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Cover image: Paraguay's Chaco forest, one of the last wilderness frontiers in South America, is home to jaguars, giant anteaters, and several groups of indigenous people. But this remote habitat is now being plundered by rapid agricultural development, and much of the forest already has fallen to make way for widespread cattle pastures. Feeding the world's growing population will present challenging problems for conservationists, as highlighted in the essay by Alberto Yanosky and other voices from the tropics. Photo by Alberto Yanosky.
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Conservation Biology

Voices from the Tropics

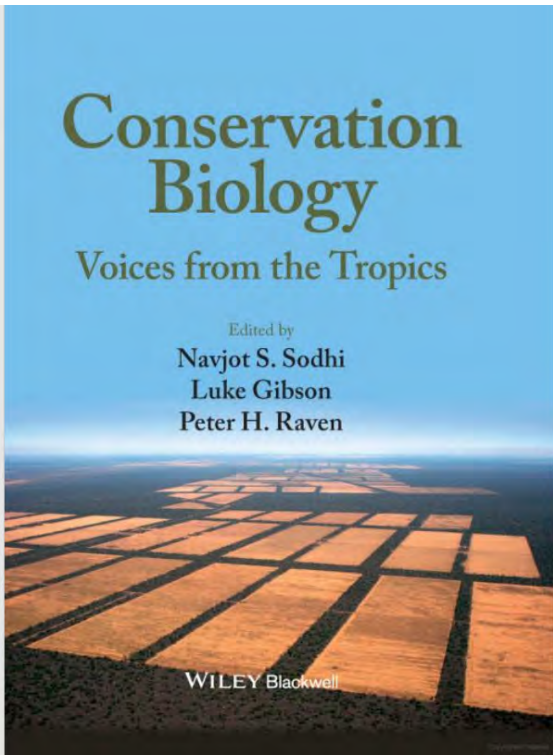
Edited by

Navjot S. Sodhi

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Roy E. Gereau is an Assistant Curator at the Missouri Botanical Garden and directs its Tanzania Program. He has been active in African plant taxonomy, floristics, phytogeography, and conservation for 28 years. He has described a number of new species from Tanzania, is a coauthor of the book *Field Guide to the Moist Forest Trees of Tanzania* (Lovett et al., 2006), and first author of the *Lake Ngasa Climatic Region Floristic Checklist* (Gereau et al., 2012). He has received funding from the National Geographic Society for biodiversity inventories, the Critical Ecosystem Partnership Fund for plant conservation assessment in the Eastern Arc Mountains and Coastal Forests of Tanzania and Kenya, and the Liz Claiborne-Art Ortenberg Foundation for studies in biodiversity conservation in the face of climate change.

Luke Gibson is based at the National University of Singapore, where he is studying tropical forest loss in Southeast Asia and its impact on biodiversity. For his PhD, he is recording extinctions of small mammal species from small forest fragments in Chiew Larn reservoir, Thailand, and the persistence – or decline – of other mammalian ungulates and carnivores in the lowland dipterocarp forest surrounding the reservoir. He has worked previously with Phayre's leaf monkeys and long-tailed macaques, studying their sensitivity to habitat fragmentation in Thailand and to biodiversity loss in Singapore, respectively. Before moving to Southeast Asia, he received his Bachelor's degree from Princeton University and his Master's degree from the University of California, San Diego.

Mwangi Githiru is currently the Director of Biodiversity and Social Monitoring at Wildlife Works Sanctuary Ltd., mainly involved in evaluating the environmental and sociological impacts of REDD projects undertaken by Wildlife Works. He has previously worked as a Deputy Director of Research with the Ministry of Higher Education, Science and Technology in Kenya. Dr Githiru has considerable experience in the environment conservation sector at the research, policy, and implementation levels. He received his undergraduate degree in Wildlife Management and his Master's degree in Animal Ecology from Kenyan universities before proceeding to get his doctorate in Zoology from the University of Oxford, UK, as a Rhodes Scholar. He then successfully completed a three-year post-doctorate at the University of Antwerp, Belgium, as a Marie Curie Fellow. Dr Githiru is also an alumnus of the Watson International Scholars of the Environment (WISE) Program at Brown University, USA, and the Archbishop Tutu African Leadership Programme.

Amleset Haile completed her Bachelor's study at Haramaya University, Ethiopia, in Agriculture and her Master's in Management of protected areas at Klagenfurt University, Austria. Previously, she worked in Mekelle University, Ethiopia, as an assistant lecturer in the faculty of Agriculture and Natural Resources Management, responsible for both academic and research activities. At present, she is the assistant national coordinator of the project CASCAPE (Capacity building for scaling up evidence-based best practices in agricultural production in Ethiopia) in collaboration with Wageningen University, Netherlands. Amleset's research interest is in contributing to societal efforts to use natural resources efficiently to assist conservation and livelihood improvement activities. To make her dreams a reality, she also participated in international training including Beekeeping for Poverty Alleviation in Belgium (2008) and Climate Change in Denmark (2009), and in 2010 she was a fellow of the African Women Scientists in Climate Change Award. She also participated in the Environmental Leadership Program at UC, Berkeley, in 2012.

