

## Book Reviews

### Braided rivers on the coffee table

Peat, N. and Patrick, B. 2001. *Wild rivers*. University of Otago Press, Dunedin. 142 pp. Paperback, ISBN: 1-877276-15-4, \$49.95.

*Wild rivers* is the fourth book in the 'Wild' series and provides a beautifully illustrated look at the braided rivers of the central South Island. Primarily funded by the Department of Conservation's Project River Recovery, whose mandate is to restore the braided river environment, this book helps raise the profile of a unique area of New Zealand. The book follows the rivers downstream from their geological origins in the Southern Alps right through to the sea caves along the coast, with plenty of information about the different species and habitats encountered along the way. The combination of photographs or illustrations on every page, with text that varies from small captions to paragraphs providing detailed information, means the book will appeal to a wide range of audiences. Placed on a coffee table, the photos enable the casual reader to get a perspective from the illustrations alone, and a skim of the captions and text boxes fills out some of the details.

The book starts with an overview of the area encompassed by braided rivers as well as rock types and fossils, plus includes fascinating statistics. It then describes the geological formation of the braided rivers, including rock types, fossils, and diagrams and photos illustrating how the landscape came about, with photos showing the evidence of the past that still exists today. The next chapter looks at the braided river habitat. It describes the wide range of species — birds, invertebrates, fish, plants, and lizards and the different habitats and threats. This discussion follows through to where the rivers meet the sea and the different range of species and habitats found there. The photos of the different species are excellent, but don't search too hard for the wrybill nest amongst the river stones — it has been cropped out of the frame!

The next section examines the habitat adjacent to the rivers themselves — firstly the midland ranges between the Waitaki and Rangitata rivers, and then the core area of the Southern Alps where the rivers originate. Again, in each chapter, the range of habitats, plants and animals are described in detail with beautiful photographs.

The final chapter describes the conservation issues facing braided rivers. Given the huge range of threats (e.g., different weed species, effects of damming and water abstraction, predators, stock on riverbeds, politics between interest groups) this section only touched on most issues briefly. It could have contained more detail as many people are unaware of the huge range of threats and the serious impacts these pose to the braided river habitat. Describing the consequences of some of these threats in more detail would have given a more complete picture.

This book would be a welcome addition to any ecologist's coffee table, and of interest to the general public also. Having spent five years living and working in this area of New Zealand myself, I felt the authors accurately conveyed the beauty, character and uniqueness of the region's natural history. It's the sort of book you want to leave lying around for others to pick up, flick through and marvel at the photos.

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### What is agricultural biodiversity?

Moller, H., Hamilton, W., Hutcheson, J. and Perley, C. 2001. *Towards safeguarding New Zealand's agricultural biodiversity: 1. A database of publications, research projects and applications; 2. Research gaps, priorities and potential case studies*. Ministry of Agriculture and Forestry, Wellington, NZ. Compact Disc containing reports, database and instructions.

Copies of the database and two companion reports are available on compact disk from the Information Bureau, MAF, P.O. Box 2526, Wellington, New Zealand.

This 'novel publication' may well be a good model for making available results of literature analyses. The authors were contracted by MAF to (a) evaluate MAF's biodiversity obligations to the Convention on Biological Diversity (CBD), (b) identify needs and gaps in understanding so that MAF can better meet those obligations in future, and (c) facilitate the preparation of New Zealand case studies concerning soil biota, pollinators, sustainable forestry, and integrated landscape and farming systems: these case

studies are obligations of signatories to the Convention. The resulting two reports and Endnote™ literature database are a most useful resource. Even better it is on a CD and the environmentally aware can read it without sacrificing trees.

Before discussing the reports, I will first describe the contents of the compact disc. All text files are available in Word or Mac versions. There is a ReadMe file (essential reading), an Endnote™ (reference database) library, Endnote™ styles file, a report, a synthesis report, and separate files for appendices D to K.

The instructions for preparing Endnote™ for the library file were clear and easy to follow. Those users on local area networks will have to get their network manager to install the CBD style. This is needed to use special fields and key words to sort the entries. [As a recent convert to Endnote™, I can strongly recommend it as both a tool for adding and formatting citations for papers and for handling literature databases.] The Endnote™ database contains 6458 publications, 169 research projects and 101 application initiatives. Appendices D–K list the title, source, abstract and salient notes of each record. Each of these appendices deals with a particular topic such as Concepts (D), and the four case study areas (E–H).

