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IN THIS ISSUE

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The Frontiers of India's Biological Diversity

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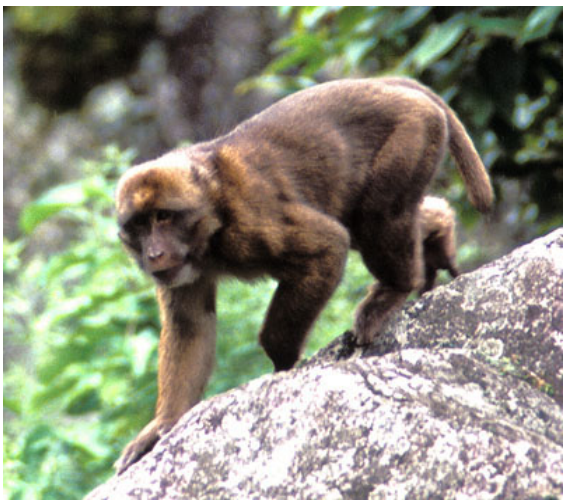
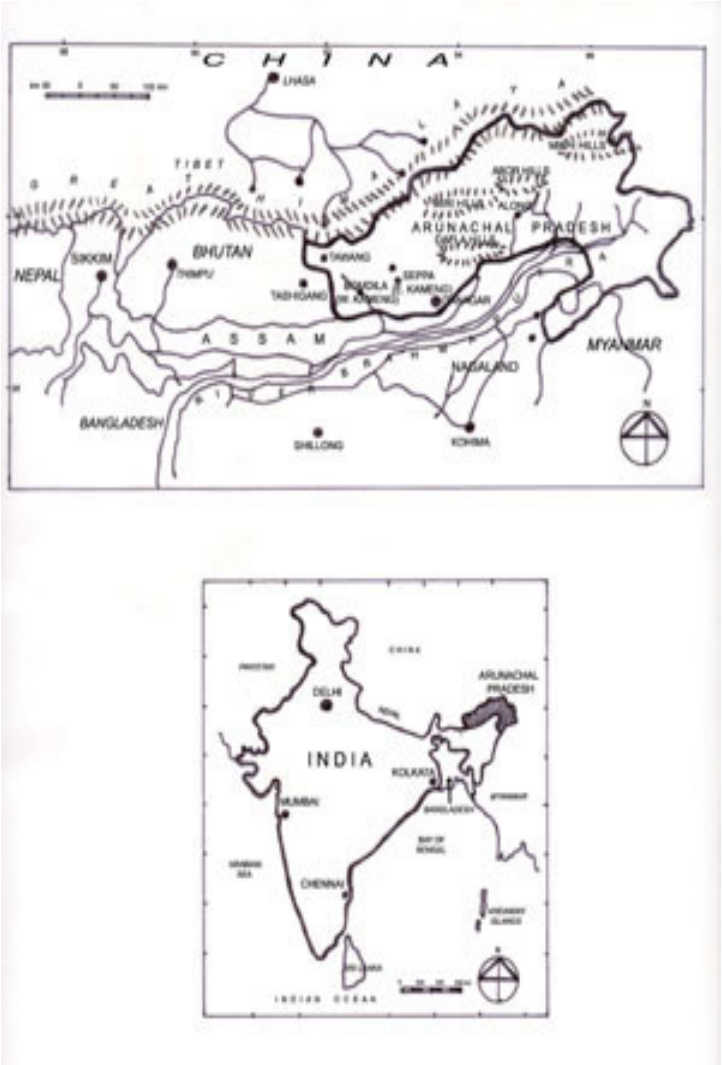
India has a long and rich history of tropical science. But here, as elsewhere in the tropical world, there are surprises to be discovered. One thinks immediately of the description, in December 2004, of a new species of macaque from India – the Arunachal macaque *Macaca munzala*. I use the word description deliberately, because this species was long known to the local people, and the species name rightly reflects this knowledge. *Mun zala* means "deep-forest monkey" in the language of the Dirang Monpa people of Tawang and West Kameng Districts of Arunachal Pradesh, where this species lives. The new macaque was discovered by science during field trips to these areas by Indian scientists from the Nature Conservation Foundation in Mysore, the National Institute of Advanced Studies in Bangalore, the Wildlife Conservation Society in New York, and the International Snow Leopard Trust. In this habitat, the largely Buddhist local community abstains from killing wildlife for food or sport, although the monkey has been reportedly shot for crop raiding. This species, one of the world's highest-living primate species, lives at altitudes between 1,600 and 3,500m, and is thus a veritable yeti.

Macaca munzala has an unusual pale yellow patch on a dark crown and is quite distinctive. Is this discovery of a new monkey species in India within Arunachal Pradesh surprising? Not really, because Indian scientists know that Arunachal Pradesh is one of the last frontiers of biological diversity in India. Following the discovery of this macaque, some of the same team members also reported the occurrence of the Tibetan macaque *Macaca thibetana* in Arunachal Pradesh in the 10 May, 2005 issue of *Current Science* (Kumar et al. 2005). The Tibetan macaque is also a high altitude species, and the new macaque species *M. munzala* probably occurs sympatrically with the Assamese macaque *M. assamensis* and *M. thibetana* through parts of its range. Apparently the Monpa people of Tawang district report the presence of four macaques in this region (Kumar et al. 2005); these authors believe that the *lung pra* ('warm-area monkey') is the Assamese macaque found in the lower elevations, the *na pra* ('forest monkey') is the Arunachal macaque or *M. munzala*, and the *bar pra* ('mid-elevation monkey') probably represents hybrid forms. It is possible that the fourth macaque, the *la pra* ('mountain-pass monkey') may represent previously unrecorded troops of the Tibetan macaque in high-altitude areas of the district. Recent expeditions into Arunachal Pradesh by the Indian partners of the Wildlife Conservation Society and the Nature Conservation Foundation have also reported the leaf deer *Muntiacus putaoensis*, the black barking deer *Muntiacus*



