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BOOK REVIEW

Analysing Ecological Data, A.F. Zuur, E.N. Ieno, G.M. Smith (Eds.). Springer, Berlin, Heidelberg (2007). 672pp., €69.99, ISBN: 0387459677

Judging by the many titles that appeared over the last 5 years, there seems to have been a rise in the market for ecological statistics. *Analysing Ecological Data* by a group of ecologists-gone-statisticians from Scotland is the latest book in this area and based on years of teaching and consultancy experience. Their clients seem to mainly include descriptively working ecologists as not a single sentence in this book is devoted to manipulative research in the field or laboratory. The book differs from many of its competitors in its structure: it contains a general introduction to several fields of descriptive ecological data analysis (370 pages), which is augmented with 17 chapter-length case studies (275 pages).

The book covers moderately advanced problems within a variety of topics. The reader is expected to be familiar with multiple regression and basic concepts such as AIC. It then goes through generalised linear models (omitting any mention of negative binomial or gamma models important in some fields of ecology) and generalised additive models before turning to mixed models. While these receive a general introduction and a working example, their significance for experimental data (with repeated measurements, split-plots and nesting) is not mentioned at all. After a brief look at classification and regression trees (neglecting to include their more robust modern extensions), the book devotes 100 pages to multivariate statistics. This is my favourite part: the text appears competent, the structure is excellent and different interconnections between multivariate models are demonstrated, but the next four chapters on time series and spatial models barely scratch the surface of each topic. Many issues are addressed but left unfinished and the reader has little guidance on how to carry out a time series or spatial analysis from beginning to end (which is left instead to the case study chapters).

The case studies, which comprise the whole second part, are the book's main strength. While it is impossible to cover every potential aspect of ecological data analysis, these case studies touch on many of the common practical problems: data distributions, missing data, collinearity, high noise levels, small sample sizes, inconclusive trends, alternative explanations and approaches. Due to the extensive index, specific problems can be looked up in the relevant case study, where methods are also referenced back to the introductory part. The authors team up with ecologists for these chapters and are thus able to present a balanced view of both the statistics and the ecology. It is particularly gratifying to read about significant terms being rejected because their ecological interpretation is too convoluted, and, conversely, about trends being accepted because they offer new ecological insight. This combination of hypothesis-guided analysis and statistical competence provides the reader with an intuitive sense of the strengths and limits of ecological data analyses.

Having finished the book, it is very clear that the case studies are the authors' real point of interest, and that the first part only covers the statistical ground required for the second, which explains why the introductions often appear patchy and incomplete. The most common phrase in the book is "for further details see Legendre and Legendre (1998)". In fact, only readers already moderately knowledgeable about any of the methods presented will profit from this book, because too many of the "details" are not presented and too often the reader is referred to "other literature on this topic". I felt particularly disappointed about the chapters on time series analysis and the fact that many statistical trends over the last few years have not found their way into the book: Bayesian statistics, permutation methods and machine learning. Clearly, this book is an additional statistics book, not a principal work such as the above-cited Legendre and Legendre or Quinn and Keough. In summary, I can recommend the book primarily as advanced material for ecologists with interests similar to the case studies presented in the book.

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