

Evolution and divergence – an adaptive dynamic model

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Abstract

The evolution of complex communities, with interacting species at different trophic levels, is modelled as phenotypic strategies based on a game theoretical approach. A simple predator–prey dynamic model is extended into an adaptive dynamic model concerning both ecological and evolutionary time scales. By simulating the dynamics of the model and seeking evolutionary stable strategy (ESS) solutions, which fulfil both ecological and evolutionary stability requirements, the potential complexity of a community can be pictured in an adaptive landscape. I have investigated the outcome of such ESS landscapes by varying predator and prey niche breadth and the intensity of the prey–prey competition. The adaptive landscape can also serve as the basis for an evolutionary process, where strategies are permitted to move among hills and valleys that are constantly changing. I have made simulations to study this evolution through time and the result is a series of dynamic processes, which illustrate many different phenomena. One single model can include the study of population cycles and adaptive diet switching of the predator, ecological and evolutionary stability properties, and also invasion problems, community closure and ESS attainability.

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