Multimodality in diversity-disturbance relationships for generalized competition-colonization dynamics

Jinbao Liao[1], Gyorgy Barabas[2], and Daniel Bearup[3]

[1]Jiangxi Normal University
[2]Linkopings universitet
[3]University of Kent

March 07, 2024

Abstract

Disturbance has long been recognized as a critical driver of species diversity in community ecology. Recently, it has been found that the well-known intermediate disturbance hypothesis, which predicts a unimodal diversity-disturbance relationship (DDR), fails to describe numerous experimental observations, as empirical DDRs are diverse. Consequently, the precise form of the DDR remains a topic of debate. Here we develop a simple yet comprehensive metacommunity framework that can account for complex competition patterns. Using both numerical simulations and analytical arguments, we show that strongly multimodal DDRs arise naturally, and this multimodality is quite robust to changing parameters or relaxing the assumption of a strict competitive hierarchy. Having multimodality as a robust property of DDRs in competition models suggests that much of the noise observed in empirical DDRs should be a critical signature of the underlying competitive dynamics.

Hosted file

`manuscript.docx` available at https://authorea.com/users/729573/articles/709870-multimodality-in-diversity-disturbance-relationships-for-generalized-competition-colonization-dynamics