BOOK REVIEWS

Flora of New Zealand Lichens. Galloway, D. J. 1985. 662 pp., 13 figs. (inc. 4 maps, 9 plates). P. D. Hassellberg, Government Printer, Wellington

The richness and diversity of the New Zealand lichen flora is obvious even to the most casual of observers, so it is not surprising that lichens featured among the earliest plant collections made in that country by Joseph Banks and Daniel Solander over two hundred years ago. Since that time many prominent European lichenologists have made substantial contributions to the elucidation of this flora including Thomas Taylor, Churchill Babington, Joseph Hooker, William Nylander, James Stirton, William Lauder Lindsay, J. Muller Argoviensis, P. J. Hellbom, G. Einar Du Rietz, and Alexander Zahlbruckner. Of those resident in New Zealand, the contributions of Charles Knight, James Murray, William Martin and David Galloway himself are the most significant.

The last major account of New Zealand lichens was Zahlbruckner's posthumously published 'Lichenes Nova Zealandiae' (1941) based largely on the collections of H. H. Allen and J. Scott Thomson. Over the past 25 years New Zealand lichens have figured prominently in numerous publications - so much so that an updated overview of the lichen flora in terms of modern taxonomic concepts was long overdue.

David Galloway has now provided us with this overview with flair and style, in a flora which is a worthy successor to the long lichenological tradition of the country. The present volume discusses 958 taxa in 210 genera and is the first major Southern Hemisphere lichen flora to be published this century. As such it will be of particular interest to those studying lichens of Australia and South America as well as those of New Zealand itself.

Brief sections on the history of lichenological exploration in New Zealand, on the taxonomic literature relating to New Zealand lichens for the period 1781-1983 and a list of collectors of New Zealand lichens (and of the institutions where their collections are held) precede the main section which is devoted to taxonomy.

In a field where taxonomic concepts are rapidly changing, it is unrealistic to expect that anyone person could treat a flora as diverse as that of New Zealands lichens. In his preface Galloway acknowledges no less than 40 colleagues for assistance with taxonomic and historical problems. Hence the taxonomic concepts presented in the Flora were developed by Galloway in association with a large number of international authorities and this greatly enhances the overall value of the work.

A major objective in recent studies of the ascomycetes has been the attempt to integrate the lichenized and non-lichenized representatives into a single taxonomic scheme. In several alternative approaches emphasis has been placed on ascocarp ontogeny and the detailed morphology of the ascus, but their has been no general acceptance of anyone scheme. Galloway has taken what seems a sensible approach at this stage and arranged the genera alphabetically. Keys to the genera are provided with the initial delineation being based on growth form. Each genus is described in detail and where possible, a commentary on the genus in New Zealand is given together with up-to-date references for further information.

In keeping with modern lichenological trends practically all the new genera proposed during the last decade have been accepted, including the segregates of *Parmelia* sens.lat. However there still remain some genera which are treated in a conservative manner - for instance the large Austral genus *Psoroma* (with 25 + species in New Zealand). However Galloway notes that this genus is a heterogeneous assemblage which' may well prove to be divisible into two or more independent genera' . Heterogeneous 'genera' of course remain particularly in the microlichens (at the time of printing for example, the genus *Lecidea)* but this simply reflects the current state of lichen taxonomy rather than a criticism of this Flora.

On the other hand Galloway has a rather broader species concept but, even so, often emphasizes the difficulties met with in differentiating certain related species. The species concept is always a matter for controversy among lichenologists, not the least being the taxonomic status given to chemical races of a morphological entity. At the one extreme is the school of though which considers that all chemical races deserve specific status, while in contrast a few workers still choose to ignore chemistry altogether. In the present Flora, chemical characters are detailed (where known) but species are not distinguished on

chemical characters alone - species in many groups are defined to include two or more' chemodemes' . This 'middle of the road' approach is one that is followed by the majority of present day lichenologists.

Keys to the species within each genus precede detailed species descriptions which are also arranged alphabetically. Species descriptions follow a standard format and discuss thalline, apothecial and chemical characters when known. A biogeographical designation is assigned to most species.

The descriptions themselves are clear and not too detailed, but unfortunately the number of illustrations is very limited. This may tend to intimidate the less determined workers but the author has attempted to refer to other works where illustrations can be found (e.g. Martin & Child's 'Lichens of New Zealand'). Distributional and habitat data and ecological notes are given for each species, and this material will. provide an invaluable resource for those interested in these aspects of lichens and ecology in general.