The first report “Towards safeguarding New Zealand’s agricultural biodiversity: A database of publications, research projects and applications” describes the reason for the project, which derive from New Zealand’s commitment to the Convention on Biological Diversity and includes the need to provide case studies in four focal areas. Most of this report deals with objective 1 of the project (as follows); Review literature and existing research underway relevant to MAF’s CBD commitments. Most the report describes how the items for the database were located, selected, how additional key words added and how to search the database most efficiently. This report describes in detail how the database was gathered and structured, and how to search it most efficiently. Every step is meticulously documented, for example Appendix A lists all the special key words generated for this project and their particular meaning in the context of the database material.

The second report “Towards safeguarding New Zealand’s agricultural biodiversity: research gaps, priorities and potential case studies” forms the crux of the project and is 230 pages long. This includes 6 appendices that include an explanation of the ‘The ecosystem approach’ (C), ‘Potential New Zealand case studies for the CBD web site concerning agricultural biodiversity and forestry’ [103 are listed] (E). This report fulfils objectives b and c which are to identify needs and gaps in understanding so that MAF can better meet those obligations in future, and to

facilitate the preparation of New Zealand case studies concerning soil biota, pollinators, sustainable forestry, and integrated landscape and farming systems.

The report explains that under the CBD agricultural biodiversity means the variability among living organisms associated with cultivating crops and rearing animals and the ecological complexes of which they are part, including diversity within species, between species, and of ecosystems with a unique feature being the emphasis on its utility to human beings. The authors then argue the case for an ecosystem approach to managing biodiversity in an agricultural landscapes. This makes a lot of sense to someone involved in crop protection and who is concerned about biological control and management of herbivore populations that may be resistant to pesticides or conversely have overcome crop plant resistance. The authors then explain that within the context of the CBD, the ecosystem management is a bottom up approach that involves the human component. In my experience this has been essential for the successful implementation of integrated pest management for crops and is a must for conserving indigenous biodiversity in the agricultural landscape. The concept of ecosystem management and its implementation is core to the rest of the report.

The report (chapter 3) then discusses the significance of the high proportion of endemic organisms in New Zealand and the implications for ecosystem management. Among the issues discussed are the abundance of indigenous insect species, biological control, and the importance of seral vegetation such as indigenous shrublands as diverse ecosystems and the opportunity to restore or establish such habitats in agricultural landscapes. The chapter concludes by recommending that *MAF takes a strong national advocacy and facilitating role for ecosystem management approaches to conservation of biodiversity in agricultural and forestry landscapes.*

Chapter 4 calls for a combination of very applied research to solve specific problems and fundamental research to understand how ecological processes work in New Zealand’ agricultural landscapes, together with ‘adaptive management’ or ‘learning by doing’. The report then discusses the National Science Strategy Committee ‘Sustainable Land Management’ strategy and urges that MAF ‘the SLM strategy be used as a platform to launch increased effort to safeguard agricultural biodiversity’.

Specific knowledge gaps are identified in four focal areas (landscapes, forestry, pollinators and soil biota) in Sections 5 to 8 of this report, and 35 items are collated in Table 3 (page 115). The requirements of case studies are discussed in Chapter 9 and 103 suggested case studies are listed in Appendix E.

This is a densely argued report and hard reading

for someone not conversant with developments in ecological theory. The authors appear to be fighting what they believe are entrenched views and this may have contributed to the my difficulty. The report says many things I agree with, but also comes to conclusions and recommendations to which I take strong exception. I think that there are several reasons for this. One is a confusion over what is agricultural biodiversity in the New Zealand context. A second is the background and biases of the authors, who have strong experience in forestry including forest entomology and vertebrates.

What is agricultural biodiversity? This answer to this question is clearly given on page 10 of the report, but somewhere along the way the focus in the reports switches to indigenous biodiversity in agricultural and plantation forestry landscapes. The definition given is as follows:

*“For the purposes of the Convention, agricultural biological diversity means the variability among living organisms associated with cultivating crops and rearing animals and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. The unique feature of agricultural biological diversity is the emphasis on its utility to human beings”.*

In my view this needs to be interpreted in a New Zealand context. In New Zealand most of the biodiversity in agricultural and horticultural farms is composed of exotic organisms at all trophic levels and in most habitats. Within productive habitats (grasslands, crops, plantation forests) there are some important indigenous species, such as grass grub and porina and some of their natural enemies. However, these are a minority of the diversity of organisms present (see the report for details). In contrast, in Europe much of the biodiversity in the agricultural landscape is composed of indigenous species. So, encouraging hedges and leaving wide uncultivated and unsprayed field margins will enhance indigenous biodiversity and may even assist with pest control in crops. Also, most of the soil organisms are indigenous and tillage practices that favour soil organisms will enhance indigenous biodiversity.

