Editorial

The subject of biological diversity is a highly complex one; its treatment must accordingly be comprehensive and varied. This volume does not aim at merely adding to the immensely grown and meanwhile apparently incalculable number of individual publications on "biodiversity", all the more since already many excellent articles and books have been published (see *e.g.* List of References Kratochwil in this volume). It is rather our objective to investigate biodiversity on the up to now little studied coenosis and landscape levels. Phytosociological and animal-ecological fields are considered, as well as theoretical approaches to biodiversity and aspects of its application in nature and landscape protection and preservation. Since biodiversity has so far been predominantly studied in the Anglo-American area, it seemed to be of value to discuss this complex topic from a Central and southern European viewpoint, based on data gathered in these regions, and to thus promote a global discussion.

The volume "Biodiversity in ecosystems: principles and case studies of different complexity levels" comprises twelve publications, divided into three chapters:
1) "Biodiversity: survey and principles"
2) "Fauna, flora, and vegetation in ecosystems: some aspects of biodiversity"
3) "Biodiversity and nature preservation"

In order to further develop scientific theories, it is first of all necessary to synoptically depict the structure of the theory with its individual principles, concepts, and hypotheses. This is done in chapter 1: "Biodiversity: survey and principles." A definition of the concept "biodiversity" and its ranges of validity are presented, as well as different forms of intra- and interbiocoenotic diversity. Special emphasis lies on the formulation of certain questions and hypotheses on biodiversity. It is not so much the authors' objective to work out generalities, but to compile - and, if possible, specify - general statements on biodiversity always recurring in the literature. While in A. Kratochwil's article 30 hypotheses on biodiversity are discussed, in most cases critically and including counter-hypotheses, M. Schaefer's contribution shows, at models and examples, the direct linkage of concrete results of a 15-year research project on Central European beech forest ecosystems to important hypotheses on biodiversity.

The major part of the articles is found in chapter 2: "Fauna, flora, and vegetation in ecosystems: some aspects of biodiversity." In this chapter, single case studies are presented, encompassing quite different ecological objects, spatial dimensions, and complexity degrees. G. and S. Pignatti's article deals with Mediterranean ecosystems and the spatial distribution of species diversity. Small-scale mapping of biodiversity will in future be especially important to find solutions to global biodiversity problems. One great challenge will be to depict the biodiversity of the earth's ecosystems within the framework of geographical information systems. The contribution demonstrates in an impressing manner coincidences of the plant species diversity in Italy with the macroclimate (temperature, precipitation etc.). The authors emphasize the importance of human impact on biodiversity, without which the species diversity in the Mediterranean area would be much lower, compared to the vegetation under natural conditions.

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Whereas G. and S. Pignatti's article focuses on a small-scale treatment of "biodiversity", A. Schwabe's work aims at its registration and analysis on a large scale. In this context, sigmasociology constitutes an especially valuable tool. By the recording and analysis of vegetation complexes, considering also microhabitats, landscape units are differentiated on a phytosociological basis. A landscape mosaic can thus be typified. Case studies have shown that the method is broadly applicable; also large areas can be precisely recorded and analyzed as to their phytocoenotic diversity. By determining different degrees of anthropogenic influence (hemeroby), the influence of man on biodiversity can be "measured". The applicability of this method is of special importance for Environmental Impact Assessments.

R. Pott's article on the pasture-woodlands in north-western Germany shows exemplarily that the great biodiversity in Central Europe is due to extensive management by man since the Neolithic Period. The diversity of different vegetation types with the biocoenoses they are composed of reflects a broad repertoire of varying historical management forms. A preservation of such natural and cultural landscapes presupposes comprehensive knowledge about their origin and development.

The article by V.K. Brown and A.C. Gange demonstrates at models that there is a direct causal connection between plant diversity and insect herbivory. A causal analysis of biodiversity therefore requires the study of biocoenoses. The development of a biocoenological structure in the course of succession is an interactive process, during which leaf-eating insects increase the plant diversity by altering the competitive situation and by creating microhabitats.

Similar to the contribution by Pignatti and Pignatti, H. Mattes chose a small-scale approach to assess biodiversity. In his article, he deals with the biogeography and the species diversity of bird communities of coniferous forests in Eurasia. Here, too, certain diversity centres have been found, which however cannot solely be explained by currently effective ecofactors. Fauna-historical aspects are the key to special diversity patterns.

The calculation of diversity indices is still a common procedure to compare the diversities of different localities or habitats. R. Schröpfer shows exemplarily the limitations of such procedures, *e.g.* for mammal communities, in which only few dominant species characterize the species community.

One basic question is whether deterministic or stochastic relations affect the degree of biodiversity at all. J.U. Ganzhorn demonstrates at the example of Malagasy lemurs that their diversity depends on the quality of vegetation, but also on certain historical influences on the lemur community. Thus always a wide range of different (in this case, as it can be proven, deterministic) relations has to be taken into account when analyzing a diversity pattern.

The third and final chapter is about biodiversity and nature preservation. W. Haber outlines fundamental aspects of the concept "biodiversity" and its study, and problems arising in this context. The author warns of false hopes: his critical article shows scientific, social, and political limitations. H. Haeupler's contribution demonstrates that, due to inadequate basic scientific knowledge, it is very difficult to develop pragmatic approaches to the - more and more pressing - issue of protection and preservation of biodiversity. The solution can only be an intensification of research, putting - as it is currently done - special emphasis on the level of population ecology, since here the lack of knowledge is considerable.

The volume concludes with a contribution of the Federal Agency for Nature Conservation (Institute for Biotope Protection and Landscape Ecology) by J. Blab, M. Klein, and A. Ssymank, presenting the scope within which measures can be taken, and the prospects for the future, from the point of view of a German federal authority. The authors show the linkage of basic scientific knowledge, objective and realization of a concept "biodiversity". Within Europe, the legal framework is provided by the habitat-directive of the European Union.

The treatment of each topical subject is important, independent of whether it consolidates known hypotheses and theories or alters a paradigm. Much more basic research is required for the development of a comprehensive and detailed "general theory of biodiversity." The danger, however, that the gulf between theory and practice is becoming too great, is increasing. Some current concepts, hypotheses, and theories take, as the examples of the "island theory" and the "metapopulation concept" show, the following course: First the relations are discussed by theorists, ingeniously and in great detail, usually defining the limitations and the prevailing conditions. Then the concepts developed are translated into practical measures (in this case of nature protection and preservation), and become paradigms; they are frequently misunderstood and overinterpreted. Often the theoretical generalizations in the field of applied nature protection and preservation are too imprecise, too superficial and too much simplified to allow predictions, and they can hardly be proved. Many concepts are raised to dogmata, without doing justice to the diversity of the ecological and historical conditions of biological systems. May this not apply to the "theory of biodiversity".

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