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BOOK REVIEWS

Vegetation of Southern Africa

ED. R.M. COWLING, D.M. RICHARDSON AND S.M. PIERCE

615 pp., illustr., 25 × 19 × 4 cm, ISBN 0 521 57142 1, £85; £55 in Southern Africa, Cambridge, UK: Cambridge University Press, 1997

This book is a triumph. No other word for it. At last we have a complete compendium of knowledge and understanding of the vegetation in a region with exceptional diversity of species and ecosystems. In an expanse of just over one million square miles, there are 22 000 plant species, or 5000 more than in the United States and Canada combined. Brazil has twice as many species but in a three-times larger area. The sheer scale of Southern Africa's flora is all the more remarkable in that most of the region is semi-arid with an overall mean annual rainfall of less than 16 inches.

The floristic richness resides, moreover, not only at species but genera level. There are 1930 genera (in 226 families), whereas West Africa, 70% larger and much moister for the most part, has only 1742 genera. In fact the species: genus ratio is 10.9, the highest in the world, way above Hawaii with 7.5 and New Zealand with 7.4.

The richest part of the region is the southern Cape and its fynbos, the latter being one of Earth's six plant kingdoms with 8600 species in just 36 000 square miles. (Contrast another kingdom, the boreal forests, with fewer species in a 150-times larger expanse.) The most outstanding sector of the fynbos is the Cape Peninsula, a mere 190 square miles and featuring 2285 species – or half as many again as in the British Isles.

Probably more significant than the overall totals is that almost 18 000 or 81% of the plants are endemic to the region. Compare New Zealand, 82%; Australia, 80%; Madagascar, 68% (all of them islands, hence likely to have lots of endemics); and the United States, 21%. In addition, ten families of plants are endemic to Southern Africa. Perhaps pertinent too is that many of the plants are fine to look at, as witness the many proteas and ericas of the fynbos that have become horticultural paragons around the world.

Indeed does this vegetation deserve to be celebrated, and indeed does this book do a fine job. The region is construed to encompass South Africa, Botswana, Namibia, Lesotho and Swaziland, hence it includes the fynbos, the succulent karoo and the nama-karoo, plus extensive areas of grasslands and woodlands amongst other savannas, forests, deserts, freshwater wetlands, and both coastal and marine vegetation. The book is conveniently divided into three parts. The first deals with physiography and history, covering the evolution of landscapes, climate, phytogeography, and vegetation history. The second takes us through the various biomes, looking at boundaries, distribution patterns, plant structure and function, community dynamics, ecosystem processes, and conservation and management. The final part considers 'ecological themes' such as plant form and function, herbivory, fire, alien invasions, human use, human impacts, and conservation. A formidable spectrum of topics, and while the documentation and analysis are necessarily a trifle uneven, the general level is exceptionally rigorous, clear and scholarly. The whole thing is illustrated with abundant tables, graphs, photos and the like.

The chapters are written by 47 established scientists and researchers, mostly at South African universities and research centres. Two authors are from Namibia and one from Germany, all the rest being South African – which is not as surprising as it may seem, given the predominance of South Africans in the scientific community of the region. The editors are all at the Institute for Plant Conservation at the University of Cape Town, which must rank as one of the finest bodies of its kind worldwide. Much of the Institute's professional standing derives from the leadership of Richard Cowling, who is also lead editor of this book.

In fact, some of the most illuminating writing in the book comes from Cowling's own hand. He is specially engaging when he proposes explanations for the species richness of the fynbos, and, more to the point, its capacity to generate still more species on soils that are as deficient in nutrients as any you would find in most other parts of Africa, deserts excepted. The fynbos is a veritable cauldron of evolution, and it needs someone of Cowling's insights to tell its remarkable tale.

The book's 600 pages contain half a million words. In quantity and quality alike, the book's contents are authoritative, comprehensive, and illuminating from start to finish. It all makes for a landmark publication that would still be cheap at twice the price.

