

## BOOK REVIEWS

**Vegetation of Mount Aspiring National Park, New Zealand.** A. F. Mark. National Parks Scientific Series Number 2. National Parks Authority, C/-Department of Lands and Survey, Private Bag, Wellington, 1977. 79 pages, 27 Figures, 2 coloured plates and a vegetation map. Price \$5.50.

At the beginning of this century the Department of Lands led the way in fostering pioneer studies of our vegetation. Between 1907 and 1911 Mr W. C. Kensington, the Under-Secretary, recommended seven reports to his Minister for publication. These have become classics of our botanical literature. Six of these reports were by Leonard Cockayne (on Kapiti Island, Waipoua Kauri Forest, Tongariro National Park, Stewart Island, and two on sand-dunes) and the seventh, on the higher Waimarino District, was by E. Phillips Turner, who was the Department's Inspector of Scenic Reserves.

Although it cannot be claimed that the Department of Lands initiated the idea of these surveys (the impetus came from Cockayne via the Philosophical Institute of Canterbury which had pressed the Government for a "complete botanical survey of New Zealand") at least the Department was in the vegetation business. But this brilliant beginning was not followed up, and it would be interesting to know the reasons for this. Why, for example, didn't Cockayne survey Mt Egmont, the only other National Park beside Tongariro at that time? And what was the effect of budding off the State Forest Service in 1920 on the attitude of Lands and Survey towards land and vegetation? Interest was not dead, as witness reports on Rainbow Mountain and the glacial scenic reserves of Westland in 1929 and 1930. But Cockayne was called back to do these as an old man. And after this there seems to have been a gap of some thirty years. However, the tide turned in the sixties and the National Parks Authority is now publishing surveys as important as the classics of seventy years ago. In 1976 appeared Hugh Wilson's "Vegetation of Mount Cook National Park" which was reviewed in Volume 24 of our Proceedings by Dr C. J. Burrows. This was followed by Professor Mark's survey of Mount Aspiring National Park which is the subject of the present review.

Mount Aspiring National Park is an elongated mountainous area of 287 206 ha on each side of the Main Divide, ranging from 30 m a.s.l. to the summit of Mount Aspiring at 3 036 m. Professor Mark made a reconnaissance survey of this area of rugged

topography and high rainfall between 1967 and 1969, and the present publication is largely derived from an unpublished report to the Park Board in 1972. An account of the localities sampled and the routes taken, whether on foot or by helicopter would have made an interesting appendix, but that the Park was well covered can be seen from the distribution maps of selected species.

The introduction contains an outline of the geology, soils and climate of the region. This is followed by a description of the six altitudinal zones—lowland, montane, subalpine, low alpine, high alpine and nival—and the species which define them. A combination of these altitudinal zones and four major vegetation types—forest, shrubland, tussock-grassland and fell-field—gives 19 vegetation types and these are described in the main section of the report. In addition several minor types are described including communities on the ultramafic rocks of the Olivine Branch Valley. In contrast to areas in Marlborough and Nelson, no species exclusive to serpentine have been found here.

An important conclusion from study of the forests is that: "whereas silver beech apparently occupies almost all of its potential range within the Park the distributions of mountain and red beech are quite anomalous yet generally similar, being confined to the southern region". It is suggested that this pattern is not determined by present conditions but is due to a northward migration of red and mountain beech from southern refugia. "The greater northward extension of silver beech (to the Paringa River) could indicate either a more efficient dispersal or, perhaps more likely, a more northern refugium during the most recent glacial period". Professor Mark also draws attention to several other interesting patterns of distribution which were broadly established during the survey but which could be checked in more detail. The description of the forest types also contains valuable comments on the published observations made on this region by J. T. Holloway.

The survey disclosed that most severe modification of vegetation was caused by red deer and that on the western side of the Divide it was the alpine vegetation and sub-alpine scrub which was drastically modified whereas on the eastern side it was the forests. Eighty-eight permanent photo-points were set up in 1970~72 and changes have already been observed arising from commercial hunting. Professor Mark concludes: "assuming that animal numbers remain at least as low as at the time of

this survey (1969) some striking changes in composition and density of cover can be expected in most types of vegetation. Perhaps we may eventually see a return of the magnificent alpine herb fields described in early writings on the Mount Aspiring and other regions. . . . The forests will probably take longer to recover".

In his review of the Mt Cook bulletin Dr Burrows suggested that the vegetation maps would have been much better in colour. This has been done with the Mount Aspiring bulletin, but whereas Mt Cook had 5 vegetation maps at 1: 60 000, Mt Aspiring has only one vegetation map at 1: 200 000. I think this is too small a scale.

