Schulze, E.-D. (ed.): **Carbon and Nitrogen Cycling in European Forest Ecosystems.** – Springer Verlag, Berlin – Heidelberg – New York 2000. ISBN 3-540-67025-4. 500 pp., CD ROM database under a separate cover. DM 98.33, GBP 34.00, USD 49.95.

The book under review presents results of two projects of the European Community: Nitrogen Physiology of Forest Plants and Soils (NIPHYS) and Carbon and Nitrogen Cycling in Forest Ecosystems (CANIF). Started in 1995, these ambitious investigations have been executed in experimental sites situated along a latitudinal transect across Europe, from Italy to Sweden, and lasted over a 5-year period. Compiled by 70 authors, the results are summarized in 21 chapters divided into five parts, and completed by a database digitalised in a CD-ROM and included in an envelope attached on the back cover.

Introductory Part A contains (*1*) "preliminary" assessment of the carbon and nitrogen cycles in forest, and proposed experimental design of the project, (*2*) outline of the major objectives of the project, and (*3*) description of experimental sites studied by the unified methodology and the same scientists – specialists for certain geochemical and physiological processes. As explained by the authors, this magnificent project was a response to the needs of two international documents – the Climate Convention, and the Kyoto Protocol – referring to air pollutions and fuel emissions, which should be equilibrated with biological sinks. It is expected, for example, that increased nitrogen deposition affects carbon cycle and results in different rates of mineralisation. Predictably, biogeochemical processes differ in various soil and forest types and over various climatic zones.

In view of the complexity of geochemical analyses and biological measurements, selection of a suitable set of study sites in Europe was a formidable task. The authors speak about a "continental transect", but the reviewer dares to express doubts about the ultimate choice of 12 sites whose affinity was identified mainly by macroclimatic values and air pollution loads. It appears that the sample plots differ by parent rocks (gneiss, limestone), a variety of soils and georelief (orientation, inclination), by structure of the stands (even-aged and single-dominant stands, composed of broad-leaved and/or needle-leaved trees), and by different management and history (natural/planted). In Part E, the authors admit this sampling trouble, but the inhomogeneity of the sites did not prevent them to produce some figures and iconic models which exaggerate the actual potential of their observations with regard to the European continent.

Part B contains seven separate chapters which analyse plant-related processes, such as tree growth and primary production, biomass, root growth, nutrient pools, nutrient concentrations in stands, nitrogen uptake in roots and mycorrhizas, uptake and utilisation of atmospheric pollutant nitrogen, and cycling of stable nitrogen, carbon, and sulphur. These physiological and biogeochemical processes require fairly sophisticated approach and, most of the data are unique and useful, particularly those which compare Norway Spruce (*Picea abies*) and European Beech (*Fagus europaea*). Understandably, some of the observations could not be undertaken in all 12 sample sites, but even then, many quantitative results gained under field conditions and in laboratory experiments represents a rich source of information. The reviewer, himself a root ecologist, appreciates the chapters describing root growth measurements (Chapter 5) and nitrogen uptake processes in roots (Chapter 6). The former study compares data obtained by soil coring, root windows, and in-growth cores. According to these investigations, the current levels of high nitrogen deposition did not lead to a significant decrease in root growth. With regard to the nitrogen uptake, the ectomycorrhizal systems of spruce and beech were not fundamentally different! The study into the canopy uptake and utilisation of atmospheric pollutant nitrogen estimates that between 16 and 42 % of the annual tree demand for nitrogen could be provided by canopy uptake of atmospheric pollutant nitrogen.

Heterotrophic processes are described in six chapters of Part C. Soil respiration fluxes were measured at four site and the presented data illustrate the both spatial and temporal variation in stands dominated by spruce or beech. These results are valuable, because soil respiration has several times been proposed as a suitable parameter for future "transcontinental" ecological projects. Chapter 12 on carbon mineralisation is another contribution towards the same goal: to obtain a rough estimate of annual carbon mineralisation in the field, laboratory measurements were extrapolated by means of sophisticated calculations. While reading Chapter 14 on soil nitrogen turnover in forest soils, the reviewer regrets that some older results of Central European soil microbiologists (D. Fehér, J. Seifert, V. Káš) could not been exploited as comparative data with the project under review.

In Part D, three chapters introduce into the book genuine biological aspects. One of these chapters tested the hypothesis that pollutant nitrogen deposition has contributed to reduction in forest's fungal diversity. The analysis of the authors is based both on carpophore occurrence and "ectomycorrhizal morphotypes" of the root tips. The found that at all studied sites 90 % of all root tips were ectomycorrhizal: on 6 908 root tips of the spruce, and on 8 171 root tips of the beech, 43 and 39 morphotypes were distinguished, respectively. The sensitivity of mycorrhizal fungi to exposure to mineral nitrogen was apparent in spruce, and less pronounced in beech.

Called "Integration", the final Part E also contains three chapters. One of the summarized long-term changes in one French and two Czech catchments receiving high loads of acid deposition. At all sites, sulphur input decreased linearly during the recent study period, while nitrogen input remained approximately stable. The last but one chapter is a deep analysis of carbon and nitrogen cycling in forests dominated by spruce and beech. An elaborated model called "nutrient cycling and competition" (NUCOM) has been applied in order to explore the ecosystem functioning, mainly the carbon and nitrogen interactions, and especially the feedback relations between tree growth, decomposition, and mineralisation processes. The last chapter pronounces important conclusions with regard to the role of biodiversity in the carbon and nitrogen cycles of the forest. The studies lead the authors to conclude that there are no major differences between tree species in ecosystem fluxes, however, significant differences occur at the process level, mainly those concerning the adaptation to the use of nitrate. Fungal, bacterial, and invertebrate communities profoundly vary in their impact on decomposition and mineralisation, however, "net biome productivity" (excluding woody mass) of "European forests" maintains and is estimated in the order of 0.2 Gta^{-1}, which is almost 20 % of the fossil consumption in European Community, and thus exceeds the 8 % reduction commitment declared by the Koyto Protocol.

Good occasional results! "Net scientific productivity" of NIPHYS and CANIF projects, however, is much greater – in spite of the above mentioned geographical constraints.

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