Tropinet

Volume 17, No. 3 September 2006 Supplement to BIOTROPICA Vol 38 No. 5

The Association for Tropical Biology and Conservation

Organization for Tropical Studies
where science and nature converge

THE TROPICS OF ASIA, PAST AND PRESENT

Editor: **Lyn Loveless**, Department of Biology, The College of Wooster, Wooster, OH 44691. Phone: (330) 263-2022. Fax: (330) 263-2378. Email: mloveless@wooster.edu

Tropinet is accessible on the ATB website at http://www.atbio.org

Production Editor:**Carol Mozell** OTS
Design by **Katherine Hartman**

MEGAFAUNAL EXTINCTIONS IN TROPICAL ASIA

by Richard T. Corlett
Department of Ecology & Biodiversity, The University of Hong Kong, Hong Kong, China
For correspondence: corlett@hkucc.hku.hk

The last 2-3 million years has been marked by a new pattern of extinctions, particularly among large terrestrial vertebrates. These extinctions were non-synchronous, so they cannot have been caused by a single global catastrophe, and unsubstituted, i.e. they were not replaced by a different species occupying the same niche (Schuster & Schüle 2000). Some unsubstituted extinctions in the late Pliocene and early Pleistocene have been attributed to early human ancestors, but it is not until the late Pleistocene that the correlation between human expansion and the extinction of large vertebrates becomes indisputable. The spread of anatomically modern *Homo sapiens* coincided – more or less – with the extinction of half the world's megafaunal (>45 kg) genera, with the correlations most compelling in Australia, northern Eurasia, the Americas, the islands of the Caribbean and Mediterranean, and, most recently, in Madagascar and New Zealand (Burney and Flannery 2005, Martin 2005).

By contrast, the forested areas of tropical Asia apparently escaped this wave of megafaunal extinctions, ostensibly because human population densities remained very low until recently in much of the region. Those few extinctions that occurred have generally been attributed to climatic and associated vegetation changes (e.g. Medway 1972). The story is complicated, however, because of the long and poorly dated history of human occupation in tropical Asia. Between the arrival of *Homo erectus* 1.8 million years ago and modern *Homo sapiens* (70-)50,000 years ago, the region was home to populations – often known only from their teeth and/or stone tools -- whose relationship with these two species is still far from clear. *Continued on page 2*

DIGITAL INVENTORY OF BIOLOGICAL RESOURCES OF INDIA

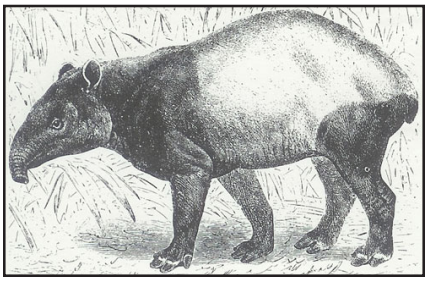
by R. Uma Shaanker, K.N. Ganeshaiah and S. Natesh[1]
School for Ecology and ConservationUniversity of Agricultural Sciences GKVK, Bangalore 560065
The Ashoka Trust for Research in Ecology and the Environment (ATREE)Hebbal, Bangalore 560024
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore 560 064
[1]Department of Biotechnology, Ministry of Science and Technology
CGO Complex, Lodhi Road New Delhi 110 003
For correspondence: rus@vsnl.com

Following the adoption of the Convention on Biological Diversity (CBD), biological resources have come to be regarded as a precious but untapped capital of any country. Consequently, the last few years have witnessed an unprecedented interest in conserving the valuable biodiversity of a country and ensuring that the intellectual property rights (IPRs) associated with these resources are protected. Towards this end, several countries, including the USA, UK, Madagascar, Australia, China, and South Africa have made important strides in documenting and digitizing their respective biological diversity. Spatial maps of the distribution of economically important resources and of species that are either fragmented or faced with small population sizes have since been developed. The databases have helped monitor the loss of biological diversity from a regional landscape to a global scale. Typically the efforts have involved a systematic data curation wherein the information on the occurrence of species is compiled in a data-accessible format. The data are then treated on a GIS-platform to obtain spatially explicit distribution maps. The databases have found utility in a number of analytic tasks, *Continued on page 2*

Continued from page 1

MEGAFAUNA: What is clear, is that these populations coexisted with a megafauna considerably richer and – in as far as this can be judged from the archaeological record - considerably more abundant than any that exists in the region today (e.g. Ciochen et al. 1996; Bekken et al. 2004). This megafauna included both taxa that are now extinct and ones that still survive, but in fractions of their former ranges.

Notable losses since the Pleistocene include the elephant-like stegodons (*Stegodon* spp.), a giant terrestrial ape (*Gigantopithecus blacki*), a giant tapir (*Megatapirus augustus*), and a giant pangolin (*Manis palaeojavanica*). There is no direct evidence for hunting of any of these species, but it is striking that all are large, slow-moving, terrestrial animals. Such animals must have been very vulnerable to hunters armed with the spears that we know contemporary human populations had elsewhere. Two of the most dramatic examples of range reductions fit the same pattern as the extinctions: the orangutans (*Pongo* spp.), which retreated from south-central China to their recent ranges on Borneo and Sumatra at the end of the Pleistocene, and the giant panda (*Ailuropoda melanoleuca*), which retreated north from a range that encompassed northern Thailand. It is possible to come up with plausible explanations for each of these, species by species, without invoking human impacts, but when these explanations are put together they appear to require contradictory environmental changes. The role of human hunters in Pleistocene extinctions and range restrictions in tropical Asia remains an open question, but spears and traps deserve at least as much consideration as climate and vegetation change.



Despite the megafaunal losses of the Pleistocene, tropical Asian forests supported a diverse megafauna into historical times, consisting of the Asian elephant, two widespread species of forest rhinoceros, the gaur and other forest bovids, a tapir, several species of large deer, several pigs, the tiger and leopard, three species of bears, and the two surviving species of orangutans. A typical forest site on the Asian mainland may have supported 10 or more species weighing more than 45 kg.

