

Billheimer, Dean; Guttorp, Peter; Fagan, William F.

Statistical interpretation of species composition. (English) Zbl 1073.62573

J. Am. Stat. Assoc. 96, No. 456, 1205-1214 (2001).

Summary: The relative abundance of different species characterizes the structure of a biological community. We analyze an experiment addressing the relationship between omnivorous feeding linkages and community stability. Our goal is to determine whether communities with different predator compositions respond similarly to environmental disturbance. To evaluate these data, we develop a hierarchical statistical model that combines Aitchison's logistic normal distribution with a conditional multinomial observation distribution. In addition, we present an algebra for compositions that includes addition, scalar multiplication, and a metric for differences in compositions. The algebra aids interpretation of treatment effects, treatment interactions, and covariates. Markov chain Monte Carlo (MCMC) is used for inference in a Bayesian framework. Our experimental results indicate that a high degree of omnivory can help to stabilize community dynamics and prevent radical shifts in community composition. This result is at odds with classical food-web predictions, but agrees with recent theoretical formulations.

MSC:

- 62P10 Applications of statistics to biology and medical sciences; meta analysis
- 62F15 Bayesian inference
- 65C40 Numerical analysis or methods applied to Markov chains

Cited in **35** Documents

Full Text: [DOI](#)