The bulletin concludes with a list of native ferns and seed plants found in the Park, and the more prominent naturalised species. The pattern of distribution is indicated for each species as well as the communities in which the species occurs. In Mt Cook National Park 437 species of native ferns and seed plants were listed by Wilson, whereas in Mt Aspiring there are 548. This is a reflection of the lower altitudes of Mt Aspiring and its greater area, straddling the Main Divide, which allows not only north-south but east-west gradients in vegetation.

This is a very readable and valuable account of the flora and vegetation of a large area of difficult South Island mountain country which has hardly been studied before by botanists. It should be more widely available. The Government Bookshop in Christchurch has never heard of it. That wouldn't have happened in 1910.

E. J. Godley

#### **Plants and Landscape in Westland National Park.**

Peter Wardle (with illustrations by Keith West). National Parks Scientific Series Number 3. National Parks Authority, C/- Department of Lands and Survey, Private Bag, Wellington, 1979. 168 pp. Price \$7.50.

The aim of this series, to adopt the author's words, is to help the people of New Zealand to see that complete sectors of their wonderful landscape and vegetation should be protected in their primeval state forever, in so far as it is still within human power to do so. But professional ecologists have come to expect to derive profit as well as pleasure from reading it. They will not be disappointed. Peter Wardle has published scientific accounts of the vegetation, flora and glaciology of South Westland. He has drawn on these and on his years of fieldwork, background reading and reflection to

produce a text that is rich in fact, crisp and vivid in style, and deftly interlocks the field sciences with history, pre-history and a touch as aesthetics. But the main aesthetic appeal of the volume is of course from the many delicate, detailed and graceful drawings by Keith West. The author has added about a dozen very effective photographs.

The chapters deal with Climate and Vegetation, Soil and Succession, Flood Plains Swamps and Lakes, Coastal Vegetation, History of Plants and Landscape and the Changing Vegetation. Much information is packed into two appendices. One lists the species for each class of vegetation with code letters which tell you, for example, that *Schefflera digitata* enters the forest succession early on moraines and persists abundantly, or that *Poa colensoi* is abundant in dense or open grassland, mainly where drainage is poor. The other adds descriptive detail for genera and species, for which it serves as an index and glossary of popular names. I found the chapter on History particularly lucid and absorbing, but the object throughout is to relate land and vegetation changes in climate, geology and soil and the activities of animals and man. This keeps up interest on every page and provides over-all a liberal education.

It is good to see a text as complex as this so free from errors. Only one reference misled me; the recognition of a 50 000 year stage (p. 50) seems to be contradicted by the statement that nearly all soil and vegetation have developed within 14000 years (p. 104). The latest name changes proposed for plants are wisely not adopted and convenience presumably relegated them to a tail-end list rather than their proper places in Appendix 2. The blank inner faces of the cover might well have carried the maps, adding one that spreads far enough to locate all South Island place names mentioned.

From reading this book two hopes arise. The first is that it and others like it will achieve the object of the series. This above all implies full appreciation of the threat that browsing animals are to National Parks, reserves that probably give the best impression today's world can offer of the great Antarctic Continent before the Ice Age. The second wish is simpler—that Dr Wardle will now bring up to date "The Vegetation of New Zealand".

Geoff Baylis

**Ecology of Kowhai Bush, Kaikoura.** D. M. Hunt and B. J. Gill (Editors). Mauri Ora Special Publication 2 (1979). The Biological Society, University of Canterbury, Christchurch. 54 pp. Available from

The Editor, Mauri Ora, Zoology Department, University of Canterbury, Christchurch 1. Price \$1.50.

Kowhai Bush is a remarkable remnant of forest that, according to the Editors, was "once common on the river-flats of the eastern South Island but now rare". The booklet was compiled to describe the special features of Kowhai Bush and to summarise existing knowledge by a series of abstracts, generally by the investigators concerned. There are sections on the history, physical aspects, vegetation, invertebrates, amphibians, reptiles, birds and mammals, with separate sections on the inter-relationships of kanuka and manuka, tardigrades, the breeding and behaviour of five species of birds, and predation by mammals on eggs and nestlings of birds. There is a fold-out vegetation map, checklists of plants (282 species), birds (25 species) and mammals (12 species), a list of contributors (10), and a bibliography. There is a very useful final appendix on suggestions for further research.

For anyone contemplating research at Kowhai Bush this booklet is a must.

