TRACKING PALEOENVIRONMENTAL ASSOCIATIONS IN VERTEBRATE MICROFOSSIL BONEBEDS IN THE UPPER CRETACEOUS (CAMPANIAN) JUDITH RIVER FORMATION, MONTANA

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The Upper Cretaceous (Campanian) Judith River Formation of north-central Montana preserves abundant vertebrate microfossil bonebeds (VMBs), which are accumulations of millimeter to centimeter scale vertebrate fossils that range from intact bones of small animals to small bones and fragments of large animals. Previous work on the taphonomy of Judith River VMBs suggest that they represent time-averaged accumulations of resilient fossils that accrued in freshwater aquatic basins (lakes, swamps). Over 7500 fossils (including unidentifiable fragments) from two VMBs (WBN15-18: hereafter referred to as Site 1, and CC13-015: hereafter referred to as Site 2) were studied in relation to the presence/absence and relative abundance of eight general taxonomic groups: osteichthyans, chondrichthyans, amphibians, turtles, crocodiles, champsosaurs, dinosaurs, mammals, and squamates. The Site 1 sample (n=1168 identifiable specimens) was recovered from a localized outcrop of brown massive siltstone rich in carbonaceous debris. The Site 2 sample (n=2735 identifiable specimens) was collected from a more expansive outcrop of massive gray silty mudstone that preserves abundant freshwater clam and gastropod shells. Given the fully dissociated nature of material in both sites, identifiable specimens were counted as a single individual (we recognize that this inflates counts). Despite similar taphonomic characteristics and depositional settings, the two sites exhibit distinct distributions of taxa. Site 1 is dominated by animals with terrestrial affinities (>80%), most notably dinosaurs. Site 2 is dominated by semi-aquatic and fully aquatic groups overall (>95%), including fish, turtles, crocodiles, and champsosaurs. However, one sample from Site 2 preserves a decidedly greater proportion of terrestrial taxa (again, dinosaurs), comparable to site 1. We interpret these patterns to potentially reflect “onshore-offshore” control on collections, with samples dominated by terrestrial animals representing more shoreline proximal settings. This interpretation is supported by grain size trends and the distribution of plant debris, which tends to be more abundant in the lake margin settings. These results suggest potential to track paleoecological associations in VMBs at a finer level than previously suspected.

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