

Book Reviews

Ecology light 1.0

Townsend, C.R., Harper, J.L. and Begon, M. 2000. *Essentials of ecology*. Blackwell Science, Oxford, U.K. xviii + 553 pp. Paperback, ISBN: 0-632-04348-2, £24.95

This text is an abridged version of the larger *Ecology: Individuals, populations and communities* by the same authors (1996). It deviates in organisation from others in the field (e.g., Krebs 1994, Smith 1996), demonstrating that general ecology texts are unlikely to provide coverage in any standard format. This perhaps reflects the breadth of the subject as well as the complex nature of the material. Having said this, it took some adjusting to follow along with this most recent addition to the field. The text is organised into four parts, with Part I being a fairly standard 'Introduction to Ecology' (Chapters 1 and 2). Hereafter, it parts company with other texts. Part II deals with the physical environment and its association with the biota and Part III provides the 'nuts and bolts', covering the major levels of ecological organisation from the individual through to the ecosystem. The text concludes with an applied perspective, with a trio of chapters on 'Sustainability', 'Pollution' and 'Conservation' (part IV). This is a sensible layout for use with introductory ecology courses, although the content and organisation of chapters within sections (particularly Parts II and III) is occasionally a little confusing. For example, the intended simplicity of Part III (i.e., coverage of individuals, populations, communities and ecosystems) is not always obvious in chapter headings. Despite this, one chapter I found particularly interesting was that on 'Organism as a habitat' (Chapter 7). This presents a novel and thought provoking way of getting students to think about ecological concepts in a subject area that is 'closer to home' (i.e., their own bodies). In general, the writing style is easy to follow and the explanation of concepts is clear and concise. The quality of the graphics is also excellent.

One area that was a little disappointing was the coverage (or lack thereof) of population genetics, an area of increasing importance in present day ecology and conservation and an area relatively well covered by both the Krebs and Smith texts. This coverage is also lacking in the 'big' book (Harper *et al.*, 1996), and the limited reference to the topic (in the Conservation chapter) is essentially the same material as that provided in the big text. Hopefully, coverage of this topic will be enhanced in future editions. There are also occasional editorial and typographical errors, such as in Chapter 3

where an entire sentence is duplicated on successive pages. Overall, this is a good introductory text, and with the appropriate coverage of population genetics it would serve well for undergraduate ecology courses.

References

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- Krebs, C.J. 1994. *Ecology: The experimental analysis of distribution and abundance*. 4th edition. Harper Collins, New York, U.S.A.
- Smith, R.L. 1996. *Ecology and field biology*. 5th edition. Harper Collins, New York, U.S.A.

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A box of chocolates: The diversity of biodiversity

Kato, M. (Editor) 2000. *The biology of biodiversity*. Springer-Verlag, Tokyo. xii + 324 pp. Hardcover, ISBN: 4-431-70262-8, US\$135.00

The eponymous character of the movie *Forrest Gump* stated that "life was like a box of chocolates. You never know what you're gonna get." This book, based on papers presented at a symposium honouring Otto Solbrig who won the 1998 International Prize for Biology, is a Gump-like chocolate box. The book is divided into four sections which look very interesting: Species diversity and phylogeny, ecological biodiversity, development and evolution, and genetic biodiversity. However, there is little to link the chapters, no holistic overview, no synergy, not even a hint of post-modernist analysis. Given that the term 'biodiversity' can mean almost anything unless strictly defined, we should not be surprised that most recent advances in ecology, evolution, development and systematics are touched upon. Not that there are poor chapters - each is very good. However, for every strawberry cream (avian evolution in Pleistocene North America) there is a nut whorl (the origin of reproductive isolation), for each turkish delight

(developmental genetics and diversity of form) there is a viennese fudge (patterns of tropical tree diversity). And like a box of chocolates, individuals will argue over which flavour they prefer.

