Occupancy Estimation and Modeling. Inferring patterns and dynamics of species occurrence

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BOOK REVIEW

Occupancy Estimation and Modeling. Inferring patterns and dynamics of species occurrence

By: MacKenzie, D.I., Nichols, J.D., Royle, J.A., Pollock, K.H., Bailey, L.L. & Hines, J.E.
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Numerous studies rely on occupancy or presence/absence data, e.g. understanding and predicting species distribution under diverse scenarios of climatic change and land use, dynamics of fragmented populations and metapopulations, and dynamics of invasive species. While presence/absence data can often be seen as just a simple either/or dichotomy, there is a fundamental asymmetry: we can often be pretty sure that a given species is present after observing it, but being sure of its absence is much more difficult. This book addresses many of the important issues related to this asymmetry and how this should be taken into account to make proper inferences about patterns and processes. To ignore the uncertainty inherent in assessing absence leads to biased conclusions and potentially harmful decisions.

The book has 10 chapters focusing on general and specific issues relevant to presence/absence data. The first chapter is a general introduction to scientific approaches in ecological sciences, and the general principles exposed are relevant to most students, researchers and managers, particularly *before* they embark on their own studies. The second chapter gives details on the various kinds of uses of occupancy data. The third chapter is a quick overview of basic principles of statistical inference, relying on the very extensive experience of the different authors of the book. It strikes a difficult balance among different approaches, and I very much liked the pragmatic view advocated here. The next six chapters focus on increasingly more complicated modelling strategies and designs, starting with models for single species and single seasons (chapters 4 and 5 of which the latter includes heterogeneity in detection probabilities), design considerations for single-season studies (chapter 6), single-species and multiple-seasons studies (chapter 7) and finally studies addressing patterns and processes at the community level (chapters 8 and 9). All chapters include detailed examples, and software exist for implementing most of the analyses described. Chapter 10 looks at a wide range of issues that need to be addressed in future studies, and PhD students looking for interesting topics should definitely read this chapter!

I very much enjoyed reading this book. The authors' unique experience in designing field studies, analysing various data sets, and developing and implementing new statistical methods is clearly reflected in their balanced view throughout this work. What is stressed are principles and models, not 'ready-to-use' recipes. This probably implies a high level of investment on the short-term, but a large benefit on the long-term. Ecology relies increasingly on more sophisticated designs and analytical methods, and this book is a good example of this trend. It can be used both as a classroom textbook and as a useful reference readily available on your bookshelf. The only criticism I could have concerns the topics covered and the restriction to animal populations and communities, clearly many of the ideas and methods discussed are relevant to plant ecologists too!

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