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A new hybodont shark (Chondrichthyes, Elasmobranchii) from the Upper Triassic Tiki Formation of India with remarks on its dental histology and biostratigraphy

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Abstract.—A new lonchidiid genus, *Pristrisodus*, from the Upper Triassic Tiki Formation of India is described based on multiple, well-preserved, isolated teeth. Comparative analysis resulted in synonymizing *Parvodus tikiensis* and *Lissodus duffini,* which are known from the same horizon and resulted in a new taxon, *Pristrisodus tikiensis* n. comb. These teeth are elongated with mesiodistal length greater than or equal to twice the labiolingual width and have a high principal cusp, lateral cusplets, a distinct ridge near the crown-root junction labially and higher up on the crown lingually, weak ornamentation, and linear depression along the crown-root junction. Five morphotypes based on overall shape, robustness and crown height are determined. The teeth show a gradual monognathic heterodonty. The anterolateral teeth (morphotypes I – II) have high, pyramidal principal cusp with two or three small but pointed cusplets, and triangular labial and lingual protuberance. The posterolateral teeth (morphotypes III – IV) have four incipient cusplets, relatively low principal cusp, bilobed/rounded, hanging labial and incipient lingual protuberances. Morphotype V comprises anterior teeth that are broad, triangular and robust, and have rounded/blunt principal cusp, one cusplet, and low, hanging labial peg. Multivariate analyses corroborate the qualitative assessment of the Indian hybodonts. Dental histology of *Pristrisodus* n. gen., shows that it is distinctly different from other lonchidiid genera. The assemblage of freshwater sharks, along with other vertebrate microfossils of the Tiki Formation, shows similarity with that of the lower Tecovas Formation of the Chinle Group, USA. The euryhaline nature resulted in the adaptation of the hybodonts to freshwater systems in India during the Carnian.

Introduction

Hybodont sharks, one of the most successful chondrichthyan lineages, appeared in the Late Devonian (Ginter et al., 2002) and became extinct at the end of the Cretaceous (Becker et al., 2004). The hybodonts attained a high diversity during the Triassic, but their abundance started decreasing from the Jurassic onwards (Cuny et al., 2007). These were mostly euryhaline, capable of inhabiting rivers and lakes (Cuny, 2012). Freshwater hybodont sharks are reported from different horizons throughout the world (Heckert, 2004; Fischer, 2008; Klug et al., 2010; Cappetta, 2012; Johns et al., 2014; Manzanares et al., 2016), although complete preservation of these forms are rare, and mostly represented by various types of teeth, cephalic spines, and scales (Fischer et al., 2010; Klug et al., 2010). All hybodonts are characterized by a tooth enameloid containing single apatite crystallites (Reif, 1973) and anaulacorhize or sponge-like pattern of root vascularization (Maisey, 1987; Cappetta, 2012).

In India, several isolated and discrete Gondwana basins (Fig. 1.1, inset) are rich in varied vertebrate fossil assemblages (Bandyopadhyay, 1999, 2011), including vertebrate microfossils (e.g., Datta et al., 1978; Datta, 1981, 2005; Yadagiri, 1986; Prasad and Sahni, 1987; Prasad and Cappetta, 1993; Patnaik, 2003). Studies on fossil fish teeth collected from the Gondwana sediments of India are scarce and was initiated by Jain et al. (1964), who reported an undescribed dipnoan, subholostean, and pleuracanth fishes from the Upper Triassic Maleri Formation of the Pranhita-Godavari (PG) Basin. Later, Jain (1980) described *Xenacanthus indicus* from the same formation. The hybodont fishes, including *Lonchidion indicus*, were described from the Jurassic Kota Formation of the same basin by Yadagiri (1986). Subsequently, the formation yielded different hybodont taxa (Prasad et al., 2004). Prasad et al. (2008) described multiple hybodonts from the Upper Triassic sediments of India, whereas a diverse assemblage comprising actinopterygians, dipnoans, and indeterminate chondrichthyans was reported from the Lower Triassic Panchet Formation of the Damodar Basin by Gupta (2009).

The current study focuses on a new collection of isolated hybodont teeth collected from the Upper Triassic Tiki Formation of the Rewa Gondwana Basin, India, which are described based on gross dental morphology and histology. Comparison with other existing Late Triassic hybodont taxa shows that these

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