

BOOK REVIEWS

Structure and Function of Tundra Ecosystems.

Rosswall, T. and Heal, O. W. (editors): Ecological Bulletin No. 20. Swedish Natural Science Research Council. August, 1975.

The volume is partly the proceedings from the 5th International Meeting on Biological Productivity on Tundra, held at Abisko, Sweden, in 1974 as part of the many results now appearing from the International Biological Programme (IBP). Papers are included covering the following sites: arctic tundra (Canada, USA, USSR), subarctic and subalpine (Finland, Norway, Sweden, U.K., Ireland), alpine (Austria), maritime and subantarctic tundra.

The papers describe the characteristics of the individual sites which took part. These are very readable accounts from good binding, pleasant type and layout, and more importantly similarity in format of all papers including content and layout of tables, and with one exception, uniformity in SI units. Each paper generally covers environmental conditions (climate, microclimate, soils), primary production (vegetation communities and dynamics), standing crop and production, production processes, herbivores (invertebrates, vertebrates, production processes), carnivores (invertebrates, vertebrates, production), decomposition and soil processes (rates of decomposition, microbial biomass and interactions), energy flow and nutrient cycling, and man's influence on the ecosystem. In most cases each stage has been carried through to quantitative estimates. As a succinct description of particular sites there can be little criticism and one is reminded again that the tangible result of an international programme rests on a few individuals in different parts of the world.

The other papers on probably the more useful comparison between tundra sites and other ecosystems is in preparation "Tundra—Comparative Analysis of Ecosystems", ed. J. J. Moore, Cambridge University Press.

The IBP programme has achieved much but the reviewer's qualms are not against the particular authors but that people may not be sufficiently critical of the alternative scientific method that seems to be arising as a consequence of it. As an ecologist I can only applaud the attempt to identify and consider simultaneously all aspects of a given ecosystem and to show their qualitative and quantitative relationships—"word models" described in the text. However, if one set aside the meteorological data, or soil and other laboratory type measurements, the actual field measurements of biological parameters is still "thin on the ground". When one combines

the difficulty of many of these measurements, the apparent lack of replication or other methods of assessing probable errors in most of the published report, and determination of many parameters by difference, one is uneasy about the reliability of some values. The alternative scientific approach appears to be: get an estimate (preferably with some international replication), put it in a computer model, and if the predicted answers approach measured values then reality has been approximated. This is an attractive approach, under test, but not yet passed. The empirical data supplied by these tundra sites will contribute to test both the approach and also their own consistency.

Tundra was taken to include alpine as well as arctic and antarctic tundra and yet in spite of our local work there was no New Zealand contribution, in this or any other IBP programme. This is an indictment on ourselves for dismissing the IBP as too "airy-fairy" at its inception, while its value is only just being realized now that the formal programme is finished and its results appearing. Let it be hoped that there is a different reaction to the successor "Man and the Biosphere" programme.

D. Scott

Biogeography and Ecology in New Zealand. (Monographiae Biologicae, vol. 22), edited by G. Kuschel, pp. XVI + 690, Dr W. Junk by, The Hague, 1975. ISBN 90-6193-079-0. Cloth bound. Price NZ\$72.00 (200 Dutch Guilders).

This book which contains more than 300 figures, photographs, tables and maps, and ten fold-out pages, provides a most interesting and useful review of the large amount of information that has accumulated on the biota of New Zealand, with emphasis on its ecology and biogeography. It is more or less complementary to the volume edited by Dr G. R. Williams (The Natural History of New Zealand—An Ecological Survey, Reed, Wellington 1973) and is an important addition to New Zealand biological literature, successfully conveying an overall picture of New Zealand natural history, past and present. The volume contains 17 chapters, the first three dealing with the geological history, climate and soils, provide a background for the following ones which cover the fauna and flora and some aspects of Maori and European influence on the environment. The chapters are as follows: The geological history of

New Zealand and its biota by C. A. Fleming; The climate by J. D. Coulter; The distribution and properties of soils and their biota by Q. W. Ruscoe; Flora and vegetation by E. J. Godley; The amphibians, reptiles, birds and mammals by P. C. Bull and A. H. Whittaker; The freshwater fishes by R. M. McDowall and A. H. Whittaker; The kiwi by B. Reid and G. R. Williams; The tuatara by I. G. Crook; The marine benthic ecology and biogeography by G. A. Knox; The limnology by V. M. Stout; The land snail fauna by F. M. Climo; The spiders and harvestmen by R. R. Forster; The terrestrial insects by J. C. Watt; The freshwater insects by I. D. McLellan; The insects in relation to plants by J. S. Dugdale; Adaptation and change in Maori culture by R. C. Green; The influence of man on the biota by J. T. Salmon. All authors are acknowledged authorities in their respective fields.

Two chapters provide useful and interesting summaries of our knowledge of two animals that have put New Zealand on the map since their discovery, the kiwi and tuatara. It is appropriate that this should be so in a book aimed at overseas readers seeking a ready reference to information about our country.