The Arunachal macaque, *Macaca munzala*. Photo by M.D. Madhusudan.

crinifrons, and the Chinese goral *Nemorhaedus caudatus* (an animal related to the goat), all species that were previously unknown from India (Datta et al. 2003), although they were known either from neighbouring Myanmar or China.



Map of India with enlarged inset showing Arunachal Pradesh. Not to scale. Map courtesy of Ulhas Rane and Avinash Sawant.

Why has the biological diversity of Arunachal Pradesh been so poorly documented? Most of the earlier faunal surveys seem to have been conducted in lower altitude lowland and mid-elevation forests, while the higher altitudes in the Himalayas seem to have been largely unexplored. This is a consequence of rugged terrain, lack of infrastructure such as roads, and a long history of isolation as a result of political factors. Arunachal Pradesh shares borders mostly with the Tibet Autonomous Region of China, and also with Bhutan and Myanmar (see map), and the proximity of these international borders has also contributed to the difficulty of access. This lack of easy access due to geopolitical reasons has been an important factor in Arunachal Pradesh's splendid — or not so splendid —- isolation, depending on one's perspective. This beautiful Indian State (whose name roughly translates into "the land of the rising sun") also has the lowest human population density within India, with only between 10-13 people per km^2. The low human population, which mostly consists of various tribal groups and ethnic minorities, has also helped the survival of large relatively undisturbed tracts of forests, although this is likely to change with increasing pressures in the future.

The last decade of the previous century and the first decade of this century have been marked by the discovery of several new large mammals in Asia. Several of these were found in Vietnam and in Myanmar, a pointer to the fact that the biological diversity of countries facing war or political unrest often remains undocumented by scientists although these species are usually familiar to locals. Such species include the Truong Son muntjac, named *Muntiacus truongsonensis* for the Truong Son range of mountains in Vietnam and first found in 1997; the saola or Vu Quang ox discovered in 1992 and named *Pseudoryx nghetinhensis* for the two Vietnamese provinces Nghe An and Ha Tinh; the giant muntjac discovered in 1994, and named *Megamuntiacus vuquangensis* for the Vu Quang Nature Reserve in Vietnam; and the Tainguen civet, *Viverra tainguensis*, discovered in 1996 and named for the Tainguen Plateau in Vietnam. The leaf muntjac *Muntiacus putaoensis* was first found in 1997 near the town of Putao in Myanmar and five years later it was also found in India in Arunachal Pradesh (Datta et al. 2003). It is also clear that regions such as the north-east of India, including Arunachal Pradesh, which are at the junction of major biogeographic realms such as the Indo-Malayan, and Palaearctic, and at a more regional level, the Indo-Chinese, are bound to harbour an enhanced faunal and floral diversity. Such areas are justifiably included within the list of global hotspots and world heritage sites for the preservation of biological diversity (Myers et al. 2000).

Are there other frontiers in Indian biodiversity? Surely everywhere one looks, new species will be discovered, especially among micro-fauna such as insects. This is to be expected since tropical areas are yet to be completely explored. However, there are several types of frontiers of biological diversity that one may expect to advance only with special efforts and not just with intensive random sampling. One type of frontier has been illustrated above and consists of the systematic investigation of geographically remote areas that have had limited visits from scientists whose principal agenda has been specific faunal and floral surveys. The other type of frontier that can yield species that cannot usually be discovered by normal methods of faunal surveys is one in which species are linked by close symbiotic association in the form of mutualism or parasitism, and can thus only be found in a specific investigation of host species. I will use one example to illustrate this point. The basal legume *Humboldtia brunonis* (Fabaceae; tribe Detarieae) (see picture of flowers and leaves) inhabiting the Western Ghats of India has African affinities and is a storehouse of biological diversity. This understorey tree is a transitional ant-plant that is highly unusual in that it is polymorphic for the presence of domatia – swollen hollow internodes that house ants. Even more interestingly, these domatia not only harbor ants but a diverse microfauna that includes earthworms, centipedes, scorpions, beetles, bees, and roaches besides other groups (Rickson et al. 2003, Gaume et al. 2005a,b). At least two

***Humboldtia brunonis* flowers. Photo: Laurence Gaume.**

new invertebrate species have been discovered in this microfauna, one of which is certainly restricted to the genus *Humboldtia*. The tiny ant *Vombisidris humboldticola* (Zacharias and Rajan 2004) has only been found associated with *Humboldtia* and lives solely within its domatia; furthermore, being timid and small it does not contribute to the protection of the plant. The parasitic allodapine bee *Braunsapis bislensis* (Michener et al 2003), found so far only within the domatia of *Humboldtia brunonis* in the beautiful forest of Bisle in Hassan District in Karnataka, south India, is a cuckoo-bee in that it lives within the broods of other *Braunsapis* species. There, it feeds on either eggs or larvae of its host bee or steals pollen from incoming host worker bees. It is probably safe to say that these two new species would not be found in normal random sampling of arthropod diversity.

