Macroecology & Macroevolution

THE INFLUENCE OF ANCESTRAL BODY SIZE ON ECOMORPHOLOGICAL TRENDS IN SYNAPSID RADIATIONS

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'Small-bodied faunivore' is the dominant ancestral ecomorphotype early in crown mammalian radiations, but it is unknown how far back this trend extends within Synapsida (the mammalian total group). To examine synapsid macroevolutionary patterns in a phylogenetic context, we built a time-calibrated meta-phylogeny of 2,128 synapsid species from the Carboniferous through Eocene (305–34 Ma), based on 211 published character matrices, each weighted according to their dependence on 'parent' matrices. All published character matrices focusing on non-mammalian synapsids were included, making the meta-phylogeny comprehensive for non-mammaliaform synapsids. Further, we used the most comprehensive early mammaliaform matrices. We then collected jaw length measurements (as a proxy for body size) and dietary information for 408 synapsid species (37 non-therapsid pelycosaurs, 134 non-cynodont therapsids, 46 non-mammaliaform cynodonts, 80 non-therian mammaliaforms, and 178 therians). We used the meta-phylogeny in conjunction with jaw length measurements to investigate patterns of body-size and dietary evolution during radiations of synapsid subclades.
The results show that faunivory is the typical ancestral diet of each major radiation within Synapsida, but the small-to-large trend in body-size within radiations does not become established until the end-Triassic size bottleneck near the base of Mammaliaformes. Instead, 'pelycosaur', 'therapsid', and 'cynodont' subclades have ancestral jaw lengths that are considerably larger than non-therian mammaliaforms and therians. The shift to small ancestral body sizes is one of several aspects of the mammalian phenotype to emerge in the Late Triassic. Furthermore, by placing 'mammaliaforms' and mammals near their likely lower size limit, this change forced most subsequent body-size diversification to consist of trends toward larger sizes, altering macroevolutionary dynamics for the remainder of synapsid history.

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NON-AVIALAN THEROPOD ECOSPACE DRIVEN BY EXTINCTION EVENTS, ORIGIN OF FLIGHT, AND RADIATION OF FLOWERING PLANTS

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By giving rise to birds in the Jurassic, theropods are the most morphologically and ecologically diverse clade of dinosaurs. However, even when excluding birds, non-avialan theropods represent an extremely diverse group of Mesozoic dinosaurs (>400 valid species) with a great species richness and a large array of body size, feeding ecologies (carnivores, herbivores, omnivores, piscivores, myrmecophages, etc.) and ecological niches (ground-dwelling, semi-aquatic and scansorial/arboreal). This study aims to identify evolutionary and ecological drivers that have shaped theropod communities throughout the Mesozoic by exploring ecospace modelling using 232 genus-level non-avialan theropod taxa. Five ecological parameters—paleoenvironment, habitat, body size, diet and locomotion—were used to explore ecospace modelling and ecospace occupation in non-avian theropods through time. Diet was considered using three parameters (dietary preference, feeding strategy, and trophic guild), which were assessed and categorized based on the results of a cluster analysis conducted on a data matrix of 60 discrete feeding-related characters. Ecological morphospace and disparity curves were plotted over seven time bins of the Mesozoic and compared with curves on species richness, body mass, and angiosperm within-flora richness and abundance. Our preliminary