

Compositional approach to the analysis of species abundance data

G.S. Monti¹, and S. Migliorati¹

¹ Department of Economics, Management and Statistics, University of Milano-Bicocca, Italy
gianna.monti@unimib.it

Abstract

The investigation of species associations is a classical problem in ecology, in order to describe and predict environmental characteristics. Species associations, which arise when two or more species co-occur (presence-absence data) or are correlated (abundance data or community composition data) either more or less frequently than expected due to chance alone. Several statistical methods have been utilized to detect species associations, such as correlation analysis, analysis by contingency table, the use of cross-variograms and others.

The analysis of species abundance data table, $\mathbf{Y} = [y_{ij}]$ of size $(n \times p)$ with sites $i = (1, \dots, n)$ and species $j = (1, \dots, p)$, requires a suitable transformation to apply any statistical analysis such as principal component or canonical redundancy analysis which, for untransformed data, preserve Euclidean distances among the objects.

As a first attempt Legendre and Gallagher (2001) proposed a transformation based on the square root of ratios between components of the composition. In this contribution we would apply the log-ratio approach to the analysis of species abundance data introducing the Aitchison geometry (Aitchison, 1986) in this framework. The log-ratio transformations produce acceptable projections of the correlations among species in principal component space that will be used to analyze association among species.

REFERENCES

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