Leaves of *Humboldtia brunonis*. Photo: Laurance Gaume.

There are thus many frontiers of biological diversity in India that can be advanced only with directed, purposive investigations. Such studies are more meaningful especially when the role of the new species in community interactions is demonstrated. There are yetis yet, waiting to be discovered.

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Natural History of Hong Kong

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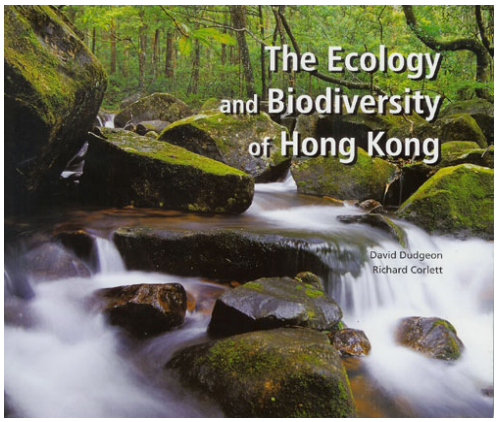
A review of D. Dudgeon and R. Corlett. 2002. ***The Ecology and Biodiversity of Hong Kong.*** Friends of the Country Parks, Joint Publishing (HK) Company Ltd., Hong Kong. 336 pp with color photographs. ISBN 962-04-2388-7. HK$ 150.00 + 170 references

For a book writer, it is always a challenge to make the writing scientifically accurate, while at the same time making the book readable and enjoyable. I think Drs. Dudgeon and Corlett in their recently published book "The Ecology and Biodiversity of Hong Kong" have successfully reached this goal.

Hong Kong consists of 1100 km^2 of coastal southern China and adjacent islands, near the northern margins of the Asian tropics. The book provides a comprehensive review of research findings on the ecology and biodiversity of this area. Most of the results presented are from the authors' own research findings as well as from their colleagues and many graduate students from the Department of Ecology and Biodiversity at the University of Hong Kong. The contents cover a very wide range of topics, from terrestrial communities to fresh water systems, from the ecological context to an evolutionary perspective. It surely provides a rather fundamental and accurate understanding of the natural history of Hong Kong. This knowledge would be relevant to both educational and conservation activities. Much of the information could also be useful for biogeographical comparisons with other parts of the world.

The book starts with a brief overview of general ecological concepts, followed by the environmental, historical and biogeographical background. A long history of human occupation and a current population of over 7 million makes Hong Kong a case study of human impacts. The book then moves to community dynamics and a description of the major ecological functional groups, such as herbivores, pollinators, seed dispersers and predators. In the last three chapters, it provides an overview of the biodiversity of Hong Kong, highlighting the importance, problems and urgency of conservation. As the authors state at the end of the book, "The time for passive observation is past. Saving what we have and restoring what we have lost will require more than knowledge: it will also require action." For educational purposes, it includes a glossary of the technical terms which may not be familiar to non-specialists and also a comprehensive list of literature sources for each chapter for people who wish to know more about the ecology of Hong Kong.

A major selling point for this book, both in the English version and the Chinese translation published at the same time, is the inclusion of more than 200 attractive and informative color photographs. The photos provide a very good view of the beauty and diversity of biological organisms as well as their habitats in Kong Hong. The book is very beautifully written. When reading the book, you may have a feeling just like drinking a fine Chinese tea, or listening to beautiful music, or just walking up along a lovely stream in a forested valley on Hong Kong island.



BOOK REVIEWS

SEED FUTURES

by
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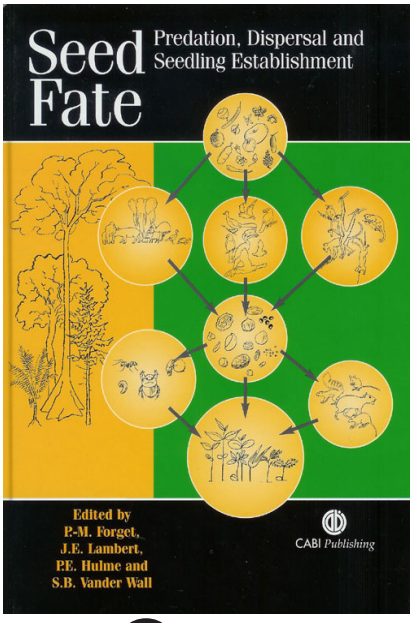
A review of Pierre-Michel Forget, Joanna E. Lambert, Philip E. Hulme and Stephen B. Vander Wall, eds. 2005. ***Seed fate: predation, dispersal and seedling establishment.*** CABI Publishing, Wallingford, UK. ISBN 0-85199-806-2. Hardcover, xv + 410 pp. $140.00 (cloth)

Modern studies of interactions between fruits and frugivores and the dispersal of seeds in tropical forests began in the 1970s, and progress in the field has been periodically summarized in a series of edited volumes from international symposia (Estrada and Fleming 1986; Fleming and Estrada 1993; Levey et al. 2002). By the mid-80s, it was known that seed dispersal, and more importantly, seed fate was a complex process involving not only ostensibly mutualistic frugivorous vertebrates that provided primary seed dispersal, but also invertebrate secondary seed dispersers such as ants, dung beetles, and a plethora of invertebrate and vertebrate seed predators. But understanding the fate of seeds after primary dispersal didn't gain much momentum until the 1990s and then only for seeds that are large enough to be tagged or tracked. Nonetheless, we now know a substantial amount about the fate of (large) seeds and how primary and secondary seed dispersal and seed predation interact to help determine patterns of seedling recruitment in a variety of temperate and tropical ecosystems.

