

Patterns in body mass distributions: sifting among alternative hypotheses

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Abstract

Understanding how animals interact with their environment is critical for evaluating, mitigating and coping with anthropogenic alteration of Earth's biosphere. Researchers have attempted to understand some aspects of these interactions by examining patterns in animal body mass distributions. Energetic, phylogenetic, biogeographical, textural discontinuity and community interaction hypotheses have been advanced to explain observed patterns. Energetic and textural discontinuity hypotheses focus upon the allometry of resource use. The community interaction hypothesis contends that biotic interactions within assemblages of species are of primary importance. Biogeographical and phylogenetic hypotheses focus on the role of constraints on the organization of communities. This paper examines and organizes these various propositions about species body mass distributions and discusses the multiple competing hypotheses, how their predictions vary, and possible methods by which the hypotheses can be distinguished and tested. Each of the hypotheses is partial, and explains some elements of pattern in body mass distributions. The scale of appropriate application, relevance and interpretation varies among the hypotheses, and the mechanisms underlying observed patterns are likely to be multicausal and vary with scale.