Bila-Isia Inogwabini is the country manager at Christian Aid in the Democratic Republic of Congo. Prior to his appointment at Christian Aid, Inogwabini was a Post-Doctoral Researcher at the Swedish University of Agricultural Sciences, Uppsala, and a Senior Scientific Advisor at the World Wide Fund for Nature. Dr Inogwabini received his PhD in Biodiversity

Management and Master's degree in Conservation Biology and has 20 years of experience in large mammal conservation. His conservation efforts are internationally recognized: he received the 2007 National Geographic Buffett Award for leadership in conservation in Africa and the UNESCO Young Scholar Award for his research on bonobos.

James D. Jacobi is a biologist with the US Geological Survey's Pacific Island Ecosystems Research Center. He has been conducting research in Hawaii for over forty years with primary emphasis on studying the ecology and status of native plant and bird species, as well the impacts of invasive species on Hawaiian ecosystems. A major focus of his research has also been mapping the distribution of plant species and communities throughout the Islands relative to both current conditions and predicted future climate scenarios.

Richard K.B. Jenkins Richard Jenkins works for the IUCN Global Species Programme and is based in Cambridge, UK. He lived in Madagascar between 2002 and 2012 where he established a biodiversity organization called Madagasikara Voakajy. He obtained his PhD from Cardiff University and his Bachelor's degree from the University of East Anglia.

Michelle Kalamandeen is an environmentalist who has worked extensively for over 12 years in numerous indigenous communities of Guyana. She has a background strongly focused on social justice, ethical implications of conservation actions, and protected area designation and management. Michelle holds a Master's degree in Biodiversity, Conservation and Management from the University of Oxford and has an extensive list of journal and book publications. She currently works as the protected areas coordinator for the Guyana Marine Turtle Conservation Society and is a lecturer at the University of Guyana. She is the coordinating secretary for the National Committee for UNESCO's Man and Biosphere Reserves and an executive board member of the Guyana Human Rights Association.

Gustavo H. Kattan is a biologist with a particular interest in the study and conservation of the biodiversity of the tropical Andes. He received his PhD from the University of Florida and for 14 years was a Conservation Ecologist with the Wildlife Conservation Society in the Colombia Program. Currently he is Associate Professor in the Biology program at Pontificia Universidad Javeriana in Cali, Colombia. He has published over 70 papers in scientific journals and book chapters, and

many technical reports, including conservation plans for several species of birds and mammals.

Lian Pin Koh is Assistant Professor of Applied Ecology and Conservation at the Department of Environmental Sciences, Swiss Federal Institute of Technology (ETH Zurich). Lian Pin received his Ph.D. from Princeton University, USA. He has published over 70 articles in peer-reviewed journals including *Science*, *Nature*, *Proceedings of the National Academy of Sciences of the USA*, *Trends in Ecology and Evolution*, *Ecological Applications*, and *Conservation Biology*. He has served on the editorial board of *Biological Conservation*, *Animal Conservation*, *Biotropica*, *Tropical Conservation Science*, and *Endangered Species Research*. Visit his website (www.lianpinkoh.com) for more information.

Inza Koné holds a PhD in Primate Conservation Biology from the *Université Félix Houphouët-Boigny* (former University of Cocody), Côte d'Ivoire. He is currently a lecturer at the *Université Félix Houphouët-Boigny* and a research associate at the *Centre Suisse de Recherches Scientifiques en Côte d'Ivoire* (CSRS), Abidjan, where he is Head of the Biodiversity and Food Security Department. He is a member of the Scientific Committee of the Great Apes Survival Project of the United Nations Environment Program (GRASP/UNEP), the Advisory Board of the Institute for Breeding Rare and Endangered African Mammals (IBREAM) of the University of Utrecht, the Netherlands, and the Pygmy Hippo subgroup of the IUCN/SSC Hippo Specialists Group. His research focuses on the management of natural resources linking ecology, economics, culture, and the behavioral ecology and conservation of endangered large mammals. For his internationally outstanding achievements in the conservation of species and habitats, Inza Koné was awarded the 2001 WWF award for the conservation of the Tai National Park (a World Heritage site in Côte d'Ivoire), the 2005 Martha J. Galante Award of the International Primatological Society, the 2009 Future For Nature Conservation Award (Netherlands), and the 2012 Whitley Award for Nature Conservation (UK).