Much of our current understanding of these processes is summarized in this book, which began with a symposium at the 2002 ATBC meeting but has been expanded to include a more global coverage of the subject. The book's objectives are to evaluate recent data on seed fate in diverse geographical regions at a variety of spatial scales both in ecological and evolutionary time, and to evaluate the impact of a variety of animal taxa, from small invertebrates to medium- and large-bodied mammals, on seed fate. The 23 chapters are written by 48 authors from around the world. After an introductory chapter by the 4 editors, discussing seed fate pathways, the book contains 3 main sections: seed predation (6 chapters), primary seed dispersal (10 chapters), and secondary seed dispersal (6 chapters). Beyond the introductory chapter, 12 chapters are broad literature reviews, 8 are case studies of particular systems, and 2 are methods papers. Twelve chapters are tropical in focus, and 10 deal with temperate habitats. The book concludes with a 15-page index.



Overall, this is a well-edited book that contains an attractive mix of well-written reviews and data-rich case studies. In my estimation, only one chapter is of substantially lower quality in terms of writing and editing. While many of the case studies will be of interest to limited subsets of readers, most of the review chapters have lasting value and will likely serve as important springboards for new research. Although the book contains excellent reviews of temperate dispersal and predation studies, I will focus on tropically oriented chapters in the rest of this review.

In the section on seed predation, Dalling reviews the fate of seed banks of shade-intolerant plants in moist tropical forests. He indicates that seed size profoundly affects the fate of buried seeds, with small seeds (< 2 mg in mass) suffering from low germination rates when buried more than 5 mm deep and elevated dessication rates when buried less than 5 mm deep. Despite these mortality risks, small seeds can sometimes persist in the soil for a few months to several decades. How they avoid predation by earthworms and fungi is poorly understood. Beck presents a thorough literature survey of the effects of peccaries on neotropical seeds. Although they kill substantial numbers of seeds and seedlings and can sometimes limit plant recruitment, these medium-sized mammals are also effective seed dispersers, especially of small seeds that they ingest and carry long distances. They also create good germination sites with their wallowing behavior. Other ecological effects of these gregarious, wide-ranging mammals include predation on insects whose larvae develop in large seeds and exploitation competition with other terrestrial vertebrate frugivores. Finally, Dennis et al. summarize the results of their extensive studies of seed dispersal and predation in fragmented Australian tropical forests by classifying plants into 3 groups. Group 1 contains plants whose seeds are always eaten/cached and never dispersed by frugivores (classic 'nuts'); group 2 contains plants whose seeds are eaten by predators but that are also dispersed by several species of frugivores; and group 3 contains plants whose seeds are not eaten by predators and are only dispersed by frugivores. Their research shows that group 2 plants are most likely to suffer reduced recruitment in a fragmented landscape that filters out certain frugivores (e.g. cassowaries) but not granivores (e.g., rodents).

In the section on primary seed dispersal, Lambert and Chapman thoroughly review the fate of primate-dispersed seeds, noting interesting New World-Old World differences in how fruit-eating primates deal with seeds. New World cebids usually ingest seeds whereas Old World cercopithecines often spit them out. Although spit seeds are generally dispersed shorter distances than ingested and defected seeds, high variation in rates of seed predation by rodents around and away from fruiting plants makes it difficult to predict the effect that loss of primates from tropical forests will have on plant recruitment and future forest structure. Most of the other reviews in this section deal with temperate birds and mammals that scatter-hoard seeds and thus act as both seed predators and dispersers. In a purely conceptual chapter, Theimer explores scatter-hoarding rodents as conditional mutualists. His thesis is that these rodents (e.g., tropical agoutis and temperate tree squirrels) are conditional mutualists in a relationship that depends on two ratios: (i) seeds to seed hoarders and (ii) recruitment of unhoarded seeds to hoarded seeds. He points out that although there are exceptions, more seeds are usually cached than eaten in years of large seed crops. Based on this, he develops a graphical model to illustrate potential mutualistic and antagonistic effects of scatterhoarders as functions of seed crop size compared with the fate of seeds in the absence of scatterhoarding. The model predicts that rodents will tend to be seed predators at low seed crop sizes and seed dispersers as crop size increases (up to a saturation point). It also predicts that forest fragmentation will affect seed: seed hoarder ratios and change the impact of seed hoarders from mutualists (in large fragments) to antagonists (in small fragments).

In the section on secondary seed dispersal, Vander Wall and Longland provide an excellent discussion of the evolution of two-phase seed dispersal (diplochory) involving both primary and secondary seed dispersers. They propose two general models to explain the evolution of new dispersal mechanisms from an ancestral, usually abiotic method of dispersal. One model involves a gradual switch from one abiotic or biotic method to another biotic method (e.g., from bird dispersal to ant dispersal). The other model postulates the sequential acquisition of secondary dispersal whenever secondary dispersers (ants, dung beetles, rodents) move seeds underground and away from seed predators and/or into favorable germination sites. Andresen and Feer provide a stimulating review of the complex web of interactions involving dung beetles, seeds of various sizes, rodent seed predators, and pathogens. Seed size has an important effect on probability of burial by dung beetles and depth of burial. Their recent research indicates that secondary dispersal by these beetles can increase seedling survival by reducing rates of predation and pathogen attack as well as by reducing the impact of intraspecific competition that occurs when seeds are deposited in clumps. The final chapters deal with methods for studying seed fate. Jansen and den Ouden advocate using video monitoring to determine rates of seed removal and the behavior of scatter hoarding birds and mammals. Forget and Wenny review methods of labeling and tracking seeds.

