REVIEWS

A Prodromus of the British Hieracia. H. W. PUGSLEY. Pp. 357 with 16 plates from drawings by the author, and 1 figure in the text. London: issued as Vol. 54 of the *Journal of the Linnean Society of London*, and sold at the Society's rooms and by Longmans, Green & Co., Ltd., 1948; £3.

Hieracium is generally regarded as the most difficult of all the larger critical groups of British phanerogams. The genus exhibits a range of variation which almost defies classification by ordinary taxonomic methods, and previous attempts to revise our Hawkweeds have been patently inadequate even by the standard of the times at which they appeared. More satisfactory work has been done by French, German, Swiss and Scandinavian botanists but efforts to relate British material to continental names have not been successful. Such results were inevitable while European workers had only a slight acquaintance with the *Hieracia* of the British Isles and our own botanists had little experience abroad. The *Prodromus* not only exhibits a much higher scientific standard than its predecessors but it also represents the fruits of long experience in the field both in these islands and on the Continent.

The complexities of the task awaiting a monographer of *Hieracium* can only be adequately appreciated by those who have tried to name their own material. In Britain the group includes few well-marked species which are at all widely distributed—such as *H. umbellatum*, *H. prenanthoides*, and *H. Pilosella*. In addition, there are some local plants, such as *H. cambricum*, with sufficiently clear-cut characters for easy recognition. Some of these, like Pugsley's new *H. deganwyense*, are apparently restricted to a few individuals on a single rock-face. But the great majority of our Hawkweeds differ from their allies only in characters which are hard to appreciate and still harder to define.

These differences are in part due to environment. A single colony of a common and plastic species such as *H. Lachenalii* growing partly in shade and partly in the open, partly in deep rich soil and partly on dry shallow soil (such as Pugsley named for me from Grin Low, Buxton), will show such a range of variation that it is difficult to believe that they all belong to the same taxonomic unit. In addition, parthenogenetic reproduction is widespread in *Eu-Hieracium*. Besides sexual species there are triploid, tetraploid and pentaploid apomicts known in Scandinavia and it is almost certain that they occur here. On account of apomixis small variations are reproduced from seed and it is to this that the multiplicity of very local variants is attributable. Almost every cliff where Hawkweeds abound provides its own selection. Where they are sufficiently well marked they receive special names; when the

differences are less easily defined they are merged by taxonomists with variants from elsewhere. Hence the group, as Pugsley remarks, consists of " a multitude of named forms with which no other genus of flowering plants can be compared." To typify these names is a difficult enough task. To arrange them in a logical account capable of practical application requires judgment and shrewd observation in addition to painstaking research of a kind which few men are fitted to undertake.

Even with these attributes there is room for doubt whether ordinary taxonomic methods as employed by Pugsley can ever produce a completely satisfactory account of the group. The best that can be hoped for by a monographer is that he will be able to carve out of the great mass of variable material sufficient definable units to enable future workers to name most of their material. In this Pugsley has been remarkably successful. A rough estimate may be hazarded that he has accounted for 75 to 80% of the plants gathered by an average worker. The balance will include definable but undescribed units (of which a number were known to Pugsley but not included in his account—cf. p. 20) and also variants which can perhaps never be satisfactorily incorporated in any descriptive work. Appreciation of this is necessary both for an understanding of the magnitude of the task the writer undertook and for intelligent use of the *Prodromus* as a work of reference.

The first 25 pages of the book are of an introductory nature. The history of the study of *Hieracia* in Britain is succinctly stated with reference to such foreign work as is appropriate. An excellent section on morphology includes definitions of some of the special terms used later in the work and much original observation. Special attention is drawn to the value of the characters provided by the receptacular alveoles which have been neglected by some earlier workers. Then follow three pages on classification, a useful account of experiences with Hawkweeds in cultivation, and a statement of the material mainly consulted and the author's standards for nomenclature.

The main part of the book commences with a 10-page Conspectus of sub-genera, sections, series, and species. In this the author's knowledge and experience are displayed to full advantage. The arrangement adopted is based on that of Zahn's monograph in *Pflanzenreich*, **IV**, **280**, 1921-3, but it differs fundamentally in the distribution of Zahn's " intermediate species " and " hybrids " between the generic subdivisions, and in the non-adoption of the grade of sub-species. In addition, new groups have been created where required. The result is an arrangement which is probably as near to perfection for naming British Hawkweeds as can be devised. The mastery of the characters of so many described units and their arrangement in a workable scheme is one of the outstanding features of the *Prodromus*. If this Conspectus could be reprinted and issued separately it would be a great convenience even for those who possess the whole work.

The descriptive part of the book occupies 294 pages and includes 260 species. It is interesting to compare this figure with the number of species accepted for Britain by other writers:—

Backhouse (1856)—33 species.
Hanbury & Thompson (1904)—97.
Linton (1905)—124.
Roffey in *London Catalogue* (1925)—248.