Virendra Kumar taught Botany at the University of Delhi for over three and a half decades. He received his PhD from the University of Delhi and has authored a number of books/motographs, including *Chromosome Numbers of the Flowering Plants of the Indian Subcontinent* (1985), *Botanical Survey of India, Kolkata* and *Environmental Sensitivity of the Himalayan River*

Basins (2000, CSMIE Monograph Series). He was awarded Homi Bhabha Fellowship in 1975 and, as a recipient of UNESCO and Royal Society grants, Virendra carried out research on rhododendrons at the Royal Botanic Gardens, Kew; Harvard University; and the University of Virginia. As chairman, he was responsible for providing ecological orientation to the world famous Chipko movement by recommending a ban on deforestation in the Himalaya in the mid-1970s. He is currently engaged in completing his two books: *North American Rhododendrons and Evolutionary Divergence in Rhododendrons: An SEM Study of Leaf Surfaces*.

William F. Laurance is Distinguished Research Professor at James Cook University in Cairns, Queensland, Australia, and Prince Bernhard Chair in International Nature Conservation at the University of Utrecht, the Netherlands. He studies how environmental threats, such as habitat fragmentation, logging, hunting, wildfires, and climatic change affect tropical forests and their species. He works in the Asia-Pacific, Amazon, Africa, and tropical Australia, and has published five books and over 300 scientific and popular articles. He is an Australian Laureate, former president of the Association for Tropical Biology and Conservation, and co-winner of the BIVA Frontiers in Ecology and Conservation Biology prize, among other honors.

Nigel Leader-Williams is Director of Conservation Leadership at the University of Cambridge and a Fellow of Churchill College. A trained veterinary surgeon, he completed a PhD on the ecology of introduced reindeer on South Georgia and a post-doctorate on the conservation of rhinos and elephants in Zambia. As previous Director of the Durrell Institute of Conservation and Ecology, and in his present role, Nigel builds capacity in conservation through research and teaching that sits within both natural and social sciences, focusing on large mammals that conflict with peoples' interests. His most recent book, *Trade-offs in Conservation*, was published in 2010.

Jianguo (Jack) Liu holds the Rachel Carson Chair in Sustainability, is a University Distinguished Professor of Fisheries and Wildlife at Michigan State University, and also serves as Director of the Center for Systems Integration and Sustainability. He has been a guest professor at the Chinese Academy of Sciences and a visiting scholar at Stanford University (2001–2002), Harvard University (2008) and Princeton University (2009). Liu takes a holistic approach to addressing

complex human–environmental challenges through systems integration, which means he integrates multiple disciplines such as ecology and social sciences. His work has been published in journals such as *Nature* and *Science*, and has been widely covered by the international news media. In recognition of his efforts and achievements in research, teaching, and service, Liu was named a Fellow of the American Association for the Advancement of Science (AAAS) and has received many awards, including the Guggenheim Fellowship Award, the CAREER Award from the National Science Foundation, the Distinguished Service Award from US-IALE and the Aldo Leopold Leadership Fellowship from the Ecological Society of America.

Narong Mahanop (formerly Khao Yai National Park superintendent) is currently the director of Wildlife Conservation Office, Department of National Parks, Wildlife and Plant Conservation, Thailand. He began his career in the Royal Forest Department in 1981, serving as head of the Reforestation Project. During this period, Narong participated in trainings and study trips of many international and regional organizations, including Mississippi State University, USA; the 2nd Conference on ASEAN Heritage Park (AHP), Malaysia; the 4th Regional Conference on Area (PA) in Southeast Asia, Malaysia; the 31st Session of the World Heritage Committee, New Zealand.

Dino J. Martins is a Kenyan conservationist and entomologist. He holds a PhD from the Department of Organismic and Evolutionary Biology at Harvard University. He has published widely on pollinators and insects in scientific, natural history, and environmental journals. His work has been featured in the *Smithsonian Magazine*, on the BBC as well as in *National Geographic*. He is the current Chair of the Insect Committee of Nature Kenya, the East African Natural History Society. Among his awards and fellowships are the Ashford Fellowship in the Natural Sciences, the Graduate School of Arts and Sciences (GSAS), Harvard University, 2004 Smithsonian Institution SIWC-MRC Fellowship, and 2002 and 2003 Peter Jenkins Award for Excellence in African Environmental Journalism. In 2009, he won the Whitley Award for his work with pollinators in East Africa. He was named a *National Geographic* “Emerging Explorer” in 2011. Dino is currently a post-doctoral fellow with the Stony Brook – Turkana Basin Institute. His work continues to explore the intricate connections between insects and human life and livelihoods.

