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REVIEWS

Beadle, N. C. W. *The Vegetation and Pastures of western New South Wales.* Pp. 281, with 161 figures and a map. Sydney. 1948.

To an Australian botanist the study of vegetation in Britain seems very academic. The communities are described, the soil types are familiar, the unexplained facts offer no immediate prospect of becoming explicable, and it seems that nothing short of an entirely fresh approach is likely to enliven the subject. In Australia it is quite otherwise. Attempts to apply the American concept of succession to Australian vegetation have at least demonstrated that the concept is not easily applicable, and that the whole apparatus of classification needs overhauling before it can be applied to *Eucalyptus* forest and mallee and saltbush. This alone is enough to tempt an English botanist in Australia to take up ecology. But more tempting still is the absence of primary surveys over large tracts of the country. The plant communities have not been accurately described except in South Australia and in parts of Victoria and New South Wales.

Dr Beadle's contribution to Australian ecology, which is summarized in this book, is to describe and to classify the vegetation and soils of an area of 150,000 square miles in western New South Wales. The area includes open sclerophyll forests and Savannah, with dominant *Eucalyptus* species, *Acacia* and *Casuarina* scrub, *Atriplex* and *Kochia* saltbush, and three types of grassland (*Astrebla*, *Stipa* and *Chloris-Danthonia*). He presents his results in an admirable coloured map, together with species lists and photographs. His account is much more than a catalogue, for Dr Beadle was concerned with plant indicators, the value of the vegetation for pasture, and the effects of soil erosion on the nature of the plant communities. There are chapters on topography, climate, soils, and the effects of erosion.

All this information is of very great value to botanists and agriculturists, and Dr Beadle is to be congratulated upon fulfilling a task in the high tradition of Australian pioneers. The ecologist is, of course, interested most of all in the way the material has been classified. Dr Beadle might excusably have made no effort to classify it at all; or he might have designed a fresh system of classification to meet the conditions of Australian arid vegetation. He has done neither of these, but has attempted to stretch the conventional terminology, based on seral stages and climaxes, to cover his material; and it has led him into considerable difficulty.

In the reviewer's opinion it is unlikely that the word 'climax' can be applied at all to most plant communities in Australia. A plant community which appears to be stable and insensitive to fluctuations in the environment may well deserve the name of climax, but it is the experience of many ecologists that many communities in Australia display no such stability. One would not expect stability in a climate of such extremes and with such an irregular rainfall. Consequently, Dr Beadle has to postulate several sorts of climaxes, and even the dubious post-climax, to describe what are probably plant communities in a very delicate equilibrium with a very capricious environment. The classification is made more confusing because Dr Beadle (for good and sufficient reasons) is unable to adopt for New South Wales the classification used by Wood for South Australia, and he does not define carefully enough some of the terms he uses, for instance the unfortunate term 'climatic succession'.

If one judges Dr Beadle's work as a contribution to theoretical ecology, it has very little that is new, except that it demonstrates the inapplicability of American and English methods to the classification of Australian vegetation. But the work was not intended as a contribution to theoretical ecology; it was done to catalogue the vegetation of a stretch of country larger than Great Britain and Ireland. Judged on this criterion the work deserves the highest praise.

ERIC ASHBY

Olaf Gallöe. *Natural History of the Danish Lichens: Original Investigations based upon New Principles.* $11\frac{1}{4} \times 8\frac{1}{2}$ in. Pp. 654, with 887 plates containing 3634 figures and pictures. Copenhagen: E. Munksgaard. 1927–48. In 10 parts (only 1–7 as yet published). Price per part 40 Danish Kr.