The increase in Pugsley's work is very much greater than these statistics would suggest. A number of species accepted by earlier writers are reduced to varietal rank or shown to have been included in British works through false identifications with foreign plants. This applies particularly to names taken up by Linton and Roffey. In some instances (e.g. *H. exotericum*) Pugsley's species include several plants which were formerly treated separately. The net gain in additions to the British list is so much the greater. No fewer than 71 new specific names on Pugsley's authority (including those published briefly in 1941, *Journ. Bot.*, **79**, 177-183 and 193-197), appear in the *Prodromus*, and a considerable number of those already described on the Continent are added to our flora for the first time. He has cut away much of the dead wood which littered the ground before planting new trees.

The species are all treated on a uniform plan. Each section is preceded by a conspectus. For each species he gives synonymy, icones, exsiccatae, distribution in Britain (by vice-counties) and abroad. The descriptions are very full and drawn up in the sequence of habit, stem, foliage, inflorescence and fruit so that comparison is facilitated. A diagnosis in Latin is included in the case of novelties. In addition, the outstanding characters are summarised in a paragraph (or more) which usually also sets out the botanical history of the plant in Britain and its relationship to allied British and foreign forms.

Very great skill is shown in these observations, which bring out the really important characters in a way which has never been done for British *Hieracia* before. With a herbarium sheet beside you it is often possible to obtain a clearer idea of the salient characters of a species from Pugsley's remarks (so often prefaced by " is readily known " or " is remarkable for . . . ") than from the whole paragraph of description. Once the features of the species are grasped the varieties and forms usually fall into line without difficulty.

It is apparent throughout the work that Pugsley has examined Hawkweeds in far greater detail than any previous British workers. In fact, some of the latter must have relied almost entirely on macroscopic characters using the lens to very poor advantage. *H. cillense* is a particularly good example of this. The material on which it is based was collected by Augustin Ley and described as *H. hypochaeroides* in W. R. Linton's *British Hieracia*. It was said to be characterised by dull grey-green foliage but the fact that the colour of the leaves is due to abundant stellate hairs on both surfaces was entirely overlooked. This character is to be found in only one other Hawkweed of the Sec-

tion *Vulgata* and on it Pugsley founds his new Subsection *Stellatifolia*. Similar attention to details of the hairs and glands on all parts of the plants is recorded in all the descriptions.

By way of testing the adequacy of the accounts given in the *Prodromus* I have used it to rearrange my own collection of some 500 gatherings. With one or two exceptions (e.g. *H. lepistoides* K. Johansson) all the names which had been used on the labels were precisely accounted for in the synonymy. Only a few instances were found of new county records and these were mostly plants which Pugsley had determined himself some years ago. Almost all the gatherings from well-known collectors were cited. From this it would appear that his work in collating names employed by earlier authorities has been thorough and the distribution in Britain is shown as adequately as can be expected.

While subjecting the *Prodromus* to this test I encountered several difficulties. The most serious of these arose from the inadequacy of the citations of material—and especially of those of the distribution records. To base a vice-county record on a plant of which the only details given are " Dorking (Lousley) " is not sufficient. I have collected at least a dozen Hawkweeds (three of them on one day) which have been labelled with detailed localities including the name of this Surrey town. It is only by the determinations written by Pugsley on the sheets in my herbarium that it is possible to match up the record with the material on which it is based. Moreover, the reader is left guessing about the whereabouts of the specimens and the only clue given in the *Prodromus* is " The specimens cited as exsiccatae and those shown in the distribution lists under each species . . . are mostly to be found in the Natural History Museum." Difficulties and ambiguities are certain to arise over many of the specimens intended to support the records since *Hieracium* species so often grow in company. In spite of this Pugsley's distribution lists must be accepted as the basis of further recording of vice-comital distribution. If he had given full details of each record the book might have been too long to be printed.

An almost equally serious difficulty arose from the author's failure to use dated determinavit slips when examining herbarium material. His knowledge of Hawkweeds grew very rapidly. His concepts of the limits of species and the names to be used were (as might be expected) subject to continual change and this went on right up to the time of his death. As late as October 1947 he handed me a note correcting an earlier naming about which he had altered his opinion. In these circumstances the value of an undated determination is limited and it should be used with caution. Fortunately I was in the habit of dating his notes when the plants were returned to me but in cases where this was not done it is impossible to say whether they reflect his later views or not.

A criticism of the accounts of the species arises from the rather surprising omission of flowering dates. Pugsley was very well aware of

the useful additional character this provides in the case of the Hawkweeds he studied so carefully near Tunbridge Wells. Here, for example, he drew my attention to *H. trichocaulon* flowering about a month earlier than *H. tridentatum* with which it can be confused. He formed the opinion that most (but not all) of the species in that district had sharply defined times of flowering which could be useful in helping to distinguish them from their allies. If this is the case with lowland *Hieracia* it may well also apply to the mountain plants. Both in Wales and Scotland rock-faces certainly produce a different selection on early summer visits from those to be found later on. It is unfortunate that the information available on herbarium labels has not been collated.

The nomenclature used in the book will need very careful re-examination. Owing to the multiplicity of names and the highly critical nature of the group it seems inevitable that errors will be found. These were no doubt increased by the extreme difficulty of the later years of the author's life and the impossibility of consulting many rare books under conditions of war-time dispersal. In addition, Pugsley had a certain obstinacy of character which prevented him from tidying up his nomenclature. He regarded " *comb. nov.*" and " *nom. nov.*" with suspicion because the terms are not embodied in the International Rules. Insufficient care was taken over typification. Readers should refer to Wilmott's notes (1944, *B.E.C. 1941-2 Rep.*, 518-522) on the names published in 1941. It will be found that the prototypes cited there for *H. carneddorum* and *H. chloranthum* differ from those given in the *Prodromus*.

