

LOCOMOTOR BEHAVIOR OF PALEOCENE MAMMALS: INSIGHTS FROM THE SEMICIRCULAR CANALS OF THE INNER EAR

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The end-Cretaceous mass extinction triggered the collapse of ecosystems and a drastic turnover in mammalian communities leading to the demise of many ecologically specialized species. While Mesozoic mammals were ecomorphologically diverse, recognizable ecological richness was only truly established in the Eocene. Questions remain about the ecology of the first wave of mammals radiating after the extinction. Here, we use the semicircular canals of the inner ear as a proxy for locomotor behavior. Thirty new inner ear virtual endocasts were generated using high-resolution computed tomography scanning. This sample was supplemented by data from the literature to construct a dataset of 79 fossils spanning the Jurassic to the Eocene alongside 262 extant mammals.

Vestibular sensitivity was measured using the radius of curvature against body mass and the residuals of this relationship were analyzed. The petrosal lobule size relative to body mass were compared with the inner ear data as they have a role in maintaining gaze stabilization during motion. Paleocene mammals exhibited smaller canal radius of curvature, compared to Mesozoic, Eocene, and extant taxa. In the early Paleocene, canal radius and associated petrosal lobules were relatively smaller on average compared to other temporal groups, suggesting less ability for fast movements.

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