No longer. The Asian elephant, forest rhinoceroses, and big cats occupy small and largely non-overlapping parts of their historical ranges, meaning that less than 2% of tropical East Asia still supports an intact historical megafauna. Perhaps 60 Javan rhinoceroses and around 300 Sumatran rhinoceros are all that remains of populations that must have numbered in the millions 5000 years ago. Many forests sites, including areas under legal protection, support only the most tolerant ungulates, with a species of pig usually the last megafaunal survivor. Tropical East Asia has the highest rates of deforestation and logging in the world, but the proximal cause of most large vertebrate declines is hunting, reflecting not only the growth in human populations and increasing accessibility of fragmented forests, but also the massive local and regional markets for meat, skins, and animal parts, often for traditional medicine (Corlett *in press*).

The ecological roles of the Asian megafauna have received little systematic study, although there is plenty of anecdotal evidence for their importance in seed dispersal and understorey dynamics. Most of the major botanical reference sites (such as the 50-hectare plot at Pasoh, Malaysia) were established after the loss of the majority of their megafauna, so they cannot provide a baseline for comparison with defaunated sites. Thus we are not only losing our megafauna, we are losing it before we understand what it does. Tropical biologists ought to find this fact hugely embarrassing and funding studies of megafaunal ecology in the few places where they are still possible should have a high priority.

The wave of megafaunal extinctions may have come late to tropical Asia, but it is here now. It is impossible to read about the megafaunal extinctions in Australia, North America, or Madagascar without a feeling of immense sadness that such magnificent animals were lost so near to our own time, yet we are allowing it to happen again in front of our eyes. It is too late to do anything about the stegodons, *Gigantopithecus*, or the giant tapir, but we have one last chance to save tropical Asia's historical megafauna before it joins these ghosts from the Pleistocene.

Literature cited:

Burney, D.A. and Flannery, T.F. 2005. Fifty millennia of catastrophic extinctions after human contact. Trends in Ecology and Evolution 20: 395-401.

Bekken, D., Schepartz, L. A., Miller-Antonio, S., Hou, Y. and Huang, W. 2004. Taxonomic abundance at Panxian Dadong, a Middle Pleistocene Cave in South China. Asian Perspectives 43: 333-359.

Ciochon, R., Vu, T. L., Larick, R., Gonzales, L., Grun, R., de Vos, J., Yonge, C., Taylor, L., Yoshida, H. and Reagan, M. 1996. Dated co-occurrence of *Homo erectus* and *Gigantopithecus* from Tham Khuyen Cave, Vietnam. Proceedings of the National Academy of Sciences USA 93: 3016-20.

Corlett, R. T. *in press*. The impact of hunting on the mammalian fauna of tropical Asian forests. Biotropica

Martin, P. S. 2005. Twilight of the mammoths: ice age extinctions and the rewilding of America. University of California Press, Berkeley, California.

Medway, Lord. 1972. The Quaternary mammals of Malesia: a review. *In* P. S. Ashton and H. M. Ashton (Eds.). Transactions of the Second Aberdeen-Hull Symposium on Malesian ecology: The Quaternary Era in Malesia, pp. 63-98. Department of Geography, University of Hull, Hull, England.

Schuster, S. and Schüle, W. 2000. Anthropogenic causes, mechanisms and effects of Upper Pliocene and Quaternary extinctions of large vertebrates. Oxford Journal of Archaeology 19: 223-239.

Continued from page 1

DIGITAL INDIA: including identifying the gaps in data collection and curation, in predicting species discovery patterns, in locating populations and sites for *ex situ* and *in situ* conservation, and in formulating short and long term strategies for the conservation of the species.

In the recent past and in keeping with the CBD, India has begun to formally develop a digital inventory of its biological diversity. India harbors an estimated 89,450 described species accounting for about 7.3 per cent of the global biodiversity. However since most of these descriptions are scattered in innumerable archives, including published flora and faunal volumes, they are rarely accessible for easy use. In fact the lack of knowledge on *what bioresources occur* and *where* has been a major constraint in harnessing the potential of bioresources for human well being. But this is now to set to change, with the recent efforts underway at various institutions to digitize and document the country's biological resources. The University of Agricultural Sciences, Bangalore has, for instance, developed a complete digital inventory of the plant resources of the Western Ghats (*Sasya Sahaydri)*, one of the two megadiversity hot-spots of the country. The inventory has compiled information from 148 floras from the late 18th century through today, and includes information on taxonomic details, images and distribution of over 6,100 species of plants at a resolution of 10x10 sq. km. A number of features including the valid names and synonyms of plant species, images, common names in 80 languages and dialects, thematic maps of taxonomic richness at family, genus and species levels have been made available. The Bangalore group has also developed other databases including *Sasya Bharati* (Plant resources of India) – covering over 13,000 plant species of the country, *Sahyadri Pathangam* – a butterfly inventory of the Western Ghats at a 5x5

sq. km scale, and *Bird database* - including 1200 species of birds of India. Among some of the other noteworthy digital inventories are those on medicinal plants (by the Foundation for Revitalization of Local Health Traditions, FRLHT), traditional knowledge systems (by NISCAIR), people's biodiversity registers (by Center for Ecological Sciences, Indian Institute of Science), floral and faunal databases called *Indflora* and *Indfauna* respectively (by the National Chemical Laboratory), and spatial databases by the National Remote Sensing Agency. In an effort to reach out to a wider clientele, the Ashoka Trust for Research in Ecology and the Environment (ATREE) and the University of Agricultural Sciences, Bangalore have together also made available a few of the digital inventories as well as spatial data sets and images through web-based sites, namely www.plantsofindia.org and www.ecoinformatics.org. The latter site is intended as a publicly accessible resource for integrated and value-added information on ecology and the environment that actively promotes collaboration in applied research and capacity building in the area of ecoinformatics.

