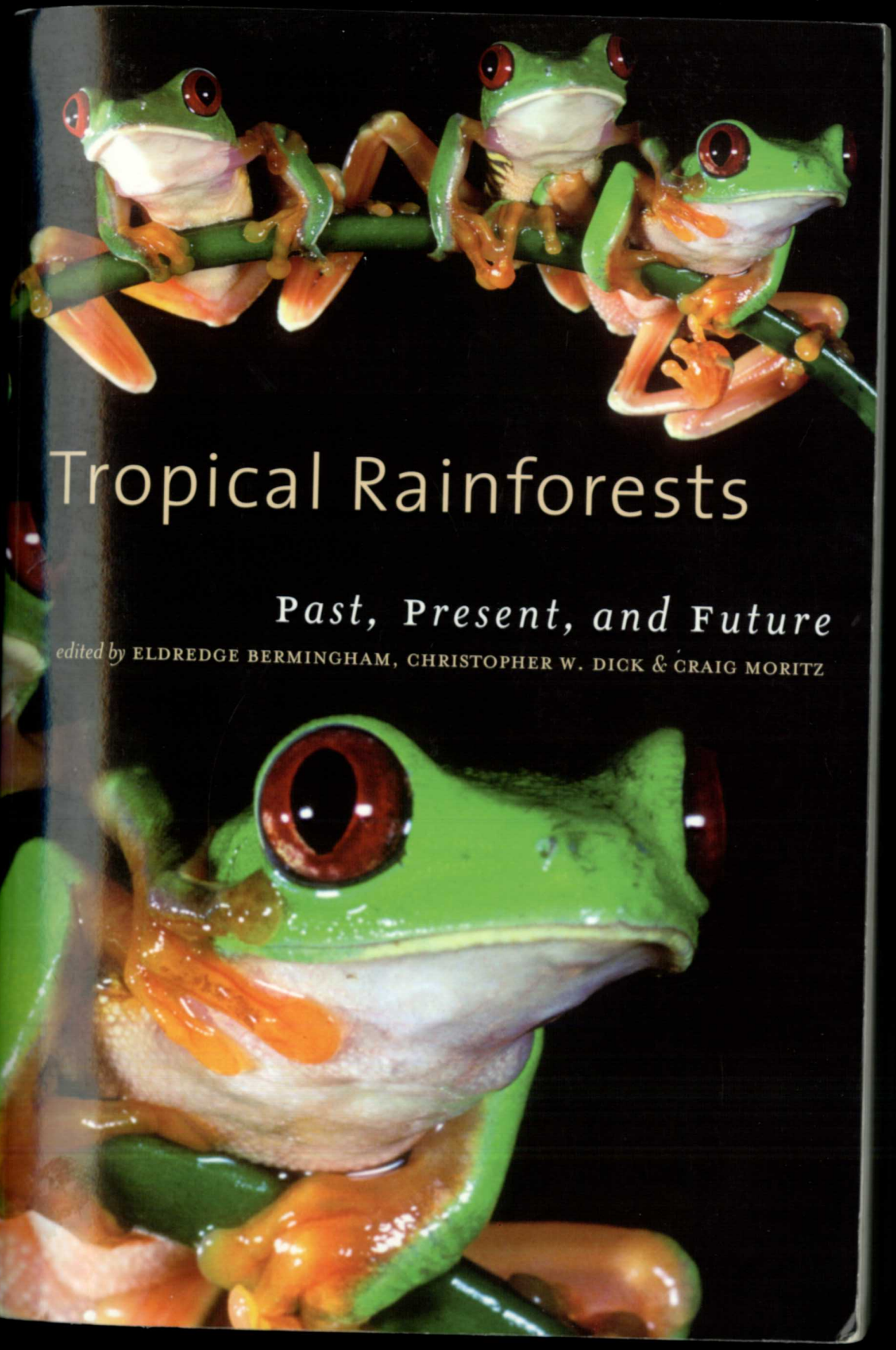

Tropical Rainforests

Past, Present, and Future

edited by ELDREDGE BERMINGHAM, CHRISTOPHER W. DICK & CRAIG MORITZ

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Overview: Processes, People, and Prospects for Tropical Rainforests

CRAIG MORITZ, CHRISTOPHER W. DICK, AND ELDREDGE BERMINGHAM

The real future of tropical biology lies in whether, within our generation, the academic, social and commercial sectors can collaboratively preserve even small portions of tropical wildlands to be studied and used for understanding, material gain, and for intellectual development of the society in which the wildland is embedded.

—D. H. Janzen (1986, 305)

If a tree falls in the forest and there's no biologist there to hear it, it definitely doesn't make a sound.