The prime objective of any Flora is that it serve as an identification manual for serious botanists. In my own experience I have found that the present volume performs this task very adequately - overall the keys work well and the descriptions are very satisfactory. Furthermore the taxonomic concepts used are well within the mainstream of present day lichenological thought.

One of the great strengths of this Flora is the fact that the numerous taxa based on New Zealand material have been typified as far as possible. This will prove a continuing boon to lichen taxonomists in the Southern Hemisphere, who often experience difficulty in locating types long-distance in inaccessible European herbaria. The dimensions of this task cannot be overestimated, and this outstanding contribution towards nomenclatural stability is indeed one of the most important features of the work.

The commoner species are provided with an extensive list of synonyms where applicable and this too will prove of considerable utility.

The present Flora also contains much information useful to the general botanist, student, and interested amateur, but it does not make lichenology easy! This is a volume for the dedicated amateur or professional who is not intimidated by having to undertake the microscopic preparations and chemical tests necessary for certain identifications. For those willing to acquire the simple skills necessary, this Flora will undoubtedly make the New Zealand lichens fascinating and comprehensible.

The Flora of New Zealand Lichens will not and was not meant to provide the final word on New Zealand lichens. Galloway estimates that only about 60% of the total lichen flora is treated. The undescribed taxa are for the most part to be found among the microlichens as they have received little attention in that country and the Southern Hemisphere in general. As a consequence a large numer of generic treatments are presented as tentative or introductory only. Further, a number of the rarer species treated are known from few specimens or only from the type. In such cases distributions can only be estimated and the necessity for further collection of New Zealand lichens is obvious. The potential for taxonomic, phytogeographic, and ecological studies on New Zealand lichens remains virtually unlimited and Galloway provides us with a sound basis for further work and a stimulus for much broader interest in the subject.

To conclude: this is one of the best written and stimulating works in general lichen taxonomy that the reviewer has read for some considerable time. It certainly does not solve all the problems in New Zealand lichenology but it will remain a major source of information and a stimulus to all workers in this field, particularly in the Southern Hemisphere, for many years to come. David Galloway is certainly to be congratulated on the publication of this excellent volume which should find a prominent place in the libraries of all serious lichenologists, interested amateurs, and the general botanical community.

J. A. Elix

The threat of nuclear war. A New Zealand perspective. The Royal Society of New Zealand, 1985. Miscellaneous Series 11. ISBN 0-908654-10-3. ISSN 0111.3895. 83pp. $10.00

We are unaccustomed to The Royal Society producing reports on contentious issues where science and politics are so intermingled, where fact, propaganda and uncertainty compete for attention, and where scientific or technical 'solutions' are far from obvious. So for even venturing its opinion on this transcendent issue The Royal Society deserves praise.

The report is the outcome of two years' work by an *ad hoc* committee of seven, with a few persons providing additional assistance in specific areas. It

‘ describes the present threat of nuclear war with special reference to New Zealand, possible ways of relieving this threat, and the role of scientists in these endeavours' . The chapters cover: the issue of nuclear war and politics; nuclear weaponry; climatic effects on the southern hemisphere; medical effects of nuclear war; some possible economic effects of northern hemisphere nuclear war; scientists, politics and the nuclear arms race; the possibility of disengagement; glossary; a useful bibliography; and seven appendices, primarily outlining different scientific resolutions on nuclear war along with two proposals on how to reduce nuclear armaments.

The report deals, therefore, with a broad range of issues, some more successfully than others. It starts off, correctly in my opinion, by looking at the role of the scientist in the nuclear issue. This (too) brief introduction concludes:

‘In particular on the complex of issues surrounding the threat of nuclear war, scientists, in our opinion, have an undoubted right, indeed a responsibility, to state their attitudes.'

That is a brave and important beginning, given the unease or indifference with which most scientists avoid the nuclear issue. Since few scientists in New Zealand are likely to have any formal education in the ethical and social dimensions of science it is not surprising that most are reluctant to accept a scientific responsibility *per se* to contribute to the resolution of this problem. By articulating such a responsibility The Royal Society has thrown its considerable reputation behind the general issue of social responsibility by the scientific community.

