

## Tropical forest ecosystem dynamics

Long-term field work at Danum, Borneo (SE Asia), and Korup, Cameroon (Central Africa), over last 28 yr has taken a quantitative community-ecosystem approach to functioning of tropical rain forests. Only by having this continuous effort can even a start to understanding these complex species-rich natural woody systems be achieved. Vegetation is historically and environmentally contingent, and generally not in any state of measurable equilibrium. Manifold interacting causes, lead to manifold effects and responses in a highly intricate manner which are difficult to predict. The two sites, and their associated projects, have therefore formed, and continue to form, the core of this section's research in Bern. The research has, by its nature, an international and global perspective.

Over the last decade the focus has been on the following key topics (i) measuring the dynamics of tree communities in terms of species-specific mortality, growth and recruitment rates, (ii) investigating the importance of environmental stochasticity, in particular the role of drought perturbation, on ecosystem instability, and (iii) following whole tree growth, architectural and physiological processes (light and water relations), and modelling of tree-tree competitive interactions (Borneo); (iv) studying nutrient cycling in rain forests, particularly for phosphorus and potassium, and which also involves the ecology of ectomycorrhizas, (v) undertaking field experiments to investigate biotic agents (herbivores and pathogens) to determine their roles in recruitment of dominant tree species, and (vi) recording of tree phenology (especially mast fruiting) and linking this to climatic variability and soil resources (Africa).

These largely empirical approaches are underpinned by advanced statistical analysis and mathematical modelling. The work research is mainly basic and fundamental ecology, but there are several applied aspects (e.g. reforestation on phosphorus-poor soils, secondary succession after logging) which lead to sounder tropical forest conservation and management. A complementary direction within the section in recent years is in theoretical and philosophical analysis in ecology, efforts very much concerned with the implications of newer general insights coming directly from the field studies mentioned. Also, and within Switzerland, a project on the water relations and tree dynamics of oak stands in the Wallis has now been running for over 10 years: in this new attempts are being made to link mechanistic tree models to probabilistic ones predicting tree mortality.