

## Biodiversity of mediterranean ecosystems in Australia

Ed R. J. Hobbs. 1992.  
Surrey Beatty & Sons, Chipping Norton, NSW.  
245 pp + x, 11 chapters, 17 colour plates.  
RRP A\$65.

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THE Hobbs and Saunders publication machine continues unabated! Invariably conservation-oriented, jointly or singly, they have edited six major publications in the past six years and at least one other is on the way. The publisher, Surrey Beatty, has been involved with three of them, and of course, has launched this scientific journal (PCB) as well as publishing the proceedings of the conference held in Brisbane in 1991 entitled "Conservation biology in Australia and Oceania". Hats off to the publisher and to Saunders and Hobbs for being so active in this vital field.

The book grew out of a workshop held in Perth that explored the role of biodiversity in ecosystem functioning, as part of an agreed international focus (IUBS/SCOPE) on this topic in the world's mediterranean regions. From workshop date of December 1991 to publication in September 1992 bespeaks an almost frenetic activity on the part of authors, referees, editor and publisher. Unfortunately quality and depth of material suffer a little from undue haste. A few chapters I found ordinary, not offering me any greater insight to the functional importance of biodiversity; and despite its undoubtedly attractive format — hard (photographic) cover, compact size, nice paper and typeface, numerous colour plates — there are more than a few mistakes and grammatical errors.

The title is a bit misleading, as the focus of the book is strongly southwestern Australian rather than Australian *per se* (this admission is made belatedly in the final chapter). As defined using Koeppen's climate classification, mediterranean regions are confined to southwestern Western Australia and the gulfs region of South Australia extending into western Victoria. Since there are few recent ecological publications concerning the latter region, the western slant is acceptable if not the title.

Hobbs has edited the written work well in that I could read most chapters easily, i.e., they flowed nicely. The exception was Chapter 8 (Lavorel and Noble) which I had difficulty reading — rigorous editing could have improved the clarity of expression substantially. As well as co-authoring two others, Hobbs contributed the first and final chapters giving the reader a smooth passage into and out of the book. The first provides the background to the workshop and scope of the issues to be explored, and defines central concepts like diversity and biodiversity. Correctly, he notes the historical confusion surrounding use and definition of the various levels of diversity ( $\alpha$ ,  $\beta$ ,  $\gamma$  etc.). I was annoyed then when Hopper (Chapter 2, p. 34) applied the term  $\gamma$ -diversity instead of  $\beta$ -diversity. Similarly, having

emphasized that the notion of biodiversity incorporates structural and functional concepts (pp. 2–3) and not simply the number of species, different authors proceeded to adopt alternative positions — from the static, species-list approach to the dynamic, functional approach that I prefer (exemplified by Lamont, Chapter 6). Pattern diversity (landscape-scaled) and related concepts of patch-size and grain were not referred to here; this is an oversight given that landscape-scale is the most crucial for conservation-management — a chapter devoted to this topic should have been included. While Hobbs defines ecosystem function, discussing various themes and the hierarchical nature of it admirably, the obvious counterpart, ecosystem collapse or dysfunction, is not defined, nor described with any clarity; yet naturally, this notion is frequently tossed up in later chapters.

In the concluding chapter, Hobbs synthesizes some of the previous material and points the way forward, identifying some critical areas for further research. Also, we are informed here that very mixed reviews of some chapters were received from referees, and that this book should be "prodded and poked" like a "strawman", to help in formulating new approaches and perhaps reject some of the concepts presented.

Hopper (Chapter 2) describes the patterns of and accounts for the very high plant species diversity in south-western Australia. Specific and subspecific differentiation is highest in the Transitional (intermediate) Rainfall Zone which equates roughly with the Wheatbelt. There appear to be more species in this one zone than constitutes the entire South Australian flora! Hopper concludes that evolution has occurred more rapidly than in adjacent wetter (forested) and drier pastoral zones as a response to a dynamic disturbance regime, climatic and sea-level oscillations, patchy distribution of varied soil types, and the rainfall regime. Many rare species having localized distributions and diverse functional roles characterize the flora.

I found Chapter 3 by Groves and Hobbs fairly trivial (the content, not the topic); it revolved around diverse rooting strategies of plants but then proceeded to implications of these at the landscape scale, e.g., salinization caused by the replacement of deep-rooted perennials with annual crops. Saunders and Hobbs (Chapter 4) compared the impacts on biodiversity of land use and climate change. Naturally they concluded that it is a bit akin to Nero's fiddling, to worry too much about the potential effects of climate change some 50 years down the track. The effects of fragmentation, invasions and degradation are immediate and continually worsening, both in terms of loss of specific and genetic diversity and lost economic production. It is a good, simple chapter with a direct message.

