Species?environmental diversity relationships are shaped by the underlying species?area curves

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Abstract

The relationship of environmental (ED) or habitat (HD) diversity of a landscape with its species richness (S) is of much interest. Based on underlying species?area (S?A) curves, we show that the standard linear relationship lacks theoretical support. The S?ED relationship is the product of numerous S?A curves per habitat and number of distinct habitats in the landscape. We recognize three basic S?ED patterns: convex, unimodal, concave, based on three fundamental S?A curves: power, logarithmic and sigmoid. The preponderance of positive linear or absence of S?ED/HD relationships reported so far can be attributed to six causes. These include: only testing for linear relationships; limited data sets that exclude small, unique or isolated habitats; regressions are against non-causal variables; and use of biased data that have not been ground-truthed. Hump-backed S?ED curves should apply widely in regions with species-rich biota and need to resurrected, provided data collected are sufficiently comprehensive and accurate.

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