Sittichai Mudsri (formerly Bado-Sungai Padi National Park superintendent), is now a director of Forest Fire Control Division, Department of National Parks, Wildlife and Plant Conservation, Thailand. He also serves as a research collaborator and consultant of “Hornbill Research and Community-based Conservation Project” in Bado-Sungai Padi National Park. He received the Honorary Award in “Creative Solution for Land-Use Problem by Community-based Forest Management” from UNESCO in 2009.

Carolina Murcia is the Science Director for the Organization for Tropical Studies and Adjunct Faculty in the Biology Department at the University of Florida. Previously she was the Sub-regional Coordinator for the Northern Andes at the Wildlife Conservation Society, and for over a decade a Board Member of the Society for Ecological Restoration. She is a biologist with a PhD in tropical conservation, with over 20 years of experience in ecology and conservation of Andean forests. She has published over 30 scientific papers, coauthored one book, and authored a number of technical documents in conservation policy in Colombia.

Maharaj K. Pandit is a Professor at the University of Delhi. A conservation biologist, Raj received his PhD from the University of Delhi. He was elected a Fellow of Linnaean Society of London in 2001 and is a recipient of Raffles Biodiversity Fellowship award from National University of Singapore (NUS). Raj subsequently taught at NUS as Visiting Senior Fellow. His work focuses on the Himalayan ecosystems and the endangered taxa, and his research interests include understanding the ecological, genetic, and genomic causes of plant rarity and invasion, impact of developmental projects on the Himalayan biodiversity, and species’ response to climate change in the Himalaya.

Flavia Pardini has been working as a journalist for 20 years in Brazil, the US, and Australia. She has reported on financial and economic matters for *Gazeta Mercantil*, *Reuters* and *CartaCapital*. In 2005, she co-founded *Página 22* (www.pagina22.com.br), the first Brazilian magazine dedicated exclusively to sustainability issues.

Renata Pardini is a Professor at the University of São Paulo (USP), Brazil. Her research program focuses on mastozoology and landscape ecology, especially on how structural thresholds affect biodiversity in human-modified landscapes. She has also acted as a consultant in management plans for conservation units, and in discussions on designs for monitoring programs associ-

ated with the payment for ecosystem services, as well as on how to improve the ecological components of environmental impact assessments. She participated as a teacher in the short-term course at the Federal University of Bahia (UFBA), from which some results are presented in chapter 10.

Kelvin S.H. Peh has completed a three-year European Union Marie Curie EST fellowship and received his PhD from Leeds University. Currently an AXA Post-Doctoral Fellow and a Post-Doctoral Researcher at St. John’s College (Cambridge), Kelvin’s work involves close collaborations with various environmental organizations such as the Global Secretariat of BirdLife International, the Royal Society for the Protection of Birds, and the United Nations Environment Programme’s World Conservation Monitoring Centre. Kelvin also has extensive ecological fieldwork experience in Central Africa and Southeast Asia.

Carlos A. Peres, born and raised in Belém, Brazil, was exposed to Amazonian ecology and conservation from age six and his father’s 5200-ha landholding in eastern Pará, consisting largely of undisturbed primary forest, became a natural history playground. For the past 25 years, he has been studying wildlife community ecology in Amazonian forests and the biological criteria for designing large nature reserves. He currently co-directs four conservation science programs in Neotropical forests. In 1995, he received a Biodiversity Conservation Leadership Award from the Bay Foundation, and in 2000 he was elected an Environmentalist Leader for the New Millennium by *Time Magazine* and CNN. He is currently a Professor in Tropical Conservation Biology at the University of East Anglia, UK, and divides his time between Norwich and fieldwork at multiple field sites in lowland Amazonia.

Rohan Pethiyagoda has contributed extensively to the scientific literature on Sri Lanka’s biodiversity, having worked primarily on the taxonomy and conservation of freshwater fishes and amphibians. The Wildlife Heritage Trust, established in 1990 and since managed by him, is the country’s premier publisher of biodiversity-related literature, having contributed also to exploration and research that led to the discovery of hundreds of new species on the island. He is presently a research associate in fishes at the Australian Museum, Sydney, serves as editor for *Asian Freshwater Fishes of Zootaxa*, and is a trustee of the International Trust for Zoological Nomenclature. He has

previously served as Environment Adviser to the government of Sri Lanka, as a member – and deputy chair – of the IUCN Species Survival Commission, and as a committee member of the World Commission on National Parks and the Global Amphibian Specialist Group. He is a fellow of the National Academy of Sciences of Sri Lanka and has been recognized through several international awards and prizes including the Rolex Awards for Enterprise.