On nomenclature Pugsley took an essentially practical view. He regarded it very properly as the handmaiden and not the mistress of taxonomy, and it was this attitude which laid him open to criticism. It is far better to continue to use his names until such time as someone else has acquired a comparable knowledge and experience of the taxonomy of the group rather than to attempt to alter them piecemeal for purely nomenclatural reasons. The *Prodromus* will give a tremendous stimulus to the study of Hawkweeds in this country. It is hoped that great caution will be exercised in publishing changes until its contents have been assimilated and understood.

The main body of the work is followed by an account of " The distribution of Hieracia in Britain and their origin." For the first time the geographical relationship of our species is analysed and related to the Continent. The conclusions support the taxonomic work earlier in the volume and are an important addition to our knowledge of plant geography.

The general impression left after examining the *Prodromus* could hardly be better expressed than by a paraphrase of its author's own words (p. 7) with reference to Zahn:—" It is impossible not to admire this work of Pugsley's, which is a monument of critical research, patient investigation and infinite labour; and when, in classifying the British forms . . . one is unable sometimes to agree with his conclusions, it

may well be wondered that such differences of opinion are not more frequent, when the complexity of the genus is remembered, and the difficulty or impossibility of a monographer obtaining adequate material for examination of the almost innumerable forms involved." Pugsley has done for British *Hieracia* what he did for *Euphrasia* and in reducing chaos to order he has produced the most important addition to the literature of British taxonomic botany which has appeared for several decades. When he died in November 1947 the last batch of galley-proofs had still to be corrected. We are greatly indebted to Mr N. Y. Sandwith for the skilful way in which he carried out the difficult task of seeing the work through the press.

J. E. Lousley.

The Genus Crepis. Ernest Brown Babcock. Pp. 1030 + 22 with 305 figures [diagrams, maps and line drawings], 36 plates (1 coloured) and 19 tables. Part One, the Taxonomy, Phylogeny, Distribution and Evolution of *Crepis*: Part Two, Systematic Treatment. Issued as Volumes *21* and *22* of *University of California Publications in Botany*. Berkeley and Los Angeles, California: University of California Press (London: Cambridge University Press), 1947; Part One, $4.00 cloth, $3.50 paper; Part Two, $12.00 cloth, $10.00 paper [10¼″ × 6¾″].

This book is probably the first example of a complete monograph of a large genus of plants in which modern taxonomic methods are used to supplement classical ones. The interest of the book, therefore, extends, for British botanists, far beyond the few British species of the genus.

Part One (196 pp.) contains the general matter, as explained in its title. It starts with an account of the author's researches, which are divided into three main groups: (1) taxonomic, (2) research on the chromosomes [i.e. chromosome numbers and morphology] and (3) genetic and cytogenetic research. The author rightly emphasises that the basis of his treatment rests [as a monographic treatment always must] on the basis of comparative morphology and that cytogenetic research and geographical distribution are used in conjunction with it and not as the primary basis of classification. The value of cytogenetics, however, becomes apparent when it is seen that the author was enabled by its use to reduce to *Crepis* several genera recognised on the basis of morphological characters (e.g. scales on the receptacle) which proved not to be of fundamental importance in this group.

The majority of *Crepis* species are diploid. Apart from one American section (*Psilochaenia*) of secondary polyploids with x (basic number) = 11, polyploidy was found in only 6 species out of 103 examined. Of the 97 diploid species, 3 have n = 3, 58 n = 4, 19 n = 5, 14 n = 6 and 3 have n = 7. In spite of the prevalence of n = 4, the more primitive species have n = 5 or 6, and Professor Babcock concludes from this and

other evidence that 6 was the original haploid number in the genus. There are three general trends in karyotype evolution: (1) decrease in chromosome number; (2) increase in asymmetry of the chromosomes and (3) decrease in chromosome size, each occurring along a number of lines. Except for x = 7 and 11, the various numbers occur in a number of different sections.

Comparatively few characters have been investigated genetically, but the scales on the receptacle mentioned above are shown to have a simple genetic basis in two instances. [It would be interesting to find out if receptacle scales have the importance usually attributed to them elsewhere in the Compositae.] Much of the genetical work consisted in hybridising different species (about 200 interspecific crosses were made) with a view to determining their relationships by observations on the sterility and chromosome behaviour of the hybrids obtained.

The author concludes that in *Crepis* gene mutation and structural changes in the chromosomes have been the important factors in evolution, that polyploidy is of slight importance and that apomixis only occurs in Sect. *Psilochaenia*.

In Chapter 2, on Taxonomic Concepts, the kinds of species found in *Crepis* are analysed and set out in a table on the basis of polymorphic as against monomorphic; diploid as against polyploid; and apomictic as against sexual. The author recognises and names subspecies, but rejects Latin names for ranks below this, calling them " minor variants " and giving them only numbers. The reasons for this latter course are not clear. Bentham and Hooker's subgenera are rejected and the genus is divided into 27 sections which " can be grouped roughly into three divisions, namely primitive, intermediate and advanced." These three divisions, however, in no way correspond with Bentham and Hooker's subgenera.