Eric Spurr

**Soil Organisms as Components of Ecosystems.** U. Lohm and T. Persson (Editors). 1977. Proceedings of the 6th International Colloquium of the International Society of Soil Sciences. Held in, Uppsala, June 1976. 614 pp. Price about US \$33. Ecological Bulletin/NFR 25. ISBN 91-546-0235-1.

This bulletin contains 94 papers from more than 200 participants and contributors so I hope I am excused from a detailed account of its contents. The colloquium was divided into a poster session and four "sit-down" sessions entitled:

- Community structure and niche separation in the soil system.
- The role of soil organisms in nutrient cycling.
- Plant roots in the soil system.
- Models of soil organisms and their environment.

Readers familiar with the problems facing soil zoologists will recognise these topics as being the basis of a diversity of opinion and not a little theorising. Thus the area of discussion is pertinent but do the papers deepen our knowledge or are they trivial repetitions of papers from previous colloquia? The answers are yes and then no. There is abundant food for thought and meaty information. But what are so obvious by their absence are papers on technique. The study of soil

animals must have matured if a colloquium, such as this, can dwell almost entirely on the results and the implications of research rather than on the manifest problems of collecting them.

I don't think I am being unfair if I point at the session dealing with modelling soil biota as being the weakest of the four. This is, perhaps, excusable because, in order to model biological systems satisfactorily, there must be some firm theory and a smattering of reliable data, especially when dealing with such confounding complexity. Although the International Biological Programme (IBP) initiated studies in North America are yielding the desired results through the work of D. C. Coleman and others there is still a long way to go. (Where was New Zealand when IBP started?). If this 6th Colloquium is an indication of the degree of enlightenment in soil zoology, will the 7th indicate the degree of integration, perhaps brought about by certain truths emerging from the works under discussion?

I was attracted to J. E. Satchell's closing presidential address by the title "Earthworms-the trombones of the grave!" and found to my surprise that, in view of the lumbricine associations of the author and the portents of doom in the title, the paper was a light-hearted plea. Perhaps it arose because of the arrival of "Zen and the Art of Motorcycle Maintenance" at Grange-over Sands, Cumbria, United Kingdom. In thinking of the thoughts of a collembolan quivering in fear and trepidation at the sound of the heavy breathing of a pseudoscorpion, Satchell asks for the injection of more insight and perception into science to balance the necessary (but boring?) cold logic. Anything to make science more interesting, I suppose. I do not wish to introduce levitude to a light-hearted paper but I have a feeling that Satchell does not realise that the successful modeller of ecological situations (who he is gently knocking) often has insight and perception as his major ingredients because of the lack of reliable facts!

This last paragraph is typical of my reaction to this book. Every time I start looking for a specific item, I find myself side-tracked by another fascinating titbit. This is particularly frustrating when attempting to review, rather than read (!) a work of this kind. Such diversions are only possible when the presentation and format of a publication are of the highest quality. The papers are short, to the point and digestible, although some authors have rambled on a little. All credit must go to the Editors for rounding up the papers in reasonable time and for turning out material of such consistently high quality.

The answers to several questions I have been asking are in this publication. For instance, Johnen and Sauerbeck, in comparing the results of conventional root washing and an accurate tracer technique, give an indication of what is really below the paddock surface, compared with what we usually measure. There is at last more data about the contribution made by the microbial biomass to a litter system. U. R. Singh hits my personal jackpot by relating CO<sub>2</sub> emissions from a forest floor with the population density of soil microarthropods and mycoflora.

These reactions to this major work are obviously personal. I hope that, following the way that science is supposed to work, these comments will stimulate others to get hold of this book and try to prove me wrong. Again, at a personal level, I wish this compendium had been available when I entered the dirty-finger-nailed world of soil biology ("biology" because these broad-minded fellows actually include microbiologists into their midst). Any research student working on the ecology of the biota of the soil who is in possession of this publication will be at an immediate advantage. The literature review of his or her thesis is already half written.

John Wightman

**Biology of the Reptilia, Volume 7, Ecology and Behaviour** A. Carl Gans and Donald W. Tinkle (Editors). Academic Press, London, 1977. 720 pp. Price \$64.25.

This is the first volume of the "Biology of the Reptilia" series to be devoted to certain aspects of the ecology and behaviour of reptiles. Seven topics only are covered; further topics will be dealt with in subsequent volumes. Each of the seven topics is presented as a separate chapter written by an acknowledged expert or experts in that field.