The authors wanted to describe the nuclear threat in non-technical language and this they have done well. Readers wanting a brief introduction to nuclear weaponry and its effects should find this account easy to follow, although by using single values for the nuclear inventories of nuclear powers the report gives a misleading impression of how accurately these amounts are known outside military establishments. Giving quotes of the range of values would have been better.

I found the chapter on climatic effects rather disappointing. Granted, it is much more difficult to predict climatic effects than medical effects, but the authors seemed reluctant to weigh up the present evidence and conclude that qualitative predictions of long-term global effects following nuclear war can now be made with some confidence. Since this issue is not really resolved, the chapter alternates between considerable coverage of critics of climatic effects and bland statements about what those effects might be. For example, 'If the smoke cloud persisted long enough and was dense enough it could have the effect of both inhibiting photosynthesis in plants and producing changes in climate'. The reader is not told why smoke clouds will likely lead to lowered temperatures since the unique characteristics of nuclear smoke clouds in blocking incoming solar radiation while leaking heat as infrared radiation is not explained. The chapter is almost devoid of any account of the biological consequences of harsh climatic conditions. It fails therefore to give a necessary overview of the possible disruptions that may affect the New Zealand environment. This will not be such a disadvantage for Ecological Society members who will be able to complement this report with the Council's own statement on the environmental consequences of nuclear war. The weakness of this chapter is a pity, since evaluating the likely traumas facing New Zealand society in a post-nuclear world is difficult if the basic environmental conditions are not specified, even in a general way.

In contrast, the human injuries caused by nuclear explosions and the likely medical consequences for New Zealand of a northern nuclear war are dealt with in a much more straightforward manner. The severe problems caused by the loss of drugs (almost all are imported and have limited shelf life) and equipment, plus the difficulties of maintaining' high technology' facilities, are discussed realistically. This makes sober reading.

A scenario of economic life in New Zealand after nuclear war is outlined in Chapter 5, wherein an isolated New Zealand economy is 'faced with the desperate need for self-sufficiency' . This is truly an area where imaginative yet realistic predictions are needed, especially when political and social factors are given greater weight than they are here. The major economic problem areas are adequately outlined (end of international trade, breakdown of market economy) and our dependence on imports is highlighted in two useful tables (although the listing of tea as a strategically important import left me puzzled).

Other scenarios could, and should, be developed for our post-nuclear options. This one is useful in exploring some of the relevant factors and could easily be expanded. However, it ignores cross-linkages between sectors (how the collapse of key industries would affect others) and the critical elements in the imported components of some

industries. For example, the motor vehicle assembly industry derives 60% of its final financial output from imports. But if that 60% includes *all* the engines needed to manufacture motor vehicles, then the reliance on imports is effectively 100%. This scenario also assumes that social, political, and cultural institutions will survive the profound psychological traumas of a nuclear war and that we will be able to rely on conventional mechanisms (including communications) to continue functioning. Other commentators may have more pessimistic views.

The remaining chapters grapple with some difficult topics, scientifically speaking, that is. I refer to the nuclear arms race, politics, deterrence, disarmament, and efforts by scientists to reduce the nuclear peril. A tall order in just 14 pages. The authors give the impression of treading gingerly through unfamiliar territory where their scientific expertise is not particularly helpful in commenting on profound political and ethical issues. They would clearly have benefitted from having social scientists on their writing team. Instead, there is an illogical and inaccurate denigration of social science as not being value-free and, therefore, not being capable of objective analysis. Sociologists of science have long recognised a subjective, value component in *all* science disciplines, even in the so-clled 'hard' sciences (e.g. Nature 22/29 Dec 1983,727-30). Besides, a value-linked position does not automatically exclude rational argument.

But I don't wish to leave too negative an impression of the vaue of this report. If half, or even a quarter, of the 18,000 membership of the Member Bodies of The Royal Society are interested enough to read it and think seriously about these issues which now starkly confront the scientific community then it will have been a success.

Readers, both scientist and non-scientist, who are then moved to 'do something' will need to look elsewhere for guidance and recommendations. The report comes to a slightly confused and hesitant ending, not wishing to put forward recommendations, particularly ones which might be construed as 'political'. The authors conclude that prevention of nuclear war is the only practical route to survival. I agree. Bur apart from encouraging other groups to make their views heard, and encouraging the country as a whole (i.e. the Government) to 'express its viewpoint in international forums' , the report leaves no guide posts along the rocky road to prevention of nuclear war.