In addition to the above efforts, a major initiative in developing digital inventories of biological resources was launched by the Department of Biotechnology (DBT), Government of India under its National Bioresource Development Board (NBDB). Through the participation of ten institutions in the country, the inventory, entitled *Jeeva Sampada* (meaning Wealth of Bioresources) documents information on medicinal and economically important plants, animal, and microbial resources. Comprising 82,000,000 records for over 39,000 species, *Jeeva Sampada* is easily the most exhaustive and largest bioresources data base (about 7.0 GB) ever in the country.

In summary, these recent efforts have provided an unique set of databases, both spatial and non-spatial of the bioresources of the country. Realizing the need to network these diverse databases and to provide a front end for its effective use, the Department of Biotechnology, Government of India has recently established the Indian Bioresource Information Network (www.ibin.co.in) in the country. This network was formally launched by Mr. Kapil Sibal, Union Minister for Science and Technology, Government of India on July 25, 2006 in New Delhi. The IBIN will facilitate the use of the existing digital databases by diverse end users, promote the interlinking of these diverse databases through a continuous interaction and finally support a continuous growth of the databases and their utility in conservation science and technology development. The entire system, which is operational on the existing Bio-grids of the Bio-informatics network of the DBT, will be made available on the web through suitable access and control systems. Undoubtedly these major initiatives are going to have profound implications for the conservation and managed utilization of the bioresources of the country. From botanists to bioprospectors, students to scholars, and forest managers to policy makers, the development and integration of the various databases in the form of IBIN marks an important application of information technologies to the conservation of India's biological diversity.

LAS CRUCES BIOLOGICAL STATION

The Las Cruces Biological Station is one of three stations owned and operated by the Organization for Tropical Studies (OTS) in Costa Rica. Located at 1100 m (3600 ft) above sea level along a spur of the Zapote coastal range, it is about 300 km southeast of the capital San José in Coto Brus County. Las Cruces receives about 4 m of rainfall annually, with a distinct dry season from December to April. The forest is classified as a tropical premontane rainforest according to the Holdridge system.

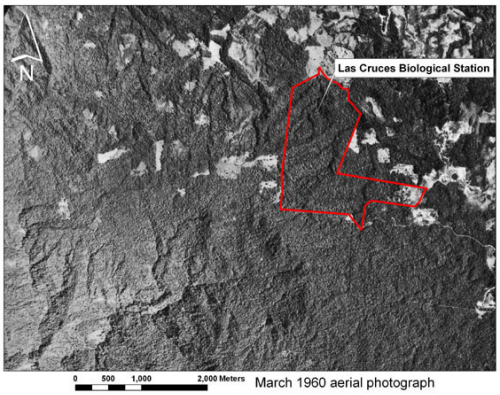
Coto Brus is one of the most deforested counties in Costa Rica; it is also one of the most recently deforested. The forest is very fragmented, and the regional landscape is made up of a mosaic of mixed-use agricultural fields. Originally a principal coffee growing region, most land has been converted to pasture in the last decade due to the global drop in coffee prices. Given the steepness of land and high annual rainfall, conversion to pasture has resulted in many environmental problems including soil erosion, water contamination, and flooding.

The Station owns one of the largest remaining forest fragments in the region. With ~200 hectares of primary forest and over 50 hectares of adjacent secondary forest, the fragment is home to over 2,000 native plant species. Numerous smaller fragments are scattered throughout the area, and some biological connectivity exists in the form of living fence rows and narrow corridors along riparian zones. However, rather than viewing this landscape as an impediment to research, it is this that makes Las Cruces an ideal station at which to study the effects of forest fragmentation and isolation on animal and plant communities. The area is also ideally suited for research on biological corridors and restoration ecology.

Las Cruces is working to actively promote and facilitate research in these areas in a number of ways. In August 2005 we hired a fulltime GIS coordinator, charged with acquiring all aerial and landsat information available for this region. Collections date back to the late 1950s, which coincides with the earliest colonization of Coto Brus County. Accordingly, a comprehensive GIS database is being compiled for the land use history of this region. In addition, our GIS manager is documenting the changes that have occurred in land use over the past 50 years. We are also determining the location and ownership of fragments around Las Cruces and mapping watersheds and other important topographical landmarks. These databases are available to all researchers at Las Cruces.

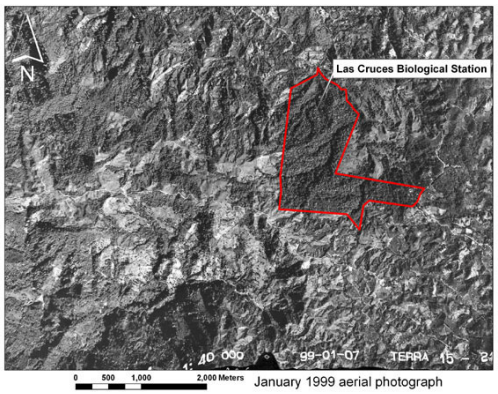
A second goal of our mission at Las Cruces is to continue a land acquisition program and, in doing so, to expand our protected areas and connect some of the isolated forest fragments around the station. Given the predominant agricultural land use around Las Cruces, most new land acquisitions will be former pasture. Accordingly, these purchases will be ideally suited for restoration ecologists to conduct research on forest recovery and the design and execution of biological corridors to link up isolated fragments. The current land campaign is focused on the purchase of a 16-hectare forest fragment that is isolated from the Las Cruces fragment by 500 m. The purchase would incorporate the 16 ha fragment and some 20 ha of pasture that will be made available for research. We hope to complete the purchase by the end of 2007. Future acquisitions will allow for the replication of restoration projects, and the

Continued on page 8



March 1960 aerial photograph

LEFT: 1960 aerial photograph of Las Cruces and surrounding area showing the original forest cover that was present.
RIGHT: 1999 aerial photograph showing the extensive deforestation that has occurred and the effective isolation of Las Cruces.