The first chapter, by Eric R. Pianka, deals with reptilian species diversity. Pianka, working with desert lizard communities, is the only person to have undertaken detailed investigations of this topic. He demonstrates how spatial, temporal and trophic features of the environment may be considered as the primary components influencing the numbers of reptilian species present. Aspects of reptilian species diversity are briefly compared with other taxa, especially birds and mammals. Various correlations presented suggest that different physical factors operate to regulate diversity of the different taxa and give some support to a proposed hypothesis that ectothermic reptiles might enjoy a

degree of competitive superiority over endothermic birds in arid environments.

The second chapter, by Thomas W. Schoener, covers competition and the niche. Schoener gives an excellent review of three kinds of competition in reptiles: (1) interference, (2) interspecific exploitation, and (3) intraspecific exploitation. Each category is dealt with in a separate section. Simple deterministic, instantaneous and differential equation models are reviewed, then relevant studies evaluated as are additional alternative, non-competitive hypotheses. Most studies discussed are observational ones made on lizards, and most of these are from two geographical regions, the Caribbean (the evolutionary radiation of *Anolis*) and western North America. It is easy to see why lizards, of all reptilian groups, are best suited for observational work. Crocodylians are restricted in habitat and distribution while snakes and turtles are often inconspicuous and sometimes rare. Lizards, however, sometimes surpass birds in conspicuousness and Schoener, as an example, relates how "some anoles, which sleep at night clinging to peripheral leaves and twigs, can be plucked from their resting places like fruits, marked, and then released with apparently no increase in their wariness of humans". Experimental studies of competition using lizards are only now beginning to be done. Schoener concludes that while a combination of characteristics uniquely separates the niches of most reptiles from those of other groups, no one characteristic is exclusive to reptiles.

Harold Heatwole, in the third chapter, considers habitat selection in reptiles. He emphasises a behavioural approach which involves "analysis of the immediate important environmental stimuli and the corresponding responses of the animal in its choice of habitat". Although the habitats of a large variety of reptiles have been described, the author maintains that most of these studies have revealed little concerning the nature of the responses involved or the stimuli evoking them. Some examples are given of how various stimuli, both physical and biotic, may influence an animal's choice of habit. Nothing is yet known of the relative roles of learning and stereotyped behaviour in reptilian habitat selection: experimental studies are just beginning to appear.

Studies on the population dynamics of squamates, crocodylians and rhynchocephalians are reviewed in the fourth chapter by Frederick B. Turner. For each group in turn, observed densities are considered along with methods of their estimation, schedules of mortality and reproduction and their interactions, and some mechanisms which regulate population

size. Emigration and immigration are not considered in depth. More information is available on lizards than any other reptilian group but a considerable number of studies have been undertaken on snakes. Until better methods can be developed to sample snake populations, however, Turner questions the suitability of these animals as subjects for the study of population dynamics. The section on crocodylians is mostly confined to discussion of recent studies on the Nile crocodile and the American alligator. In the brief section on rhynchocephalians, recently published work on the tuatara is clearly and adequately summarised. Turner points out that population studies of reptiles have rarely contributed to advances in theory of population dynamics, nor does he think that this situation will change appreciably. However, he sees no reason why research on this topic could not be addressed to important applied and theoretical questions including studies on commercially exploited or endangered species and theoretical studies designed to determine the factors controlling the local abundance of a species.

The fifth chapter, by J. A. Stamps, reviews the social behaviour and spacing patterns in lizards, the only reptilian group for which a sufficiently

large literature has accumulated to merit an extensive review on this topic. In part, according to the author, this is due to the conspicuous aggressiveness of saurian species, nearly all of which exhibit some form of territoriality. Information on other reptiles is not only meagre but suggests a lack of territoriality. Emphasis is placed on field studies of social behaviour since, as the author points out, behaviour is easily altered by confinement. The chapter is divided into three sections. In the first, lizard families are considered separately and the spacing patterns, foraging methods and display behaviour of each one discussed in turn. In the second section, the effects of food specialisations (carnivore, herbivore, ant-eater) on spacing patterns, the formation of dominance relationships and possible functions of male territoriality are discussed. The final section summarises information on territorial displays and colour patterns, and the effect of visibility, home range size and other factors on territorial behaviour. A flow chart model of spacing patterns in lizards summarises information available on adult male insectivorous lizards. Although the model "suffers from several limitations" it shows, very clearly, how phylogenetic and ecological factors can influence spacing patterns.

