

BOOK REVIEWS

H. P. HALLBERG: *Vegetation auf den Schalenablagerungen in Bohuslän, Schweden*. Acta Phytogeographica Suecica 56 (1971), 136 pp., 73 figs. (English summary). Price Skr. 48.—.

The subject of this paper is the treeless vegetation occurring on shell deposits in the province of Bohuslän on the West coast of southern Sweden, North of Göteborg. These shell accumulations are of marine origin and are scattered throughout the province. They are situated from 0–130 m above sea level and are of late Glacial to very recent age. The thickness and the extent of the deposits are very variable.

The paper is much more than just a description and classification of the various vegetation types. The author, working according to the principles of the French-Swiss school of phytosociology, may be called in a way a pupil of Tüxen. He pays much attention to habitat factors, floristic specialties, phytogeographic aspects, etc.

Following a general introduction, the second chapter is devoted to a subdivision of the area under study on the basis of geological, geomorphological, climatic, floristic, and vegetational data. The soil, the shell deposits themselves, and the influence of man are also taken into account. As it turns out, almost all of the shell deposits have previously been partly dug away or otherwise disturbed by man.

Chapter three treats the flora of Bohuslän, especially in its phytogeographic aspects. The author deals extensively with about one hundred taxa of phanerogams, but, far from confining himself to this group, also with an approximately equal number of Bryophytes, several tens of non-epiphytic lichens, and some fungi (Gasteromycetes). Eight distribution maps of several taxa of phanerogams and cryptogams complete the paragraph.

Chapter four deals with the Scandinavian literature on shell deposits; chapter five gives details on the method and terminology employed.

Chapter six, about 50 pages, treats the various vegetation units: the beach communities, the dry, and the moist grasslands. They are arranged in six classes, eleven associations, and 24 subassociations. All vegetation types are extensively compared with data in the literature; much attention is also paid to succession, life forms, contact communities, and distribution.

Every association described is accompanied by a table; the relations between all associations are expressed by a cumulative table. The cryptogams form an integral part of this portion of the work.

A large number of photographs serve as illustrations. The quality of some of them is, in the reviewer's opinion, one of the few points detracting from the value of the excellent work. Particularly some photographs of vegetations rich in cryptogams contribute little, if anything, to the text. The captions occasionally call attention to details not discernible in the pictures.

Chapter seven contains detailed studies of three shell deposits located at different distances from the sea and at different altitudes. The vegetation is mapped, ecologically interesting species being individually marked.

The usefulness of the publication is enhanced by the addition of soil analyses, numerous vegetation tables, and also by a complete index of names of phanerogams, cryptogams, and plant communities appearing in the text. The very extensive list of references, containing over 420 titles, is symptomatic of the thoroughness of this most recommendable paper.

At present the existence of the herbaceous vegetation on the shell deposits in Bohuslän is threatened. Depopulation of rural districts results in cessation of pasturing and/or mowing, leading to the establishment of trees and shrubs and afforestation of open sites. Exploitation of the substrate and recreation threaten the remaining vegetation, another reason for being grateful for the publication of this extensive and well-documented study.

J. H. WILLEMS

W. WEBER, *Biologie in Stichworten, I. Botanik (Morphologie, Anatomie, Systematik), II. Botanik (Physiologie, Ökologie, Fortpflanzung, Geobotanik)*. Verlag Ferdinand Hirt, Kiel, 1972. Paperbacks, resp. 152 pp., 71 figs., and 136 pp., 54 figs., DM 15.80 each volume.

Biologie in Stichworten will consist of seven parts: two for botany, two for zoology, three for "Humanbiologie". According to the introduction it is intended for use as an introductory compendium and as a repetitorium. In practice it will be functioning mainly as a repetitorium, because reading of these booklets can never replace the reading of even the most simple textbook as an introduction to any field of botany.

Necessarily formulations and definitions are very concise and generalized, usually only leading to more or less harmless simplification which is useful for educational purposes. For instance, meristematic cells are said to possess dense protoplasts (as opposed to vacuolized protoplasts), but no mention is made of the highly vacuolized cambium cells treated in the same category (I, p. 60). Also, in the chapter dealing with the mineral nutrition of plants (II, p. 20) the important phenomenon of 'contact exchange' of nutrient ions between soil particles and root surface is not mentioned. Furthermore, though it is recognized that the plant absorbs ions and not salts, accumulation of salts and not of ions against a diffusion gradient is discussed, presumably in order to evade the introduction of the more difficult, but more relevant notion of electrochemical potential.

Only in a few instances oversimplification has led to more serious mistakes or omissions. So is alternation of hard and soft tissues in the bark given as the rule (I, p. 83), whilst this character is in fact restricted to a minority of Angiosperm groups only. In all groups of Pteridophytes and Spermatophytes the sporangia-bearing organs are called sporophylls, without even mentioning the possibility that some of them could be non-phyllomatic at all.

