

Dynamics of biodiversity: Effects of mutation rate and carrying capacity on evolutionary adaptations

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Adaptive dynamics have integrated and extended concepts and techniques from evolutionary game theory. Specifically, adaptive dynamics theory centers on the notion of evolutionarily singular strategies, a generalization of classical evolutionarily stable strategies. Singular strategies are the potential end-points of adaptive processes and can be classified in terms of stability, convergence, invadability and mutual invadability. A new type of singular strategies, focused on by adaptive dynamics, are evolutionary attractors that (quite unexpectedly) result in disruptive selection once reached. In such situations a monomorphic population can become dimorphic and undergoes what is called evolutionary branching. Such branching, leading to phenotypic differentiation of subpopulations, can be a first step towards speciation. The specific ways, however, in which ecological and evolutionary variables affect the dynamics of branching (and of evolutionary extinctions) are not yet well understood. It is the aim of this project to analyze the joint effect of two critical variables, mutation rate and carrying capacity, on events of evolutionary branching. This investigation, through extension, provides insight into processes of speciation and into the dynamics and stability of biodiversity patterns.