The sixth chapter, the longest in the book, covers variation and evolution of stereotyped behaviour in reptiles. It is co-authored by Charles C. Carpenter

and Gary W. Ferguson. The chapter is divided into two sections. In the first section, Carpenter gives a survey of reported stereotyped reptilian behavioural patterns. Over 1000 references are given. For each order or major group of reptiles, the various types of agonistic, courtship and mating behaviour have been categorised. Code numbers have been assigned to each act and act system which together make up the behavioural actions described. Where appropriate, these numbers are listed for each family, genus or species, according to the level of the reference made to the behaviour. Each literature reference has also been assigned a number thus allowing the author to present, as an Appendix, a superb cross-referenced catalogue of all reported behavioural patterns. In the second section, Ferguson considers social displays of reptiles: (1) their signal value, (2) their adaptive significance, (3) their evolutionary origin, (4) their taxonomic significance, and (5) the heritability of their variation. Few studies on such topics exist, so the author very usefully outlines techniques that could be used for future research on these subjects. His final impression on finding "a few excellent studies scattered among a sea of anecdotes" is that "reptilian ethology is in its infancy, but that its future is bright".

The final chapter, by Gordon M. Burghardt, deals with learning processes in reptiles. No such review has ever before been published. The chapter begins with a brief consideration of the various theoretical approaches to learning and some of the methods involved. For each major learning situation (e.g., habituation, respondent conditioning, mazes, operant conditioning, partial reinforcement) available knowledge is then reviewed for each group of reptiles. Only experimental studies conducted in the laboratory are considered. The majority of studies on reptilian learning deal with turtles and the author makes a plea for more diversity in species studied. Finally, the results presented are related to the evolutionary significance of learning, life history and ecological factors. Comparisons within and across vertebrate classes are made and a list of future research needs suggested. Reptiles can learn tasks of considerable complexity and there is no type of problem learned by all birds and mammals that is beyond the ability of all reptiles. The author hastens to add, however, that it would be rash to conclude that there were no relative differences between the reptiles and other vertebrate classes.

This scholarly volume is a credit to its editors. Typographical errors are minimal, the indexes are accurate and the references have obviously been thoroughly checked. The book is expensive but

certainly worth the cost. I believe no ecologist who deals with reptiles can afford to be without or not to have access to this impressive volume. I hope its vitality will stimulate ecological and behavioural investigations of our own New Zealand lizard fauna as so much remains to be done in this field.

Donald G. Newman

**Land Alone Endures, Land Use and the Role of Research.** Compiled by L. F. Molloy. New Zealand Department of Scientific and Industrial Research, Wellington. Discussion Paper No.3, 1980. 284 pp. Price \$12.00.

This Discussion Paper has been prepared by DSIR scientists as background material for the Land Use Advisory Council in developing national land use policies. It covers subjects ranging over rural and urban use, minerals, mining, water, recreation, nature conservation, scientific research, and land administration. Illustrations and photographs are of a high quality.

The limitations of the Discussion paper lie in its length, and the attempt to cover such a large field of review. A more effective message on the scientific base for land use decisions could have been achieved with a shorter text, and the omission of speculative and not necessarily expert opinions on land administration.

In the Foreword it is noted that "Land use" like "Energy" will be of key importance during the 1980s-but there is almost no discussion in the text of the impact of energy production, from mining, farms or forests, despite its vital importance to any committee considering the future use of land.

Land use itself is a contentious issue, but equally research, and particularly research priorities, are contentious issues for scientists. The present

document outlines the research requirements and organisation for different facets of land management. Some of the issues raised seem less pertinent to land use than to research administration in New Zealand.

The reader is assured (p. 263) that ". . . most land use decisions are made by private citizens. . . . Yet, few land owners are knowledgeable enough, or have access to the necessary information, to be able to make sound planning decisions." One would hope that there does not mutate an elite group of planners, which, given all knowledge in a revamped research organisation, will begin to dictate land-use to a vacuous land-owning public.

Although there is a considerable amount of subjective matter in "Land alone endures", there is also objective data which is well reviewed and presented. Chapter 3, in particular, develops a clear approach to land classification based on soil and climatic information. The views expressed on "hill country" classification are timely, and the overview of the research requirements are sensible and pertinent.

Ecologists will be interested in this publication, not only in the narrow context of conservation, but also in the broader issues of a country being forced to rely on its own resources. The principles enunciated in Chapter 3, might be further developed to interpret changes in native vegetation and growth rates, besides serving a useful purpose in production ecology. Some might argue with the "multiple-use" of land which is advocated, but not defined, in this volume. Those who embrace the concept must also accept some strange bedfellows.

Discussion Paper No.3 presents some science and lots of ideas. If good decisions arise from long discussions it will have served its purpose well. Land is not alone in its endurance.

Alan Nordmeyer