The term *Gefässe* is used – a grave error indeed – for vessels and tracheids together (I, p. 68–69), but is in fact a synonym for *Tracheen* only (see the official Multilingual glossary of terms used in wood anatomy, 1964). A last example: in guttation and bleeding (II, p. 18) secretion of salts into the vessels and subsequent osmotic suction of water is a generally accepted mechanism, whatever the role of active water transport which is mentioned here as the only principle involved.

The fact that the different parts of botany are divided over two volumes has its disadvantages because the cross-referencing is not always perfect. In the descriptions of the Ferns one finds the terms *Trophophyll* (I, p. 111) and *Annulus* (I, p. 112), but only via the register of part II definitions can be found.

The system is a conservative one, which is very sensible for a book of this character. Recognition of the "Hydropterides" as a subclass comprising Salviniales and Marsileales, however, goes a bit far and could rather be called obsolete than conservative.

The annotations given in the chapter on Systematics are for some groups extremely brief. Usually this is understandable (fossil groups, some thallophytic taxa), but sometimes it is not: the Ginkgoinae, e.g., must do with "Einzigste rezente Art *Ginkgo biloba*, Relikt in China und Japan" without even the smallest indication of a description or characterization. The Gymnosperms for that matter are also rather scantily treated in the chapter on Reproduction, where under the heading *Fortpflanzung der Spermatophyten* in fact only the reproductive organs of the Angiosperms are considered.

Outside Germany the usefulness of the books is restricted because in many cases (but not always) examples given are indicated by their German names only. And who outside the German-speaking part of Europe will know the *Schwedischer Hartriegel*, the *Schwarzwurzel*, and the *Kleiner Ampfer*? Some of the German plant names can be found through the register and the chapter on Systematics, but others (like the three mentioned above) not.

At least in the Netherlands where many botanists are more familiar with English terms than with German ones, these books may also be valuable for scientists as a simple glossary for German terminology.

The chapter "Geobotanik" treats in 6½ pages of text and one full-page map the floristic, ecol-

ogical and historical aspects of plant-geography, the "*Vegetationskunde*", and the floristic subdivision of the world. Consequently, the treatment of this discipline is far less thorough than that of other aspects of botany, e.g. anatomy (64 pp.) or physiology (78 pp.). It could probably better have been omitted than given in this format.

No book is perfect, but the number of mistakes and inconsistencies in this book is quite low. The books are well produced and have – through the use of different types and print in black and red – a conveniently surveyable lay-out. The figures are schematic and clear. On each page, in one of the margins, one finds the words "*Raum für Zusätze*", a needless repetition, a bit comical or rather annoying – whichever the user's mood!

The merits of these booklets as a comprehensive compendium and repetitorium on an elementary level far outweigh their weaknesses and they can certainly be recommended as very good specimens of their kind.

P. BAAS
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Prediction and measurement of photosynthetic productivity.

Proceedings of the IBP/PP Technical meeting, Trebon, 14–21 September 1969.
Pudoc – Wageningen, 1970.

Recently a number of proceedings of symposia have been edited where agronomists and plant physiologists presented their contributions on the production research in combined meetings. Among these the section photosynthesis and production of the international biological program was particularly successful since it brought together such a highly qualified group of scientists around the central theme of the use of models and computers in the field of production.

In a number of sections the following subjects were discussed:

1. Structural and functional models of higher plant stands.
2. Mass and energy transfer in stands of higher plants.
3. The energy economy of plants.
4. Models of leaves and measurement of the photosynthetic characteristics of plants in the laboratory and under field conditions.
5. Controlled environments in analysis of photosynthetic characteristics.
6. Algal photosynthetic systems in nature and in culture.
7. Methods of general interest.

Each of these chapters includes a number of lectures, the relevant discussion, and a summarizing paper, so that an excellent picture of present-day knowledge is easily accessible. Plant physiologists, microclimatologists, and agronomists have presented papers important not only for their common interest, but as well for their colleagues in their own field not working in agriculture. In the field of plant physiology, for instance, detailed studies on the structure and the mechanism of the photosynthetic apparatus deal with the most recent developments. Attention has been paid also to differences between species in this respect. It appeared to be still rather difficult to evaluate exactly respiration levels especially in relation to growth and photosynthesis, although the chemistry of this process down to the molecular level is well-known for years. The microclimatological studies presented show the meaning of different approaches for our understanding of carbon dioxide and water vapour exchange between a plant or a crop and the ambient air. Since transpiration is one of the main energy dissipating processes the water economy of crops has also been considered.

The most striking aspect of the meeting is, however, that the lecturers of the various disciplines discussed so profoundly the possibilities and also the impossibilities of the use of models. Certainly there were some reservations, perhaps mainly due to lack of experience, but

the examples presented were promising and undoubtedly will lead to more common use. Besides the results revealed more than anything else large gaps in plant physiological knowledge. That the latter is considered indispensable for a more complete understanding of crop growth has been made clear rather convincingly since almost every discussion ended with a request for more plant physiological research at the plant – crop organization levels in order to reduce the number of uncertainties the program-makers still have.