In summary, the contents of this book make it clear that while we have made substantial progress in understanding the complex interactions that determine the fates of seeds, there is still much to be learned. Determining the fate of small seeds with substantial dormancy capabilities remains as challenging now as it was in the 1970s and 80s. Nonetheless, ecologists interested in seed fate will want to buy this book to see how far this field has progressed and to glean stimulating new ideas for future studies.

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The Christensen Fund Graduate Fellowship Program in Plant Conservation

The International Center for Tropical Ecology (ICTE) at the University of Missouri-St. Louis is offering a fully funded fellowship to students from tropical America, Africa, Madagascar, Asia, Malesia and the Pacific Islands with strong leadership and research potential in applied plant conservation. This fellowship is available to individuals with applied plant conservation experience and strong academic credentials for studies leading to a M.S. or Ph.D. degree. This Graduate program in Plant Conservation, developed in collaboration with The Christensen Fund and the Missouri Botanical Garden, is designed to educate plant conservation scientists from the world's tropical regions. The fellowship provides recruitment and repatriation airfares, stipend, tuition fee waiver and the chance to apply for competitive research funds.

To learn more, visit: http://icte.umsl.edu/scholarships/plantconservation.html or write to: Executive Director, International Center for Tropical Ecology, University of Missouri-St. Louis, 8001 Natural Bridge Road, St. Louis, MO 63121-4499, USA (email: icte@umsl.edu). Application review, for admission in the following August, will begin on December 1, 2005 but complete applications received before January 15, 2006 will be considered. Application forms can be obtained from the ICTE's web page at http://icte.umsl.edu/application.html or by writing: Executive Director, International Center for Tropical Ecology, University of Missouri-St. Louis, 8001 Natural Bridge Road, St. Louis, MO 63121-4499, USA. If you would like to receive printed materials (brochures and poster) describing this program and activities of the International Center for Tropical Ecology, please send your full mailing address to icte@umsl.edu.

A FEAST FOR THE CENSUS

by
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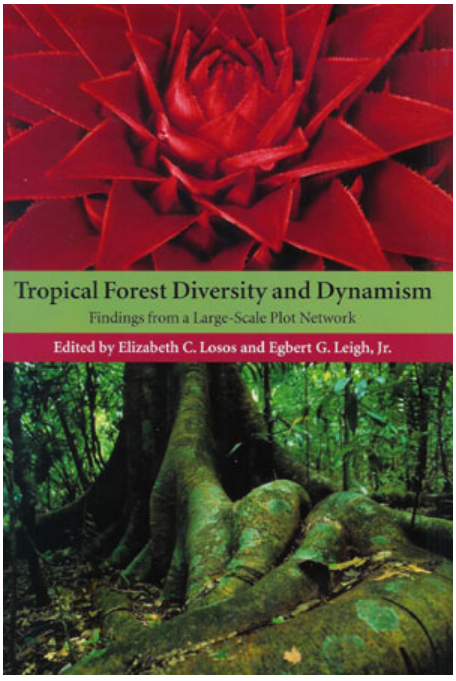
A review of E. C. Losos & E. G. Leigh, Jr. (eds.). 2004. ***Tropical Forest Diversity and Dynamism: Findings from a Large-Scale Plot Network.*** Chicago University Press, Chicago. 645 pp. with black and white figures; 38 chapters by 103 contributors; >700 references. ISBN 0-226-49345-8. $38.00 (pbk)

If the 15 large-scale forest dynamics plots established around the tropics over the last quarter-century by the Center for Tropical Forest Science banded together to form a country—at 5 km^2, bigger than the Vatican but smaller than Liechtenstein—this handsome volume could serve as its constitution, state of the union address, and handy guide book. Land of frequent treefalls and chronic budget shortages, blessed with three million trees, 6,000 woody plant species, and a handful of elephants, and home to some of the best science to ever come out of tropical forests: welcome to Plotugal!



The country is small, but the book is sprawling. Eight chapters set the stage with overviews of history, climate, soils, etc., while 15 ten-page chapters describe each plot—all of this leaving room for a 15-chapter round-table of plot-based articles on plant ecology. One would have to be an ungrateful wretch not to recognize the massive amount of work and contribution to tropical science all of this represents. Even so, since the book's many excellent aspects have been treated in an earlier review (Knapp 2005), here I play the wretch's advocate, for the sake of balance, and focus on its shortcomings.

Let's start with the minor. The editors have let a number of typographic errors escape their scrutiny of the 645 pages (dyanmics, plat, etc.); one plot location is spelled differently in different chapters. Each plot description chapter includes both a beautiful perspective map and an unattractive topographic map of the same piece of ground. Some readers will spend more time puzzling over why both maps were included than they will studying the lay of the land. The regional maps for each plot are excellent, but there is no world map to show locations of all 15 plots at a glance.

