

Marc Kéry • J. Andrew Royle

APPLIED HIERARCHICAL MODELING IN ECOLOGY

Analysis of distribution, abundance and species richness in R and BUGS

Volume 1: Prelude and Static Models

Applied Hierarchical Modeling in Ecology: Analysis of distribution, abundance, and species richness in R and BUGS offers a new synthesis of hierarchical modeling in studies of plant and animal distribution, abundance, and community characteristics such as species richness using data collected in meta-population designs. This type of site-stratified data is extremely widespread in ecology and its applications in such areas as biodiversity monitoring, conservation biology, and fisheries, and wildlife management.

This first volume begins by explaining the basic concepts of distribution and abundance, hierarchical models and their Bayesian and likelihood analysis, linear and generalized linear models, data simulation, and use of R and BUGS software for fitting traditional linear, generalized linear, and simple mixed models. The second part of the volume presents six "monographs" on the hierarchical modeling of distribution and abundance for single and multiple species, using classical and Bayesian inference and based on such common data as counts, capture/recapture, distance sampling, and detection/non-detection ("presence/absence"). *Applied Hierarchical Modeling in Ecology, Volume 1* serves as an indispensable manual for practicing field biologists, as a graduate-level text for students in ecology, conservation biology, fisheries/wildlife management, and related fields, and as an overview of this field for statisticians.

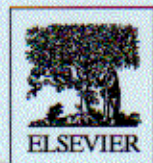
This book:

- Provides a synthesis of important classes of hierarchical models about distribution, abundance, and species richness while explicitly accommodating measurement error (imperfect detection)
- Emphasizes data simulation as a way of studying and understanding stochastic processes and statistical models
- Takes a dual inference paradigm approach by the seamless integration of both likelihood-based and Bayesian inference
- Uses the dominant software for likelihood and Bayesian analyses in ecology: R and BUGS
- Is written in a very accessible style with a large number of fully worked examples that will kick-start your analyses of your own data
- Includes access to a companion website containing data sets, code, errata, solutions to exercises, and further information, and is supported by two e-mail lists maintained by the authors
- Lays the foundation for Volume 2 of *Applied Hierarchical Modeling in Ecology*, wherein dynamic and more advanced versions of these models will be presented

Marc Kéry is a population ecologist with the Swiss Ornithological Institute. He is the author of about 80 peer-reviewed journal articles and two books on a wide range of topics, including the analysis of large-scale monitoring programs, demographic population analyses, experimental design for animal and plant surveys, and the population ecology of rare species.

J. Andrew Royle is a research statistician at the US Geological Survey's Patuxent Wildlife Research Center. His research is focused on the application of probability and statistics to ecological problems, especially those related to animal sampling and demographic modeling, about which he has authored over 100 peer-reviewed journal articles and three books.

Cover photograph: Greater Papuan Emperor – *Anax maecheni* (Drawing by A.G. Orr)



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