—Doug Daly (New York Times, *May 7, 2002)*

From the fossil reconstruction of rainforest history to the unified theory of biodiversity and biogeography, our enthusiasm for understanding the origins and evolution of tropical rainforests is tempered by the fact that these forests are quickly disappearing. Because of human pressures, tropical forests may be experiencing the greatest challenge to their ecological resilience since the Cretaceous/Tertiary boundary (65 MYA), when the impact of a meteor decimated most tropical forests (Vajda, Raine, and Hollis 2001) and disrupted important plant-insect interactions for several million years (Labandeira, Johnson, and Wilf 2002). The tropical deforestation crisis has nearly run its course in several parts of the world, such as Indonesia (MacKinnon, chap. 27 in this volume) and the Atlantic forests of Brazil. Any biologist who has contemplated the future of tropical rainforests must be deeply concerned, and this concern has led, quite naturally, to an increasing effort to link the results of basic research to conservation.

EVOLUTIONARY PROCESSES AND CONSERVATION PLANNING

Biologists play a key role in determining which lineages and geographic regions need to be conserved, and how (Margules and Pressey 2000). A clearer understanding of evolutionary and ecological processes is essential if we are to develop strategies for conserving rainforests as the dynamic systems that they clearly are. The challenge is to integrate knowledge of pattern and process while developing efficient taxonomic and spatial surrogates for each (Cowling and Pressey 2001; Ferrier 2002). For many systems, our sampling of species diversity, particularly patterns of geographic turnover, is simply too limited to develop conservation plans with any confidence that designated areas will truly capture overall diversity or the ecological dynamics that maintain it (e.g., Patton and da Silva, chap. 7, and Ruokolainen, Tuomisto, and Kalliola, chap. 13 in this volume). Understanding of the biogeographic, paleoecological, and evolutionary history of rainforest areas should improve our capacity to predict spatial patterns of diversity and complementarity from available taxonomic and environmental data (Moritz et al. 2001).

Moritz and McDonald (chap. 26) develop a process-oriented approach to conservation, with particular reference to rainforest vertebrates of the Australian Wet Tropics. In the Wet Tropics and elsewhere (e.g., Patton and da Silva, chap. 7 in this volume), vicariant processes, often combined with local extinction and range expansion (Schneider and Williams, chap. 20 in this volume), have shaped both species and genetic diversity, so representation of the vicariant areas in a reserve network should protect both levels of diversity. However, to protect the evolutionary processes that promote phenotypic diversity, and potentially form new species, it is also crucial to include environmental gradients, such as rainforest-savanna ecotones (Smith et al., chap. 9 in this volume) and altitudinal gradients (Fjeldså et al., chap. 8 in this volume), within designated conservation areas. These latter areas are frequently under greater human pressure than large areas of intact rainforest and are likely to be underrepresented if efforts are focused exclusively on rainforests.

THE PROBLEM IS PEOPLE!

While biologists have the key role of defining the fundamental principles and requirements of an efficient conservation system, the larger challenge is to mesh this information with the political and socioeconomic forces that threaten biological diversity. MacKinnon (chapter 27) and Laurance (chapter 28) provide

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dispatches on the environmental threats facing Southeast Asia and the Amazon basin, respectively, the world's principal repositories of the species richness that is emblematic of tropical rainforests worldwide. In both cases there is substantial international investment in conservation, often targeted at capacity building and economic returns to local communities, but these efforts are swamped by larger-scale national development priorities, poorly regulated international trade, and, frankly, rampant corruption. This situation stands in stark contrast to the Australian Wet Tropics (Stork, chap. 24 in this volume), where there is agreement at national, state, and local government levels on maintaining biological diversity for both intrinsic and instrumental (e.g., ecosystem services, ecotourism) values, though even here there can be conflict with infrastructure and agricultural development. It follows that the recent trends toward increased logging, burning, and clearing of rainforest, as described for Indonesia and Brazilian Amazonia, are as much political as economic.

So how can biologists, immersed in their pursuit of knowledge of ecological and evolutionary processes, help to find solutions? Effective communication of research results, beyond the confines of traditional scientific publication, is one route. The reaction of the Brazilian media to the dire prognosis for the Amazon under current development plans (Laurance, Cochrane et al. 2001; Lawrence, chap. 28 in this volume) prompted an increase in funding from the Brazilian government for environmental impact assessments. Another route is to contribute to local understanding of the immediacy and scale of the issues, via data repatriation, training, and effective interpretation of research (e.g., Faith et al. 2001). One of the only rays of hope contained in MacKinnon's assessment of the Indonesian situation related to direct action taken by local communities in Papua. When it comes to the implementation of well-conceived, science-based strategies on the ground, we have a lot to learn.