Chapters 3 and 4 deal with the criteria used in classification and phylogeny and the results obtained from their use. The habit of the plant is of great importance, the rhizomatous species being primitive and the tap-rooted species derived from them. Other phylogenetically significant characters are obtained from the involucre which shows, in general, a trend involving reduction in size, in number of bracts and in the relative size of the outer bracts. In four species the involucral bracts become much thickened and indurate, enclosing the achenes in fruit. This is shown most markedly in *C. Zacintha* which has usually been put in a distinct genus (*Zacintha*). It is, however, clearly related to the other three and the generic distinction cannot be maintained. Other criteria used are the trends in karyotype evolution, already discussed, and the results of the inter-specific hybridisations. The suggestions are made that the genus arose from *Dubyaea*, that the tap-rooted habit arose from the rhizomatous one several times, and that—with the possible exception of three sections—the genus is monophyletic.

The remainder of Part One deals with the geographical distribution of *Crepis* and with the author's theories on the origin and migrations

of the group. While these chapters contain much information, often in concise tabular form, they are, on the whole, the least convincing part of the work. The author invokes continental outlines since the tertiary period, the mountain ranges of Asia, the migration of other plants as shown by fossils, the ecological relations of *Crepis* and even the Artiodactyl ungulates (suborder Pecora, including deer, oxen, giraffes, etc). One is, however, left with the impression that he attempts too much and that he has not made out his case—that he talks of mere speculations as probabilities. Too much weight appears to be given to migration and too little to subsequent evolution. Six allied African species, for example, each now confined to a single (different) mountain or mountain range, are considered to have migrated there from Central Asia. The now exclusively American section *Psilochaenia* (distinguished from all other sections by having x = 11) is considered to have had a polyphyletic origin by hybridisation between species of various sections in Central Asia, to have subsequently migrated to North America, and to have become extinct in its original home. [The taxonomic treatment of this section in Part Two is also open to criticism on general grounds. As, however, the section has been treated in more detail in an earlier work by Babcock and Stebbins, it would be out of place to discuss it further here.] Such phrases as " because they failed for some reason to get through the Iran-Asia Minor region, remain as relics in that general region " would be more in place in a discussion on human migration than in one of that of plants. There also seems to be an underlying assumption that because a species has many primitive characters, it is necessarily old *as a species*. To sum up the section, one may say that there is too much detail given when so much is left unexplained.

Part One ends with four appendices, of which that on " Some *Crepis* Problems calling for Further Research " is the most interesting, a list of references and a good index.

Part Two contains the Systematic Treatment of the genus and deals, in all, with 196 species. Each species is fully described and illustrated by a line drawing, the illustrations including dissections and, wherever possible, the somatic chromosomes. After the description follow synonymy, distribution (in general terms) and habitat, and a discussion on variation within the species. Next comes a list of specimens seen, with the herbarium in which they occur, including, in most cases, the type. Dates of collection are only given when there is no collector's number; it would have been an advantage had they been given in all cases. A list of " minor variants " follows; these are given numbers but not named, though, if they have previously been named, the names are cited. The account of each species concludes with a discussion of the relationships of the species. Under the sections, besides a description, there is a discussion of relationships, a map (or maps) showing the distribution of the species and a key to the species. At the beginning of the part are both diagnoses of the sections and an artificial key to

them (an example which might be more often followed in monographs). The plates are photographs of types or other interesting specimens. The whole appears to be admirably done and there should be no difficulty in identifying any member of the genus by its use.

It may be of interest to set out Professor Babcock's treatment of the species given in the *British Plant List* (including those added in *B.E.C. Reports* since its publication), with their chromosome numbers. The names under which they figure in the *B.P.L.* are given in brackets, where different. († = introduced species.)

Sect. 1 *Desyphylion*
4 *C. paludosa* (L.) Moench. 2n=12.

Sect. 5 *Mesomeris*
19 *C. mollis* (Jacq.) Ascherson 2n=12 (*C. mollis* Asch.).

Sect. 10 *Berinia*
64 *C. biennis* L. 2n=40±.

Sect. 14 *Mesophylion*
114 *C. tectorum* L. 2n=8.

Sect. 19 *Phaecasium*
†138 *C. pulchra* L. 2n=8.
a. subsp *typica* Babc.

Sect. 20 *Hostia*
†142 *C. alpina* L. 2n=10.
†144 *C. rubra* L. 2n=10.
145 *C. foetida* L. 2n=10.
a. subsp. *vulgaris* (Bisch.) Babc.
†b. subsp. *rhoeadifolia* (Bieb.) Schinz & Keller. (*C. foetida* var. *hispida* Bisch.).
†c. subsp. *commutata* (Spr.) Babc. (*Rodigia commutata* Spreng.).

Sect. 22 *Pterotheca*
†155 *C. sancta* (L.) Babc. (*Lagoseris neumausensis* [*sic*] (Gouan) Koch).
a. subsp. *nemausensis* (Gouan) Thell. 2n=10.