This work is described by the author as 'original investigations based upon new principles' and it is necessary to try and explain in what way the principles are new. Lichens were considered as the trash

of vegetation in the time of Linnaeus and only one genus (*Lichen*) was used for them. In the early part of the nineteenth century a number of genera had been established and many species described, but the technique of the authors was too simple and their instruments inadequate to deal with a lichen as it would be dealt with to-day when its microscopic structure has such importance. Many of the descriptions are so incomplete that it is often necessary to compare a specimen with the type (or original) specimen on which it was founded before its identity can be fully established. It is often impossible to do this and, even if possible, may not be quite satisfactory, as many early names and descriptions were not based on single specimens but, as Galløe states: 'the author in most cases compiled his description after an examination of several specimens and by so doing he undoubtedly formed a description based upon a collective species which would no longer be considered an elementary species' and that 'if one were to submit to the earlier lichenologists a whole collection of species which are well separated according to the ideas of the present time, they might determine them as one species'. Dr Galløe suggested that these difficulties could be partially overcome if an international institute was 'established where all the type-specimens of the world were gathered together, and where, for all time to come, all new species were registered'. This did not seem likely to be achieved, so he determined to write a description of each Danish species based on a single specimen with full details of its morphology and anatomy, or if desirable, several specimens could be examined and separate accounts and illustrations given for each. In 1927, Part I was published and dealt with species of the genus *Lecidea* as understood at the present time (including *Biatora*) and many notes on its phylogeny, ontogeny, ecology, physiology and general morphology were given. Then single specimens of twenty-six species were fully described and figured. For three other species it was considered advisable to describe and figure two, three and thirteen specimens. The nomenclature follows that given in Th. Fries, *Lich. Scandinavia*, and the thirteen specimens were of *Lecidea elaeochroma* Ach. which includes *L. parasema* and some allied species of our standard British Lichen Manuals. It contains 93 pages of letterpress and 160 plates, each of which is approximately 11½ by 9 in. (29 × 22·5 cm.). Nine other volumes were intended to be published and six of these have already appeared. Part II was published in 1929, Parts III and IV in 1932, Part V in 1936 and Part VI in 1939. The publication of Part VII was delayed by the war and did not appear till 1948. These six volumes deal with species belonging to the genera *Psora, Biatorina, Catillaria, Bilimbia* in Part II; *Lecanactis, Gyalecta, Biatorella, Mycoblastus, Rhizocarpon, Buellia* and *Lecanora* in Parts III and IV; *Ochrolechia, Aspicilia, Lecania, Candelariella, Candelaria Acarospora, Pertusaria, Caloplaca, Diploschistes, Thelotrema, Phlyctis* and *Rinodina* in Part V. Part VI deals with species of *Peltigera, Leptogium, Collema* and other members of the group Peltigerales. Part VII concerns the Danish species of the fruticose and foliose lichens, *Evernia, Cetraria, Parmelia, Parmeliopsis* and *Xanthoria*. Altogether these seven volumes contain 640 pages of letterpress and 876 plates with coloured representations of many plants and with enlarged drawings of portions of the thallus and apothecia as seen under the lens or microscope. Coniocarpales, Graphidales, Cladoniales and Pyrenocarpales have not yet been dealt with but will probably be given in the three volumes intended to complete the series.

The nomenclature largely follows that given in Th. Fries, *Lich. Scandinavia*, and no synonyms are given, so that it is occasionally difficult to ascertain what species, as given in British Manuals, he is really describing and drawing. Some of the names he uses are not always correctly given according to the usual rules of nomenclature. For many specimens he gives the author of the specific name as the authority for a combination in which the generic name is different from the one used by that author. For example, *Peltigera rufescens* Weis is used by him. This was given by Weis as *Lichen canina* var. *rufescens* and the combination is due to Hoffman so that it should be given as *Peltigera rufescens* Hoff., or if acknowledgement of the author of the trivial name is desired, as *P. rufescens* (Weis) Hoff.