In Chapter 5, Main argues that the gradual loss of species from a community or landscape will tend to have negative impacts on ecosystem function, but that

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they may not become apparent until it is too late to take remedial action easily. Many “replacement” species, i.e., those performing equivalent functions, are needed because their importance will vary as conditions change (e.g., seasonal change, longer-term climatic change, different disturbance regimes). The risk of ecosystem collapse is referred to often without describing what it actually means. As Lambeck (Chapter 7) correctly concludes, some level of ecosystem functioning will always be maintained, **even in the complete absence of fauna**. Reference to “cumulative impact” theory would have been usefully included in Chapter 5 to reinforce Main’s arguments, which I found a little woolly or simplistic but basically sound and certainly politically correct. He points out there are dangers in holding the notion of “passengers”, species which are supposedly additional to the requirements for maintenance of a function and therefore expendable. Given the limited knowledge we have of ecosystem properties and of species’ functions and interactions, and knowing how variable ecosystems can be across time and space, such thinking could lead to frightening management scenarios with unforeseen consequences. In Chapter 10, Main explores decision support theory in relation to making management decisions in the face of uncertainty. A decision-tree hierarchy is used in the example illustrated, and is a good introduction for those unfamiliar with the theory and techniques. It seemed out of place in this book though given its focus on management-process.

Lamont takes a functional view of the role of plants and keystone species in maintaining diversity and ecosystem function in Chapter 6, the chapter I enjoyed most. He provides more concrete evidence for the previous chapter’s assertions, that so-called replacement species are not exact functional analogues. It is a good review of the author’s research, of the diverse functional ecology of southwestern plant life and of interactions between plants and their physical and biotic environment. Lambeck (Chapter 7) provides a largely theoretical account of the role of animals in maintaining ecosystem function. He introduces some “soul” to the book by concluding that as much weight should be given to human values and expectations in deciding if particular animals, landscapes and functions are expendable or not, as is given to scientific measurements of the significance of their contribution to overall function.

Invertebrates are the main focus of Chapter 9 by Majer: their use in impact monitoring, and their role in maintenance and restoration of ecological function, particularly decomposition and nutrient cycling. He reviews data and previous interpretations as much as theory, thus balancing Lambeck’s contribution. Two conclusions stand out; first and more theoretical is that prescribed burns are preferable in autumn than spring, because displaced functions and reduced populations will have more time to recover before the stress of summer drought is imposed; second that mediterranean ecosystems may not be as resilient as current theory suggests. It is a good chapter all round.

Chapter 8 by Lavorel and Noble was a mixture of good and bad. They integrated four major tools of

ecological endeavour — long-term observations, focused measurements, focused experimentation and simulation modelling — into a sensible framework designed to maximize information and predictive ability concerning the behaviour of complex systems such as the functioning of ecosystems. Their framework should guide the administration of research funding. Even a basic understanding of the principles and hierarchy espoused would minimize the limitations and design flaws obvious in many well-funded studies of threatened species and biodiversity. From this good start the quality fell away in the application of their integrated methodology to the two illustrative case studies. I expected their study of the controversial relationship between diversity and stability (using the well-researched garrigue landscapes of France) to reach some substantial conclusions. It didn’t, at least no more than revealed by the excellent primary papers by Lavorel and others. The second application, to test for redundancy of function in components (species or functional groups) of a “tree-grass” ecosystem, seemed of questionable relevance to mediterranean communities in Australia which I associate more with heathlands and woodlands dominated by sclerophyllous shrubs than grasses. However, as a research protocol, it seemed very polished and focussed, **and costly**. Again, I would question the value of identifying “redundancy” when there are 8 000 plant species involved (Hopper, Chapter 2) — no model could hope to account for this level of diversity and consequent breadth of function — and when a broader society objective might be to conserve **all** species.

This book will be of most relevance to researchers and managers working in the south-west and will be of use to scientists and students who want an entry to the literature focussing on process-oriented, functional aspects of terrestrial mediterranean ecosystems in Western Australia. Chapters 2, 6 and 9 are particularly good. However, with respect to the functional importance of biodiversity itself, I suspect that Schultze and Mooney’s (1993) “Ecosystem function of biodiversity” published by Springer-Verlag, and referenced extensively in this book, will be a better buy for ecologists and libraries wanting a broader, more challenging and exacting discussion of current theory and concepts.

Overall, my review is somewhat critical due to the number of errors, the haste evident in places, and because some chapters seem too lightweight. The topic is highly significant though, and through their primary research the authors are adding substantially to basic understanding of ecosystem properties and (dys)function in the south-west. How human-driven land and resource use affect natural and modified systems, and how the trend to homogenization and simplification can be ameliorated and reversed at critical spatial scales are the problems and challenges facing ecologists and conservation biologists. In meeting these challenges and attempting to grapple with the enormity and complexity of the diverse issues involved Hobbs is proving, in my opinion, to be as dedicated and effective as any ecologist in the country.