

Publication

A general framework for analyzing beta diversity, nestedness and related community-level phenomena based on abundance data

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We describe a procedure for evaluating the relative importance of beta diversity, nestedness, and similarity properties of ecological data matrices containing density, cover or biomass scores of species. Our goals are achieved by extension of the simplex approach - originally proposed for presence-absence data - to abundances. Basically, the method involves decomposition of the Marczewski-Steinhaus coefficient of dissimilarity between pairs of sites into two fractions, one derived from differences between total abundance and the other from differences due to abundance replacement. These are contrasted by the similarity function counterpart, known as the Ruzicka coefficient, and are displayed graphically using ternary (or 2D simplex) plots. Interpretation is aided by calculating percentage contributions from these components to the (dis)similarity structure. Measures of replacement and nestedness are new for abundance data; these are considered complementary phenomena reflecting antithetic ecological processes that are analogous to those operating at the presence-absence level. The method is illustrated by artificial data and a range of actual ecological data sets representing different groups of organisms, different scales and different types of data. While the simplex diagrams and associated coefficients are meaningful by themselves, their comparison with presence-absence based results gives additional insight into data structure and background factors.

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