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BOOK REVIEW

Scaling in Ecology with a Model System, Aaron M. Ellison, Nicholas J. Gotelli. Monographs in Population Biology, Princeton University Press, NJ (2021). 307 pp., ISBN 978-0691222776, € 47,50 (Paperback)

"Scaling in Ecology" is the somewhat surprising title for a scientific book that pivots entirely on pitcher plants of the genus *Sarracenia*, their demography, biogeography, ecology and the food webs in their vase-shaped leaves. By doing so, the authors exemplify the whole gamut of ecological research questions and approaches of the last 20 years with this specific system, from genetics to modelling, from food webs to conservation, from land-use to climate change. This includes topics of spatial upscaling from local studies to range-wide ecology; temporal upscaling, from short-term measurements to long-term population projections; as well as transferring to the pitcher plant-system questions and approaches originally proposed for other systems: food-web ecology, stoichiometry, tipping points, and *omics. The idea to use the North American pitcher plant as a "model system" requires some justification, and the authors argue that ecology needs in-depth study systems, and provide examples of other well-investigated organisms in biology. After reading the book I cannot see what *Sarracenia* may in fact be a model system for. Rather, the authors use the "model system" metaphor as a canvas on which they paint the ecology of the focal species.

The book is unusual in that it does not aim to comprehensively present a single genus or species in all its glorious detail. Nor does it seek to offer an overview of a section of ecological research from a specific vantage point, as most other books in this series do. Rather, it feels like a well-developed background reading for a summer field course in a New England bog, where participants shall learn a wide range of topics and methods on a manageable study object. Since the intended audience is more academic, the introductions to macroecology or resource limitation are considered supplementary material, and rightly so.

The book's four parts comprise 14 short chapters, moving from the single plant (Part 1: ecophysiology) over its demography and distribution (Part 2) to the inquiline food webs of *Sarracenia* (Part 3), ending on Part 4's application of "fashionable concepts", such as regime changes, tipping points and proteomics, to this system. Each chapter starts with a short background introduction to the underlying ecological concept, before presenting a detailed analysis of the authors' own data (all openly available) and discussion of said concept. From an editorial point of view, I am disappointed about the poor formatting of many data figures: they are twice as high as wide, filling most of a page, but seem to be designed for a (proper) square panel layout. As a result, all figures look strangely distorted, unless they contain multiple panels. This is not a mere design concern: when plotting two variables and their correlation ellipsis (as several figures in chapter 4 do), the reader uses the shape of the ellipsis as measure of correlation. However, the distortion now shows even a perfect circle as an ellipsis, wrongly creating the impression of a correlation. In an otherwise impeccably produced volume this is surprising (and rather against the wishes of the authors, I guess).

Unusual is the 150 page appendix. It is dominated by an introduction to the subject of the book, *Sarracenia*, which is complemented by very short recapitulations of methodological basics required in the main text (SDM, matrix population demography, network metrics). In a way, the *Sarracenia* appendix is not too different from a contribution to the Journal of Ecology's *Flora of the British Isles* (a long-running meticulous depiction of the ecology of all British plants, to which *Sarracenia* does not belong yet), and hence more suitable for a journal publication. Yet, it makes sense to include them as appendix, as the main text is now pitched at the general ecological level of Monographs in Population Biology, while still being consumable without recourse to external resources.

The book is eloquently written and richly structured into sections, covering a lot of ground in a somewhat superficial way. When, for example, the stoichiometry of fertilisation effects are presented, there are several pages of [N] vs [P] plots (or alike), but only a very short conclusion before the authors rush on to the next subject (the position of *Sarracenia* in plant trait space). This approach makes the content of the book feel disjoint, more like a loose assembly of studies than an actual comprehensive synthesis. The authors demonstrate how to apply to their model system whatever concept is being discussed in the ecological literature. But that does justice to neither their system nor the methods nor an ecological generalisation. In fact, most subjects touched turn out to be either inconclusive or over-theorised with this simple system. Combining population dynamics with species distribution analysis is hard, and it is thus not surprising that the authors cannot convince in their attempt to do so.

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Similarly, the food web within the pitcher plant leaves is so simple and dominated by a seasonal succession of two predatory organisms that plotting network metrics is essentially showing the effect of stochasticity in a small system, not much of food-web processes. Also the "breakdown" of aerobic conditions in the phytotelma community, and their attempt to find early-warning signals in bioindicator proteines is rather simplistic and poorly motivated. The pitcher community's respiration is almost entirely bacteria-driven, as the authors show, and may swamp *Sarracenia's* oxygen production at high level of detritus input, yielding an anaerobic phytotelma. Why should this simple resource-consumer system show the notorious early-warning signals rarely observed in other systems? These are examples to illustrate that the authors apply interesting concepts and ideas to their "model system", but often without the background required to comprehend their results in a wider context.

Overall, I think this book has a rather specific audience. Neither results nor theory are developed enough to make this book work as an "ecology by example" text book. It will be a brilliant introduction, obviously, to the *Sarracenia* system, and it can serve as a blueprint for applying a wide range of ecological concepts to a plant system.

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