January 1999 aerial photograph

ATBC 2006: "Tropical Biology: Meeting the Needs in Changing Tropical Ecosystems"

W. John Kress
Executive Director, ATBC
Smithsonian Institution

From the opening remarks by Conference Program Chair Prof Chen Jin, Director of the Xishuangbanna Tropical Botanical Garden, to the closing farewell celebration overlooking Green Lake on a beautiful summer evening, the 2006 Annual Meeting of the Association for Tropical Biology and Conservation in Kunming, China, will rate as one of the most exciting, stimulating, well-organized, and productive conferences of the association. With over 300 participants arriving from 43 countries, the interactions could not have been more international. One thing is certain: ATBC continues to perfect its mission to promote an awareness of the importance of tropical biology and conservation, its scope, and its needs, through programs of research, education, and communication. The Kunming Conference did it all.

The theme of the meeting was "Tropical Biology: Meeting the Needs in Changing Tropical Ecosystems." And the five plenary addresses, 13 symposia, four contributed paper sessions, and 60 posters hammered this theme home while at the same time expanding our understanding of the basic biology and functioning of tropical organisms, species interactions, and ecosystems. There was something of interest for everyone.

This meeting in China was only the second ever held in Asia. Hosted by the Xishuangbanna Tropical Botanical Garden (XTBG) and sponsored by the Chinese Academy of Sciences and National Natural Science Foundation as well as ATBC, advances in Asian tropical biology and the expansion of support for tropical biology in Asia were evident. The comments of Dr. Chen Zhu, Vice President of the Chinese Academy of Sciences in both a pre-conference dinner with the ATBC Councilors and during his opening address made it clear that the Chinese government was fully committed to increasing funding for ecological and environmental research. Growth of Chinese science during the last decade has been impressive, and the comments of the Vice President were most encouraging for all the tropical biologists in the audience.

The Plenary lecture by Dr. William Laurance, ATBC Current President and research scientist at the Smithsonian Tropical Research Institute in Panama, also set the tone for the meeting. In "Reflections on the Tropical Deforestation Crisis" Laurance challenged a recent paper published in ATBC journal *Biotropica* by former ATBC President Joe Wright and colleague that suggested the extinction rate in developing tropical countries may not be as severe as earlier predicted. If true, this news would be welcomed by all, but Laurance was not optimistic that the analysis was without fault. Yet the debate over whether 50% of species as accepted by many or only 25% as suggested by Wright in the new analysis may become extinct by the year 2050 seemed "academic" by many participants. Conservation of tropical forests and species dominated many of the presentations and discussion during the four days of the conference.

Each morning of the conference started off with a keynote address, with topics ranging from insects in complex communities (Roger Kitching) and bio-atmosphere hotspots and ecosystem trading in the tropics (Andrew Mitchell), to megafaunal extinctions in tropical Asia (Richard Corlett) and a challenging address on the theme of the meeting (Ariel Lugo). The symposia were equally diverse, and included sessions on pollination by vertebrates, landslides in montane ecosystems, Asian tropical biology, comparative ecology and ecophysiology, biological invasions, forest canopies, biogeography, large-scale restoration of tropical ecosystems, sustainable land use, animal-plant relationships, tropical mutualisms, reproductive ecology of tropical plants, and epiphyte diversity. The contributed papers were similarly interesting and diverse.

Besides the exciting biological and conservation science presented in the 243 presentations at the meeting, a number of important initiatives were introduced in Kunming. The first was the establishment of a new Asian Chapter of ATBC through the efforts of Rhett Harrison, Councilor Priya Davidar, and Councilor Richard Corlett. Two planning meetings at the conference, attended by many, clearly indicated that an Asian chapter was welcomed by all, and the first meeting will be convened in March in Pondicherry, India. This chapter is the first for ATBC and we will be watching to see how it contributes to the mission of the Association.

The active ATBC Conservation Committee continued its goal of addressing local environmental issues with a conference-wide meeting on an Asian conservation agenda. Under the leadership of ATBC President Bill Laurance, the Committee unanimously structured and approved an Asian "Kunming Declaration". This environment statement was approved by an ATBC plenary session on the last day of the conference, and clearly supported the goals of XTBG by urging the nations of tropical Asia to expand the number and size of protected areas within their borders, especially for forest types and eco-regions that are poorly protected in existing reserves, and for the increasingly rare areas that still retain their highly vulnerable megafauna. In addition, the declaration urged that financial support be substantially increased for scientific strategies to (a) restore degraded and secondary forests, (b) identify key regions of high biological and conservation significance, (c) enhance and maintain functional connectivity for wildlife among existing and planned reserves; (d) develop multi-national research, collaboration, and capacity-building; and (e) devise sustainable strategies for natural-resource development. The Kunming Declaration was distributed to the local and international media at the end of the conference.

The concluding social event of the conference is always the ATBC Banquet. With all participants present, the ATBC Executive Director, the President and the Awards Committee get a chance to address the conferees. John Kress, Executive Directror of ATBC, highlighted the achievements of ATBC during the last year, including the selection of *Biotropica's* new Editor, Jaboury Ghazoul from Zurich. Kress also touted the decrease in time of submission of papers to manuscript acceptance from one year to two months (submit your manuscripts asap!), and the increase in the impact factor of the journal, advances which have taken place under the leadership of retiring editor Robin Chazdon. All things are good with *Biotropica*. ATBC President Laurance, at the banquet, reaffirmed the achievements of ATBC during the last year.

Each year ATBC honors long-standing contributors to tropical biology through its Honorary Fellow awards. This year Dr. Peter Ashton and Prof. Xu Zheng-Xi were recognized for their contributions to Asian forestry and the Chinese flora, respectively. Prof Wu Zheng Xi, who recently celebrated his 90th birthday (clearly a time for reflection), could not attend the actual banquet, but an engaging video presentation of his career was shown and words of acceptance of the award were provided by Dr. Li De-Zhu, current Director of the Kunming Institute of Botany. Prof. Peter Ashton, an outstanding tropical biologist who has worked in tropical Asia for most of his career, was also honored. He was able to call in from the United Kingdom to express his excitement about being elected an Honorary Fellow and share some of his memories of research in Asia.

