

Eco-evolutionary dynamics in aquatic communities: from mathematical to organismal models

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There is a growing realization that ecological dynamics in complex communities are shaped by the interplay of ecological and evolutionary processes. I introduce several mathematical modelling approaches to eco-evolutionary dynamics, i.e. population and community models that allow for rapid evolution. Eco-evolutionary models often make different predictions than purely ecological (or evolutionary) models, which demands empirical testing and validation of these models. I present the history of testing eco-evolutionary theory with plankton-based, organismal models; the experimental system for which there is greatest progress to date. The ultimate question is whether rapid, contemporary evolution plays a major role for the dynamics of real ecosystems. A promising avenue of concrete research in this direction is the idea of “evolutionary rescue.” Under this framework, populations and species that cannot migrate need to adapt locally to avoid extirpation due to rapid environmental change. I present recent theoretical and empirical progress in this line of research, particularly with respect to the adaptive dynamics and rescue potential of complex communities.

Recommended literature:

1. Becks L, Ellner SP, Jones LE, & Hairston NG. (2012) The functional genomics of an eco-evolutionary feedback loop: linking gene expression, trait evolution, and community dynamics. *Ecol Lett***15**, 492-501.(doi: 10.1111/j.1461-0248.2012.01763.x)
2. Bell G & Gonzalez A. (2009) Evolutionary rescue can prevent extinction following environmental change. *Ecol Lett***12**, 942-948.(doi: 10.1111/j.1461-0248.2009.01350.x)
3. Fussmann GF, Loreau M, & Abrams PA. (2007) Eco-evolutionary dynamics of communities and ecosystems. *Functional Ecology***21**, 465-477.(doi: 10.1111/j.1365-2435.2007.01275.x)
4. Yoshida T, Jones LE, Ellner SP, Fussmann GF, & Hairston NG. (2003) Rapid evolution drives ecological dynamics in a predator-prey system. *Nature***424**, 303-306.(doi: 10.1038/nature01767)