On to more substantive complaints. The round-table chapters are organized into such broad and overlapping sections—habitat specialization, rarity, canopy structure, diversity, pest pressure—that their arrangement sometimes feels haphazard. Very few chapters refer to other chapters, even when their results appear to contradict each other, which heightens the reader's sense of a scattered archipelago rather than an ordered geography of ideas. The editors have made some attempt at synthesis and overview, but given the huge undertaking this represents, the summary chapters are understandably weak. One suggests that "readers should examine the papers thinking about similarities and differences." Well, fair enough. But editors should examine the papers thinking about how to bring key similarities and differences to the reader's attention, since chances are the reader has spent the day lecturing or chasing a two year-old around the house.

It would also have been helpful, given the book's six-year gestation period (it began as a proceedings volume for a 1998 conference), if the editors had indicated more clearly which material is new and which has already been published elsewhere. My impression is that a reader who keeps up with the tropical plant literature will have to work hard to ferret out new findings; a lot of the material, by now, feels outdated or recycled. One chapter cites a 1998 article by the same authors with a practically identical title, but doesn't indicate which insights are new. The introduction to another chapter notes that while its results are compelling, "improvements have been made upon [this] analysis," and cites a paper published in 2001. The chapters that describe individual plots (chapters 24-38) are packed with valuable information that will be new for every reader, but considering the constant growth of these datasets and the foreseeable difficulty of obtaining this book across most of the tropics, those chapters might be more useful as regularly updated pages on the excellent CTFS website (www.ctfs.si.edu).

One startling pattern that is apparent in the data tables of chapters 24-38 but unmentioned in the text of this volume is the severe decline in stem number of these large permanent plots over time. A quick comparison of the tables suggests that stem number has fallen in *seven of the eight plots* that have been censused more than once. For these seven, the median drop in stem number is 12%; the maximum is a stunning 30%. What is going on in these forests? Too many boots trampling seedlings? Too many hands spreading diseases? Global change? *Alien abductions*? Just as curiously, while overall stem number has declined, the number of large stems has increased in most plots. Surely these patterns deserved mention somewhere in the book.

Another dataset that goes unanalyzed here, and whose analysis might provide some valuable insights into the past and future of large plot research (cf. Fazey et al. 2005a,b), is the vast bibliography these plots have generated (see a comprehensive list of publications at the CTFS website [note to webmaster: can you make it downloadable in EndNote?]). What proportion of papers published to date offers recommendations for foresters or park managers? Which papers are most frequently cited by other scientists, which are almost never cited, and why? What proportion of papers includes data on animals? What proportion is first-authored by in-country scientists or written in a language other than English? How are these trends changing over time?

That is more than enough carping about a book that, in the end, is a must for any tropical forest library. Many of the shortcomings described above are eminently forgivable, given that this is the first attempt to draw together data from 25 censuses of 15 plots managed by >100 researchers and containing millions of trees, and given that the book's impetus should make across-plot comparisons more frequent and profitable in the near future. In the meantime, one can only hope that more funding agencies will open their eyes to the colossal contributions made by this tiny country, day after day, to tropical science—as a training center for young scientists, as an encyclopedia of basic information on tropical trees, and as a laboratory for the study of global change, to mention just a few. If ever a country made up for its lack of size with pluck and ingenuity, this is it. As the Portuguese (no relation) like to say: *País pequeno, coração grande.*

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Knapp, S. 2005. Book review of Elizabeth C. Losos, Egbert G. Leigh (Eds.). Tropical Forest Diversity and Dynamism: Findings From a Large Scale Plot Network. *Biological Conservation* 124: 555.

Modern Day Parables of the Talents for Tropical Forest Managers

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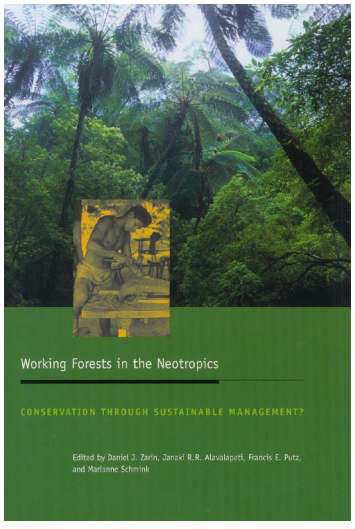
A review of Daniel Zarin, Janaki Alavalapati, Francis Putz, and Marianne Schmink (eds). ***Working Forests in the Neotropics – conservation through sustainable management?*** Columbia University Press. 2004. 432pp. $78.50 cloth, $45 paper

The 'use it or lose it' philosophy of Jesus' Parable of the Talents is still widely preached in modern secular society, and often applied to the conservation of natural resources. However, the types of use which are compatible with conservation are hotly debated, and in particular, the feasibility of sustainable tropical forest management and its relevance to conservation. Unfortunately much of the discussion is based on little information and polarised views, none of which help much in achieving the twin goals of biodiversity conservation and sustainable development. This book attempts to address this issue through focussing on a set of critical points and case studies.