Kunming could not have been a better venue for this second Asian meeting of ATBC. Chen Jin, Cao Min, and Li Liming along with their scientific and organizing committees did an exceptional job in orchestrating this wonderful conference. A new level of excellence and excitement has been established with the 2006 meeting in China. Miquel Martinez and Maurcio Quesada, next year's program chairs for the ATBC meeting in Morelia, Mexico, are going to have to work hard to top the 2006 conference. We wish them luck!

Association for Tropical Biology and Conservation

RESOLUTION IN SUPPORT OF EFFORTS TO USE CARBON TRADING TO PROMOTE TROPICAL FOREST CONSERVATION

WHEREAS, the rapid destruction of tropical forests is a major source of anthropogenic carbon emissions, accounting for up to a quarter of all greenhouse gases produced by humankind each year, and is therefore an important cause of global warming and other alarming atmospheric changes; and
WHEREAS, rapid deforestation also causes severe losses of biodiversity, increased flooding, and regional climate changes; threatens many indigenous cultures; and greatly damages the livelihoods of some of the world's poorest people; and
WHEREAS, many land uses in the tropics are unsustainable and only marginally viable economically, allowing rural residents to eke out a desperate living but little else; and
WHEREAS, tropical deforestation is being promoted by the failure of international markets to recognize the true value of forests in terms of their carbon storage and other important global benefits; and
WHEREAS, recognizing the true value of undisturbed forests, and rewarding the governments of developing countries for retaining those forests, could radically alter the flawed economic logic that is promoting rapid deforestation; and
WHEREAS, carbon trading provides a potentially powerful tool by which industrial nations and other purchases of carbon credits could provide direct financial incentives to tropical developing countries to reduce forest destruction; and
WHEREAS, the Coalition for Rainforest Nations, an alliance of developing countries led by Papua New Guinea and Costa Rica, is attempting to promote rainforest-carbon trading as a viable mechanism to reduce tropical deforestation and related greenhouse-gas emissions, while providing economic incentives to the governments and rural populaces of developing nations, to ensure that such reductions are long term in nature; and
WHEREAS, rigorous scientific, economic, and policy analyses have been conducted that establish the practical mechanics and viability of carbon trading as a means to promote forest conservation;

THEREFORE, BE IT RESOLVED that the Association for Tropical Biology and Conservation, the world's largest scientific organization devoted to the study, protection, and wise utilization of tropical ecosystems:

1. Advises tropical nations to give serious consideration to carbon trading as a means to promote forest conservation, and to make all possible efforts to achieve permanent or long-term reductions in forest loss; and
2. Urges the Parties of the United Nations Framework Convention on Climate Change to develop and implement meaningful instruments to reduce carbon emissions from deforestation in developing countries as part of its formal policies for the Second Commitment Period (2013-2017) of the Kyoto Protocol, including incentives to stimulate early action; and
3. Strongly recommends that international lenders and donors, such as the World Bank, International Monetary Fund, and aid organizations, provide initial financial assistance to developing nations that are striving to establish critical compliance and monitoring systems that will be used to regulate and control land-use activities within their national borders; and
4. Urges the international community, including national governments and non-governmental organizations, to recognize and support current initiatives, such as that of the Coalition for Rainforest Nations, to promote carbon trading as a practical economic mechanism to reduce tropical deforestation and global warming; and
5. Strongly recommends that the Coalition for Rainforest Nations strive to create carbon-trading mechanisms that benefit nations with high deforestation rates that reduce forest conversion, as well as nations with low deforestation rates that maintain those low rates in the future.

THE KUNMING DECLARATION
(21 JULY 2006)

THE CRITICAL NEED FOR FOREST CONSERVATION AND STRATEGIC RESEARCH IN TROPICAL ASIA

WHEREAS, the biological diversity of tropical forests in Asia is among the very richest and most spectacular on the planet, and likely accounts for at least a quarter of all species on Earth; and
WHEREAS, Asia has the highest deforestation rate of any major tropical region in the world, and is also being massively altered by rampant industrial logging, plantation expansion, overhunting, the illegal trade in wildlife and wildlife products, pollution and degradation of freshwater and coastal marine ecosystems, rapid human population growth, and other threats; and
WHEREAS, many species in tropical Asia have naturally restricted geographic ranges and small population sizes, rendering them inherently vulnerable to habitat destruction and degradation; and
WHEREAS, the geographic ranges and population sizes of large forest wildlife, such as elephants, rhinoceroses, tigers, sun bears, and orangutans, have collapsed dramatically in the region, to the degree that very few forests today contain the full complement of their original megafauna; and
WHEREAS, many important ecosystems in tropical Asia are seriously underrepresented within national parks and protected areas, leaving them highly vulnerable to future loss and degradation; and
WHEREAS, spectacular economic growth in Asia, particularly in China and India, is greatly escalating demands for timber, bush meat, wildlife products, agricultural land, and infrastructure expansion throughout the region, and often leads to the destructive or unsustainable use of natural resources; and
WHEREAS, rapid economic growth and the impressive development of scientific expertise in tropical Asia are creating important new opportunities for targeted research and conservation initiatives;

THEREFORE, BE IT RESOLVED that the Association for Tropical Biology and Conservation:

- URGES the nations of tropical Asia to expand the number and size of protected areas within their borders, especially for forest types and eco-regions that are poorly protected in existing reserves, and for the increasingly rare areas that still retain their highly vulnerable megafauna; and
- IMPLORES the nations of tropical Asia to support existing protected areas against illegal hunting, logging, encroachment, and other degrading activities, providing the political will and resources needed to ensure their long-term protection, especially for surviving megafauna; and
- STRONGLY SUGGESTS that reserves be linked wherever possible into regional networks and cross-national corridors, to increase their size and effectiveness for area-sensitive wildlife, and to reduce their vulnerability to many external threats; and
- RECOMMENDS that financial support be substantially increased for scientific strategies to (a) restore degraded and secondary forests, (b) identify key regions of high biological and conservation significance, (c) enhance and maintain functional connectivity for wildlife among existing and planned reserves; (d) develop multi-national research, collaboration, and capacity-building; and (e) devise sustainable strategies for natural-resource development; and
- STRONGLY SUGGESTS that policy makers in tropical Asia engage in an active and ongoing dialogue with informed scientists, in order to better understand the critical challenges facing the region and its vital natural resources; and
- URGES the People's Republic of China, by virtue of its growing economic power, considerable scientific expertise, and growing demands on natural resources in the Asia-Pacific Region, to take a leading role in promoting, funding, and developing more sustainable development strategies and conservation initiatives in tropical Asia.