Sect. 23 *Zacintha*
†159 *C. Zacintha* (L.) Babc. 2n=6. (*Zacintha verrucosa* Gaertn.).

Sect. 24 *Phytodesia*
†160 *C. nicaeensis* Balb. 2n=8.
161 *C. capillaris* (L.) Wallr. 2n=6.

Sect. 25 *Lepidoseris*
181 *C. vesicaria* L.
a. subsp. *taraxacifolia* (Thuill.) Thell. ex Schinz & Keller. 2n=8, 16. (*C. taraxacifolia* Thuill.).

Sect. 26 *Nemauchenes*
†188 *C. setosa* Hall. f.
a. subsp. *typica* Babc. 2n=8.

A few comments on the list may be made. *C. foetida* occurs as three subspecies with different, though overlapping, areas of distribution; subsp. *commutata* is the most eastern and has been regarded as belonging to a distinct genus owing to the scales on the receptacle; subsp. *vulgaris* is the most western and the only one that could be native to Britain; subsp. *rhoeadifolia* may have arisen as a hybrid between the other two. *C. foetida* var. *hispida* Bisch. is cited as a synonym of subsp. *rhoeadifolia*, but Drabble (1933, *J. Bot.*, **71**, 63), who first recorded it as British, gives only the difference of the type of hairs on the involucre; further investigation is needed to see if the subspecies really occurs in Britain, since Babcock gives it additional characters. It is not clear why Babcock uses the name subsp. *vulgaris* (1938) rather than subsp. *eufoetida* Beger ex Domin (1935) which he cites as a synonym.

It would appear that the combination *C. sancta* subsp. *nemausensis*, which is attributed to Thellung, should have been cited as " Babc. comb. nov." since Thellung is stated to have kept the species under *Lagoseris*.

Some of the varieties of *C. capillaris* given in *B.P.L.* are given under " minor variants," but others are not mentioned. It is suggested that var. *anglica*, and also " *C. Druceana*," which is considered to be a different form, may be polyploid, although such are not definitely known in this species.

C. taraxacifolia is regarded as the most widespread of eight subspecies of *C. vesicaria*, some of the others being narrow endemics, though subsp. *typica* is widespread in the Mediterranean Region. Subsp. *taraxacifolia* is usually diploid though tetraploid forms occur in Spain. It seems that they are morphologically distinguishable and they should surely be recognised taxonomically and given a higher status than " minor variants ". It is suggested that a giant form (identified with var. *gigantea* (Rouy) Thell.) which is cited from England, may also be tetraploid, though there is no direct evidence of this.

Crepis bulbosa is excluded from the genus and listed as *Aetheorrhiza bulbosa* (L.) Cass.

This monograph is likely to remain the standard work on the genus for a long time. It should serve as an example for future monographers in showing how cyto-genetics and experimental methods can be used in conjunction with morphology to elucidate even a large group. Professor Babcock is to be congratulated on a fine work.

E. F. Warburg.

Welsh Ferns. H. A. Hyde and A. E. Wade. 2nd edition. Pp. 131 + 10, 67 figures and 10 + 1 plates. Cardiff: National Museum of Wales and Press Board of the University of Wales, 1948; 5/-. [8½ × 5½; thick cardboard.]

At first sight this bears an extremely close resemblance to the first edition (1940), including the all important matter of price, which is still extremely good value at five shillings. A closer inspection shows that a large number of new county and other records have been added. In

addition, the dates when the species were " first recorded " has in many instances been put back to 1606-8, owing to the discovery of some MS. records by Sir John Salusbury in his copy of Gerard's Herbal, now in the Library at Christ Church, Oxford. The nomenclature and the discussion of the classification of ferns does not seem to have been revised and it is surprising that, while Bower's views are set out in some detail, the more recent classifications of Christensen, Holttum, Ching, and Copeland are not mentioned. Nor is there any mention of the nomenclature of Clapham's Check-List (1946). Though intended primarily for Wales, the book includes descriptions of such species as *Ophioglossum lusitanicum* and *Anogramma leptophylla* which are, in Britain, confined to the Channel Islands, and as it is the only modern systematic handbook to the British ferns, should be most useful to many outside the Principality.

The varieties included are of somewhat unequal value and require further study. Apparent new transfers of varietal names are made without quoting the name-bringing synonym. Some of the extra-British distributions would not bear very close inspection: for example, *Asplenium Trichomanes* does not occur in Peru, nor *Hymenophyllum tunbridgense* in Venezuela. The adoption of the name *Hymenophyllum peltatum* seems doubtfully correct, as to do so assumes that the British plant is conspecific with an imperfectly known plant from the island of Réunion.

The hints to collectors (on p. 32) are a useful innovation, but something might have been said about labelling specimens.

The large number of localities given for *Polypodium vulgare* var. *serratum* is surprising, as this seems to be a limestone plant in most places. It is probable that the Welsh localities require revision.

A. H. G. Alston.

The Geography of the Flowering Plants. Ronald Good, M.A. (Cantab.). Pp. 403 with 71 line drawings, 9 maps in colour and 16 photogravure plates. London, New York and Toronto: Longmans Green & Co., 1947; 30/- net [10″ × 6″; cloth].