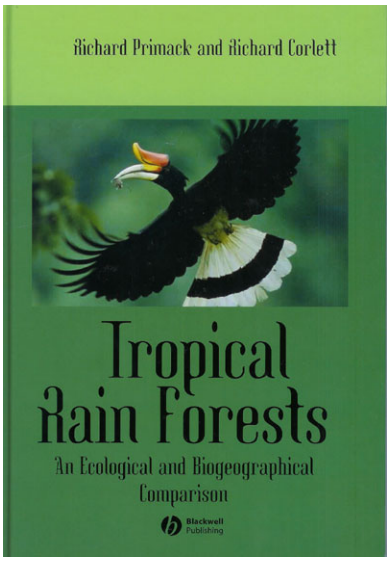


The book is divided into four sections that cover key issues in Neotropical forest sustainable management, namely: i) Industrial forestry as a tropical conservation strategy – where and how this is being pursued (5 chapters); ii) Working forests and community development in Latin America – case studies of community/ small holder management (8 chapters); iii) Working forest paradoxes – tensions between management and conservation (6 chapters); iv) Envisioning a future for sustainable tropical forest management (2 chapters). Many of the chapters originated in an international conference held in Florida in 2002. Often volumes developed from papers given at a conference lack the coherence of volumes specifically written about a topic. In this case the editors have generally been successful in putting together a coherent volume, which provides a broad coverage of the topic. Chapters by the editors at the start of the first three sections help to set the general context for the other chapters and are perhaps the most balanced and thought provoking chapters.

Inevitably with books of this nature there are gaps in the coverage. There is a heavy bias of contributions from US (62%) and Brazilian (27%) based authors with a consequent predominance of certain views. Putz (chapter 2) draws attention to differences between North American and European environmentalists in their valuation of cultural landscapes. Undoubtedly, the extrapolation of successful models from economically rich, low population

density countries to economically poor, high population density countries will always be fraught with risk. There is a lack of balance to the arguments within sections, although the sections tend to counterbalance each other, such that as a whole the book presents a full range of views. For example, contributions to the third section, which covers the tension between management and conservation, come down heavily in favour of protected areas and against what the book terms 'working forests' contribution to tropical forest conservation.' Section two chapters, in contrast, are heavily in favour of the feasibility of sustainable community forest management.

There is a heavy focus on examples from Amazonian rainforests. Whilst these forests represent the largest extent of neotropical forest and reservoirs of biodiversity, there are other neotropical forest types that conserve large numbers of endemic species whilst also being subject to management in varying degrees. Examples from a wider range of tropical forest ecosystems may provide valuable lessons for the successful integration of conservation and management. Thus, I could find no discussion of the potential role of secondary forests. Such forests cover increasing areas of some neotropical countries and provide less technically demanding options for sustainable management. Whilst, by their very nature, the tree species they conserve may not be high priorities for conservation, they do offer the possibility of continued forest cover and therefore the complementary role of the type envisaged by Fonseca *et al*. (chapter 16). Indeed the complementary role of protected areas and managed forests, when viewed on a regional landscape basis, is a recurring theme in a number of chapters, even though the emphasis of the balance between protection and sustainable management varies.



Given the complex and diverse nature of tropical forest ecosystems, along with the diversity of human cultures associated with them, it seems facile to think that one paradigm of conservation or management will suffice. Unfortunately, too often personal agendas promote over-simplistic, all encompassing solutions. Inevitably sustainable tropical forest management and conservation require sophisticated approaches. This, as a number of the chapters point out, requires high levels of education in managers (be they community or large company based), and the generation of more basic ecological data, all of which demand considerably more investment of time and resources than has been forthcoming to date. Thus the $28 billion that 'could take the world a long way towards conserving biodiversity' (chapter 16), might also achieve much when invested in the educational and ecological basis of community sustainable forest management. Whatever side of the debate one takes, it is evident throughout the book that unless a forest provides income or other highly valued benefits, whether through protection or management, it will be replaced by some other land-use.

Meeting the challenges of achieving conservation and sustainable forest management in the tropics requires the synthesis of information and deciding what lessons can be learnt, where successful practices can be extrapolated to and where they are unlikely to succeed. The last section of the book is short and limited in scope. Thus it would have been useful for the editors to have finished with a chapter that draws together the main lessons that are evident from the book and identifies opportunities and constraints. Scherr *et al*. (Chapter 8) provide a useful table that identifies where market opportunities might be found for low-income forest producers, possible business models and the potential to raise incomes, with examples from across the world. The book lacks a similar table that identifies where there are opportunities to conserve biodiversity, what would be conserved and under what range of circumstances.

There is nothing that is dramatically new, however the book is generally well written and makes interesting reading. It is reasonable value at $45, but the inclusion of colour plates that duplicate black and white figures elsewhere in the text seems unnecessary expense. It will be of most interest to students, researchers or teachers of forestry/conservation policy and would make an excellent basis for a post graduate discussion seminar series. Given the rapid development of the field and continual change in dogma it will, however, outdate relatively rapidly.

MANY FORESTS

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A review of: Richard Primack and Richard Corlett (2005), ***Tropical Rain Forests: An Ecological and Biogeographical Comparison.*** Blackwell Publishing, Malden, MA. 319 pp. + ix, 24 pages of references. $74.95.

While all of us acknowledge our great good fortune to be able to work and live, at least occasionally, in the rain forest realm, only the luckiest of tropical biologists can be really familiar with more than one rain forest region. In this thoughtful and thought-provoking book, Primack and Corlett offer eight fascinating and incisive chapters – really more like essays – highlighting what they see as essential patterns drawn onto the world's rain forest regions by history, climate, and human activity.

The differences between tropical rain forests have been the subjects of two recent Tropinet articles (R. Primack, 2003, Tropinet 14(3):1-3, and G.B. Williamson et al, 2005, Tropinet 16(1): 1-3). This book continues and expands the discussion. It is worth o a careful read by every tropical biologist who wants to complement her or his personal experiences with a larger appreciation of the tropical world.