African Biodiversity Explored

Edited by Alfonso Alonso, Michelle E. Lee, Patrick Campbell, Oliver S. G. Pauwels, and Francisco Dallmeier. *Gamba, Gabon: Biodiversity of an Equatorial African Rainforest.* Special *Bulletin of the Biological Society of Washington*, no. 12 (436 pages), January 2006. Available from Alfonso Alonso (alonsoa@si.edu), or via check or money order (price $27) payable to The Custodian of Publications, Biological Society of Washington, National Museum of Natural History, MRC 116, P.O. Box 37012, Washington, D.C. 20013-7012, USA.

Reviewed by William F. Laurance
Smithsonian Tropical Research Institute
Apartado 2072, Balboa, Panama
Email: laurancew@si.edu

Ever since devouring *The Overloaded Ark* by British naturalist Gerald Durrell, which charmingly portrayed his seat-of-the-pants expedition to Cameroon in the 1950s to collect a menagerie of exotic animals for London's Whipsnade Zoo, I have been determined to visit the rainforests of Central Africa. I finally got the opportunity in 2002, and have since returned twice, as part of an ongoing effort to understand the growing perils of roads and hunting for forest wildlife in Gabon. Reading through *Gamba, Gabon: Biodiversity of an Equatorial African Rainforest*, I was instantly transported back to a region that still resembles the magical wilderness that was once Central Africa.

The Gamba area is an 11,300 km^2 complex of intermingled beaches, swamps, lagoons, lakes, mangroves, upland rainforests, natural and anthropogenic savannas, villages, and densely forested mountains skirting Gabon's southwestern coast. It still retains some of the richest wildlife communities in Africa, including such spectacular species as forest elephants, hippos, forest buffalo, sitatunga, lowland gorillas, chimpanzees, and a dazzling variety of birds, reptiles, and amphibians. This biological cornucopia has managed to coexist relatively harmoniously with oil production and development activities in the region, especially those under the aegis of Shell Gabon, which has made its reduced-impact operations in Gamba something of a benchmark for others to follow. Less conducive to conservation have been the growing impacts of industrial timber operations, which create labyrinths of forest roads that greatly increase the vulnerability of wildlife to commercial hunters.

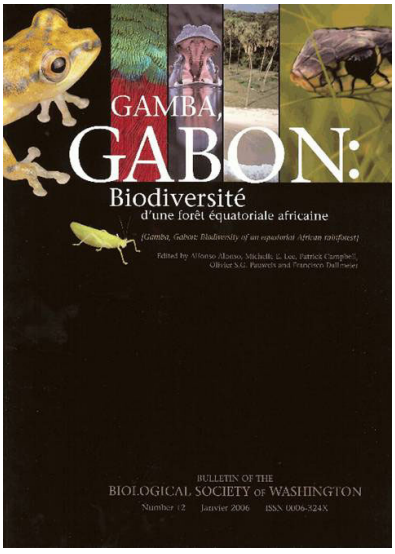
Gamba, Gabon is a collection of essays and articles by researchers working under the auspices of the Smithsonian Institution's Monitoring and Assessment of Biodiversity Program (MAB). MAB's broader mission of science-based conservation involves biodiversity studies in poorly explored regions of the world, local training and capacity building, and conservation education. In Gabon, they have been working cooperatively with local partners, especially Shell Gabon, Shell Foundation, and the Gabonese government, and with a coterie of researchers from African, European, and U.S. institutions, to document the poorly studied wildlife and ecosystems of the Gamba Complex of Protected Areas.

Perhaps the first thing to say about *Gamba, Gabon* is that it is an absolute must-read for anyone contemplating a trip to Equatorial Africa. Each article is replicated in both English and French, the latter the national language of Gabon and several neighboring countries. It is strikingly illustrated, with 32 pages of maps and images by award-winning photographers. These vividly portray the local geography, natural habitats, conservation issues, industrial development, and people of the Gamba region. Equally arresting are the many images of wildlife—fish, arthropods, amphibians, reptiles, birds, small and large mammals—and of MAB researchers and their Gabonese collaborators in the field.

The core of MAB's original efforts in Gamba involved intensive biodiversity surveys by substantial teams of specialists in five eclectic locations: (1) the greater Gamba area, a coastal basin that includes white-sand beaches, the massive Ndogo Lagoon (the largest in Africa), savanna-woodland mosaics, rainforest, farmlands, and villages; (2) Rabi, a site dominated by mature rainforest with some oil and logging activities; (3) Toucan, a somewhat drier rainforest site with nearby villages; (4) Loango National Park, a coastal zone with beaches, lagoons, savanna, and rainforest; and (5) Moukalaba-Doudou National Park, which spans an elevational gradient from lowland swamp forest to dense rainforest clinging to steep cliffs and upland granites. These areas mirror the complex array of habitats and ecosystems in the Gamba region. The great diversity of species the scientists encountered was partly a consequence of the remoteness of their study areas, and it is apparent that the logistics of working in the more far-flung locations was occasionally nightmarish.

