Adaptive Dynamics and Evolutionary Branching: Theory and Applications

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Adaptive Dynamics (AD) is a mathematical framework for the study of phenotypic evolution driven by selection in the ecological context [1,2,3]. Its main innovative feature is the formalization of evolutionary branching, that is, the sympatric divergence of two morphs under disruptive selection from a single phenotype. Subsequent evolutionary branching events are thus responsible for the increase of polymorphism in the community and, possibly, sympatric speciation.

The mathematical conditions for evolutionary branching were introduced in the late Nineties [4,5], but the formalization of critical branching events has only recently been developed [6,7]. Moreover, such critical condition triggering evolutionary branching has been systematically used to study the evolution of polymorphism in prey-predator communities [8], in bio-economic models of fisheries [9], and social systems [10,11]. Current work is addressing the emergence of sympatric diversity in life-history strategies and its role in the emergence of intransitive competitive interactions, as well as the concurrent evolution of dispersal and self-fertilization in plant communities.

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