Five rain forests are the focus of the book: the Neotropics, Africa, Madagascar, Southeast Asia, and New Guinea. The first chapter lays out the thesis: that these five forests are unique, biogeographically and ecologically, and thus merit comparative study and individualized protection. A series of 6 chapters then examines different "eco-taxonomic" groups — plants, primates, carnivores and herbivores, birds, fruit bats and gliders, and insects— each from a comparative perspective. The final chapter discusses the different pasts and futures of these forests. One of the real strengths of the book is its clear summaries of geologic and biogeographic history and of modern evidence from molecular phylogeny, to make sense of patterns and distributions. Another is the 24 pages of references - most of them very recent - which underpin the text. On the other hand, I had the sense that many appropriate citations were omitted; surely there are some classic and important papers whose authors might feel left out. Tropical ecology is not only geographically wide, but historically deep.

This book is not, as I first thought, another summary volume of cool rain forest natural history. Neither is it a comprehensive treatise on global rain forest biology. It is unabashedly selective in the groups it treats - four of the six central chapters focus on vertebrates. At the same time, this can perhaps be forgiven, since making historical and biogeographic statements requires evidence. We know far more about the phylogenetics and the fossil history of vertebrates than of insects.

Of course, there are many things to be said about the tropical forests of the world that are not summarized in this book. In some ways, the targeted readership of the volume is hard to discern. The book is a curious and engaging mix of obvious and very non-obvious statements. A tropical biologist will find much that they have heard before in these pages. But the book is also full of amazing new information and helpful distillations of tropical biology. The synthesis of this known and new information, and the overview of patterns that the authors highlight, makes the knowns all the more telling. This book would be the perfect springboard for a graduate ecology seminar. The text, moves easily from details of particular natural history case studies to evidence for large-scale migrations of the Gondwanan faunal assemblages. You can argue with the distinctions and the choices the authors make. The experiences of the authors in SE Asia tend to skew coverage (perhaps rightly) to Old World forests . I wished for more tables, summarizing the observations within the text. The mix of often excellent B/W photographs sometimes did not illustrate the species I wanted to see. But these are minor criticisms. This book is wonderful food for thought. Primack and Corlett have produced an idiosyncratic and cogent exploration of patterns, questions, and 'thought experiments,' exploring what we know. No matter how many rain forests you have been in, you will learn from reading this book.

MEETINGS CALENDAR

8TH WORLD WILDERNESS CONGRESS**,** 30 September - 6 October 2005, in Anchorage, Alaska. The theme of the meeting will be "Wilderness, Wildlands and People - A Partnership for the Planet." Registration at : http://www.8wwc.org/

PRIMER CONGRESO COLOMBIANO DE PRIMATOLOGÍA**,** 2 al 4 de noviembre de 2005, Bogotá, Colombia. Mayor informacion: http://www.geocities.com/primatescolombia/Congreso.htm

PLANTS 2010 CONFERENCE 2005, 23-25 October 2005, Dublin, Ireland. A global partnership for plant conservation – Supporting national implementation of the Global Strategy for Plant Conservation
Full details at http://www.plants2010.org/

1ST DIVERSITAS INTERNATIONAL CONFERENCE ON BIODIVERSITY**,** 9-12 November, Oaxaca, Mexico. The meeting, at the Hotel de Mision de Los Angeles, will take the theme "Integrating Biodiversity Science for Human Well-Being." The web site is at: http://www.diversitas-osc1.org/

II INTERNATIONAL CONGRESS OF DRY FORESTS, III CONGRESO DE LA CONSERVACIÓN DE LA BIODIVERSIDAD DE LOS ANDES Y DE LA AMAZONÍA, AND V ECUADORIAN BOTANICAL CONGRESS, 14-17 November, 2005. In Lojas, Ecuador. Web site at: http://www.funbotanica.org/

IX CONGRESO DE LA SOCIEDAD MESOAMERICANA PARA LA BIOLOGIA Y CONSERVACIÓN. 21-15 November, La Ceiba, Honduras. Information available at: http://www.parksinfo.net/smbc/index.html

IX CONGRESS OF THE LATIN AMERICAN BOTANICAL SOCIETY (IX CONGRESO LATINOAMERICANO DE BOTÁNICA).
19-25 June, 2006, Santo Domingo, Dominican Republic – Web http://www.botanica-alb.org/index2.html

ASSOCIATION FOR TROPICAL BIOLOGY AND CONSERVATION ANNUAL MEETING**,** 18-21 July 2006, Xishuangbanna, China. At the Harbour Plaza-Kunming, hosted by the Xishuangbanna Tropical Botanical Garden. The theme for the meeting is "Tropical Biology: Meeting the needs of changing tropical ecosystems". Details available at www.atbio.org.

NINTH INTERNATIONAL POLLINATION SYMPOSIUM**,** 23-28 July, 2006. Iowa State University, Ames, Iowa, USA. The theme will be "Host-Pollinator Biology Relationships - Diversity in Action" More information is at the website: http://www.ucs.iastate.edu/mnet/plantbee/home.html

THE INTERNATIONAL UNION FOR THE STUDY OF SOCIAL INSECTS (IUSSI)*,* 30 July – 4 August, 2006. Washington D.C. More information at http://www.iussi.org/IUSSI2006.html

FIRST EUROPEAN CONGRESS OF CONSERVATION BIOLOGY (ECCB)**,** 18-21 August, 2006, in Eger, Hungary. The theme is "Diversity for Europe." See the website at www.eccb2006.org

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