Most of the articles in *Gamba, Gabon* are taxonomically based and geographically crosscutting, in that they integrate findings from the five intrepid field surveys. The book begins with an overview of the Gamba complex and its environments (Michelle Lee et al.), accompanied by a discussion of ecological indicators and threats to the region (Franciso Dallmeier et al.). This is then followed by articles on floristic structure (Patrick Campbell et al.), orchid diversity (Tariq Stevart & Vincent Droissart), freshwater and lagoon fish (Victor Mamonekene et al.), amphibians (Marius Burget et al.), reptiles (Olivier Pauwels et al.), sea turtles (Alexis Billes et al.), birds (George Angehr et al.), small mammals (Carrie O'Brien et al.), bats (Rogelio Rodriguez et al.), arboreal and larger terrestrial mammals (Sally Lahm & Jean Pierre Tezi), very large mammals (Major Boddicker), and humpback whales (Howard Rosenbaum & Tim Collins). A further chapter summarizes a study of the karyology and chromosomal evolution of selected small mammals (Ashley Primus et al.).

The investigators made many important findings and met more than a few surprises. Among these were the highest diversities of reptiles and amphibians ever encountered in Gabon, the presence of numerous wildlife species of critical conservation concern, and sites with large concentrations of locally endemic species. Especially important were the realizations that certain habitat mosaics provide critical areas for elephants and other wildlife during seasonal resource bottlenecks, and that the Gamba Complex of Protected Areas functions as an important corridor for seasonal migrations of large mammals and anadromous fish between coastal and inland areas. The Gamba region is also ecologically connected at much larger scales, supporting a host of globally migratory species, including Paleotropical and Palearctic birds, sea turtles, certain marine fish, and humpback whales.



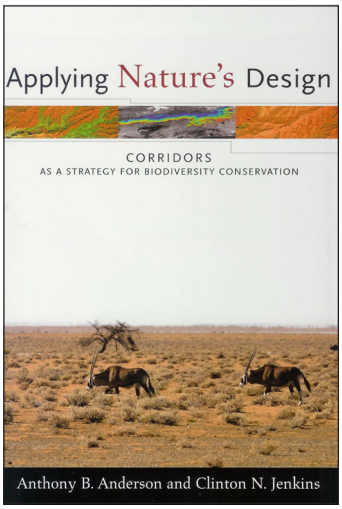
Gamba, Gabon is an excellent, cutting-edge introduction to the wildlife and ecosystems of Equatorial Africa. Gabon is today at a crossroads between heavy development pressures on the one hand, and new initiatives to markedly expand its national park system and promote ecotourism, on the other. MAB's landmark efforts to distribute this book widely in Gabon, to train Gabonese scientists, and to display the region's natural treasures to a global audience, should help to build the local support that is so crucial for sustaining Gabon's fledgling conservation initiatives.

Conservation Corridors: Practitioners lead the way

Anderson, A. B. and C. N. Jenkins. 2006. *Applying Nature's Design: corridors as a strategy for biodiversity conservation.* Columbia University Press, New York. ISBN 0-231-13411-8, 231 pp.

Reviewed by Susan G. W. Laurance
Smithsonian Tropical Research Institute
Apartado 2072, Balboa, Panama
Email: laurances@si.edu

When it comes to conservation corridors there is a large disparity between the worlds of theory and practice. The theoretical field is more than 25 years old. It has abundant datasets on wildlife using and moving through habitat corridors but little data on *the big science question*—do corridors contribute immigrants to otherwise insular populations? Hence many academics have recommended waiting until more evidence is available. Practitioners, however, have observed increasing fragmentation, urbanization and soaring land values and recognized that waiting is simply not an option. They have taken the corridor concept and implemented it. In synthesizing the experiences of some of these conservation managers, Anderson and Jenkins have, in their book *Applying Nature's Design*, identified many new ideas and approaches to corridor science.



The authors introduce 8 case studies of small- or large-scale corridors from Brazil, Costa Rica, Canada, USA, Malaysia, Netherlands, India and Nepal. In reading these case studies the first thing you recognize is that corridor implementation is only partly about species mobility and habitat requirements, and mostly about socio-economic issues. This is because the most powerful force acting on both the landscape and the successful implementation of corridors are the people that inhabit it. Linkages between parks generally occur through private lands, and it is only through meeting the landholders' needs first can we then consider those of wildlife. The scope of some of these case studies is frightening; for example, one of the landscape corridor case studies presented in this book covers a forested area of 34,000 km² between Nepal and India, where 6 million people depend on subsistence agriculture.

In their synthesis chapter, Anderson and Jenkins have identified major issues associated with implementing corridors: the obstacles, building support, effective incentives and management. Obstacles to creating corridors are generally caused by a perceived conflict over limited resources, and one of the interesting observations made in the book is that resistance to corridors is greatest in places where property rights are most clearly defined. Not only are private landowners suspicious of any restriction but groups such as pastoralists, petroleum interests, timber and mining companies have also reacted strongly to any limitations of their use of public lands.

Leadership of motivated people with vision is essential to building support from these interest groups for the successful implementation of corridor projects. Local leadership is critical, although international NGO's such as World Wide Fund and The Nature Conservancy have been effective in either directly financing corridor projects in Brazil and Costa Rica or leveraging support from other sources. Educating and encouraging the involvement of local landholders and government agencies is also crucial, and the team-building abilities of an individual can make all the difference to the success of these initiatives.

So what are the incentives that motivate people to become involved in corridors? In Brazil, the Atlantic forest case study discusses raising public awareness about biodiversity loss, and in this case the highly attractive and endangered lion tamarin species have motivated some landowners of large properties to protect their forests. Greater assistance was required by farmers of small allotments to move away from damaging shifting cultivation to agroforestry practices. Corridor initiatives hired community extension officers and technicians to educate farmers and provided seedlings for fruit, timber, fuel, and fodder including native tree species. In other case studies technical expertise in sustainable forest extraction and ecotourism was also required.

Financial incentives can motivate most people. The case studies in this book have covered the spectrum of ways landholders can be assisted, from direct purchase of land or development rights (easements) to deductions or waiving of land taxes for people who put their land aside for conservation. Funding these programs can be very innovative. For example in Costa Rica, a 5% sales tax on fossil fuels has generated funds to compensate landholders to keep their forests intact. This program (Costa Rican National Forestry Fund) appears to work successfully for the educated landholders, but poor farmers may be disadvantaged by the costs and bureaucratic paperwork.