A comprehensive book on plant distribution has been a *desideratum* for some time and this book goes a long way to fulfil the need. The subject is one which is difficult to compress into reasonable compass, needing as it does ample illustration by examples and yet comprising principles which need to be made clear. It should, perhaps, be stated at the outset that the book deals with the distribution of species, genera and families and does not set out to give a picture of world vegetation, an aspect of botany to which the name " plant geography " is also often given.

The book begins with a short introduction including sections on the importance of plant geography, the difference between vegetation and flora, classification (3 pages), nomenclature (2 pages), and the history of plant geography. The value of the sections on classification and

nomenclature is very doubtful. The attempt to define such terms as "family," "genus" and "species" on a single page can only mislead. In particular, the suggestion that a genus is a more natural category than a species or family is unfortunate. It is doubtless the fact that it is the most convenient unit for purposes of plant geography that leads to this statement. The definition of species given means little.

The main mass of the book is divided into two parts, the first containing 14 chapters dealing with the facts of distribution, the second of 8 chapters dealing with the factors of distribution and conclusions. Chapter 1 gives a brief introduction to the geography of the world and a short discussion of map projections. Chapter 2, after a brief discussion, sets out the "classification of the world into floristic units" that the author adopts. The world is divided into 5 kingdoms (some divided into sub-kingdoms) and 36 regions, many of which are further divided into provinces. The region is the unit mainly used in the subsequent discussion. A useful map is given showing the limits of the regions. It may be noted that the British Isles belong to the Boreal Kingdom, Euro-Siberian Region and the province of West Europe. It is pointed out that the Euro-Siberian Region is "much more extensive, in longitude at least, than any of the others" and that it is therefore often necessary to treat it as a special case.

Chapter 3 gives a short account of the evolutionary background. This might perhaps have been extended but is useful in showing the author's outlook. He rightly points out (p. 45) that the production of the same form from the same parent stock more than once ("polytopic" and "polychronic" descent), which modern thought considers likely to occur, is to be distinguished from older ideas of "polyphyletic descent." The suggestion made that different environments are likely to *produce* dissimilar mutations is, however, open to criticism; though, as it is likely that different environments will *select* different mutations, the effect may be the same. The remainder of the chapter deals with endemism, discontinuity and with two current theories of plant distribution.

The next eight chapters give details of distribution of families, genera and species considered in turn. In each category cosmopolitan examples are first described, followed by other types of wider distribution, then discontinuous and finally endemic types. In the last category, each region is considered in turn and the other categories are also divided geographically. Numerous maps are given, often accompanied by figures or plates of the plant concerned. These chapters are so packed with valuable information that it seems undesirable to single out anything for special comment. Many examples are given throughout and the reader will find many familiar names, of both native and commonly cultivated plants.

Chapters 12 and 13 will be of special interest to members, as they deal with the British Flora. The first chapter deals with its history and distribution, starting just before the Ice Age. An account is given

of the various views on the effect of the Ice Age and an outline of post-glacial history. An account of H. C. Watson's work follows.

An attempt is then made to estimate the number of species native in Britain. The author reaches the conclusion that the number is about 1250 (excluding microspecies). The chapter concludes with an account of Matthews' work on the geographical elements in the British Flora. Chapter 13 gives some account of the author's own work on the distribution of plants in Dorset. It is of special interest in that it is work along new lines and is of a type that might well be undertaken by any member of the Society. He points out that the distribution of some species appears to be climatically determined and that of other species edaphically. A particularly interesting group (containing *Filipendula hexapetala* and *Verbascum nigrum*) are, in Dorset, confined to the more northerly parts of the Chalk Belt and the author suggests that their distribution must be climatically determined within their edaphic requirements. It would be interesting to extend observations on these species over the whole country.

The concluding chapter of Part I gives an account of past floras and of the effect of the Ice Age. The difficulties inherent in the interpretation of fossil evidence are well brought out.

Chapters 15 to 20 are an account of the various factors controlling plant distribution. They contain little that is new, but give a balanced picture of the whole. The sections on competition, on the naturalisation of plants in New Zealand, and on Wegener's continental drift hypothesis may be mentioned as of particular interest. The chapters are well illustrated by maps showing various aspects of world climate.

Chapter 21 on " The Theory of Tolerance " sets out the author's ideas on the reasons why plants occupy definite areas. He holds that the distribution of a species is mainly determined by its range of tolerance for climate and edaphic conditions, and sets out six principles on which the " theory " is based. It is perhaps doubtful whether the principles stated should be given the title of a " theory " but the chapter contains much good sense and should clear away many misconceptions concerning plant ranges. Perhaps, however, too little weight is given to the existence of barriers to dispersal and of minor changes in conditions.

The last chapter, entitled " Conclusions," is in fact a brief recapitulation of Angiosperm history, the author's main conclusions having been set out in the preceding chapter.

The book concludes with two appendices, bibliography and indexes. The first appendix gives " Statistics of the World's Land Surfaces," arranged in vegetational and latitudinal zones, the effect of altitude also being taken into account. The second appendix is a list of discontinuous genera. There are separate indexes of plant names and of names of persons and places, but no general index.