In most lichenological works of the present time much importance is attached to the use of chemical solutions of potassium hydroxide (K), calcium hypochlorite (C) and iodine (I) in the determination of some species. Galløe states, in Vol. I, p. 13, that the 'reader will look in vain for any description of consistently carried out chemical investigations because I have gradually come to believe their value to be very small', that he has 'frequently found that chemical tests act only in patches upon a thallus' and 'that the chemical reactions have been considerably overestimated, more especially the iodine reaction and the chlorine reaction'. It seems quite likely that the metabolic products which cause the chemical

reagent to give a particular colour to the lichen may be variable in the same species, but their colorations are sufficiently trustworthy to be given in the diagnosis of the species, though I agree with Galløe that their value may be overestimated. The hypochlorite reagent was quite useful in a specimen recently obtained. I was inclined to consider it as *Lecanora rupicola* (*L. sordida* of A. L. Smith's *British Lichens*), but the apothecia were severely attacked by a fungal parasite and the thallus was partly overrun by a *Lecidea*. Some apothecia, which had suffered less severely from fungal attack, were tested by C and the expected yellow colour was obtained. This determination was confirmed by the examination of the two other plants present which were determined as *Lecidea insularis* and *Celidium varians*, since both of these are found on *Lecanora rupicola*. The indefinite results sometimes obtained by the use of C are often due to the weakness of the reagent which has been kept too long and has lost its efficiency. The use of iodine is referred to in Part IV, p. 26, in the description of the specimen determined by Branth as *Buellia sororia* Th.Fr. The iodine solution gave the usual blue colour to the medullary hyphae as *B. aethalea* does, and it seems probable that Branth's determination was wrong. Galløe expresses his doubt about the two specimens he describes as *B. aethalea* and *B. sororia* being separable into two species and certainly they cannot be according to the evidence he adduces. *B. sororia* is described by Th. Fries as having no medullary colour with iodine and as having larger spores. In Galløe's specimen both the spore size and the iodine coloration were agreeable for *B. aethalea* but not for *B. sororia*.

In recent years the use of another chemical solution, paraphenylenediamine (Pd), has been of great service in the determination of lichens especially in Cladonias. Harmand, in *Lichens de France* (1907), differentiated *Cladonia impexa* from *C. sylvatica* because the apical branches of the podetia were much less pendulous and diverged from one another in a much straighter manner. This was recorded in my 'New Rare or Critical Lichens', *J. Bot., Lond.* (1917), from a number of British botanical vice-counties, but sometimes specimens were found which were not quite typical. By the use of Pd which gives a reddish colour to *C. sylvatica* but is negative to *C. impexa* all doubts can be settled. Pd is similarly very useful in specimens which are possibly either *C. ochrochlora* or *C. glauca*, since it gives a coloration only to the former. Probably the use of these reagents may be overemphasized but not to such an extent as to neglect the help which they afford in the determination of many lichens.

Galløe accepts Schwendener's theory of the dual nature of lichens, and for each genus some attempt has been made on its phylogeny. As may be expected his remarks are made in a suggestive and hypothetical manner. For example, in discussing the origin of *Lecidea*, he states that 'whether the origin be mono- or poly-phyletic it is most probable that all species on pure mineral soil or on stone are of secondary origin and are derived from more primitive species on organic substrata, seeing that Discomycetes unaccustomed to a lichen-symbiosis could hardly be expected to initiate a symbiosis on pure stone without having first gone through a process of adaptation on an organic substratum'.

Many ecological remarks are made in regard to the Lecideas and Lecanoras and also, to a lesser extent, to other genera. Some general ecological observations are recorded. For example, in the preface to Part I, the following notes are given. 'Here we find that the lichens are absent from the darkest forests of *Picea excelsa* whereas the slightly lighter beech forests with mild humus are richer in lichens. That it is actually the conditions of light which determine the lack of lichens in dark *Picea* forests and not for instance the chemical composition of the bark, is proved by the fact that *Picea* when exposed to the light by the felling of the neighbouring trees will be covered with lichens in the course of a short time.'

The work is a valuable contribution to the study of lichens and its descriptions and wonderful figures are special features in that contribution. W. WATSON

Kendrew, W. G. *Climatology, Treated Mainly in Relation to Distribution in Time and Place.* Pp. 383, with 16 photographic plates and 125 text-figures. Oxford, at the Clarendon Press (Geoffrey Cumberlege). 1949. Price 30*s*.

This work was originally intended as the Third edition of the author's book which was first published in 1930 under the title of *Climate*. 'Large sections have now been entirely rewritten' as a consequence of 'large additions of observational material and the many developments of meteorological theory'. The