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Dynamics of Tropical Communities: 37th Symposium of the British Ecological Society

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ix + 635 pp., 23 × 16.5 × 4 cm, ISBN 0 632 04944 8 hardback, £60.00, London, UK: Blackwell Science, 1998

This book is based on the papers presented at the 37th Symposium of the British Ecological Society, held at Cambridge University in 1996. The intended readership of the book is not stated, but most authors vary greatly in the organisms and the scale of processes addressed – for example from the ecology and morphology of seeds and seedlings, to the impact of large-scale disturbances such as tropical deforestation, with new research and reviews from all major tropical biomes and regions reflecting the interests of the authors. Inevitably perhaps, given the symposium's location, there is unfortunately almost no contribution from tropical country scientists, as well as a tendency to concentrate on work done in the former colonies of northern European nations.

The book's theme is primarily concerned with trying to understand historical accidents of another kind – those chance events in nature that may have an impact on tropical communities. As the editors state in their Preface, 'Unpredictability at the individual and population level, the uniqueness of location and of time period studied and the importance of major chance environmental events affecting communities are all becoming much more apparent to

tropical ecologists . . . The demands on tropical ecologists are to be increasingly prescriptive . . . and to achieve this requires a large step forward if one's main aim is to stimulate thinking for a new framework for understanding tropical communities that takes proper account of the role of stochastic processes'.

As a conference volume, the book succeeds because most of the authors have given a great deal of time and thought to the chapters and, in spite of the variety of approaches, have mostly tackled the key issues of evaluating stochastic and deterministic processes within their subject area. The quality of work is high, and in such a large and wide-ranging book it would be unfair to single out any individual contributions for criticism. The most appealing chapters tended to take the form of overviews or reviews of particular areas. Several authors have taken advantage of ideas that journals usually do not have space for. For example, P.A. Henderson *et al*. (pp. 385–419) argue that while the perennially changing landscape of the Amazon floodplain tends to prevent speciation and local endemism, there is evidence that some major evolutionary innovations have emerged from tropical floodplain organisms which are phenotypically plastic.

Notwithstanding this example, the book is relatively weak on research in the Neotropics and Amazonia, where most tropical diversity is found. There has been important recent work here, for example showing the importance of environmental factors (e.g. climate, soil) in determining forest diversity and composition (e.g. Gentry 1993, Terborgh *et al*. 1996, Tuomisto & Poulsen 1996), all highly relevant to the book's theme. The huge issue of human impacts on community dynamics is also only addressed head-on by three or four chapters. Although individually interesting, these chapters are essentially case studies and will not be useful for most conservationists or environmental managers wanting accessible overviews of ecosystem management. But for ecologists at least there is a wealth of ideas and perspectives.

References

Gentry, A.H. (1993) Tropical forest biodiversity: distributional patterns and their conservational significance. *Oikos* 63: 19–28.

Terborgh, J., Foster, R.B. & Núñez, P. (1996) Tropical tree communities: a test of the nonequilibrium hypothesis. *Ecology* 77: 561–7.

Tuomisto, H. & Poulsen, A.D. (1996) Influence of edaphic specialization on pteridophyte distribution in neotropical rain forests. *Journal of Biogeography* 23: 283–93.

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Climate Change Policy: Facts, Issues and Analyses

BY CATRINUS J. JEPMA AND MOHAN MUNASINGHE

xv + 331 pp., 25.5 × 18 × 1.7 cm, ISBN 0 521 59688 2 paperback, £17.95 (US$27.95), ISBN 0 521 59314 X hardback, £45.00 (US$69.95), Cambridge, UK: Cambridge University Press, 1998

Nowhere else have I seen so clearly illustrated the environmental outcomes from the different scenarios of greenhouse gas emission. The first 50 pages of the book are a brilliant synopsis of the current overall data on which the Kyoto Declaration (1997) was made. The authors contributed to the Intergovernmental Panel on Climate Change (IPCC) working group III report, from which the abundant figures and tables have been drawn. The various scenarios for greenhouse gas production, mean global warming ranges and sea-level rise to the year 2100 are clearly illustrated.

The fine details of how these climate changes might effect regional Biomes are currently under intense scrutiny but the general effects are illustrated with specific examples. The next century is expected to see a greenhouse warming of between 1–4 °C; this will shift isotherms polewards by between 160–640 km. This compares to a rate of 4–200 km per century for past species migration patterns. Many forest species would be unable to migrate fast enough poleward and would probably disappear. The same pattern holds for alpine species which would be lost from all but the highest mountains and this is particularly well illustrated.