Not that there is a lack of more 'traditional' biodiversity topics in this volume. Solbrig states in his contribution "the Sciences of Biodiversity must include all the aspects of evolutionary and ecological theory concerned with the Origin and Maintenance of the diversity of living organisms. It also must include the study of human behavior and their economic activities. Finally, in order to not only understand, but also influence human behavior so as to reduce the environmentally negative aspects of their economic activities, a new environmental ethic must be developed." It is just that this chapter comes after one on handling very large data sets in phylogenetic analyses!

What is in the book for ecologists then? Several chapters are of direct relevance: A warning about 'creeping fruitless fall' (the botanical version of silent spring), an international study on whether biodiversity really does matter in an ecosystem, the effects of patchy landscapes on diversity, the role of feedback between organisms and the environment. Of less general interest are many chapters with a molecular approach: assessing variation within populations of ferns, human diversity and its history, how genetic diversity may be divided into adaptive and historical components, the diversity of fish. Finally there is a section of four papers on development. If you want to find out what a hox gene is and why they have been important in the generation of diversity then this is the place to start.

Despite being well written and presented, I could not recommend this as a 'must buy' for an individual in a market with many similar titles. However, this book has a great deal of valuable information and will sit very comfortably and productively in an institution's library.

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Ecological economics? ... not quite

Edwards-Jones, G., Davies, B. and Hussain, S. 2000. *Ecological economics: An introduction*. Blackwell Science, Oxford, U.K. vi + 266 pp. Paperback, ISBN: 0-865-42796-8, AU\$95.00

Ecological economics has become fashionable recently and continues to adopt converts from a range of disciplines who see the need to transcend disciplinary boundaries to bring about more desirable environmental outcomes.

Contrary to the name, ecological economics is much broader than a simple synthesis of the two 'eco-disciplines'. This presents problems, however, as different groups attempt to stamp different meanings on the term ecological economics. The authors' definition and their purpose in writing this book are clearly identified from the outset. They assume an audience versed in natural sciences, and thus omit introductory material in these areas. The purpose of the book is to provide a bridge into economics, ethics and environmental management for natural scientists. 'Conventional' environmental economics is introduced in order to identify 'questionable' practices, although that questioning is never explicit.

The book comprises 14 chapters broken into 4 parts. Part 1 (4 chapters) introduces the concepts and history of ecological economics, conventional environmental economics and ethics. Valuation tools and concepts of value are addressed in part 2 (3 chapters), while part 3 evaluates decision-making frameworks (4 chapters). Applications and more methods are illustrated in part 4 (3 chapters).

Ecological economists use the term 'transdisciplinary' to describe their approach to utilisation of information from numerous areas. The objective is to synthesise insights to allow a better characterisation of how the global system functions and ultimately the constraints on what humans can do within the bounds of the natural world. The approach does not eschew values and is concerned with distributional implications. The authors claim that ecological economics is concerned with integration of three strands: the economic, ecological and social systems. However, this book is heavily biased towards economics. Key aspects integral to ecological economics, namely politics and social assessment, are essentially ignored. This is somewhat strange, even with the target audience's background in physical sciences, because it does not address integration of the full range of disciplines to construct enhanced models of environmental systems.

The range of policy analysis tools presented is broad and relevant, and introduced in a very clear style accessible to readers without prior grounding in relevant disciplines. It is an extremely coherent introduction to the core concepts of environmental and resource economics and environmental assessment. The material addressing ethics and values is particularly well-written and should provide a spur for all readers to reassess their individual positions and to better understand those with different views. A concluding chapter would have been very beneficial to make sense of the vast array of analytical methods and, in particular, how they can be used together to produce better understanding. While this book fails in its stated purpose of providing an introduction to ecological economics, it is, nevertheless, a welcome addition to the bookshelf. Ecologists will find much in it to challenge

them and should find it a useful tool to aid their understanding of economics and economists.

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handbook of methods for anyone considering research in ecosystem ecology.

