
Eco-evolutionary dynamics of dispersal during biological invasions

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Abstract

Dispersal is an essential process during biological invasions and one of the principal determinants of range expansion dynamics. Understanding and predicting the spread of invasive species therefore needs to rely on the appreciation of dispersal as a trait integrated into life history. By adopting an optimality approach, I will first outline how environmental variation in its broadest sense affects the evolution of dispersal, and how this feeds back on the ecological dynamics. I will demonstrate that dispersal is an independent axis in life history, rendering correlated responses highly system specific. Ongoing, but also failed invasions, can be considered as natural experiments that provide information on the success recipes of expanding species and populations. Biological invasions per definition reflect eco-evolutionary processes out of equilibrium. During invasions, selection pressures are acting on the four stages of dispersal (pre-departure, departure, transfer and settlement). Both natural selection and spatial sorting are anticipated to shape life histories of invading species that transform a species into an invasive demon with an unexpected impact on the environment. By integrating knowledge on divergent selection pressures during invasion, theory and evidence from failed and successful invasions, I will provide a synthesis on how eco-evolutionary dynamics of dispersal affect invasion success. I will especially embrace the role of stochasticity, contingency and ecological determinism.

Keywords: dispersal, ecology, evolution, invasions

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