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Book Review

Dov F. Sax, John J. Stachowicz, and Steven D. Gaines, editors. Species Invasions: Insights into Ecology, Evolution, and Biogeography.

Sunderland, MA: Sinauer Associates; 2005. 480 pages, 56 illustrations. $74.95 (cloth), $49.95 (paper).

Invasive introduced species are considered the second most serious threat to biodiversity worldwide after habitat loss and destruction. Their impacts can be devastating, irrevocably altering ecosystems and eliminating native flora and fauna with remarkable speed and efficiency. But what can we learn from invasive species, aside from how to control them? The answer—as in *Species Invasions: Insights into Ecology, Evolution, and Biogeography*—is plenty.

Editors Sax, Stachowicz, and Gaines have assembled an accessible, topically broad, and taxonomically diverse collection of essays on how the study of species invasions can inform contemporary theory in the fields of ecology, evolution, and biogeography, the three sections of the book. In 17 stand-alone chapters, contributors explore species and community relationships, evolutionary rates and trajectories, and patterns of geographic distribution. As in most contributed volumes, the chapters vary in depth and quality. Evolution is stronger than ecology in part because when model systems are used in ecology to describe natural systems the generality may be somewhat limited.

For readers unfamiliar with characteristics common to invasive introduced species, chapter 7 provides a good overview within the context of taxon cycles. Several chapters, especially in the ecology section, present relatively straightforward assessments of the impacts of species invasions for different taxonomic groups—plants (chapter 3), birds on islands (chapter 4), and infectious diseases (chapter 5)—but these are still broadly applicable to the study of ecosystem, extinction, and host-parasite processes.

Invasive species, life history attributes (fecundity, plasticity, generation times) are particularly amenable to studying evolutionary questions. For processes that typically progress too slowly to observe in human timescales, invasive species offer opportunities to evaluate mutation, adaptation, and differentiation at accelerated rates of evolution. The compelling *Drosophila* and salmon case studies by Huey and colleagues reveal both the speed and predictability of evolution possible in natural systems. Chapters on genetic bottlenecks in invasive species (or lack thereof) suggest this mechanism may be less important for speciation than previously hypothesized.

Invasive species also provide real-time opportunities to examine the factors central to biogeography: population growth, range expansion, distribution, and abundance. Whereas one author argues that "species invasions are as old as the existence of species on earth" (chapter 12), others assert the difference between "natural" range expansions and those that are human facilitated is a matter of rate and extent. Vermeij encourages the reader to think beyond the current invasion crisis and consider invasive species from a geological temporal perspective.

Species Invasions lacks a consistent and unifying definition of "invasive" or "invasion." For example, in many chapters, the word "invasive" conforms to the applied definition of accidental or intentional transport and release of nonnative organisms by humans. In others, "invasion" refers to the expanding stage of a population (chapter 7) or biotic interchanges (chapter 12). Although chapter authors do an excellent job of clarifying the meanings they intend for the terms "invasive" and "invasion," some readers may find the inconsistent usage distracting.

Although some chapters address invasive species as threats to biodiversity, the focus of this book is not applied invasion biology. However, it is general enough to appeal to readers across disciplines. While the editors' self-described objective was to produce a work that uses species invasions to explore modern theory, they have also succeeded in producing a resource for applied invasion biologists to examine their field from fresh perspectives. Well-written, well-organized, informative, and thought-provoking, this book should be a welcome addition to the shelves of ecologists, evolutionary biologists, biogeographers, and applied invasion scientists alike.

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