REVIEWS

S. KURATA & T. NAKAIKE (eds.), with cooperation of the Nippon Pteridologists Club: **Illustrations of Pteridophytes of Japan. Vol. 7**. University of Tokyo Press, 1994. 420 pp. ISBN 4-13-061067-8 (in Japan) / 0-86008-504-X. Price: ¥ 15,000.

This volume, seventh in the series, deals exclusively with hybrid taxa of Pteridophytes in Japan. In this book 302 hybrid taxa are illustrated by photographs and maps. The production of this massive book was organised by Dr. Nakaike with the contribution of many local Pteridologists in this country.

Following the style of the former volumes, 48 hybrids are recorded in detail in the first part of this book, each with a black and white photograph of a living plant, a short record of the discovery of the hybrid, its diagnostic characters, and discussion of postulated parents, information which is unfortunately all in Japanese; furthermore a page of line drawings (sometimes substituted by high-quality photographs of herbarium specimens), a map of distribution, and a list of collector's records.

The second part records 254 hybrids more concisely. Each taxon is provided with a photograph of a herbarium specimen and a map showing its distribution.

Some hybrids are reported here for the first time. An asterisk (*) is given after the scientific name to indicate its *nomen nudum* status. Indices to scientific names and Japanese names are presented at the end of the book. The most important one is a multiple index to scientific names of hybrids and their parents.

It is really surprising to find that 69 hybrids in *Athyrium*, 47 in *Polystichum*, and 44 in *Dryopteris* are recognised from this small archipelago country. To confirm all of them, a lot of experimental work is needed. The estimated number of Pteridophyte species in Japan is only about 600.

This is an indispensable work for those seriously interested in the taxonomy and biosystematics of Japanese Pteridophytes.

X.C. ZHANG & H.P. NOOTEBOOM

MICHAEL A. HUSTON: **Biological diversity. The coexistence of species on changing landscapes**. Cambridge University Press, 1994. ISBN 0-521-36093-5 (hardcover). Price: US$ 100, UK£ 60. ISBN 0-521-36930-4 (paperback). Price: US$ 35, UK£ 25.

This book presents a most complete survey of the ecological view on biodiversity, and is certainly one of the best text books in this field. It focuses on processes to explain the regulation of species diversity in a given area.

The book is divided into four parts. The first part, entitled 'Raw material and tools', contains chapters on general patterns and the assessment of species diversity. The variety of diversity patterns found in ecosystems around the world is discussed at spatial scales ranging from the entire globe to soil particles, along with the correlated diversity of environmental conditions. This is followed by a brief address of issues related to the measurement and quantification of biological diversity.

The second part, 'Theories of species diversity', comprises chapters on equilibrium processes and landscape diversity, and non-equilibrium processes and local diversity. In reviewing the historical development of theories of species diversity, the importance of equilibrium and non-equilibrium processes in regulating species diversity is evaluated.

The five chapters in the third part, 'Mechanisms that regulate diversity at various spatial and temporal scales', deal with the diversity in populations, the structure of communities and ecosystems, and with various aspects of landscape patterns (disturbance and diversity, succession and temporal change, gradients and zonation). The mechanisms of intra- and inter-specific competition are addressed, particularly those among plants as the dominant structural organisms in most terrestrial and many aquatic and marine environments. Each chapter deals with the influence of interactions among individual organisms on diversity at a different organizational level or spatiotemporal scale.

Finally, in the fourth part, 'Case studies: patterns and hypotheses', the concepts developed in the earlier parts are applied to some of the major issues in biological diversity and some of the major ecosystems in which species diversity shows the most variability; topics treated include endemism and invasions, marine ecosystems, fire-influenced ecosystems, tropical rain forests, and some concluding comments on the economics of biological diversity.

