

Book Reviews / Boekbesprekings

Stratification of a tropical forest as seen in dispersal types

Ingrid Roth

Dr W. Junck Publishers, Dordrecht, The Netherlands, 1987.
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324 pp., hardcover

This is number 17 of the vegetation science series edited by Helmut Lieth, Osnabrück, and Harold A. Mooney, Stanford (ISBN 90-6193-897-X). It is Ingrid Roth's second contribution to the series, her first (number 6, 1984) having been the forest stratification volume on leaf structure. Apart from her numerous publications on the anatomy of tropical fruits, this prolific Venezuelan author has also written the volumes 'Fruits of Angiosperms' (1977) and 'Structural Patterns of Tropical Barks' (1981) of Borntreger's Encyclopedia of Plant Anatomy (edited by herself together with P. Ozenda, S. Carlquist and H.J. Braun).

Her present volume deals with the seed dispersal types of tropical forest trees — not just academically but on the basis of a qualitative/quantitative investigation of the trees within a 25 m wide and 67 km (!) long strip clearfelled in a humid tropical forest of Venezuelan Guiana in 1967 for an FAO-sponsored forest inventory project. Altogether 67 777 trees of 10 cm DBH and over were felled on 155.5 ha (the unexplained difference of 12 ha of the total strip area of 167.5 ha probably accounting for open ground). This represents 435 (full) stems per hectare, a figure considerably lower than the average density of comparable indigenous forest types in Southern Africa, ranging between 800 and 1000 stems per hectare, obviously because of the larger trunk diameters of the Venezuelan forest trees. Unfortunately no basal-area data are given.

In fact, not all trees encountered were studied but only 66 977, as the remaining 800 trees (1.2 percent) had not been identified by the time the book was written — 20 years after the survey and in spite of the involvement of herbaria and specialists all over the world.

The trees actually studied belonged to 375 species: an astonishingly high diversity, even for an extraordinarily long sampling strip and the low stand density, but this is explained by the almost incredibly low population densities. The most common species, *Chaetocarpus schomburgkianus* (Euphorbiaceae), has only 23 stems per hectare, and half of all species have less than one stem per hectare, with the scale of the latter category going down to 0.0064 stems/ha. (In the Amazonian forest the maximum population densities are even lower, around 16 stems/ha, which is little more than the figures for the most uncommon trees of our tropical exile forests where, with increasing north-south impoverishment and concomitant emergence of dominance, the prominent species attain population densities of 100 – 500 stems/ha.)

The author definitely did not waste the opportunities offered by the extreme species richness. The painstaking descriptions of the dispersal mechanisms, fruiting times, habitats and heights of all the different species, as well as the subsequent discussion of the various aspects, add up to a reference book on the subject — not only for Central and South American workers but also for us here in Africa. As it appears from this book, we share with the countries on the other side of the Atlantic more than a good many of our introduced trees such as species of *Anacardium*, *Astronium*, *Bixa*, *Carapa*, *Cecropia*, *Cedrela*, *Ceiba*, *Citharexylum*, *Enterolobium*, *Jacaranda*, *Pithecellobium*, *Sapindus* and *Tabebuia*. Among the indigenous trees the list of genera we have in common is even larger and includes *Capparis*, *Casearia*, *Cassipourea*, *Chrysophyllum*, *Cordia*, *Croton*, *Diospyros*, *Drypetes*, *Eugenia*, *Ficus*, *Homalium*, *Lonchocarpus*, *Manilkara*, *Margaritaria*, *Maytenus*, *Ocotea*, *Pari-nari*, *Phyllanthus*, *Prunus*, *Pterocarpus*, *Rinorea*, *Sapium*, *Sterculia*, *Tabernaemontana*, *Tapura*, *Terminalia*, *Trichilia*, *Vitex* and *Xylopia*. It is therefore no surprise if we recognize many familiar shapes among the more than 200 photographs of fruits.

Wind dispersal (anemochory) by means of wings, bladders, hair tufts and other flying devices was found in 13 percent of the species, all of them restricted to the upper forest strata. Active seed dispersal (autochory) by means of dehiscent pods or capsules and other releasing devices was encountered in 17 percent of the species, mostly also taller trees. The total of 30 percent of anemochorous and autochorous species proved to be much higher than it was previously thought to be. The overwhelming majority of species, some 70 percent, appeared to depend on animal dispersal (zoochory), using fleshy fruits (berries, drupes and indehiscent pods) or arillate seeds. These species prevail in the lower forest strata.