In his latest book *(The abolition* 1984. Picador) Jonathan Schell shows how complex the deterrence / disarmanent issues have become and the political naivety of the 'solution' proposed by the post-war atomic scientists, such as Einstein. In *The environmental effects of nuclear war* (AAAS Selected Symposium 98, 1984) Thomas Malone answers the question 'What can the scientist do?' He has many useful suggestions including a better understanding of the deep moral and ethical issues involved. Like The Royal Society report he underlies the responsibility of scientists and suggests:

'One course of action, however, would appear to be precluded: to ignore the issue.'

In this context, The Royal Society committee's choice of cover illustration is particularly appropriate; the charred remains of a wrist watch with the hands still at 8.15 a.m., as they were on 6 August 1945.

Wren Green

Lake Taupo: ecology of a New Zealand lake. Edited by D. J. Forsyth and C. Howard-Williams, 1983, Science Information Publishing Centre, DSIR, Wellington (DSIR Information Series No. 158). ISSN 0077-9636, ISBN 0-477-0.6716-6. xii + 163 pages. Price $21.00.

Taupo is the largest lake, not only in New Zealand but in the whole of Australasia, with an area of 616 km^2. Formed by a series of volcanic activities and earth movements extending over hundreds of thousands of years, it is surrounded by volcanic rocks, including large areas of pumice. Cold water springs emerging from the pumice, although they do not carry a large volume of water, contribute a substantial proportion of the phosphorous entering the lake - to the extent that experiments indicate that, at least during the period of maximum algal abundance, it is not phosphorous but nitrogen which is the nutrient most in demand.

Lakes are classical examples for the study of ecosystems, and Taupo is also noteworthy among New Zealand lakes as the first for which an attempt was made to look at several aspects of the lake together, when John Scaife Armstrong published in 1935 his "Notes on the biology of Lake Taupo". Study of the lake began in 1886 when Cussen, the District Surveyor, made the first depth soundings on any New Zealand lake. In 1902 an expedition from Cambridge University made further soundings and

also obtained samples of the bottom mud from which Benham described aquatic worms, the first study of the native fauna. Much of the early work on the biology and limnology of the lake was done by Jolly, during the 1950's, including one of the earliest studies of diurnal vertical migration in a New Zealand lake. In recent years the D.S.I.R. freshwater group based in Taupo township have undertaken details and sophisticated studies on the lake at their doorstep. It is this group which provides most of the authors for the present volume, but there are also contributions from Ecology Division of D.S.I.R., Wildlife Service, Ministry of Works and Development as well as a County Planner, school teacher, angler and university research student.

The wide range of interests of these authors indicates the breadth of coverage of the ecology of the lake. The book is a thorough account which deals with geological and human history, and use, besides physical, chemical and biological features. Interesting information is given on many specific properties. Taupo is one of New Zealand's clearest lakes, and light penetration through the water allows the growth of rooted plants to the unusual depth of 15 metres. The presence, on parts of the lake shore, of introduced aquatic weeds is not a recent problem since *Elodea* was reported at least as early as the 1940's. However, the lake is free from nuisance algal blooms. The kinds of animals found in open water, the shore zones and the well-oxygenated lake bed are described and well illustrated, and there is an annotated list of 33 species of birds associated with the lake. A good account of the biology and life history of the native fish includes the smelt, which were introduced into Lake Taupo in the 1930's to increase the amount of food for the trout. The history of the introduction of the trout, and of several other exotic fish such as goldfish, brook trout and the sailfin molly, makes interesting reading. There are several references to the enthusiasm of the author, Zane Grey, for the trout fishing in the lake. The trout fishery today is estimated as worth $12 million annually, and it is for this aspect, and as a tourist resort, that the lake is best known today. The book is attractively produced, on good quality paper, and well illustrated, making it physically a pleasant book to read. The pages have an unusually wide outer margin - perhaps for personal annotations or comments? How well the binding will stand up to the frequent usage, which some copies undoubtedly will receive, remains to be seen. In a book that has been so well edited it is surprising that, in spite of several references to Taupo's eminence as our largest lake, to discover the area of the lake was extraordinarily difficult. This information was eventually elicited only rather incidentally from a table giving catchment areas. A small table near the beginning of the book and giving the principal morphometric features would be an asset to any new edition. For many scientists a larger number of references would also have been appreciated. However, I have no hesitation in recommending this book. It is well written, by authorities in their specialist fields, and gives an excellent introduction to the ecology of Lake Taupo.

