

Publication

A practical guide to the study of distribution limits

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Factors that limit the geographic distribution of species are broadly important in ecology and evolutionary biology, and understanding distribution limits is imperative for predicting how species will respond to environmental change. Good data indicate that factors such as dispersal limitation, small effective population size, and isolation are sometimes important. But empirical research highlights no single factor that explains the ubiquity of distribution limits. In this article, we outline a guide to tackling distribution limits that integrates established causes, such as dispersal limitation and spatial environmental heterogeneity, with understudied causes, such as mutational load and genetic or developmental integration of traits limiting niche expansion. We highlight how modeling and quantitative genetic and genomic analyses can provide insight into sources of distribution limits. Our practical guide provides a framework for considering the many factors likely to determine species distributions and how the different approaches can be integrated to predict distribution limits using eco-evolutionary modeling. The framework should also help predict distribution limits of invasive species and of species under climate change.

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