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Ecosystem science

Sala, O.E., Jackson, R.B., Mooney, H.A. and Howarth, R.W. (Editors). 2000. *Methods in ecosystem science*. Springer-Verlag, New York, U.S.A. xxii + 421 pp. Paperback, ISBN: 0-387-98743-6, US\$69.95

Ecologists are increasingly interested in using ecosystem-level approaches to test general theory and understand the effects of global change phenomena. This approach often requires multidisciplinary teams having a broad array of knowledge and skills and consequently draws on a wide, diffuse literature. Because of this, choosing appropriate methods for initiating ecosystem-level research can be difficult. Sala *et al.* do an excellent job of synthesizing current methods used for ecosystem ecology by a large number of experts.

This book is organized in a series of chapters covering four broad areas: carbon and energy dynamics, nutrient and water dynamics, manipulative ecosystem experiments, and syntheses. Topics covered in the book include primary production, decomposition, stable isotopes, measuring nutrient or water fluxes, and manipulative ecosystem experiments. Each chapter is a succinct summary of current methods and contains a comprehensive reference list. Chapters are not exhaustive summaries of methods, but discuss the relative merits of commonly employed methods. Readers are directed to the relevant literature for more detailed technical information on specific methods. Most chapters are clearly written and are excellent summaries of their topic.

Because of the broad range of approaches used in the study of ecosystem ecology, the book necessarily omits several topics: historical approaches, managing data (i.e. metadata, long-term datasets), disturbance, adaptive management, linking data and models, and mini-ecosystem approaches to ecosystem ecology. Inclusion of these topics would improve the text, but I'm sure these will appear in future editions of the book. The only other concern I had with this book is its strong United States bias in both authorship (18 of the 22 chapters are by US-based authors) and the literature cited, despite authors from other regions making important contributions to the field.

Overall the book is well-written, succinct, and an excellent resource for graduate students and researchers in ecology. I'm sure this volume will become an

Methodical ecology

Southwood, T.R.E. and Henderson, P. A. 2000. *Ecological methods*. Blackwell Science, Oxford, U.K. xv + 575pp. Paperback, ISBN: 0-632-05477-8, US\$112.00

The ecologist's bible, as previous editions have been called, is now available in revised format 22 years after the last update. The book again covers all key aspects of animal population ecology: field and statistical methods for estimates of absolute or relative population abundance from all habitat types, estimation of other parameters (births, deaths, dispersal), construction and analysis of life-tables, etc. It even dabbles in community ecology with discussions of species diversity and species packing and their measurement, along with estimation of energy flow in a food web.

The main change from previous editions is that the coverage now extends to all metazoans and not mainly insects. I still detected a strong entomological flavour throughout the text but must admit that this version will be useful to all animal ecologists. Other improvements include new sections on recent developments (e.g. remote sensing, GIS), and lists of web sites of field equipment manufacturers and software distributors. The book has its own web site (<http://www.blackwell-science.com/southwood>) which provides additional illustrations, details of equipment and computer programs, and references published after the book was completed. Thus the book will never become obsolete.

The scope of the book is so broad that not all methods mentioned could be explained in great detail. Most key methods are covered in depth, and illustrated with examples. Other methods are only described superficially, and are accompanied by references where more information is available. The most useful contribution of the book is its focus on the comparative efficiency and bias of alternative methods. The authors review the strengths and weaknesses of each method, its applicability to a range of situations, and what factors need to be considered when choosing a method. This kind of assessment is often of great importance to field ecologists, and in itself justifies purchasing this book.

The book is well illustrated and well indexed, and contains only a few, mostly trivial errors. Despite the quality of the presentation, it is not an easy read. It is written in a dry, recipe-like style, and it is not the sort of

book that one reads cover to cover. That is not a problem, though, because in a lifetime, the average ecologist will only require information on a fraction of the field and statistical methods described in the book. But all ecologists, maybe especially those working on insects or aquatic animals, will find it an invaluable and most comprehensive reference text.