Patrick Pikacha works with the Solomon Islands Community Conservation Partnership foundation. He has obtained several competitive grants and conducted biodiversity research in the Solomon Islands with a focus on frogs and small mammals; he is lead author of the book *Frogs of the Solomon Islands*. Patrick is currently undertaking a PhD at the University of Queensland, Australia, and has extensive experience of coordinating conservation efforts and working with communities in different island groups to achieve conservation outcomes via working through the local land tenure systems. His passion for the Melanesian environment led him to found the Pacific Island grassroots conservation magazine *Melanesian Geo* in 2005.

Pitai Poonswad is a Professor of Biology in the Department of Microbiology, Faculty of Science, Mahidol University, Thailand. Professor Poonswad's main activities are teaching graduate students in fundamental and advanced parasitology, pre-medical students in medical parasitology, and biology undergraduates in avian biology and conservation. She supervises graduate students in various aspects of microbiology and biology. Her research focuses on hornbill biology and ecology, and her most innovative techniques have been instrumental in a series of practical conservation and awareness initiatives.

Thane K. Pratt is an avian ecologist with a focus on the conservation biology of birds in Hawaii and the tropical Pacific. He is retired from the US Geological Survey, Pacific Island Ecosystems Research Center, where he worked for twenty years as a wildlife biologist engaged in research on endangered Hawaiian forest birds. He is now writing an all-new second edition of *Birds of New Guinea*, with coauthor Bruce Beehler.

Dewi M. Prawiradilaga is a principal scientist at the Research Centre for Biology – Indonesian Institute of Sciences (LIPI). Dewi has been a long term editor of *Tremia*, zoological journal of Indo-Australia archipelago. She received her PhD in Ecology, Evolution and

Systematics from the Australian National University, Canberra. In the last fifteen years Dewi has been involved in the ecological research and conservation activities of Indonesian endangered bird species, specifically eagles.

Hajanirina Rakotomamana obtained his PhD from Kyoto University, Japan. He is currently a Professor at the University of Antananarivo, Madagascar, and Vice-President of the steering committee of the Malagasy Birds Group (Asity Madagascar). He has written several scientific papers and books on Malagasy birds. Since 2004, he has become a part of the scientific committee of Pan African Ornithological Congress. In 2005, he received Environmental Leadership courses at Beahrs, University of California, at Berkeley, USA. Currently, he is a member of the Teachers of Tropical Biology Association (a program closely related to Cambridge University).

Jonah Ratsimbazafy received his PhD in Physical Anthropology from the State University of New York at Stony Brook. He is currently the Training and Conservation Coordinator of the Durrell Wildlife Conservation Trust in Madagascar. He is also an Adjunct Professor in the Department of Paleontology and Anthropology, and a Department of Medicine veterinary at the University of Antananarivo. He coauthored the second and third editions of the *Field Guide Series: Lemurs of Madagascar*. From 2006 to 2008, he was the Vice-President of the International Primatological Society for Conservation. He is the Secretary General of a Malagasy Primate Group (GERP). He is the co Vice-Chair of the IUCN/SSC Primate Specialist for Madagascar.

Peter H. Raven has become an influential voice in systematics, ecology, and evolution worldwide over the past 50 years. He served as President of the American Association for the Advancement of Science and other organizations, Home Secretary of the US National Academy of Sciences, and is a member of a number of other academies worldwide. During his 39-year tenure as President of the Missouri Botanical Garden, he guided the Garden to a position of global leadership in conservation, with centers of activity in the tropics of Latin America, Africa, and Asia. From its initiation, he served as co-chair of the editorial committee of the *Flora of China*, a 50-volume work completed in 2013 after 20 years of effort. He is coauthor of the leading textbook in botany, *The Biology of Plants*, and coauthored leading texts in biology and the environment.

With Paul Ehrlich, he originated the important concept of coevolution.

Pedro L.B. da Rocha is a Professor at the Federal University of Bahia (UFBA), Brazil. His experience in ecological research, coordination of the Ecology and Biomonitoring Graduate Studies at UFBA, federal evaluation of graduate courses in Ecology (CAPES), and scientific boards of funding agencies (FAPESB) has contributed to his activities focusing on bridging the research–implementation gap.

Phil Shearman is currently Director of the University of Papua New Guinea Remote Sensing Centre and is a visiting fellow of the School of Biology at the Australian National University College of Medicine, Biology and Environment. Phil received his PhD from the Australian National University, Canberra. His research interests include tropical forest ecology and management, applied remote sensing, and biogeography.

Navjot S. Sodhi (1962–2011) of the National University of Singapore was one of the great minds of conservation biology. A native of Punjab, India, Professor Sodhi graduated from the University of Saskatchewan and then moved to an incredibly fruitful 15 years documenting rain forest loss and degradation in South-east Asia and their effects on populations of animals and plants. He was best known as a conservationist, someone who cared passionately about those rich lands and the people who lived in the region, and who strove, with a large group of colleagues and students, to devise ways to improve the sustainability of the area while pressures on the forest mounted rapidly.

