COMMUNICATIONS BRÈVES
≪ BIODIVERSITÉ DANS UN MONDE EN MOUVEMENT ≫
22–26 JUILLET, 2013

CONTRIBUTED TALKS
"BIODIVERSITY IN A CHANGING WORLD"
JULY 22–26, 2013

Differences in species abundance patterns of niche and neutral communities

Rosalyn Rael * Annette Ostling * Gyorgy Barabás *

Rafael D'Andrea *

The influences of species interaction mechanisms on species abundance distributions are not yet clearly understood. Recent studies focus on the relative importance of two types of mechanisms : niche and neutral dynamics. Neutral dynamics are based solely on demographic stochasticity and immigration and niche dynamics are generated by trait differences that affect the fitnesses of competing species and can enhance coexistence. One recent study showed that abundance patterns produced under niche and neutral dynamics are very similar, especially when diversity is high relative to the number of niches. While that study assumed for simplicity that species in separate niches are essentially non-interacting, we consider the distributions arising from a stochastic Lotka–Volterra competition model in which the strength of competition amongst all species regardless of niche depends on differences in a trait. We find more substantial differences between niche and neutral species abundance distributions than did the prior study, even when diversity is high relative to the number of niches. We will discuss how detectable the differences from neutral predictions would be in data. We show how the detectability depends on whether knowledge of the neutral parameters is established a priori from ecosystem characteristics, or whether the parameters are fit to species abundance data using a likelihood sampling approach. We also show how the detectability is altered by the number of niches and by increasing the number of trait dimensions from one to two. With a priori parameters, moderate to reasonable detection levels can be achieved even with a modest number of niches in a data set comparable to the 50 hectare Barro Colorado Island Forest plot. Detection is much more challenging under parameter fitting. The qualitative nature of the departure from the neutral case, as characterized by evenness, varies as the number of niches increases. This may be problematic for ascribing detected differences to niche differentiation specifically, as opposed to other potential influences such as habitat filtering.

*Department of Ecology and Evolutionary Biology, University of Michigan, Ann Arbor, MI 48109-1048, USA.