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Stochastic models in community ecology

Abstract

One of the most fundamental questions in biology is: how do so many species to coexist, given that the interactions between them are usually antagonistic? Mathematical models play a key role in answering this question, and are of timely importance for predicting how ecological systems will react to global change. I shall discuss stochastic models of community assembly based on demographic processes (births, deaths, dispersal), which can be tested against a variety of ecological patterns including species abundance distributions and species-area relationships. Simple "Neutral" models (that assume ecological interactions to be independent of species identity) can successfully predict some of these patterns, but require unrealistic assumptions about the underlying biological processes. I shall discuss how to incorporate more realistic mechanisms — such as spatial structure, protracted speciation, and non-neutral interactions — without sacrificing mathematical tractability.