

biologists is to separate the normative aspect of their work (preventing extinction and conserving diversity) from the objective aspect (conducting good science)." And yet, despite numerous studies over many decades, science may not be enough to prevent the extinction of the vaquita. Here the authors remind us that "we [scientists] are just another group of stakeholders engaged in a societal dialogue about the value of this species and the costs and benefits associated with its conservation," a humbling conclusion to a very thoughtful treatise.

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Tropical rain forest ecology

Ghazoul, Jaboury, and Douglas Sheil. 2010. **Tropical rain forest ecology, diversity, and conservation.** Oxford University Press, New York. xvi + 516 p. \$125.00 (cloth), ISBN: 978-0-19-928587-7 (acid-free paper); \$65.00 (paper), ISBN: 978-0-19-928588-4 (acid-free paper).

Key words: biodiversity; conservation biology; rain forest; tropical biology; tropical forest.

Whether or not the ecological and evolutionary processes that govern tropical wet forests are special, i.e., different or distinct from natural processes that cause spatial and temporal patterns in other types of ecosystems, the practice of tropical biology is necessarily unique. As most fifth graders in developed countries now know, wet tropical forests harbor our planet's most species-rich communities of organisms. Even if the natural processes themselves are not unusual, they have somehow uniquely produced the highest levels of diversity on Earth. This biological richness (a.k.a. biodiversity)—as well as abundant anthropogenic assaults on it—help shape the special character of tropical biology.

Ghazoul and Sheil have provided us with an introductory textbook that recognizes this special character of tropical biology, with a specific focus on wet forest ecology and conservation. The focus is justified, since "tropical forests remain large, diverse, and hard to access, whereas most species within them are small, rare, and localized." Interest in tropical diversity and concern for its loss has spurred a proliferation of college-level courses (both on campuses and in the field) that examine tropical forests and their plight, including the high-profile field courses offered by the Organization for Tropical Studies (a non-profit consortium of 63 universities and research institutions; <http://www.ots.ac.cr>). *Tropical rain forest ecology, diversity, and conservation* is just the book that the students who take these courses need.

The book contains 405 pages of clearly written text divided among 18 chapters, a useful 16-page glossary, and an extensive set of well-chosen references (>2000) with complete citations. The chapters are grouped into three sections concerning: (1) tropical organisms and their natural history; (2) patterns and processes (mostly ecological, but also evolutionary and physiological) at a variety of spatio-temporal scales; and (3) the roles that humans play in tropical forest ecology and conservation.

Section 1 ("The natural heritage") surveys the fascinating (and often bewildering) taxonomic and functional biodiversity of wet tropical forests. The coverage is pan-tropical, with key examples from each of the major regions. Separate chapters are devoted to plants, fungi and microbes, vertebrates, and invertebrates. Readers are likely to find the treatment a bit cursory for their own favorite groups of organisms, but true to the book's objective, this section provides sufficient targeted details from tropical natural history lore and the primary literature to create a grand overview of tropical biodiversity.

Tropical biology (like science in general) is not just a body of facts, but a process of informed discovery. The book exposes readers to the excitement of this process right from the beginning. For example, we learn that 40 species of primates have been recognized as new to science since 1980. In a prophetic illustration of tropical diversity and the opportunities that remain for budding tropical biologists, Ghazoul and Sheil predicted that "it is likely that this figure will be out of date by the time this book is in print." Soon thereafter (in December 2010) news broke of the confirmation of a species of lemur new to science (http://news.mongabay.com/2010/1215-new_lemur_photo.html).

Section 2 ("Origins, patterns, and processes") accounts for about half of the book's text and is the most synthetic and thought-provoking section of the book. Pointing out that "there is no single tropical rain forest," this section explores patterns and underlying processes among tropical wet forests across multiple temporal and spatial scales. The synthesis draws from a large—albeit selected—volume of tropical literature to help readers become conversant in the main themes of tropical forest ecology. Readers are introduced to hypotheses and evidence concerning such topics as the origins of wet tropical forests and high levels of species diversity, the nature and consequences of species interactions, and the strategies plants employ "to live, grow, and reproduce in an environment where many other individuals of many other species are trying to do the same."

