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Geochemical insights into the fossilization processes and palaeoenvironment of vertebrate bonebeds from the Late Triassic of India.

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The Late Triassic witnessed a highly diverse terrestrial vertebrate fauna and included various temnospondyls, diapsids comprising the early dinosaurs, specialized non-mammalian cynodonts and early mammals. It is considered as a transitional period between ancient and modern terrestrial ecosystems [1]. There are three fossil-rich Upper Triassic horizons in India, of which the Tiki Formation of the Rewa Basin is the focus of current study. Four contemporaneous Late Triassic bonebeds recovered from the Tiki Formation and having more or less same stratigraphic level were examined for geochemical signals. The bonebeds, with varying biostratinomic histories [2, 3, 4], consisted of the three major extinct vertebrate clades, namely metoposaurids, phytosaurs, and rhynchosaurs. We used trace elements as geochemical proxies to explore the palaeoenvironment and redox conditions of Tiki bonebeds during fossilization.

Multiple identifiable skeletal remains belonging to the three aforementioned taxa were subjected to inductively coupled plasma mass spectrometry (ICP-MS) to reveal high trace element concentrations that denote substantial postmortem diagenetic alterations. Significant enrichment in REE, particularly in the middle rare earth elements (MREE) is seen because of the presence of iron oxide in an oxidizing fluvial setting that prevailed during fossilization. The specimens displayed a consistent positive europium (Eu) anomaly and low uranium (U) concentration, which are attributed to a locally reducing microenvironment caused by the decay of organic matter in the bones. However, the cerium (Ce) anomalies are variable and point towards differences in pre-burial weathering, rate of burial and fluctuating burial depths. The study concludes that the four contemporary Tiki bonebeds have undergone similar early diagenetic pathways where burial was a single-phase event, most likely caused by a major flooding event, irrespective of whether the accumulation was time-averaged attritional or catastrophic, and were deposited in a terrestrial and fluvial setting. Such comprehensive study is the first of its kind and highlights the role of geochemical signatures in understanding provenance, early diagenetic microenvironments, and fossilization pathways of contemporary bonebeds.

[1] Bandyopadhyay & Ray (2020) *Episodes* 43, p.438.
[2] Mukherjee & Ray (2012) *PPP* 333, 75–91.
[3] Datta et al. (2020) *JVP* 39, e1726361.
[4] Rakshit & Ray (2021) *Historical Biology* 33, 2193–2215.