ABSTRACT

A multidimensional study of a new metoposaurid-dominated highly diverse multitaxic bonebed from the Upper Triassic Tiki Formation of India reveals a new metoposaurid taxon characterised by multiple cranial and postcranial features. Phylogenetic analysis shows that the new Tiki taxon is basal to the other Indian, European and North American metoposaurid genera. Skeletal reconstruction shows a wide parabolic skull with blunt anterior end and a robust lower jaw, a barrel-shaped body, small limbs and a long tail, the mediolateral flexion of which provided the main hydrodynamic thrust. Bone microanatomy of the new Tiki metoposaurid reveals cortices composed of alternating vascular zones and annuli and/or lines of arrested growth suggesting pronounced cyclical fast and slow growth phases, which can be correlated with variable responses to environmental conditions. Three distinct ontogenetic stages are identified. A fully aquatic lifestyle was proposed for the new Tiki taxon though a change from terrestrial or amphibious mode of life to deep water swimming with ontogeny is evident.

In addition, five isolated nearly complete claws or ungual phalanges recovered from the same bonebed were examined. Based on several diagnostic features, four of these ungual phalanges are identified as belonging to the theropod dinosaurs. The remaining claw is unlike that of any theropods in terms of high robusticity and near symmetry, though similarity is seen in other features suggesting that it belonged to an indeterminate dinosaur. This new find points towards the presence of small dinosaurs in the Tiki fauna.

Another major component of the bonebed is the multipsecific unionid genus *Tihkia*. The species are differentiated based on the shell shape, length and height proportions, convexity or inflation and nature of growth lines, though these taxa show location-wise heterogeneity and differing palaeohydrological conditions. A distinct seasonality is suggested by microgrowth increments of the unionid bivalves, which corroborates the bone microanatomy of the new metopsaurid taxon. On the other hand, the bonebed has yielded numerous varied coprolites, including the scroll coprolites pertaining to a new ichnotaxon *Tikicopros triassicus*, which constitutes the first record of the scroll coprolites from the Mesozoic. Other forms include two new ichnotaxa of the spiral coprolites and multiple non-spiral coprolites. All of these coprolites contain varied fish scales, and fragmentary remains of teeth and bones as inclusions, and were produced by various types of chondrichthyans, dipnoans, actinopterygians and carnivorous and/or omnivorous tetrapods. The study of these coprolites highlights the inter-relationship between their producers, and their connectedness within the Tiki vertebrate palaeoecosystem.

The Tiki rivers and surrounding floodplains were populated by highly diverse animal communities occupying terrestrial, semi-aquatic and aquatic realms, where scavenging and/or predation were common. Two distinct biostratinomic modes comprising (i), natural death, decomposition and differential preburial modifications, and (ii) breaching of banks during flooding events, mass death and high energy deposition of sediment load including various aquatic fishes and unionids are hypothesised. The new bonebed is a time-averaged accumulation, whereas the other two coeval bonebeds resulted from catastrophic events. Moreover, the mortality dynamics and fossilisation pathways of various animal communities were distinctly different depending on the habitat and palaeobehaviour of the Tiki animals. Hence, a dynamic and highly diverse vertebrate life is envisaged for the Late Triassic Tiki scenario.

Keywords: Coprolites, Gondwana, India, Late Triassic, Metoposaurid, Unionids.