As is inevitable in a book of this scope, there are a number of errors. Some of them will be, however, rather surprising to anyone with a good acquaintance with the British Flora and should have been avoided. A few examples may be given. The map (p. 202) showing the distribution

of *Pinguicula* in the British Isles shows the doubtful Skye and erroneous Sutherland localities for *P. alpina*, but not the recognised one in E. Ross (though the plant is now extinct there); and the similar map of *Primula* shows *P. elatior* as extending to the East Anglian coast and *P. veris* as absent from Orkney and the Inner Hebrides. The definition of " Denizen " is not Watson's and corresponds closely with Watson's " Alien "; and " Casual " was recognised as a separate category by Watson in his *Compendium* (1868). The application of the term " phenotype " to the number of apparently different *species* is peculiar. *Utricularia* and *Pinguicula* are not (p. 291) restricted to " markedly acid habitats ". *Asparagus* (p. 91) is not confined to " South Africa, Mascarenes to Malaya " and *Ligustrum* (p. 356) should not be given as an example of a genus of " Eastern North America and East Asia with extensions into the tropics of one or both hemispheres." Many other examples might be given.

A criticism of a more general nature is that one is left with a feeling that there is a gap to be bridged between the facts as set out and the conclusions drawn from them. An attempt to interpret some of the distributions given in earlier chapters would have added considerably to the interest of the book.

This gap, and the somewhat prosaic style in which the book is written, make it a book to refer to rather than one to read, but, as such, it may be recommended to all interested in the broader aspects of the British Flora.

E. F. WARBURG.

Natural History in the Highlands and Islands. F. FRASER DARLING. Pp. xvi, 303, 32 col. pl., 32 black and white pl., 9 maps and diagrams, and 15 distribution maps. London: Collins (The New Naturalist: 6), 1947; 16/- net.

The Scottish Highlands are primarily the product of their geology and climate, which are such that cultivation is limited to alluvial and other occasionally favourable areas, while the mass of the country is given over to mountain grassland, peat moor, and bog, where the steep slope, high rainfall, and wind, do not leave bare rock. Man is comparatively scarce, but his sheep—formerly cattle—and deer have affected the vegetation considerably during the last century or two.

The rocks are mostly old and hard, not weathering easily, and in the west, especially near the Atlantic and on the islands, the area of bare rock greatly increases owing to the greater rainfall and higher wind. Sheep crop the herbage more closely than did the cattle, so that the water drains away better; the trees are prevented from regenerating, bracken increases, and the fine pasture which made sheep farming profitable is being destroyed. Heather is burned for the benefit of grouse and sheep, and the sheep and deer destroy the young firs.

The interplay of all these, and other, forces on the wild life of the Highlands, as well as the description of Nature there, is the author's theme. He first outlines the geology and climate, and their effect on

the plant cover in general. He says that tradition says that the climate of the Highlands and Islands has deteriorated during living memory, [but Corstorphine of Arbroath told me that in his lifetime he found the highlands drying up, which he put down to the replacement of the hill cattle by sheep]. The effect of the high winds and Atlantic gales is emphasised, and to the Southron needs to be: in West Sutherland I once unsuccessfully sought a sandy strand marked on the map, to be told by a local that all the sand was blown away one night by a gale.

The relief and scenery is then described, under five heads. The plates give a good picture of what the visitor may expect—a wild beautiful country, mostly hill and moor, where one may walk all day and meet nobody. It is a pity that the colours are not exactly those which one knows, but colour printing has still some way to go before it depicts scenery satisfactorily. I do not agree with the author's protest that the Outer Hebrides are not treeless. They *are* essentially treeless, as anyone who knows them well will agree. Even the trees planted at Stornoway have a hard time, and *native* trees are limited to a few birches, rowans, and aspens in a few sheltered gullies. The winter gales, which as in Connemara make bare a high proportion of rock on slopes, prevent tree growth except for a few sycamores and planted conifers, and to one returning from a few weeks' visit to the Islands the mainland looks as if a green cloth had been spread over the rocks, and birch woods at first seem astonishing novelties. I also take exception to the author's stress on " arctic " affinities of the highlands. The existence of a few species which can grow in the true arctic flora—and here mostly limited to the highest tops—does not make the vegetation more than boreal. Such species grow with others which cannot grow in the botanical arctic, which is not determined by the line of the Arctic Circle, and this stress of arctic affinities strikes a false note to one familiar with the real arctic flora.

The effects of man are then considered—the biggest one being the destruction of the ancient forests within historic times. He rightly emphasises the need for protecting and assisting the endemic variety of Scot's Fir [Scot's Pine is a mere botanist's name: fir is cognate with fire, for which the wood is used], as the few remains of its forests are often in serious danger, and most planting is of the non-endemic variety. Wars were the chief cause of forest destruction, and now felling; sheep and deer prevent the regeneration which cattle permitted. The larger mammals have suffered as severely as the forest: each is dealt with in turn. Birds have often suffered in consequence, but the Great Auk was lost by man's stupidity. Fortunately the Grey Seal has survived till man has become civilised enough to protect it. The effects of man's sporting activities and his establishment of deer forests and grouse moors are described, and the plants of deer forests receive some mention. The evils of overburning of heather are set out. The birds of the area are dealt with one by one. Other groups of animals receive some mention, and incidentally a few plants.