The New Zealand Biodiversity Strategy puts the emphasis on indigenous organisms and exotic organisms of economic importance. The latter include crop plants, where maintaining genetic biodiversity is important, and beneficial insects such as honey bees and natural enemies of crop pests. There are two points to be made. Firstly I think that there is an important role for indigenous organisms in agricultural landscapes and the report has many good ideas about how to encourage this (see below). Secondly I believe that within the productive habitats in the agricultural

landscape, ecological function is more important than biodiversity. For example, in a cabbage crop, it would not matter if 500 or 1000 natural enemies (pathogens, parasitoids and predators) of the herbivores (including those that damage cabbage) were present if an effective natural enemy of a key pest was absent. Similarly, in exotic grasslands, the ‘health’ of the soil is dependant upon earthworms, not just any earthworm species, but the group of exotic earthworms that in New Zealand are called ‘top soil-mixers’.

From the perspective of enhancing indigenous biodiversity in the agricultural landscape, the long-term benefits are going to come from the subject of Chapter 5, which covers ‘Integrated landscapes and farming systems’ and considers how biodiversity, and particularly indigenous biodiversity can be enhanced in the agricultural landscape, especially on privately-owned land. The authors believe that protecting biodiversity on productive landscapes needs a fresh approach that is not premised on the idea that reserves are the only option, though they remain one option in a pluralism of approaches. The authors also believe there is a need for integrated research involving all disciplines. More critically, they identify a need to influence the culture of land owners/managers, to get them to recognise value — whether financial, social or environmental — of changes to land management that will increase biodiversity. Interestingly, this report does not mention two important drivers, the Forest Stewardship Council and the European Retailers Scheme (EUREP-GAP), that reward producers with markets and better prices and which require conservation practices that favour indigenous species and ecosystems. [While writing this review, I heard a radio report about a how a major buyer of milk is developing guidelines for its suppliers to protect water ways. These include fencing and planting riparian strips, a major opportunity for creating terrestrial indigenous ecosystems and increasing the economic value of unpolluted water.]

One objective of the MAF contract was to provide ideas for case studies to be submitted to the Convention on Biological Diversity. An overwhelming 103 suggestions are provided with priority rankings for criteria such as ecological, economic and social importance (Appendix E). They range from paper exercises, e.g. ‘Review of New Zealand integrated ecological landscapes and farming’ to examination of practical conflicts, e.g. ‘Bee keeping and heather in Tongariro’ and ‘Burning in tussock grassland’, plus some practical issues that can have an impact on indigenous biodiversity, e.g. ‘Hedgerows landscapes’, ‘Whole farm plans’, ‘Erosion control’, ‘*Clematis vitalba* control’, ‘Ducks unlimited’, ‘Cabbage tree — sudden decline’. However, there are some that have no link to either indigenous biodiversity or functional

ecology of the productive habitats.

This report is ambitious, a hugely useful resource, and a challenge both for MAF and biologists working agricultural/horticultural and forestry landscapes. There are 52 recommendations to MAF summarised in Appendix F of the synthesis report. I am not sure how practical many are for MAF to implement. It will be important to focus on the key issues. The first issue is to clarify the concept of 'agricultural biodiversity' in the New Zealand context. This would be a suitable topic for the next New Zealand Ecological Society Conference.

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**Making statistical tools accessible to ecologists: two practical guides for teachers and practitioners**

Scheiner, S.M. and Gurevitch, J. 2001. *Design and analysis of ecological experiments*. Second Edition. Oxford University Press, Oxford, U.K. 431 pp. Paper, ISBN 0-19-513188-6, \$140.00 N.Z.D.

McCune, B. and Grace, J.B. 2002. *Analysis of ecological communities*. MJM Software, Gleneden Beach, CA, U.S.A. 300 pp. Paper, ISBN 0-9721290-06. \$35 U.S.D.

Two recent books present a range of statistical techniques to ecologists in a non-intimidating way. Scheiner and Gurevitch have edited a second edition of the popular *Design and analysis of ecological experiments*. McCune and Grace have just published *Analysis of ecological communities*. Both books make a good attempt at communicating new or specialised statistical techniques to practising ecologists or teachers.

