NEW PERSPECTIVES ON THE TAPHONOMY AND GEOLOGICAL CONTEXT OF LOTOSAURUS ADENTUS (ARCHOSAURIA:POPOSAUROIDEA): RE-EXAMINATION OF THE TYPE LOCALITY FROM THE MIDDLE TRIASSIC BADONG FORMATION, HUNAN, CHINA

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ABSTRACT

The Lotosaurus Quarry, traditionally dated to the Anisian, is unique in that it is a dense bonebed from which tens to hundreds of individual bones and partially articulated skeletons of Lotosaurus adentus have been collected since its discovery in 1971. Lotosaurus adentus is a highly unusual, small-bodied, ornithopod poposaurusid archosaur known primarily from a single type locality in Sangzhi County, Hunan Province, south China. Members of our team returned to the quarry over 600 new samples were collected in 2012 in order to excavate an expansive new region of the bonebed in a search for other Middle Triassic vertebrates. Due to their work over 600 new bonebed samples were exposed and left in situ. Local authorities subsequently built a protective structure over the site to facilitate future research and geotourism. Our team mapped the distribution of the exposed fossils and reinterpreted the taphonomy of this important locality in early 2015. Two new layers were recorded during the excavations and the fossil bonebed is a monospecific assemblage, characterized by pervasive disarticulation and a lack of apparent damage from predators and scavengers, and a preferential orientation of elements. Detailed sedimentological analyses of the locality and other exposures of the Middle Triassic Badong Formation were conducted. We also utilized U-Pb detrital zircon geochronology to better constrain the age of the locality and formation, and to help reconstruct sedimentary processes. We believe that the bones primarily accumulated due to the flow conditions of a fluvial-floodplain depositional setting as previously suggested. The presence of a population of younger individuals that died within the bonebed indicates that Lotosaurus is likely to be the Late Anisian age, rather than Anisian as previously reported. Lotosaurus lies among, or just outside, a grouping of derived poposaurid archosaurs known from the Upper Triassic of North and South America, making this result more congruent with the phylogenetic projections.

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REFERENCES


DZ GEOCHRONOLOGY

The maximum depositional age we find for sample 17r-15-1a is 252.2 ± 5.9 Ma, whereas the maximum depositional age we find for sample 16-1-5-3 is 236.3 ± 8.0 Ma (Figure 6).

Our data suggest that Lotosaurus adentus may be slightly younger than previously thought.

Provenance analysis of the sediments suggest that sediment was primarily derived from local sources in the South China Block and do not provide any direct evidence to suggest connectivity between the North and South China Blocks by this time, suggesting that Lotosaurus evolved on the South China Block.

TAPHONOMY OF BONEBED

This bonebed is a large, monospecific assemblage which shows little to no damage from predators and scavengers, thorough disarticulation, and preferential orientation (Zhang, 1975) (Figure 5).

We believe that the bones primarily accumulated due to the flow conditions in an ancient river.

Fractal analyses will be used to analyze the overall bone distribution. We hope that this will demonstrate that these fractal analyses may be a useful tool for similar, future studies. We will also employ clay mineral analyses in an attempt to address paleoclimatic questions.

SUMMARY OF RESULTS

Our data suggest that Lotosaurus adentus is likely to be Ladanian in age, rather than Anisian as previously reported.

Our results indicate that this locality formed in a fluvial-floodplain depocenter with sediment derived from numerous sources, rather than in a tidal flat setting as previously suggested.