Just as no organism can be the master of all trades, no textbook can be everything to everyone. Even so, I think the authors used good judgment in selecting the concepts, hypotheses, and examples they cover. Following treatments of the origins and biogeography of tropical wet forest biota, the focus narrows onto the organisms that account for most of the physical structure and biomass: trees. Chapters concerning their eco-physiology and community dynamics (including interactions with herbivores, pollinators, seed dispersers) are partic-

ularly good, whereas the chapter on ecosystem processes is a bit too brief for its scope.

Section 3 (“Our future legacy”) examines the human connection to wet tropical forests. This final section accurately portrays the history and contemporary nature of human interactions with tropical wet forests, without taking on a pessimistic tone. These human dimensions are not simply mentioned in passing; nearly a quarter of the book is devoted to them.

Abundant geographic comparisons and contrasts make the book especially informative and broadly appealing. The geographically comparative content will help readers relate various organism-, population-, and community-level patterns and processes to the contexts of their own experiences, whether they are temperate-zone undergraduates and early-stage graduate students anticipating first visits to the tropics (or upon returning home) or students who have grown up in tropical countries. I am also glad to have a copy on my bookshelf, since it provides points of departure and a handy set of references to guide further, more in-depth inquiry.

I enjoyed perusing the many text boxes, summary tables, and well-chosen figures and photos. Even so, I think more should have been included. For example, in this type of introductory book, line drawings to illustrate key features of focal taxa or simple figures to illustrate conceptual models can be effectively employed.

I noticed few mistakes, either typographical (e.g., “tropical” [instead of “tropical”], Plate 10) or factual (e.g., “touracos in the Neotropics” [they are African birds]). However, the

presentation and punctuation style concerning scientific names in much of the book is unusual. A species’ common name is often followed by its appropriately italicized Latin binomial, but without punctuation between the common and Latin names. In addition, there are several cases in which two family names are listed side-by-side for a given species of plant without an explanation that these represent former and current classifications (e.g., “Sterculiaceae Malvaceae”).

From their dedication page I infer that Ghazoul and Sheil are hopeful that there is enough “curiosity [about] and concern for tropical forests and their peoples” that their book will remain relevant for years to come. At the very least they have demonstrated that “we know enough to show why it is important that we should know more.” Their book provides a useful introduction to those who might take up the challenge.

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Conserving our environmental future

Kareiva, Peter, and Michelle Marvier. 2011. **Conservation science: balancing the needs of people and nature**. Roberts and Company, Greenwood Village, Colorado. xxix + 543 p. \$90.00, ISBN: 978-1-936221-06-6.

Key words: conservation science; environment; natural resources; policy; society.

Environmental conservation is the practice of managing humans and nature collectively and sustainably. The science of such conservation includes natural (e.g., biology, chemistry, geosciences), social and behavioral (e.g., anthropology, economics, political, communication), applied (e.g., engineering), and formal (e.g., computer, statistics) sciences that are often autonomous, even when applied to solving problems. But the complexity of conservation demands trans-disciplinarity, and our ability to grasp and synthesize across these sciences, and then implement solutions to environmental problems, is key to a reasonably satisfying future.

In this text, the authors intend to help teach undergraduates and beginning graduate students “the scientific foundations of conservation while highlighting strategies to better connect its practice with the needs and priorities of a growing human population.” The recognized balance between the needs of people and nature, as holistic and common-sense as it seems, is a much-needed and practical teaching approach essential to environmental literacy. Here,

the authors present the case for why conservation is needed; the policies, protection strategies, and plans for conservation of landscapes; the factual basis of the science used to guide policies and practices; and examples of natural systems in which conservation science has been, is being, and needs to be applied. As a result, the book is a comprehensive, entertaining, and thoughtful overview of how humans affect the world we live in, and how we think and know about environmental processes. The authors present reasoned and provocative discussion of the challenges we face while traveling the difficult road that lies ahead, and the book is thus an imperative read.

More particularly, the first section of the book tells us why humans are a dominant ecological force in the world and explores the consequences of this dominance, including species extinction, habitat loss, climate change, and introduction of exotic species. The road to species extinction is more carefully described, using genetic insights, comparative extinction rates, the idea of functional extinction, and biodiversity protection. The exploration of the topic of ecosystem services puts into perspective the degree to which we rely on functional ecosystems and the environment, and is an essential economic perspective.

The second section begins by relating the past and recent history of conservation policy as related to biodiversity loss and ecosystem degradation, and emphasizes an international perspective. Protected lands, whether governmental or private, are then investigated, with emphases on trends and methods. The creation of conservation plans with geographic perspec-