Roth considers the last-mentioned group, especially the shade-tolerant species, as the more primitive. She advances the theory that the forest understory represents the equivalent of the early angiosperm flora, a formation consisting of short trees and shrubs overshadowed by taller gymnosperms and tree ferns. As the angiospermous trees lengthened in their upward struggle for light, they changed their hygromorphic shade-leaves into xeromorphic sun-leaves — a process still being repeated by every tree growing through the critical understory height — and adapted their seed dispersal mechanisms by developing dry dehiscent structures or light wind-transport devices, or by deriving drupaceous fruits from berries through a gradual reduction of the number of seeds. Even capsules may have evolved from berries. (In this context one comes to think of the initially fleshy fruits of many euphorbiaceous or celastraceous species hardening later into valved capsules or, as another example, the berry of our *Diospyros lycioides* which after maturity turns into a brittle semi-capsule. Are they transitional forms, or rather double-action devices: summer zoochory, followed for what has not been taken, by winter autochory?)

Seasonal periodicity of fruiting is discussed in great detail, confirming that trees compete for dispersal agents as much as they do for pollinators, and therefore tend to shift

into open or little occupied seasonal niches, which results in the staggering of fruiting times over most of the year, a phenomenon Roth calls 'mutual avoidance'.

The reader will do well to prepare himself for these and other stimulating conclusions and interpretations by carefully studying the 44-page 'general' part introducing him to basic fruit and seed types, selective factors, seasonality, dispersal methods, predation, co-evolution, germination and establishment: a useful text on the subject (though challenging lecturer and students to enrich the cited examples with local species).

The bibliography is comprehensive and truly international with English, German, Spanish and Italian titles. One wonders how many South African plant anatomists and ecologists are aware of a German paper (K. Stopp, 1958) on dispersal-inhibiting mechanisms in the South African flora. All but forgotten classics like Beck von Managetta's 'Frucht und Same' (1913) and E. Ulbrich's 'Karpobiologie' (1928) are included as well.

The work opens up new perspectives for the study of our trees and forests in the light of past and on-going evolution 'as seen in dispersal types'. Roth has emphasized the all-importance of the evolutionary view by prefacing the book with a quotation in German, deserving translation: 'The creation of the living has been designed for development; death would otherwise not make sense.'

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The European Garden Flora III (Casuarinaceae to Aristolochiaceae)

Edited by S.M. Walters, J.C.M. Alexander, A. Brady, C.D. Brickell, J. Cullen, P.S. Green, V.H. Heywood, V.A. Matthews, N.K.B. Robson, P.F. Yeo and S.G. Knees

Cambridge University Press, Cambridge, New York, New Rochelle, Melbourne, Sydney, 1989.

Sponsored by the Royal Horticultural Society.
XV + 474 pp and 42 figures

The European Garden Flora is a manual for the accurate identification of cultivated ornamental plants in Europe, both out-of-doors and under glass. The first of the projected six volumes of the work deals with Pteridophyta, Gymnospermae and the angiosperm families Alismataceae to Iridaceae. Volume two covers the families Juncaceae to Orchidaceae, and the present volume Casuarinaceae to Aristolochiaceae.

Fourty-nine families are dealt with in the present work to which various authors have contributed. The Flora is arranged according to the Engler and Prantl system expressed in Melchior's edition of *Syllabus der Pflanzenfamilien*. A key to the families is given and for every family containing more than one genus, and for every genus with more than

one full-entry species, a dichotomous key is provided. For most genera containing 5 — 20 species an informal key is given, based largely on the more easily recognized characters. Notes on the cultural requirements and methods of propagation are generally included in the observation of each genus. References to taxonomic books, articles and registration lists are cited for each family and genus.

The following information is provided for every full-entry species: the current name, followed by synonyms; references to good illustrations and illustrations appearing in the publication; a short description; the wild distribution, as far as it can be ascertained, in italics at the end of the description of each species; the hardiness and flowering time. A few keys to species tested proved to work easily. The descriptions are short, but the essential diagnostic characters are given.

The book presents a valuable contribution to the knowledge of the 'flora' of the gardens of Europe, and is of importance to botanists and horticulturists. To the South African botanist and horticulturist it provides a good indication of the species from this continent likely to be encountered in European gardens.

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Tropical Rain Forests of the Far East

T.C. Whitmore

Second Edition, 1984

Clarendon Press, Oxford

Obtainable from Oxford University Press at approximately R140-00
352 pp.