One criticism of the book is that past climate forcing mechanisms (change in earth orbit, sunspot activity, and so on) were not considered by IPCC III, and are not discussed here. The current warm interglacial period has lasted around 10 000 years, and, on the basis of past climate cycles, could revert to a long glacial period in the next 4000 to 10 000 years. That being so, however, we must consider the now obvious, anthropogenic induced, climate change effects within the next 100 years rather than the (currently unquantifiable) multi-millennial time scale global-cooling effects.

The ethical, social, economic and political implications of global warming are well researched and presented. The concept of equity is important as the 49 cm mean global sea-level rise predicted for 2100 will cause coastal wetland loss with a current value of US$46 billion, but with 85% of this loss being in developing countries, for example Vietnam.

The free-rider problem associated with public goods is discussed. Here individual countries take advantage of the strategies of others, without committing themselves to the cost of similar behaviour themselves. This 'tragedy of the commons' behaviour with respect to global warming abatement has been noticed in some of the world's strongest economic powers.

The cost effectiveness and optimal response options are all carefully illustrated. What the current models of climate change still do not include are the fine details that could predict local catastrophic failure of ecosystems which are perturbated outside of their normal equilibrium states.

The very recent work by Raymo *et al*. (1998) shows that regional climate changes of 10 °C can take place in periods as short as 10 years, if failure of the deep ocean circulation currents occurs. This work is an outstanding guide to understanding of and the prompting of international cooperation in order to mitigate the negative impacts of rapid climate change.

Reference

Raymo, M.E., Ganley, K., Carter, S., Oppo, D.W. & McManus, A. (1998) Millennial-scale climate instability during the early Pleistocene epoch. *Nature* 392: 699–702.

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Ecotoxicology. Ecological Fundamentals, Chemical Exposure, and Biological Effects

ED. G. SCHÜÜRMANN AND B. MARKERT

xxix + 900 pp., 24 × 16 × 5 cm, ISBN 0 471 17644 3 hardback, US$150.00, £115.00, New York, USA: John Wiley & Sons, and Heidelberg, Germany: Spektrum Akademischer Verlag, 1998

Professors Schüürman and Markert start their long book with an oriental quote: 'If you know a thing, it is simple. If it is not simple, you don't know it.' Over the course of the subsequent 27 chapters, covering 900 pages and written by 37 different authors, they proceed, intentionally or not, to demonstrate that ecotoxicology is definitely not 'simple' though to follow their proverb through to its logical conclusion would be to do their authors a grave disservice.

The great strength of this book is the panoramic sweep of the subject, that places ecotoxicology firmly within its context within population and community ecology, biochemistry, chemistry and legislation. I would firmly recommend that all with an interest in the effects of pollution, not just ecotoxicologists, have access to a copy of this book, though at US$150 it is probably a book to order for an institutional library rather than for a personal bookshelf.

The book is divided into four sections: Historical Introduction and Ecological Fundamentals (five chapters), Chemicals in the Environment (eight chapters), Bioaccumulation and Biological Effects of Chemicals (eight chapters) and Contributions to an Ecological Risk Assessment (six chapters). Few, apart from book reviewers, will attempt to read this book from cover to cover and this is acknowledged implicitly with sufficient repetition between chapters to ensure that each can be read without recourse to those before and after. However, much credit must go to the editors for the careful organization of these chapters to present a logical and coherent view of the topic. The only minor quibble is that molecular biological methods get relatively little coverage and a frank appraisal of the prospects for developing such techniques for routine purposes would have been interesting.

With only 6 of the 37 authors having English as their first language, the prose is at times rather leaden. The use of English is competent and workmanlike, but many of the chapters lack the zest that the authors may have been able to bring had they been writing in their native tongues. Another minor criticism is that some of the Figures are poorly reproduced and one (Fig. 17.1) contains a glaring typographical mistake. Overall presentation of the volume, however, is good.

These comments are, however, minor. Final-year undergraduates, postgraduates and researchers will find much of value in this book. In their introduction, Schüürman and Markert comment on how the theoretical basis of ecotoxicology has not been able to keep pace with the need to achieve results of practical relevance for society. The reviews in this book go a long way to rectifying this. I expect my volume to become well-thumbed with time. That is the best recommendation that I can give any book.

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