

Book Reviews

Metacommunities. Spatial Dynamics and Ecological Communities. Marcel Holyoak, Mathew A. Leibold, and Robert D. Holt, editors.

Chicago, IL: The University of Chicago Press; 2005. ISBN 0-226-35063-0 (hardcover) 0-226-35064-9 (paperback).

In the early to mid-twentieth-century ecology was often dismissed as “the study of everything connected to everything else.” This book’s title, obviously extending Levins’s metapopulation concept, suggests an expanded interest in ecological linkages. The editors, also major contributors, are to be commended for the assembly, and the conceptual integration they anticipate will launch a new (and important) ecological subdiscipline. The 20 multiauthored chapters, and a brief summarizing “Coda,” admirably introduce this goal.

Metacommunities are defined as a “set of local communities that are linked by dispersal.” Potential challenges abound: the level of connection is critically dependent on dispersal about which ecologists remain woefully ignorant; communities may or may not be at species saturation, which influences invasibility; sites may be sources or sinks of dispersing individuals; and the consequences of variable food web topology are difficult to define, let alone the highly variable but certainly not equivalent strengths of interaction. Four dominant perspectives about metacommunities appear throughout the book as unifying themes central to understanding spatial dynamics: patch dynamics, in which the species composition of multiple patches, for example islands, represents a colonization-competitive prowess trade-off; species sorting, resulting from localized spatial heterogeneities which favor certain species and not others, enhancing coexistence, and which thus represents a resurrection of the niche-centric era of Hutchinson and MacArthur; mass effects, in which dispersal alters the species densities or masses within a set of heterogeneous assemblages; and a neutral perspective, in which species are essentially equivalent, and trade-offs between, say, dispersal and competitive abilities are minimal.

Whether *Metacommunities* will launch a new era of ecological enlightenment is arguable. The book’s

metatheory is based primarily on competition, yet we know trophic interactions can over-ride competition. Can this simplification generate a more robust and inclusive ecological theory? Macroecological patterns are given their due, but in a multi-causal, pluralistic world can local processes be identified from more global patterns of abundance and distribution? The book continually identifies the fundamental challenge of determining the spatial scale of environmental variation relative to the dispersal kernels. Wide-ranging and ample dispersal effectively yields homogeneous space, and in turn, mass action dynamics that are entirely compatible with Lotka–Volterra modeling. However, different results are obtained with a cellular automaton approach characterized by spatially restricted interactions. The contrast highlights the need for ultimately finding the right theoretical format, if such exists. I commend the authors for linking theory with empirical studies. But the majority of the examples are spatially discrete: pitcher plants, small islands, rock pools. Can theory aimed at these boutique examples help ecologists understand spatially larger situations, for example lakes or open systems with few barriers to potential dispersal, for example oceans and their shores? It does not help that in the chapter that develops scale transition theory, a technique for translating local scale processes to those of the metapopulation, the crab example is developed for isolated rocks whereas their primary residence is within nearly continuous mussel beds.

Metapopulations is well-produced, generally clearly written, and logically organized with definitions provided and assumptions and limitations identified. Is it hopelessly premature or does it herald a substantial advance toward understanding the central role of space in ecology? I do not know the answer, but the question is probably immaterial. This book should be widely read, as much for its stimulation as for its substance.

Robert T. Paine
Department of Biology, University of Washington

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