In reading the various discussions one gets the impression that almost everyone was convinced that programming should proceed even though not all of the demanded physiological data are available. Seemingly in contradiction with this general acceptance was the final conclusion of one of the well-known plant physiologists, who stated: "The moral of this story is that a logical progression need not involve programs or computers". However, one has to keep in mind that this was a conclusion from a "heavenly" joke on Sherlock Holmes and who else would rank himself with this famous detective?

R. BROUWER

K. FAEGRI and L. VAN DER PIJL: *The principles of pollination ecology*. 2nd edition, 291 + XII pages, 53 figures, 8 tables. Pergamon Press Ltd., Oxford, 1971. Price (hard cover) £ 5,-.

As indicated by the title and stated in the introduction, this does not pretend to be a comprehensive manual which would have run into many volumes. Neither have the authors attempted to achieve completeness, but, rather, they have tried to formulate general principles of pollination ecology which should enable the student to make his own observations with a more profound understanding and should serve him as a frame of reference.

The first chapter briefly reviews the history of the study of pollination ecology, from the early practices to achieve or improve fruit and seed setting by cross-pollination, the gradually evolving understanding of the sexuality of plants – which was first properly recognized by Camerarius –, through the role of pioneers like Koelreuter, Sprengel, Darwin, and others, to the modern period, and concludes with a short section on some textbooks. The following chapter is a short survey of techniques in pollination ecology. Pollination is considered as a specialized type of spore dispersal: the fourth chapter, consequently, deals with spore dispersal in cryptogams, to end up with pollination in gymnosperms.

The fifth chapter, on pollination in angiosperms, is the main chapter of the book, covering 142 pages. The first sections treat various aspects of structure, function, and adaptation of the angiosperm flower. Important is the distinction between the morphological term "flower" and the ecological term "blossom". Ample attention is paid to the phenomena of cross- and self-pollination and the various ways in which the first is promoted. The two main ways of abiotic pollination, viz. anemophily and hydrophily, are treated next. The extensive section on the much more complex phenomenon of biotic pollination starts with a general discussion in which also terms describing blossom-visitor relationships are defined. The ensuing parts first deal with the plant side of the relationship, i.e. the various modes of attraction and the structural blossom classes. The largest group of blossoms, that of the conspicuous, advertising, type, is subdivided into 6 subgroups which may be mentioned here: dish- to bowl-shaped, bell- or funnel-shaped, head- or brush-shaped, gullet-shaped, flag-shaped, and tube-shaped blossoms. The attention is then focused on the animals and the various categories of invertebrates, chiefly insects, and vertebrates that have given rise to more or less distinct pollination syndromes. Diagnoses of the syndromes are given, partly in the form of tables.

The sixth chapter discusses "retrograde" developments, i.e. abiotic pollination of a secondary nature, autogamy, and apomixis and vegetative propagation. Two of the blossom types quoted above are further elaborated in particular connection within a given taxon, viz. the flag blossom in Leguminosae and the gullet blossom in Tubiflorae. In the first edition of the book this chapter also contained a section on the orchid flower which has been omitted from the second edition, largely, no doubt, because the interested reader can now be referred to the book

by Van der Pijl and Dodson on this subject. Two chapters treat various aspects of pollination ecology and speciation, and applied pollination ecology, respectively.

The closing chapter contains case histories to serve as illustrative examples to some of the principles expounded in preceding chapters. These include both well-known and less known plant species. In view of size and scope of the book only a small number of examples could be included; another limitation is, as admitted in the preface, that many regions have hardly or not at all been studied yet. In spite of this the reader will find much to arouse his interest here, such as the story of *Ficus* which now incorporates important discoveries as recent as 1969. The heading 'Ficus species', incidentally, is slightly misleading as no account of this large genus as such is given, but, rather, the attention is still mainly centered around the mediterranean *F. carica*, well known from cultivation. Needless to say, very much work still awaits before a more complete insight in the pollination of the genus *Ficus* as a whole will have been gained. Also noteworthy are, among others, the sections on pollination syndromes within the Papilionaceae and Labiatae-Scrophulariaceae.

Pollination ecology has long suffered from neglect but has been gaining some attention again in more recent times, as can be seen from the list of references in this book, and also when comparing the first edition, of 1966, with this second revised edition. It is a controversial field and discussions on many aspects of adaptation could easily lead to arguing of a teleological kind or to another extreme, the denial of any functional interpretation of observed structures. The authors, only too aware of this, have aimed at objectivity throughout, in which they succeeded quite well. They state that when using the word "adaptation" they 'have in mind a statistic relation, viz. the observed (or ex analogia inferred) fact that in most instances a certain structure functions in a certain manner, which is made possible by the morphology (and ethology) of the organism(s) concerned'. The study of pollination is indispensable in modern taxonomic practice. It is also obvious that pollination forms an integral part in evolutionary processes. Hence this book, which provides a good amount of information in comparatively little space, is essential to courses in many fields of botany and biology in general and should be read by all students and teachers in botany. The list of references will be a useful guide to the large amount of literature in this field.

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