Herwasono Soedjito is a senior scientist at the Research Centre for Biology – Indonesian Institute of Sciences (LIPI), a former Director of Man and the Biosphere (MAB) Indonesia Program – UNESCO and received his PhD on Forest Ecology from Rutgers University, USA. He has been undertaking research activities since 1980 in the fields of ecology, management of tropical rainforests, and later on expanding his interest in cultural and biodiversity conservation as well as monitoring of indigenous knowledge. He spent years travelling extensively in Indonesian forests and living with local communities in Kalimantan. He was also counterpart of WWF Kayan Mentarang (1991–1995) and Project Manager of WWF Betung Kerihun in West Kalimantan (1995–1998). Scientist and Site Manager of Bulungan Research Forest (BRF)-CFOR in Malinau – East Kalimantan (1999–2002), Director of Indonesian

Man and the Biosphere Program – LIPI (2003–2007), Director Terrestrial Program of Conservation International Indonesia (2008–2009), and was Fire, Research, and Monitoring Manager of Kalimantan Forests and Climate Partnership (KFCP) – Australia Forest Carbon Partnership (IAFCP) a demonstration area for REDD+ on the Ex-Mega Rice Project in Kapuas District of Central Kalimantan (2010–2011).

Dimitrina Spencer obtained her PhD from the Institute of Social and Cultural Anthropology and Linacre College, University of Oxford. She was the project anthropologist on the DFID funded Cross River State Community Forestry Project in south east Nigeria from 2000 to 2002. She conducts research and teaches anthropology of international development at the University of Oxford. She has co-edited: *Anthropological Fieldwork: a Relational Process* (CSP 2010) and *Emotions in the Field: the Psychology and Anthropology of Fieldwork Experience* (Stanford UP, 2010).

Robert Spencer is a Business Line Director for sustainability services at URS Corporation. A Fellow of the Royal Geographic Society and Chartered Geographer, he has a Masters in forestry and land use from the University of Oxford and Linacre College. He was the Project Manager of DFID's multi-million pound Cross River State Community Forestry Project in south east Nigeria from 2000 to 2003. He went on to deliver the major Yunnan Environment Development Programme (YEDP), also funded by DFID and focussing on the environment-poverty nexus in south west PR China. Robert Spencer has since offered forestry and land use advice in many contexts and countries, most recently Gabon, and is currently focussed on woodland carbon sequestration schemes in the UK. He is Chairman of URS' Infrastructure & Environment division Sustainability Committee for Europe and a member of the UK's Living with Environmental Change (LWEC) Business Advisory Board.

Flora I. Tibazarwa is a lecturer in the Botany Department at the University of Dar es Salaam. She has a Master's degree in Forest Ecology and a PhD in the eco-physiology of marine plants using molecular approaches from the Radboud University in the Netherlands. Her research interests are conservation biology, abiotic stress, and modern biotechnology. She has over 10 years' experience conducting environmental impact assessments and natural resource management. She is the current chairperson of the Tanzania

Phil Shearman is currently Director of the University of Papua New Guinea Remote Sensing Centre and is a visiting fellow of the School of Biology at the Australian National University College of Medicine, Biology and Environment. Phil received his PhD from the Australian National University, Canberra. His research interests include tropical forest ecology and management, applied remote sensing, and biogeography.

Biodiversity Information Facility Governing Board, a national facility for coordinating biodiversity informatics. She has won several research grants that have supported both Master's and PhD students.

Marika Tuivawa has been the Curator of the South Pacific Regional Herbarium since 1998. An internationally acknowledged expert on Pacific Island plants and vegetation, Marika is a much in demand regional botanist and experienced conservation biologist. She is also a founding trustee of Fiji's highly respected conservation organization NatureFiji/MareqetiViti, the only local non-government organization in Fiji focused on the conservation of threatened species. Marika received his Master's degree from the University of the South Pacific in 1996 and has been involved with numerous regional biodiversity and conservation projects since, producing not only many technical reports and major publications in international journals but also mentoring some of the regions' most impressive up-and-coming conservation biologists.

Bethany L. Woodworth is an avian ecologist specializing in the demography and ecology of forest birds. She worked as a Research Wildlife Biologist with US

Geological Survey, Pacific Island Ecosystems Research Center, for ten years, focusing on developing conservation and recovery strategies for threatened and endangered Hawaiian forest birds. Bethany now teaches environmental sciences in the Department of Environmental Studies, University of New England.

