

The impacts of exotic species on their neighbors can be better understood by accounting for demographic stochasticity, facilitation, and community composition in fitness models

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July 27, 2020

Abstract

Biological invasions have long fascinated ecologists as they fundamentally alter ecological communities, often in surprising ways. The demography of interacting native and exotic populations are core drivers of invasions. Demographic models estimate the strength of species interactions but have several shortcomings, including disregarding facilitation and focusing only on competition, disregarding individual-level variance in demographic parameters, and focusing on one exotic species at a time. In this study, we investigate the fitness outcomes of eleven native and exotic species from a diverse annual plant community in Western Australia. We use a Bayesian demographic modelling approach that integrates demographic stochasticity and facilitation. Facilitation mediated by exotic species played an integral role in the invaded community, but demographic stochasticity caused many species interactions to vary from facilitative to competitive, regardless of abiotic conditions. Our approach reveals variation that could be responsible for the diverse and unexpected impacts of exotic species on recipient communities.

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