

Comparative taphonomy and paleoecological reconstruction of two microvertebrate accumulations from the Late Cretaceous Hell Creek Formation (Maastrichtian), eastern Montana

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ABSTRACT

Although microvertebrate accumulations are commonly used for paleoecological reconstructions, taphonomic processes affecting the final taxonomic composition of an accumulation are often ignored. This research explores the effects of abiotic taphonomic processes on the taxonomic composition of terrestrial microvertebrate accumulations by comparing a floodplain and a channel lag deposit from the Maastrichtian Hell Creek Formation in eastern Montana. Distribution of skeletal elements with specific physical attributes and relative abundance of taxa correlate with the hydraulic indicators (i.e., grain size, sedimentary structures) of the depositional facies. Transport distances, hydraulic equivalencies of dominant skeletal elements, amount of hydraulic sorting and reworking, and degree of time averaging vary between deposits and significantly affect taxonomic distributions. Relative abundance data, in conjunction with chi-square test results and rank-order analysis, show that size, shape, abrasion, and taxonomic compositions vary significantly between assemblages. The fine-grained assemblage is dominated by tabular, low-density elements, such as cycloid scales and fish vertebrae. Dense, equidimensional elements, such as teeth and ganoid fish scales, dominate the sandstone assemblage. Rank-order analysis results demonstrate that relative abundance of hydraulically equivalent skeletal elements from morphologically similar organisms can be compared regardless of accumulation in nonisotaphonomic deposits. Statistical comparisons were made among osteichthyans using ganoid scales, caudates using vertebrae, ornithischians using teeth, and testudines using shell fragments. Results show that portions of the assemblage analyzed using hydrodynamically equivalent elements are not significantly different, despite different depositional environments.