DIFFERING EFFECTS OF SIZE AND LIFESTYLE ON BONE STRUCTURE IN MAMMALS

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The skeleton is involved in most aspects of vertebrate life history. Previous macroevolutionary analyses have shown that structural, historical, and functional factors influence the gross morphology of bone. The inner structure of bone has, however, received comparatively little attention. Here we address this gap in our understanding of vertebrate evolution by quantifying bone structure in appendicular and axial elements (humerus and mid-lumbar vertebra) across therian mammals (placentals + marsupials). Both cross-sectional geometry and trabecular traits were acquired through µCT-scan data. Our sampling captures all transitions to aerial, fully aquatic, and subterranean lifestyles in extant mammal clades. We found that mammalian inner bone structure is highly disparate. We show that vertebral structure mostly correlates with body size, but not lifestyle, while the opposite is true for humeral structure. The latter also shows a high degree of convergence among the clades that have acquired specialised lifestyles. Our results suggest that radically different extrinsic constraints can apply to bone structure in different skeletal elements. Refining these broad trends will require including additional key fossils to the dataset. These will for instance comprise Oligocene talpids from Southern Germany.