Other chapters that will be appreciated by students include a general review of corridor design literature and a discussion on the theoretical foundations of corridors (here the authors have followed the original outline of Andrew Bennetts' (1999) *Linkages in the Landscape*, IUCN). The book is well written but at times the structure is a little awkward. At the rear of the book there is an excellent in-depth description of the case studies that is preceded by the synthesis chapter. At times I needed more information about the case studies to help me evaluate the findings in this chapter (for example size of the corridor, number of landholders etc.), and moving between the case studies and the synthesis chapter meant I was frequently losing my place. It might have been easier if the authors had written a few sentences about each site in the beginning of the chapter so it would be possible to read the chapter without stopping. In all I think Anderson and Jenkins have provided a very thoughtful book that demonstrates how important socio-economic issues are to the conservation of habitat on private lands and how innovative the approaches of practitioners have been in implementing corridors in real world landscapes.

Continued from page 3

continued expansion of protected habitat in the region. Ultimately, we hope to develop Las Cruces into a key tropical research center that is focused on the fields of conservation biology, restoration ecology, and landscape ecology.

In addition to the high plant diversity in our forest fragment, there are over 100 species of mammals at Las Cruces, of which 43 are bats. We have over 400 recorded species birds and thousands of insect species. Nonetheless, seven mammal species are known to have gone locally extinct and many others are threatened (Pacheco et al. 2006). In addition, a number of bird species are now only found in the Las Cruces fragment and their long-term viability is not well known (Daily et al. 2001). Thus it is critical to understand the conservation dynamics of this region in order to make sound conservation decisions and increase the protected area that Las Cruces covers in a strategic manner. Over time, isolated forest fragments can be bridged and ultimately we may be able to connect Las Cruces to large distant fragments such as the Guaymi reserve (7500 hectares), some 8 km away.

The station also houses the Robert and Catherine Wilson Botanical Garden, considered the most important in Central America. The garden has a rich, internationally recognized collection of tropical plants from around the world and includes the second largest collection of palms worldwide. Over 3,000 species of plants are found on the 12-hectare property.

Las Cruces can provide room and board for up to 80 people. The station is equipped with classrooms and wireless access to the internet, as well as laboratory and library facilities for researchers and academic courses for short- or long-term stays.

If you are interested in more information about Las Cruces and the possibility of conducting research at the station and/or donating to our land campaign, please contact the station director Zak Zahawi (zahawi@ots.ac.cr), or visit our website (http://www.ots.ac.cr/en/lascruces/). In Costa Rica, the station number is 773-4004. OTS is a nonprofit consortium of almost 70 universities and research institutions from the US, Costa Rica, Peru, Mexico, South Africa, and Australia. Our mission is to provide leadership in education, research, and the responsible use of natural resources in the tropics.

LITERATURE CITED:

Daily, G. C., P. R. Ehrlich, and G. A. Sanchez-Azofeifa. 2001. Countryside biogeography: use of human-dominated habitats by the avifauna of southern Costa Rica. Ecol. Applications 11:1-13.

Pacheco, J., G. Ceballos, G. C. Daily, P. R. Ehrlich, G. Suzán, B. Rodríguez-Herrera, and E. Marcé. 2006. Diversidad, historia natural y conservación de los mamíferos de San Vito de Coto Brus, Costa Rica. Revista de Biología Tropical 54:219-240.

Smithsonian Institution's Monitoring and Assessment of BiodiversityProgram (MAB) professional training course for international scientists, resource managers and educators. The course will take place Sept 17 - Oct 9, 2006 in FrontRoyal, Virginia at the National Zoo's Conservation and Research Center. Topics include vegetation, mammals and arthropods,an introduction to project planning, GIS, and statistics. For more information contact Jennifer Sevin at sevinj@si.edu or look online at www.si.edu/simab

CURSO IBEROAMERICANO TEÓRICO-PRÁCTICO DE INTERACCIONES PLANTA-ANIMAL/,* 6-26 de Noviembre de 2006, Instituto Venezolano de Investigaciones Científicas, Caracas, Venezuela. Curso intensivo, dirigido a estudiantes de posgrado en ciencias biológicas y afines. Acreditación: 5 UC. Costo de la matrícula: US $ 400.00 (incluye alojamiento y alimentación). Información: Dra. Virginia Sanz (vsanz@ivic.ve)

Tropinet

Vol. 17 No.3
September 2006
Box 90632
Durham, NC 27706-0632

Tropinet is published quarterly by the Association for Tropical Biology and Conservation (ATBC) and the Organization for Tropical Studies (OTS) and is distributed free of charge to interested readers. To receive *Tropinet*, please send name and address to OTS. Suggested contributions of $15 or more are gratefully appreciated. Please write *Tropinet* on check payable to OTS and mail to OTS at address indicated below.

ATBC is an international society that promotes tropical biology and conservation in its broadest sense. ATBC publishes the quarterly journal BIOTROPICA and sponsors annual meetings and symposia. Information: W. John Kress, ATBC Executive Director, Smithsonian Institution, US National Herbarium, Department of Botany, NBH 166, Washington, DC 20560.

OTS is a non-profit consortium of 65 academic and research institutions in the United States, Australia, Latin America, and Asia. Its mission is to provide leadership in education, research and the responsible use of natural resouces in the tropics. Graduate, undergraduate, and professional training and research facilities are provided at three field stations in Costa Rica. Information on OTS and *Tropinet* contributions: OTS, Box 90630, Durham, NC 27708-0630.

Tropinet
Vol. 17 No. 3
September 2006
Duke University
Organization for Tropical Studies
Box 90632
Durham, NC 27706-0632

Official Business
Penalty for Private Use, $300

Nonprofit Org.
US Postage
PAID
Durham, NC
Permit No. 60