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A Primer of Ecology with R

M. Henry. H. Stevens
Springer-Verlag, New York, 2009.
ISBN 978-0-387-89881-0. 388 pp. EUR 54.95.
<http://www.springer.com/978-0-387-89881-0>

Ecology is a complex discipline that can best be understood by making suitable abstractions, or models. The simplest mathematical models are composed of general rules and rarely require more than two equations. These models have the advantage that they apply to a variety of systems. The book of Stevens primarily focuses on population dynamics, a field where such simple models are commonly used. While the ideas in the book are not new, and this is not the first “primer” of ecology, the novelty lies in the tools that are used to make the theory work and that will undoubtedly bring this type of analysis closer to the individual researcher and the students.

The book is subdivided into three parts; it has ten chapters, and two appendices.

Part 1 covers single-species models and lays the fundament of what is to come. The first chapters on density-independent growth (Chapter 1), density-independent demography (Chapter 2) and density-dependent growth (Chapter 3) introduce important concepts such as finite rate of increase, discrete growth factor, doubling time, stable stage structure, reproductive values, stable limit cycles, bifurcations, stability, etc. The concept of space is introduced in Chapter 4. This first part switches between discrete and continuous time models, solved with matrix algebra or with differential equation solvers.

The second part of the book builds further upon the introduced concepts and deals with two-species interactions. It comprises a chapter on competition (Chapter 5), predation, parasitism and disease (Chapter 6).

The special topics of Part 3 deal with multi-species interactions, discussing amongst other foodwebs, spatial and temporal niche partitioning and, surprisingly, community composition and diversity.

Finally, the two appendices give a very short introduction to the R language.

In contrast to other “primers” of ecology, the book explains how to implement these simple models in R, using many worked-out examples. However, it is not just a book about R. It also contains much material dealing with the history, applications and theory of the different types of models. It thus provides useful pointers to the literature, while the many worked-out

examples will prove useful to graduate students and to researchers as a starting point for their own research in the field.

The book mainly targets graduate students, and this sets the style and tone, which is quite narrative and easy-reading, making it a great read for novice modelers. The text is interspersed with R-code, which is contained in text boxes, and that can be used as a way to quickly browse through the contents of the chapter.

A slight imperfection is the rather large amount of typos, although only rarely they may confuse the reader. The most conspicuous typo is to be found in Appendix A, where R is said to be the free version of § (the L^AT_EX equivalent of \S), and this all throughout this chapter. In addition, some parts of the R-code are quite advanced, yet given with little background.

That ecological modeling still does not have the popularity that it deserves has been, at least partly, due to the absence of a good and affordable software framework to implement and analyze mathematical models. Until recently, one either had to resort to software, freely available to universities, but quite expensive for the individual, or buy software that provides a graphical interface, but whose repertoire of solution methods is quite restricted. Traditional programming languages, such as Fortran or C, which are less expensive and for which freely available compilers exist, have little appeal to students. They may be easy to learn, but there is little that can be done with them, e.g., producing a graph. R has the ability to change that. In our institute, R is more and more taking the place of the spreadsheet, database, programming language, visualization package, and of course the statistics package. In addition, it is becoming better and better equipped for scientific computing. And students like it, because it is free and powerful.

Undoubtedly, this book will contribute to the further democratization of mathematical modeling and the use of R in this field. Given the variety of the topics covered, the highly readable text, and the ready-to-use code excerpts, I consider the book an absolute must for those who are active or intend to work in the field of population modeling.

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