Ecological stability in evolving communities

Jacob Johansson

Abstract

Ecological stability was analysed for communities that evolve in sympatry according to a model within the framework of adaptive dynamics. Theoretical species with one single trait radiated over a continuous trait space. Ecological dynamics were driving forces for the evolution and included resource availability, inter- and intraspecific competition. Three different stability measures were calculated for ecological communities along the course of evolution. First, dominant eigenvalues were used to estimate resilience, or return time for the ecosystem after a perturbation. Coefficients of variation were used in order to measure two other aspects of stability; risk of extinction for individual species and variability for total community biomass, respectively. During speciation events, communities showed little resilience and newly formed species exhibited the highest risks of extinction. When communities radiated, the system as a whole became less variable but the resilience decreased. High environmental correlation, intermediate to strong density dependence and narrow niche widths lowered the risk of extinction for individual species shortly after speciation, something that might indicate that formation of species in sympatry is facilitated by these conditions.

Project supervisor: Jörgen Ripa
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