V. M. Stout

The New Zealand beeches. Ecology, utilisation and management. John A. Wardle, 1984, New Zealand Forest Service, Wellington. ISBN 0-477-05753-5. 447 pp. Price $45.00.

Many books by all sorts of experts and would-be experts have been written about trees. Some have been by authors wielding fluent and romantic pens who have adopted various degrees of licence as they have portrayed their subject matter. And despite the sombre, often mist shrouded, dull green perspective of New Zealand beech forest there is little doubt that in the hands of an artist another entrancing literary spell could have been woven. But this is not that kind of book. This is good dispassionate science presented with clinical precision by a practitioner who is thoroughly conversant with his subject matter.

Chapter 1 is devoted to the historical biogeography of the genus and to a detailed description of the New Zealand taxa including maps which show with considerable precision where each is to be found in this country.

In the context of the title of the book the next two chapters (60 pages) are something of a surprise in that they describe the distribution of all forest types in New Zealand, not only beech. Yet such an overview is appropriate because it does give a dimension to and emphasises the importance of our *Nothofagus* forests.

Chapter 4 (30 pages) tells how beech forests are typed and describes the fashion in which they vary along environmental gradients. The information makes interesting reading because it is a successful accounting for phenomena which although generally accepted, have not previously been explained in detail.

An ecosystem approach is adopted in the second part (4 Chapters, 110 pages) and involves consideration of short and long term disturbances in beech forests, from recent fires to Holocene climatic fluctuations. Interactions with insects, fungi, birds and mammals including man are also appraised.

Part 3 (3 Chapters, 75 pages) is more autecological and explains life histories including reproduction, growth and temporal performance of beech stands. Part 4 (3 Chapters, 70 pages) is devoted to uses and management of beech. The author demonstrates that beech forests are a valuable source of timber but he emphasises too their importance in watershed protection and in meeting recreational and amenity needs. Generally the text reads easily; parts, chapters and sections are sequential and themes logically developed. Several findings and syntheses are presented for the first time so it is much more than just a rehash; there are distinct notes of novelty and freshness about the book. Issues are rarely forced. Definitive answers are not necessarily provided and readers may sometimes find themselves making their own final evaluations.

There are over 100 figures including some 40 photographs which have reproduced well, are meaningful and not the doubtfully necessary adjuncts that such illustrations can sometimes be. One can imagine that the author must have been tempted to embellish by including some spectacular scenic pictures but there is only one which could be placed in such a category and indeed only four are in colour.

The rest of the figures, mainly bar and line graphs, well support the text and like all good figures are titled and annotated so as to be quite comprehensible within themselves. A few esoteric professional ecologists might regard them as overly simplistic yet they are direct and should increase the impact of the book on most readers. There are 40 tables which also add general lucidity although again there could be a minority quibble that confidence limits, probabilities and the like are lacking.

Many will remember the debate which a dozen or so years ago surrounded proposals to fell portions of South Island beech forest and some will recall the intellectual confrontations involving members of this Society and senior Forest Service personnel at our Invercargill Conference in 1974. Doubtless opinions will continue to vary on the extent to which indigenous beech forest should, in the interests of the nation's economy be exploited, but this book provides many more facts and much more substance on which propositions can be debated. There is also a tacit implication that knowledge, wisdom and tolerance are going to be required all along the exploitation/ conservation spectrum in the future.

John Wardle has become well enough known for his own field and experimental research on beech in the past 15 years but in this book he has cited nearly 700 references which suggest a prodigious amount of information. What is impressive is that all this has been distilled so to allow a fair and balanced presentation between two covers. There can be little doubt that the book will remain the definitive work on beech for many years to come and provide an enlightened platform on which future studies can be mounted.

It is something of a pity that the book has been printed on a paper so glossy that reading is almost impossible unless the light source is precisely positioned over one's shoulder and for me that is an annoyance. Even so, trivial and pedantic criticisms notwithstanding and given that this is probably not a book that is going to captivate the uninitiated, it is surely a must for foresters and forest ecologists and for all those of whatever persuasion who would seek to influence management attitudes. It should prove invaluable too, for teachers and students as well as for interested scientists and informed laymen. I would be surprised if within its sphere, the book does not become something of a "Citation Classic".

J. P. Skipworth