Alberto Yanosky received his bachelor's and doctoral degrees from the University of Mar del Plata and his Master's degree from the University of Entre Rios, both in Argentina. He has been working on species conservation, population, and community and landscape ecology, as well as environmental and social safeguards, civil society organizations, and the role of society in conservation. He has experience mainly in the Americas, but has also worked in Africa and Central Asia. His working experience in the environmental and training sectors began in 1985, and now, with more than 25 years of experience, he has published more than 100 scientific papers and books. In 2011, he won the National Geographic Society/Buffett Award for Leadership in Conservation for his efforts to protect threatened habitats and species in Paraguay.

CHAPTER 1

INTRODUCTION: GIVING A VOICE TO THE TROPICS

Luke Gibson¹ and Peter H. Raven²

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In this book we deal with an apparent paradox: the apparently lush ecosystems of the world's tropics, teeming with life, are exceedingly vulnerable to disturbance and disintegration. The voices of authors from many tropical countries provide examples of the successes and failures that they have met in pursuing conservation objectives in their countries. Although each person's experience has been unique, they add up to deliver a number of common themes that we shall review in the concluding chapter of this book. The enormous projected population growth in the tropics, coupled with the desire for much higher levels of consumption by a majority of people in a world whose resources are already being used more rapidly than they can be replenished, forms a situation that makes necessary the pooling of our intellectual and financial resources to try to find our way back to sustainability in a socially just world.

Knowledge about the tropics was slow in reaching Europe, although occasional spectacular animals from tropical Africa were brought to the courts of Europe and China even in Classical times. Although the lure of the Indies and their riches of spices were great, it took a massive effort on the part of Portuguese explorers to round the southern tip of Africa and travel on to the East Indies in the half century before Columbus. Subsequently, the Portuguese, Dutch, Spanish, and ultimately the English reached far-flung localities in

tropical lands and established settlements there. These settlements were coastal, however, and mostly lay in regions that had similar coastal and beach plants and animals over wide areas. As a result, the Encyclopedists, who attempted to catalog life from the late seventeenth century onward, including Carl Linnaeus, who founded our modern taxonomic system in the mid-eighteenth century, had no real idea of how biologically rich the tropics actually were. In fact, it was not until the extensive travels of Alexander von Humboldt (1799–1804), who traveled thousands of kilometers through Latin America cataloging and observing its abundant life, that the world began to understand the biological riches of the tropics in their true glory.

Subsequently, Charles Darwin's observations and collections from the voyage of the *Beagle* (1831–1836) began to reveal the intricacy of tropical ecosystems and to detect the thread of evolution in them. His writings (Darwin, 1845) and those of Alfred Russel Wallace (Wallace, 1869, 1889), who explored the Amazon from 1848 to 1852 and the Malay Archipelago from 1854 to 1862, brought these hitherto mystical regions to life for the general public, stimulating continuous scientific exploration for the subsequent century and a half that has continued to the present day. From the specimens that entered the great museums of the world, it ultimately came to be understood that the majority of the world's species, two-thirds or more of them,

occurred in the tropics. The vast majority of them, perhaps 19 out of 20 (mostly small to very small animals and fungi) have yet to be discovered or named scientifically! It is no wonder, then, that our understanding of tropical ecosystems is so limited and our ability to convert them to sustainable agricultural systems often so limited.

Europeans reached the tropics with a colonial mentality, bent on extracting their natural resources as efficiently as possible and thus enriching the countries from which they had come. It was during the course of this effort that many tropical systems were seen to be fragile – incapable of replenishing the resources that had been extracted – and the disintegration of ecosystems that were highly productive initially often caused them to be devastated rapidly.

The knowledge available about tropical ecosystems and the biodiversity that occurs in them is poorer than that concerning temperate ecosystems. Part of the reason for this deficiency lies in the colonial history of most of the regions; those who studied them were often members of expeditions from abroad, and not resident scholars who confronted the special problems of the tropics on a daily basis. As the institutions of tropical countries and their scholarly communities have built up slowly and unevenly, the destruction of their ecosystems has accelerated much more rapidly and uniformly. One of the reasons for this disparity has been rapid population growth, especially in the tropics. At the time of Alexander von Humboldt's travels just over 200 years ago, there were not quite a billion people in the world, a minority of them living in the tropics or what are now considered developing countries. Today, there are more than 7 billion people on Earth, five-sixths of them living in developing countries, including the tropics. One billion people are projected to be added to this number during the next 12 years (Population Reference Bureau, 2012). In Africa, for example, where so many people are malnourished or starving at present, the 950 million people who live in sub-Saharan countries today will be joined by another 500 million people by 2025! The combination of explosive population growth, demand for increased consumption that is growing still more rapidly, and the continued use of often antiquated or damaging extractive technologies are destroying natural communities all over the world, nowhere more rapidly than in the tropics. By the middle of this century, which is as soon as we could begin to hope for global population stability, 2–2.5 billion people will have joined our current numbers,

the great majority of them poor, and almost all of them living in developing countries. Putting the matter another way, each night when the world can be said to sit down to the dinner table, there are 200,000 more people needing to be fed. Against this background, the need for strengthening our knowledge of the tropics is evident, and the need for resident scientists and practitioners who can work to build sustainable systems for the countries with our help is absolutely urgent. This knowledge must then be put to use for the benefit of the people who live in tropical countries so that there can be a hope of attaining global sustainability.