The book starts from a very useful distinction between two hierarchical components (p. 3), i.e., number of functional types (guilds) and number of functionally analogous species within each functional type. Subsequently, it is stated that a functional classification is of more use for understanding the regulation of species diversity than a phylogenetic classification (p. 4). It is asserted (p. 9) that understanding biodiversity is not an attempt to find a single mechanism explaining all, but trying to find out when and where which of the mechanisms hypothesized prevails. Hence, it is concluded (p. 103) that the specific predictions of the theory of island biogeography is likely to apply only under a very limited set of (taxon-specific) circumstances where the theory's assumptions are valid. Any theory about species diversity only explains diversity patterns when the mechanisms on which it is based are the most important regulators of diversity. Conclusions like these should be starting points for discussing the phylogenetic approach in evaluating the various patterns. However, in this book pattern analyses from a phylogenetic point of view is almost completely neglected. There is neither a discussion of the merits of the ecological and the phylogenetic approaches nor of a possible integration. In this respect I regard it also an omission that in the chapter on assessing biological diversity no attention is paid to recently developed measures of biodiversity incorporating taxonomic dispersion.

The chapters on the (non-)equilibrium processes are to me the most difficult part of the book. I find especially the conclusions not clearly formulated and rather ambiguous (which might just reflect the state of the art). Huston argues that local heterogeneity in structure and resources contributes primarily to the number of different functional types in a community. The core regulating mechanism of species diversity is extinction (p. 104–105), which is less scale-dependent than positive processes that counterbalance it (i.e. migration and speciation). If competitive equilibrium occurs, it usually results in competitive exclusion and local extinction. It is especially invoked as an stochastic phenomenon operating at large spatial scales over long time periods. The non-equilibrium or dynamic equilibrium model applies to competitive interactions within a relative small patch of landscape (which is regarded a constellation of such patches) and describes it as a result of population fluctuations within that patch;

the maximum diversity being influenced by the pool of species present in the total landscape of the region. Huston devotes a very interesting discussion to the level of diversity and the relation between frequency/intensity of disturbance and rate of population growth and competitive displacement (p. 135, 231). The dynamic equilibrium again differs for different organisms, being correlated to, e.g., functional type (p. 152) and life-history (p. 147). The descriptive model is used throughout the book.

Huston pays quite some attention to endemism and invasions, and especially his discussion of the latter is of interest. Regarding endemism, he states that this is an ecological phenomenon (p. 341), which again neglects the historical component. It is a pity that this phenomenon is not incorporated in the discussion of biodiversity measures. Besides, I find the remark in the legend of Fig. 11.3 (p. 315) rather strange, i.e., "note orientation of ... mountainous regions is primarily north-south in boreal and temperate zones and primarily east-west in the tropics and subtropics." First, Africa is not included in the figure. And second, it can just as well (or even better) be argued that mountainous regions in the Americas are primarily north-south oriented and those in the Old World east-west.

The latitudinal gradients discussed (p. 16 ff.) pertain almost exclusively to the Northern Hemisphere, whereas N.I. Platnick (Patterns of Biodiversity. In: N. Eldridge (ed.), 1992, Systematics, ecology and the biodiversity crisis: 15–24) has discussed this bias by showing patterns for the Americas with highest species diversity in temperate South America. It is stated that the most dramatic and biologically important latitudinal diversity gradient is that of plant species. But fortunately quite some attention is paid to a comparison of tropical vegetations and extremely rich mediterranean areas like the Cape Province (p. 306 ff., 520–521).

Huston gives a thorough overview of quantitative data on the diversity of tropical rain forests. According to his model of disturbance/productivity maximum biodiversity is to be found in areas where both components are similar, i.e., both being low or high, but that the highest levels are to be found where the components both are low. This is mainly based on an analysis of the similarities between tropical and mediterranean areas. He further states that the high levels of species diversity and high rates of endemism in the tropics are not merely the result of long periods of time for the evolution and accumulation of species, but result from the low rates of competitive displacement that allow species to avoid extinction and to coexist for a long period of time. Also, the same environmental conditions (directly or indirectly affected by temperature and precipitation) that result in a low rate of competitive displacement and prolonged coexistence may also lead to high rates of speciation by reducing geneflow and dispersal, thus contributing to both the generation and the maintenance of high species diversity.

Much more can be said about this book, but your attention may be drawn already. I recommend it to everybody interested in biodiversity, even though in my view no real attempt has been made for a synthesis of actual and historical factors to explain present-day biological diversity.

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