The chapters on the life-histories of the Red Deer and Atlantic Grey Seal are interesting but do not concern the botanist. There is a chapter on the woods, but it is concerned as much with animals as with plants and shows that the author is no botanist; there are many errors. In the chapter on the summits of the hills there is more about plants, with far too many mis-spelt names, quite apart from the adoption of the zoological practice of using small initial capitals where botanical rules of nomenclature require capitals. Pages 150-151 reach the limit in an amazing compilation of errors: the author is evidently not familiar with his subject.

Sagina nivalis is not (p. 150) found " in the courses of tiny streams ": *Menziesia coerulea* does not grow on a " summit ": *Saxifraga cernua* is included among the " fairly common and most beautiful flowers of the tops," whereas it rarely flowers, is not beautiful, and is limited to a few square yards on one Ben: our *Erigeron* is not *E. alpinus* but *E. borealis*: *Arctostaphylos Uva-ursi* does *not* (p. 151) " go very high ": *Arctostaphylos alpina* does grow in the Arctic, but should not be termed " very much an arctic plant " as it occurs in the Pyrenees, Apennines, and Carpathians: *Vaccinium uliginosum* is not a plant of " high meadows," and there never was any question of its replacing *V. Myrtillus*: Cloudberry has *orange* fruits, not " red ": and, finally, the Crowberry common in " alpine grassland " is *Empetrum hermaphroditum*, not *E. nigrum*, which keeps to lower elevations.

The chapter on " The Shore, the Sea Loch and the Shallow Seas " has more of plants, and more errors. The shore Orache is not *Atriplex patula* but *A. glabriuscula*. The Sea Campion is called Bladder Campion (*Silene "maritimus"*). *Salicornia* is not mentioned as a constituent of salt marsh, nor are many other species which are there: the peculiar sheep-cropped " billiard table " marshes, pink with flowering *Armeria* at the heads of sea lochs, merit better description, as do the wonderful flowery " machairs " of the west of Scotland, with their thousands of Frog and other orchids, Thalictrums, and a host of species not mentioned in his list. Among the sand binders with marram we find " Sea purslane (*Atriplex portulacoides*)" ! possibly *A. laciniata* often common on the foreshore but not a sand binder; and the common northern sand-binders—*Honkeneja peploides*, *Potentilla Anserina*, and others which surprise the southerner—are not mentioned. *Carex arenaria* " does its bit," but it does not do much ! The sea-weed zonation is described, but the abundance of the true *Zostera marina* in the Sound of Harris—a remarkable sight—is not noted. The importance of sea-weed in Island cultivation is mentioned but not the probable effects of its recent removal in quantity for industrial purposes, which may produce quick money but a bad future for cultivation. [However, as there is no bakery in a large part of the Long Island—bread comes to South Uist from Glasgow and meat to North Uist from Dingwall—the Islands may manage without any cultivation, perhaps !] It seems a pity to refer to the sea-weed " *Lithothamnion* " [is it that?] as " coral," even if " not made

by the coral polyps '' : it may be so colloquially, but in such a book this should be corrected, not endorsed. The fish (especially herring) do not concern us here. The chapter on The Suboceanic Island is of interest to all who love islands, and there are some nice illustrations. The flora of North Rona is listed, but it is not right to refer to the species not noticed by Atkinson as " losses."

We end with Lochs and River Systems; a little botany but not good, and the usual crop of errors in names and of omissions. At the end of the few pages of Conclusions the author remarks that " the search for accurate knowledge, surely, is a cornerstone of morality," which makes one wonder why he, with so many right ideas, is so inaccurate. The bibliography of 12 pages is useful but not, of course, exhaustive. None of the distribution maps concerns plants.

I have found the book difficult to review. It is so well written, so full of enthusiasm, so stimulating, so pleasant to read and, like the rest of the series, so well produced—except for four loose pages (the same in three copies seen) which may get lost—and well illustrated. It fulfils many of the aims of the series as set out by the publishers. It is therefore the greater pity that it was not revised by suitable readers before it was printed: the author needed a botanical collaborator. If this review seems to be harping on errors it must be emphasized that the editors set as their aim " a high standard of accuracy." Botanically speaking the book is inadequate, and an adequate account of the vegetation of the area is sadly needed as that given by Tansley in his Vegetation of the British Isles also showed unfamiliarity with the area. Even the plates are not free from error: there is (pl. VIIb) a nice view of Mealisval labelled Suinaval, to take which the photographer would almost have had to make a *volte face*! I could multiply the tale of errors and some are bad: to one who knows both it is rather ridiculous to say that the roadsides about Elphin and Cnochan are like the verges of an English lane: there cannot be any Alpine Hawkweed on Tanera: Aspleniums on tree trunks are presumably Polypodies, and so on. But one does not expect a Scot to pass " Rannock," or to call his Wild Hyacinth the " Bluebell (*Scylla nutans*)" [*sic*], and the Bluebell of Scotland the Harebell (*Campanula*—or should it be Charybdis?). No: there are really too many errors in a book meant for the general reader who cannot be expected to recognise them, though he will read with pleasure and not regret his purchase.

A. J. WILMOTT.