Unfortunately for the achievement of sustainability in tropical regions, the extractive mentality that began with colonialism has persisted in many nations. Moreover, the numbers of resident scientists in most areas are small, especially in the face of the incredible biological diversity that occurs there (Barnard, 1995). A recent review of articles published in two of the leading international tropical ecology journals found that only 6.2% of tropical countries were represented, and 6.2% of all those articles came from just 10 countries (Stocks *et al.*, 2008). Furthermore, 6.2% of the articles were written by lead authors based at institutions outside the country where the research was carried out.

This geographical bias has a historical foundation: much research by Europeans has been and still is conducted in their former colonies in the Old World tropics (Clark, 1985). In the Western Hemisphere, European scientists also began the period of exploration, but they were followed by many scientists from the US. These scientists chose to conduct research in the Neotropics because of their proximity and richness and, more recently, because two of the largest international scientific organizations – the Organisation for Tropical Studies and the Smithsonian Tropical Research Institute – are based in Latin America, fostering collaborations with American researchers (Clark, 1985). Regardless of historical patterns and their underlying reasons, we have more to learn about the biodiversity and ecology of the tropics than that of any other part of Earth. Knowledge about tropical biological systems can clearly be accumulated more efficiently by residents than by occasional visitors. There is an important role in these investigations for the major systematic institutions of the world, which are mostly located outside of the tropics, in exploring their biology in the future, but clearly partnerships between them and tropical institutions hold the key for the best and most solid progress. Overall, there is a definite need for

greatly accelerated research programs in the tropics, programs that can be conducted best by people who live there. When they are the ones most clearly involved in the research, it can be applied most easily to problems of conservation and sustainability in the regions where these scientists are working.

In this book, we present diverse examples of the ways that scientific principles have been applied to the conservation of tropical ecosystems, and the success of these efforts. We do this by giving a voice to people from these tropical regions, who live there or who have worked there for major portions of their lives, thus gaining practical experience in the application of what we collectively are learning. We invited some of the leading conservation biologists from a variety of tropical countries to share their perspectives on important conservation issues in their countries. The following chapters provide stories of success and loss, of small communities in Thailand working together to protect horribles, of disordered national governments failing to protect forest habitats and their resident species within, and of many other practical experiences, both successes and failures. Our book is organized by geography, with the chapters arranged into sections corresponding to the four major tropical regions: Africa, the Americas, Asia, and Oceania. At the end, we also include a Diaspora section, with chapters written by people from the tropics who now work on tropical conservation issues at institutions outside of the region.

We deliberately chose the integrative discipline of conservation, implying also the building of sustainable ecosystems, for emphasis here: the needs for conservation are urgent. Conservation, however, rests on a foundation of knowledge built by ecologists, systematists, soil scientists, and especially by social scientists. In many parts of the tropics, the base on which conservation can be carried is notably deficient. Steps must be taken urgently on the basis of what we do know, however, because opportunities are slipping through our fingers with increasing rapidity. At present, the world's people are estimated to be using on a continuous basis about 150% of what the world can produce sustainably (<http://footprintnetwork.org>), which means that every natural system we know will be simplified, depleted, and made less beautiful until we find a way to live within our means in a world where social justice becomes an important theme.

There are some significant gaps in the coverage in this book. Although many tropical countries are represented, gaps remain particularly in Central America, Andean and northern South America, central and southern Africa, and large parts of Southeast Asia. For one particular country, we invited two people to contribute a chapter, but both ultimately declined to submit a chapter critiquing the conservation measures in their country, fearing backlash by the government and the potential loss of their jobs. This country is regrettably not included in this book, the voices of its potential authors silenced. The limit of freedom of expression is a fundamental concern in many tropical regions, where particular governments can be intolerant of criticism, constructive or not, and sometimes even repressive to those who choose to offer it. The people of the world share a common interest in survival, and the challenge will be met only by finding sustainability for our planet. We hope that one of the benefits of this book will not only be to help empower those who live and study in tropical countries to be able to do an even better job, but also to help us all understand the need for common action based on mutual understanding and some of the means pertinent to taking such actions effectively. We sincerely hope that our book will help to highlight the many problems – and some of the potential solutions – facing countries in the tropics, and ultimately every one of us as well.

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