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book review

Headwaters in the clouds

Tropical Montane Cloud Forests, by L. A. Bruijnzeel, F. N. Scatena & L. S. Hamilton (editors), 2011, Cambridge University Press, 768 pp. £65 (Hardback) ISBN: 9780521760355; <http://www.cambridge.org/>

Tropical Montane Cloud Forests (TMCFs) are gaining in scientific popularity since a first international symposium on this ecosystem was held in Puerto Rico in 1993. The promotion of the meeting by the UNESCO International Hydrological Programme illustrates a far-reaching effect of cloud forests: they act as water collectors for tropical forelands. TMCFs also harbour extraordinarily many plant species, contributing to outstanding positions in each of the five hottest spots of plant diversity.

Why edit yet another comprehensive opus on TMCFs, after several previous fundamental works, despite their encompassing under 0.15% of the global terrestrial surface? The answer is clear to those who know this biome: there hardly exists a more fascinating environment than exuberant, moss-covered cloud forests, often called elfin forests due to their mystical appearance. They form highly complex ecosystems, which on different continents show divergent biocœnoses because of their fragmentation and isolated position within distinct tropical mountains in the Neotropics and, to a lesser degree, in the Paleotropics, and in a few cases even on Pacific islands. This book deals with general features of TMCFs (12 chapters) and contains examples from Middle America (21), South America (19), Southeast Asia (10), Africa (5) and Oceania / Australia (5). Most contributions result from a conference in Hawaii in 2004. A first glance reveals a nearly complete thematic spectrum.

The book is subdivided into seven sections with a total of 72 chapters. The first part contains general features of TMCFs. Altitudinal distributions are presented in an introductory chapter, though integrative references to surrounding belts are missing. A useful GIS-based modelling approach provides instructive data on TMCF resources and losses including tables on their dimensions and distributions. Interestingly,

Indonesia and Congo rank first in national extent, with neotropical countries falling lower down. A climate chapter is based on a dataset of 477 weather stations in cloud forest sites. Many graphs present vast dot clouds of data from stations between 200 and 5,000 m asl, which raises the confusing suspicion that TMCFs occur in regions of extremely dissimilar climates. A short but informative chapter on changes in fog precipitation should have been part of a later section, as also applies to one on epiphytism. Comments on global and local soil variations, as well as on nutrient cycling and limitation in TMCFs, provide convincing and compact estimations. Coloured maps of TMCF distribution highlight their restricted extent and natural fragmentation on a global scale.

The subsequent and sadly brief section on regional aspects of floristic and faunistic diversity contains fascinating information from all TMCF-bearing continents. The range extends from research on epiphyte-diversity on solitary trees (up to 4,806 individuals of 114 vascular plant species on one single fig tree!) to potential and actual distribution patterns of the mountain tapir and Andean bear. The only point of criticism is that in a book on a biological realm this section could have been broader.

The third section on hydrometeorology covers a broad remit since fog, rain and their interception are decisive triggers for the formation of TMCFs. Several parts display the importance of potential evaporation and irradiation as driving forces for the variable character of forests. Additionally, the degrees of litter mineraliation and soil acidity become crucial causes of ecological peculiarities. The contributions vary from rather specialist methodical content (e.g. measuring interception, usage of stable isotopes for diagnoses of precipitation origins) to comments on the water

retention capacity of epiphytes. The tone of several chapters conveys the impression that TMCFs serve more as open-air laboratories for procedural techniques rather than as interesting ecosystems in their own right.

After a section on nutrient dynamics, physiological features such as water use and photosynthesis in TMCFs are addressed in the fifth section. Corresponding implications of forest conversions into pastureland and the resulting dramatic alterations in microclimate and soil hydrology once again highlight the unique physical properties of these dense and dark stands. The sixth section on climatic variability and change further illustrates effects caused by clear-cut for alternative land usage. The long-range implications of lowland land use change through vertical shifts in the condensation level, as well as responses of epiphyte formations to stand climate changes and their value as indicators, are stressed here too. Global warming has implications for increasing rates of fire with fatal consequences for TMCFs. An interesting aside, albeit barely related to the climate topic, is the last chapter on modelling regeneration dynamics and succession rates on abandoned land.

Chapters on cloud forest conservation, restoration, and management follow in the last section, including historical aspects of deforestation and regrowth, partly in the light of social background. Sustainability concepts and lessons for the future are demonstrated by specific case studies (e.g. epiphyte breeding, fire management). Two informative chapters are included on assessments needs and payments for the environmental services provided by TMCFs. A final contribution compiles the state of knowledge and a pathway towards sustainability. This broad outlook groups core issues into five strategic themes: ecosystem function, climate change, nature conservation, ecosystem management (and restoration), and species management. A tabular appendix including data on around 50 TMCF sites appears isolated and out of place.

Two thirds of the authors are employed in institutions of extratropical countries, which illustrates a major problem in TMCF preservation: expert knowledge on functions, values and protective measures for this endangered ecosystem is concentrated in Europe and the USA rather than in the countries concerned. The deepening of specific insights provided by the book might contribute to an improved transfer of knowledge through scientific cooperation.

Despite the efforts of the editors to create an integrated opus it suffers from the patchwork character of symposium volumes, with contributions of varying quality. Sporadically overlong tables or figures of similar content consume much space. Several topics are missing, such as geomorphologic processes or impacts of ecological disturbance regimes. Also absent are general descriptions of typical growth forms and leaf features. Nevertheless, the attractively designed book offers a presentation of copious themes and a vast collection of references, and thus should be considered an important source for experts to enlarge their knowledge of TMCF ecosystems.

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