This book gives an account of the Far East rain forests and links a great number of specialized research papers into a coherent whole. The knowledge of the rain forests of the Far East outweighs that on African or neotropical rain forests by far. The book is composed of five sections. Part one introduces the forests of the region, the structure of the forests in terms of different life forms, stratification and tree form, and animals and their interactions. Part two covers the climatic environment of the forests, the water balance and seasonal cycles in plants and animals. Part three describes the growth cycle of the forests, including seed dispersal and germination, seedling establishment and growth into trees, growth rates and forest yield, nutrient cycling and the ecological basis of rain-forest silviculture. Part four describes the soil environment (by C.P. Burnham), the different kinds of forest such as dry-land rain forests, wet-land rain forests, monsoon forests, and mountain rain forests, conifers in the forests, animal life of different forest formations, and variations within the tropical lowland evergreen rain forest and its causes. Part five covers the important role of man in the tropical rain forests such as through logging and shifting cultivation, and concludes with a view of the future.

The book emphasizes three main subject areas in which there have been substantial advances in knowledge in recent decades: the seasonality of climate, especially rainfall, and its consequences for animal life; the growth rates and ecological requirements of individual tree species; and the nature of variation within rain forest communities.

Technical terms which may be unfamiliar are defined. S.I. units are used.

The text is illustrated throughout. Two maps are provided: a map of the tropical Far East with some of the main conservation areas, inside the front cover; and a map of Malasia, Australia, Melanesia and Micronesia, inside the back cover. Of the 680 references in the first edition, 570 are retained and another 570 new ones were added. A select list of publications which contain descriptions of tropical rain forests of the Far East, is included. Apart from the general index, the book contains a useful index to the plant names.

This soft-cover book will be useful to students of biology, forestry and agriculture, and of interest to anyone concerned about the future of the rain forests.

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Macrolichens of East Africa

T.D.V. Swinscow and Hildur Krog

British Museum (Natural History), Cromwell Road, London SW7 5BD, England, 1988

Price: £20

ISBN 0-565-01039-5

viii + 390 pp.

This is the first book dealing with a macrolichen flora (or for that matter, any lichen flora) on the continent of Africa, or in the tropics. The book enables botanists, lichenologists and lichen enthusiasts to identify any of the 629 macrolichen species occurring in East Africa (southern Ethiopia, Kenya, northern Tanzania and Uganda). The book is a culmination of about 20 years of research by the authors on East African macrolichens, which includes field work. Much of the treatment in this book is also available separately in journals such as *Nordic Journal of Botany* and its predecessor *Norwegian Journal of Botany*, *The Lichenologist*, and *Bulletin of the British Museum of Natural History (Botany Series)*, but much of the book is also original. Most of the taxonomy is that of the authors, but a few specialists have helped them with a small number of genera.

The book begins with a survey of lichen habitats in East Africa, which includes colour photographs of some of them. Also included are a number of colour photographs of lichen specimens from East Africa. The main body of the text is

the taxonomic treatment, which begins with a key to the genera using characters that are easily observed as well as ascospore characters. The genera are treated in alphabetical order after this, with a key to the species after a short genus description.

The species descriptions, also in alphabetical order, follow the key. These are short and diagnostic emphasizing characters visible under a lens or dissecting microscope, but ascospore and pycnidiospore dimensions are always given when known, and aspects of their morphology are used fully. All the species descriptions have a short paragraph on the ecology of the lichen in East Africa, as well as a statement on its distribution on our planet. Most of the species descriptions also carry a statement on the lichen substance chemistry of each species, as well as those spot reactions that are positive. A large selection of black-and-white photographs (188) illustrate the species, as well as a few line drawings.

The nomenclature is generally good and up-to-date, but there are still areas of contention as regards the generic splits in the Parmeliaceae. The synonymy has been limited to one per accepted species in this treatment, with a number of entries carrying no synonyms. Each name has the author and original literature cited in standard abbreviated form after it. References to the monographic literature are offered under the generic descriptions, with a full list of the literature cited at the end of the book. In addition, a list of selected synonyms is presented at the end of the book, because of the decision to restrict the number of synonyms in the text to a maximum of one per accepted species.

The book ends with a brief description of how to examine lichens morphologically and chemically. A useful glossary of terms is also presented. Although the book is arranged alphabetically throughout, an index is presented which is still very useful.

Only a few new combinations (3) and no new species are proposed in this book.

The text throughout this book is clear, concise and free of typographical errors, and the large selection of black-and-white photographs illustrating the species are good. The taxonomy and nomenclature are good, and the book represents a critical appraisal of the macrolichens of East Africa. Students of macrolichens in other parts of Africa, south of the Sahara, will find the book very useful indeed, as I am finding it useful in southern Africa — the major exception being the saxicolous Parmeliaceae.

The authors are to be congratulated on this excellent and thorough work. This book is highly recommended and is a must for those interested in or studying macrolichens from subsaharan Africa, and will be useful to those studying macrolichens from other tropical and subtropical areas of the world.

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