

Revue des livres

Book Review

GOTELLI, N. J. & A. M. ELLISON, 2004. A Primer of Ecological Statistics. Sinauer Associates, 445 p., 17 × 23 cm, softcover, US\$34.95, ISBN 0-87893-269-0.

It is always a race against time while teaching statistics courses (at the undergraduate and graduate levels) to ecologists. Indeed, there is never enough time to cover the wide range of parametric and non-parametric statistics. This is unfortunate as most biologists and ecologists in their research are mostly using the non-parametric tests and randomization tests, while they would like to use Bayesian statistics if they knew how.

Why are parametric statistics not the most appropriate methods for the majority of ecological data analyses? The reasons why parametric statistics are often not suitable for ecological data are numerous. First, the lack of conformity of the data to analytically known distributions can be attributed in part to the sampling or experimental designs. For instance, the sample size may be too small, such that the sampling distribution does not fit any known analytical distribution. Another common situation when parametric statistics cannot be used is when ecological data are autocorrelated either in time, space, or both, therefore violating the assumption of residual independence required to use parametric statistics. Ironically, while ecologists' statistical training is mainly about parametric statistics, their statistical needs require either modified or new methods able to deal with the specifics of their ecological questions and data.

It is therefore amazing that up to now ecologists have not had an introductory textbook of statistical methods crafted specifically for their needs. Gotelli and Ellison's book fills this void. Their approach in writing this textbook was radical: they started from a *tabula rasa*. Rather than follow the usual content of existing biometry and biostatistics textbooks, they designed their book from scratch, focusing on the statistics that are usually not taught at the undergraduate level: Bayesian statistics and randomization tests. Consequently, they assembled a sequence of topics organized into three parts: (I) Fundamentals of probability and statistical thinking; (II) Designing experiments; and (III) Data analysis.

The most important step in the study of statistics (parametric and Bayesian ones) is to understand probability theory. The first chapter of the book, which is also the key one, provides a thorough presentation of probabilities (conditional and Bayesian) for a new-comer to the field of statistics. The following chapters of the first part present how data can be summarized by simple measures of location and spread and how hypotheses can be formulated. These are followed by the chapter that makes this book unique, Chapter 5, where the authors present and compare the three statistical analysis frameworks needed to analyze ecological data: parametric, Bayesian, and Monte Carlo (randomization). For this chapter only, the book is worth buying. Although it is just an overview of the essence of these three types of analyses, it is an excellent one.

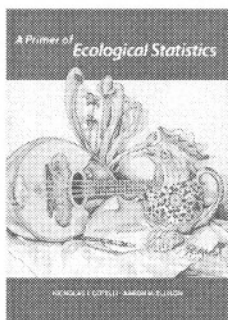
The second part of the book aims to help ecologists design effective sampling and experimental studies. It covers the main notions that need to be considered to obtain replicates that are not confounded, so that the effective sample size can detect potential treatments effects. To make these fundamental issues clear, the authors use helpful ecological examples as well as illustrations. The last chapter of the second part presents how data exploration can be performed to check data behaviour (range, distribution, outliers, errors, etc.). In addition, this chapter stresses the importance of documenting data, describing the data by means of metadata information that summarizes how the data were collected (what, when, where, and how). It is good to train students early to have the

good habit of documenting how and why the data were collected. Without such metadata, data often can be useless.

Finally, the last part of the book covers the usual parametric data analysis methods (regression, ANOVA, contingency tables) and the multivariate methods (MANOVA, measurements of multivariate data, ordination, classification, multiple regression). The chapter on regression includes the classic linear regression and some useful regression methods for ecological questions (robust, quantile, logistic, non-linear, multiple) and path analysis. Similarly, the chapter on ANOVA surveys the wide range of methods used to analyze ecological data (randomized block, nested ANOVA, *n*-way ANOVA, split-plot ANOVA, repeated measures ANOVA, and ANCOVA) followed by *a priori* and *a posteriori* comparison methods. The chapter on the analysis of categorical data ranges from contingency tables to goodness-of-fit tests. The last chapter presents an overview of the essence of multivariate data analysis. This chapter gives a general idea of the methods commonly used in ecology to synthesize multivariate data. It therefore introduces undergraduate students to the next round of methods that can be used to explore the complexity of community data sets. To cover so much about multivariate techniques in so few pages (usually it takes an entire book to present these methods) was a challenge by itself. The authors aimed to show the breadth of methods rather than to give an in-depth explanation for each one.

In short, only positive superlatives come to mind to describe the merit of this book. Its obvious strength is that it was written by ecologists for ecologists. From now on, I will use this textbook to teach statistics to undergraduate students and I will suggest it to graduate students and researchers who need to refresh their statistical knowledge.

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PAULY, D., 2004. Darwin's Fishes: An Encyclopedia of Ichthyology, Ecology, and Evolution. Cambridge University Press, xi + 340 p., hardcover, US\$80.00, ISBN 0-521-82777-9.

Darwin's Fishes: An Encyclopedia of Ichthyology, Ecology, and Evolution, by Daniel Pauly, is a unique and insightful analysis of Charles Darwin's contributions to ichthyology and to evolutionary biology in general. The book is encyclopedic in format. Most of the text consists of 478 alphabetized entries on topics relating to fishes, but many entries covering broader aspects of ecology and evolution are included as well. After the alphabetized entries, nearly 1,000 annotated references provide Darwin's comments on other published works, helping the reader create an appropriate context in which to view Darwin's writings. Readers can progress through the text from A-Z or may choose instead to jump from entry to entry based on the extensive cross-referencing that occurs. What emerges from either approach is an appreciation for Pauly's engaging humor, his thorough knowledge of the topic at hand, and his creativity in assembling such a volume.

Reading this book is an adventure. A typical entry may list where a species was first collected and catalogued by Darwin, and Darwin's original description may be given. Where the reader will be taken next