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Original article

A new assemblage of freshwater sharks (Chondrichthyes: Elasmobranchii) from the Upper Triassic of India[☆]



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ABSTRACT

This study reports the first occurrence of a varied xenacanth assemblage from the Upper Triassic Tiki Formation of India, based on multiple well-preserved isolated teeth. Based on distinct tooth morphology, two species of the genus *Mooreodontus* are described: *M. indicus* and a new species, *M. jaini*. The new species is diagnosed based on a tricuspid crown containing two stout, slightly diverging lateral cusps pointing in the same direction, a high median cusp, crown-base angle almost at 90°, large, rounded, apical button with several foramina and multiple, 8–9 coarse vertical cristae on all the cusps. Dental anomaly in the form of a partial quadri-cuspidate xenacanthid tooth is present in the collection. Another group of xenacanthid teeth have bicuspid crowns with two upright, asymmetric cusps, where the mesial cusp is thicker than the distal one, and consistently lack a median cusp. Such distinct bicuspid tooth morphology is usually present in Palaeozoic forms and is reported for the first time from the Late Triassic. It is considered to belong to a new taxon, *Tikiodontus asymmetricus* nov. gen., nov. sp., of indeterminate family. Distinctive tooth histology also differentiates the two Indian genera *Mooreodontus* and *Tikiodontus* nov. gen. from other xenacanthid taxa. In addition, the Tiki assemblage has yielded multiple chondrichthyan dermal denticles, which may be subdivided into two morphotypes based on their robustness and presence/absence of linear ridges on the fused cusps. India holds a unique position in terms of its Late Triassic freshwater shark fauna, as it exhibits distinct Laurasian affinities. These freshwater sharks had restricted occurrences in other parts of the Gondwanan landmass.

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1. Introduction

Elasmobranchs, a subclass within the Chondrichthyes, are cartilaginous fishes characterized by 5–7 pairs of open gill slits that are not covered by an operculum and are represented today by sharks, rays, and skates (Nair and Zacharia, 2015). Most of the Palaeozoic and Mesozoic elasmobranchs are represented by isolated teeth, which are important for taxonomic studies as these are quite resistant to weathering and are often the only remains found. Of these extinct elasmobranchs, the Xenacanthiformes represents a diverse group characterized by a fusiform body, dorsal spine and diplodont teeth (Zangerl, 1981; Ginter et al., 2010; Pauliv et al., 2014). Teeth of the family Xenacanthidae are mostly tricuspidate, non-serrated and equipped with vertical cristae (Hampe, 2003; Turner and Burrow, 2011; Pauliv et al., 2017). The base of the tooth is extended lingually with a coronal button

and a basal tubercle on the oral and aboral surfaces, respectively (Hampe, 2003). These xenacanthids are known by articulated skeletons, cephalic spines and isolated teeth (Ginter, 2004) and found worldwide in both marine and freshwater environments (Schneider, 1996; Turner and Burrow, 2011; Pauliv et al., 2014). These fishes are mostly known from Palaeozoic sediments and their diversity decreased considerably during the Triassic, with the Late Triassic represented by only one genus, *Mooreodontus* (Cappetta, 2012; Pauliv et al., 2014). The latter is mostly known from Upper Triassic horizons of North America (Johnson, 1980; Heckert and Lucas, 2003; Heckert, 2004; Irmis, 2005), Germany, England, Brazil (Schneider, 1996; Ginter et al., 2010), India (Jain, 1980), Middle Triassic horizons of Australia (Ginter et al., 2010), and Middle to Upper Triassic Madygen Fm. of southwestern Kyrgyzstan, Central Asia (Seilacher, 1943; Fischer et al., 2011).

In India, several isolated and discrete Gondwana basins of the peninsular India such as the Pranhita-Godavari (PG), Damodar, Satpura, and Rewa basins, are rich in vertebrate fossils (Fig. 1(A)). There are three Late Triassic vertebrate-fossil bearing horizons, which include the Maleri and lower Dharmaram formations of PG Basin, and

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