A multilevel mechanistic model of diversity change

William Godsoe[1], Warwick Allen[2], Lauren Waller[1], Barbara Barratt[3], Sarah Flanagan[2], Zachary Marion[4], Jason Tylianakis[2], Elena Moltchanova[2], and Ian Dickie[2]

[1]Lincoln University
[2]University of Canterbury
[3]AgResearch
[4]Statistics New Zealand

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Abstract

Changes in biodiversity reflect processes acting on the success of individual species at multiple spatial scales, including in communities, biogeographic regions, and globally. This complexity makes it difficult to analyse the mechanisms shaping diversity change using traditional approaches. To resolve this, we propose a novel approach to partition total biodiversity changes according to mechanisms reflecting species' success at multiple scales. We apply this approach to study changes in the diversity of invertebrate herbivores from a large-scale, plant community experiment. This partitioning showed that rapid changes in the relative abundances of individual species resulted in surprisingly small changes in diversity across scales. Our novel analytical method reveals how strong ecological effects at different hierarchical levels can counteract each other, resulting in weak effects on diversity across broad spatial scales.

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