—Premaxilla posteriorly narrow and nearly pointed, scarcely entering external nares; long sagittal crest reaching nasal; large anterior terrace of upper temporal fenestra, reaching nasal; pubis much larger than ischium; high, narrow neural spines; midcaudal vertebral centra with increased height.

Genus Phalarodon Merriam, 1910

Type species.—Phalarodon praesi Merriam, 1910.

Diagnosis (Jiang et al., 2006).—Nasal region with pronounced narial shelf; maxillary tooth implantation with sockets.

Material examined.—The specimen is housed in the collections of the Geological Museum of Peking University (GMPKU), bearing the number GMPKU-P-1032. It was prepared by a combination of mechanical and chemical methods.

Occurrence.—Yangjuan Village, Xinmin District, Panxian County, Guizhou Province, China. The fossil-bearing horizon, about 15 cm in thickness, lies immediately below a layer of white clay (ca. 5 cm thick, representing a marker bed for the most fossiliferous horizon). This marker bed is situated within the upper member of the Guanling Formation, which consists of alternating, thinly bedded bituminous limestones and marls. According to co-nodant data (Yang et al., 1999), the stratigraphic age of the horizon is Pelsonian (zone of Nicorella germanicus Kozur, 1990; Anisian, Middle Triassic).

DESCRIPTION

Skull.—The left half of the skull is preserved almost completely in GMPKU-P-1032, spanning 205 mm. The skull is mainly seen in medial view, but parts of the antorbital region have also been prepared from the external side. The skull bones are well preserved except for a partially destroyed region dorsal to the orbit (Figs. 1–3).

The anteriormost part of the premaxilla is broken. The premaxilla forms the alveolar margin for about 80 mm and is then replaced by the maxilla. Posteriorly, the premaxilla narrows and wedges in between nasal and maxilla to form a part of the anterior margin of the external naris (Figs. 1, 2), therefore lacking both supra- and subnarial processes. Its posteroventral suture with the maxilla is curved whereas its posterodorsal contact with the nasal is straight.

The triangular maxilla is completely preserved and has a postnarial maxillary process. It is not possible to discern its exact dorsal extent. The lateral aspect of the maxilla exhibits a long posterior ramus which extends below the orbit. Medially, this process seems to be covered by the jugal.

The elliptical external naris can be observed in both medial and external views. It is 6 mm long and 2 mm high externally and more laterally than dorsally oriented. The dorsal margin is completely formed by the nasal, the ventral by the maxilla. The distance between external naris and anterior orbital margin is about 22 mm. Anterolateral to the external naris, a small shelf, formed by the maxilla, is present.

The dorsal part of the nasal forms the anterior part of the sagittal crest, which extends anteriorly beyond the anterior margin of the external naris (Figs. 1, 2). The sagittal crest is broken along its dorsal margin posteriorly, but in its ventral part the crest is formed by the nasal, frontal, and parietal. The crest is 22 mm high at the level of the posterior margin of the orbit, and is 14 mm high at the level of the posterior margin of the external naris. The parietal is partly broken. It contributes to the posterior part of the sagittal crest, and meets the frontal in a concave suture. It joins the supratemporal posteriorly to form a domelike structure, as in other mixosaurids.

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