The volume edited by Scheiner and Gurevitch is a major update of the first edition which appeared almost a decade ago. Despite its title, this is a book mostly about analysing ecological data, mostly generated using experiments, but also using time-series, survival and other types of data as well. The first few chapters on "Theories, hypotheses, and statistics" (by Scheiner) and "Power analysis and experimental design" (by Steidl and Thomas) are terrific background reading and useful for introducing some key concepts for teaching, or for refreshing these concepts for practitioners. Ellison's chapter on "Exploratory data analysis and graphic display" is an excellent review of the strengths and weaknesses of different ways in which data are presented; these chapters are essential

reading and deal more with conceptual issues surrounding data analysis and presentation rather than specific techniques *per se*. Although there are better, book-length reviews on each of these topics, these are good summary chapters that point readers to the relevant literature for further details.

The remaining 15 chapters deal with specific statistical techniques ranging from bread-and-butter ANOVAs to Bayesian statistics. Each of these chapters follows a very similar format, covering, in turn, ecological issues, statistical issues, statistical solutions, examples and interpretation, and related techniques or applications. Most chapters develop a specific example or series of examples using an ecological dataset. These datasets, and the SAS code used to analyse them are posted on the web ([www.oup-usa.org/sc/0195131878/](http://www.oup-usa.org/sc/0195131878/)), with the intention that readers can try these analyses at home or work and compare their results against the text! Because these chapters focus on the ecological/dataset problem and statistical issues surrounding each technique, they do not cover the underlying theory and mechanics of the statistical technique reviewed. This is not really a shortcoming for a book aimed at introducing ecologists to new statistical techniques (or perhaps finding out more about techniques they already use).

Some of the new techniques covered in this book that are potentially very useful to ecologists, but perhaps under utilised, include path analysis, spatial statistics, failure time analysis, logit-modeling and logistic regression, and Bayesian statistics. This book is SAS-centric, and although you do not need to be a SAS user to find this book extremely useful, it helps. Nearly all of the chapters use SAS as the backbone for their analyses; this might explain why some important techniques that are not strongly supported in SAS, such as structural equation modelling, regression trees, and non-parametric techniques comparing groups (such as NPMANOVA, MRPP etc.) are not included in this volume. That said, I'm sure there will be several new statistical techniques on the block if or when the third edition of this volume appears.

I highly recommend Scheiner and Gurevitch's volume for teaching and for practitioners wanting an introduction to useful statistical techniques they may not be familiar with. The only major downside is the price tag: at \$140 N.Z.D. for a paperback, it's not a bargain as a text or for personal use, but it's an essential reference book.

McCune and Grace's new book *Analysis of ecological communities* is also an overview of statistical techniques for ecologists, but the similarity ends there. The first two sections of the book are a condensed overview of community matrices, sampling, diversity measurements, data transformation, documenting analyses etc. To me, these are whirlwind overviews

that merely provide a very basic background for understanding the real core of the book — ordination techniques and group comparisons.

Ordination is the backbone of community analysis, and nearly all of the core techniques are covered here (e.g. polar ordination, PCA, NMS, CA, RDA, DCA, CCA). Individual chapters give the background of an individual technique, explain when to use it, explain how it works, provide worked examples, describe what to report (with terrific advice here) and explain variations of the procedure. Again, for the dedicated statistician, you'll want to refer to the key references provided in the text. For the practitioner, the text quickly walks you through different techniques and provides enough information for you to determine the relative merits or appropriateness of different techniques.

The last section, on structural models, is short but excellent reading on topics new to most ecologists. Urban discusses classification and regression trees, methods for determining whether groups (communities, habitats etc.) differ, and what specific factors or species can be used to best differentiate these groups. Grace gives the best introduction to structural equation modelling (SEM) I've yet encountered. SEM is a multivariate technique that can be used to test multiple hypotheses, and requires the researcher to construct models of how factors interact based on theory or previous knowledge. One of strengths of this approach is that it combines measured (indicator) variables with unmeasured (latent) variables. Although specialised software is currently needed for this approach (e.g., LISREL, AMOS), it is a powerful technique that will be useful for resolving many ecological questions.

The text is well-written, clear, and is peppered with analogies and figures to help the reader understand exactly what a particular procedure does (or does not do), and the situations in which it is appropriate or inappropriate to use. The book has the feel of a much-expanded users manual for PC-ORD ([www.pcord.com](http://www.pcord.com)), but this does not detract from its usefulness as a good general reference for ecologists dealing with multivariate data, or teaching these techniques. At the modest price of \$35 U.S., it's also excellent value for money.

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