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Managing ecological data

Michener, W.K. and Brunt, I.W. 2000. *Ecological data-Design, management and processing*. Blackwell Science, Oxford, U.K. xii + 180 pp. Paperback, ISBN: 0-63205231-7

An ecologist must not only be able to precisely and succinctly analyse data in a timely manner to allow their publication, but must also have a competent grip on the management of data for other researchers to refer to in years to come. Often researchers will use any number of software packages to analysis data, but the management of the data usually exists in name only: the retrieval system employed often amounts to a spreadsheet file in EXCEL on an office PC, and that is where the 'data' management ceases. Indeed many researchers still rely on the publication of their science in journals to 'archive' their data for the future, and not on some fancy relational database with such things as metadata and a user interface.

The book takes a helpful step towards highlighting major topics in modern day collection of ecological data. It also tries not to drown the reader in too much 'techno-detail' on each topic of interest. Each of the eight chapters covers a specific area relating to the manipulation and acquisition of data, everything from research project design, development of databases, data quality assurance, and metadata, to topics on knowledge transfer. Each chapter covers its area in a sufficiently thorough manner without getting bogged down in too much jargon.

This book does not deliver to ecologists a specific plan to solve their data management issues. Its intent is to provide a guide that empowers a researcher with a focused attitude to managing important and valuable ecological information. This book would be useful to those employed in a data management role. It would also provide new scientists with a solid background on data collection methods and management tools and approaches. The only topic the book does not cover adequately is web-based data issues, one of the growth areas in ecological research. Though the authors mention this topic in passing,

one would have thought this is a major issue for scientists today, i.e., how to easily get information out to the public on the web while keeping data security and integrity intact. This topic deserved far more attention than it received throughout the book.

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Estimation of parameters

McCallum, H. 2000. *Population parameters: Estimation for ecological models*. Blackwell Science, Oxford, U.K. x + 348 pp. Paperback, ISBN: 0-86542-740-2

This book gives an up-to-date description of models and the estimation of their parameters. It concentrating on animal population models rather than plant models or community analyses, with emphasis on 'wildlife' ecology, mainly vertebrates other than fish. It aims to summarise methods of estimating parameters, with discussion of the associated study designs. After a 'parameter estimation toolbox' chapter with details of statistical methods, there are chapters on single population estimates (population size, birth and death rates, migration, rate of increase of a population, density dependence and spatial parameters), followed by chapters on two or more populations (competition, predator-prey, plant-herbivore, host-pathogen and host-parasite models).

The statistical background chapter provides essentially an overview of methods, and could not replace a statistics textbook, but up-to-date and readable references are given for the summarised techniques. There are perceptive discussions of sensitivity analysis, bias, accuracy and precision, maximum likelihood estimation, computer intensive methods (jackknife and bootstrap) and Bayesian methods. The chapters on single populations include accurate summaries of current methods in capture-recapture, line transect sampling and population viability analysis, and advice on study design and sampling strategy. There are plentiful references to articles, books, web sites and computer packages, including many recent developments. Particularly important are the comments in Chapter 3 on the use of count data as an index for population size where there is no justification for the assumption of a constant rate of detection over different samples and times.

The later chapters include competition and predator-prey models. They concentrate on deterministic models, with parameter estimation by non-linear least squares given in examples. There are simulation examples with parameter inputs from a range of values to allow for

uncertainty in parameter estimates and for environmental stochasticity. Fully stochastic models with event-based or individual-based simulation are mentioned but not covered in detail.

The book has some typos, and occasional more serious errors (for example, the definition of conditional probability is labelled as 'Bayes' Theorem). I'd have liked to see mention of the recent improvements in the Jolly-Seber model and the POP AN computer program. However, these are minor quibbles, far outweighed by the comprehensive and insightful summary of both older and more recent methods in parameter estimation. I found the explanations very clear, and each chapter has a useful summary of the main points and recommendations. The book well deserves shelf-room in the office of any animal population ecologist, wildlife manager or biometrician. I know of no other book which fills this niche as a reference on animal population models and parameter estimation.

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