Attention is drawn to the very high degree of endemism—80% for the flowering plants and well over 90% for the arthropods, and the fact that nearly all of the land and aquatic species, amounting to something like 95% of the total fauna, are strictly confined to our indigenous vegetation and cannot survive outside it. Thus the clearing of vast and continuous land areas for farming and the replacement of indigenous forests with exotic timber species is catastrophic for the native fauna. The problem of preservation of this fauna is a matter of grave concern especially when it is remembered that a high proportion of the arthropod fauna is flightless and for the most part restricted to small areas or confined to a specific native host.

New Zealand biologists will find a wealth of important information, some of it previously unpublished, covering a very broad field in this book which, no doubt, would become very widely referred to were its price not prohibitive.

G. W. Ramsay

The Liverworts of New Zealand. K. W. Allison and John Child. John McIndoe Ltd. for the University of Otago Press, Dunedin. 1975. 300 pp. Price: \$12.50.

In the Northern Hemisphere most ecologists take it for granted that cryptogams are considered in any description of vegetation and, particularly in such a

species-poor flora as that of Scandinavia, these lowly plants are regarded as some of the best indicators of environmental conditions. In New Zealand, on the other hand, there has been a general tendency to ignore anything smaller than a fern, or to have a lichenologist or a bryologist present an independent report. This practice is changing and will be helped to change further by the appearance of three uniform small books, all "co-authored" by John Child (Associate Professor of Economic History at Otago) who collaborated with the late William Martin in "Lichens of New Zealand" (1972) and with K. W. Allison in "The Mosses of New Zealand" (1971) and "The Liverworts of New Zealand" (1975). These are not full floras but each covers a large sample of the commonest and most conspicuous local members of its group, and all are generously illustrated. They allow every naturalist to become acquainted with at least a range of common cryptogams with two desirable results—first that more information can be recorded and second that published records call up a mental picture of the plants named. The latest of the series, here reviewed, should certainly not be overlooked by ecologists. As George Scott points out in his foreword, the bryophyte flora of our rain forest is not only amazingly rich but it also has "the rare distinction of being dominated by liverworts, in terms of both abundance and species-richness".

Like its companion volumes this one is arranged on a very straightforward plan. The introduction gives a general description of liverworts and their life history, points out what structures are to be looked for in collecting and identifying, lists, with annotations, the most useful books and most important classical references, and ends with a synopsis of classes and orders. For field recognition many genera are listed according to characteristics of habitat, colour, smell (!) or structure which may be used as a quick clue to identification. The next 255 pages are devoted to accounts of orders, families, genera and species. Keys to genera of leafy liverworts ("which provide the most challenges to the field naturalist"), a glossary, a select bibliography, and an index to species names and photographs complete the volume. The book is well produced, very clearly printed and comfortable to handle, but it must be treated with care as the binding is its noorest feature—by no means as robust as that of the moss volume. The price is a considerable advance on the \$6.50 charged for the other two books of the series, but this one is longer by more than 100 pages.

A recent check list (Hamlin, 1972) credits New Zealand with some 135 genera and 500 species of liverworts. Allison and Child deal with about 75

genera and more than 180 species. All but half a dozen of these species are illustrated by pen and ink drawings, including for most a habit sketch and details of the shape and arrangement of the leaves; for many species some of the special structures associated with the reproductive organs are shown, and in some the shapes of leaf cells too. Though in general microscopic characters are not relied upon in the keys provided such details are included in the descriptions. About 50 species appear in half-tone photographs as well, most of them at approximately life size, as can be judged by the magnifications noted for each drawing. Where appropriate there are simple dichotomous keys to genera and to species.

Perforce the keys contrast many structures that are very small but when these are so clearly portrayed in the drawings they should be seen and interpreted on the plants with the help only of a good hand lens. Dried stems soaked in water soon resume their fresh appearance and should be examined when damp enough to be flexible but not glistening with moisture. Even in this matter-of-fact treatment the authors cannot refrain from referring to the elegance of some of the complicated lobules of the leaves and this book will introduce many ecologists to new designs in form and colour.

Since 1955 Sainsbury's "Handbook of the New Zealand Mosses", a comprehensive and fairly fully illustrated flora, has been available to serious students, but there is no such modern precursor for the liverworts and for this reason all naturalists owe a special debt to the authors. They themselves pay tribute, in their dedication, to the pioneer work of Mrs E. A. Hodgson, of Kiwi Valley, Hawkes Bay, where for more than 30 years she has studied and written technical papers about these small plants. For all this time she has shared with Mr Allison the burden of identifying specimens for growing numbers of enquirers. As one who made great use of this "service" almost from its inception I may recall early letters from K. W. Allison, written in a

tent in a forestry camp where, if I remember correctly, he told me his microscope was set up on a box in the absence of a proper table. His 1931 paper on mosses and their habitats in the Atiamuri district, dating from this time, deals with each of the main vegetation types in turn and relates its moss flora to the higher plants.

In a busy working life with the Forest Service Mr Allison made time to publish a number of bryophyte papers, including a key to moss genera (Tuatara 1964), and to build up a collection of 10,000 moss specimens and 8000 liverworts, all now housed at Botany Division, DSIR. In later years, with failing health, he must have been very glad to have such a collaborator as Dr Child whose lucid writing and skilful illustrations, it is stated in the moss volume, have already done much to spread his own love and understanding of living things. Their joint works will be used equally appreciatively by enthusiastic amateurs and by coldly quantitative modern ecologists.

L. B. Moore

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