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Authors: Estrada, Alejandro, and Butler, Rhett

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## Editorial

# Tropical scientists engage in challenging conservation issues

**Alejandro Estrada<sup>1</sup> and Rhett Butler<sup>2</sup>**

<sup>1</sup>Estación de Biología Tropical Los Tuxtlas, Instituto de Biología, Universidad Nacional Autónoma de México

<sup>2</sup>Mongabay.com

The second issue of Tropical Conservation Science contains eight papers. In six of these the leading author is a scientist from a tropical country. One of these papers deals with habitat use and ranging patterns of Asian elephants in India in a fragmented landscape and agricultural matrix. Another focuses on the use of invertebrates in popular medicine in Brazil. A third reports on demography and seasonal movements of the common hippopotamus in southern Burkina Faso, Africa. A fourth reports on the distribution of endemic freshwater mollusks in Cuba. An additional paper updates information on the distribution of primates in Bolivia and the sixth paper investigates the assemblage of vertebrates at a fruiting fig in the Maliau basin, Malaysia. The two additional papers in this issue tackle questions regarding the stability of natural protected areas in the tropics in the context of rapid population growth pressures around them. One assesses this pressure on Kibale National Park in Uganda and the other makes a global evaluation documenting how the growth of natural protected areas has been paralleled by a rapid growth of the human population in tropical countries. In short, the second issue of TCS provides a challenging collection of conservation topics under examination in various geographic regions.

The following paragraphs briefly review each of these papers.

The paper by **Joppa and coauthors** is an opinion essay where the author's main premise is that if reserves attract people they may create a sort of "Conservation Catch-22," bringing closer threats such as illegal logging and poaching. According to the authors, if people are driven away, there is a risk of elevating conservation above human welfare. The author points out that increasingly available satellite images providing data on deforestation and growth of human settlements may be a key conservation tool since they are globally available, have high resolution, and span lengthy periods of time to ascertain trends.

In the second paper of this issue **Southworth and coauthors** argue that while national parks are important mechanisms to protect and maintain threatened or endangered flora

and fauna, many of them have become ecosystem remnants surrounded by agricultural fields. A case in point is Kibale National Park (KNP), a moist tropical forest along the equator in western Uganda, and principally important for conservation because it contains a high number of primate species, the highest known concentration of butterflies in the world, and many fish and bird species, some of which are endemic to Kibale. However, the authors report that the surrounding human context in which KNP is found is characterized by rapid population growth, high population density, heavy reliance on subsistence agriculture, and land shortage, all of which have led to park isolation. Southworth and coauthors used satellite imagery to determine the impact of these pressures upon the integrity of KNP, assessing vegetation change inside and outside the park. The authors found that KNP borders have been maintained and that there is no large-scale encroachment and loss for forest in the park. However, outside the park they detected a significant increase in tea plantations and farmland, causing further forest and wetland loss.

**Kumar and coauthors** remark in their paper that the Asian elephant, a charismatic large mammal and cultural icon, is a wide-ranging species threatened by fragmentation of its habitats in many Asian countries. As habitats shrink and fragment, elephants are forced to range into human-modified areas including crop fields, plantations, and settlements, raising the potential for conflicts with people. In light of this, Kumar and coauthors undertook the task of understanding how elephants use habitats outside protected areas and move through human use areas. They argue that such information is critical to promote strategies for human-elephant coexistence in such altered landscapes. Their study was conducted in the Valparai plateau in the Anamalai Hills of southern India. The authors followed movements of elephant herds through a landscape dominated by tea, coffee, and *Eucalyptus* plantations, interspersed with natural vegetation in the form of rainforest fragments and riparian vegetation. They found that the elephants strongly preferred riparian vegetation and rainforest fragments and avoided large tracts of tea monoculture and other habitats such as swamps and settlements. Coffee and *Eucalyptus* were important plantation habitats used by elephants, while water availability in riverine habitats seemed to determine elephant ranging pattern. Their study concludes that protection of remnant natural and riparian vegetation, restoring habitat connectivity, and regulations on felling of *Eucalyptus* plantations would help facilitate elephant movements while minimizing conflicts from direct encounters between human and elephants in fragmented tropical landscapes.

Animal-based remedies constitute an integral part of traditional medicine both in rural and urban areas in Brazil. In their study **Alves and Diaz** present a review of medicinal invertebrates in Brazil and report that at least 81 species of invertebrates from five taxonomic groups are used for the treatment of different illnesses in Brazil. The groups with the greatest number of species were insects (n=41 species), mollusks (n=17) and crustaceans (n=16), and they also report that since some of the invertebrates used for medicinal purposes are listed in the Brazilian list of threatened species, there is an urgent need to consider zootherapy in the context of biodiversity conservation in Brazil.

**Dibloni and coauthors** studied one of the last populations of hippopotamuses in southern Burkina Faso. They report that the fragmented characteristic of this animal's distribution threatens its persistence and hence it is important to monitor the demographic structure of the population and its seasonal movements. With this in mind the authors conducted counts of hippopotamus populations during a three-year period (2006-2008) in southern Burkina Faso where they tracked three herds and a total of 41 individuals. They discovered that the herds migrate among four ponds and that during these events these mammals often destroyed segments of agricultural fields through their feeding. The authors suggest that to avoid human-hippopotamus conflicts, zoning for agricultural activity and giving the four ponds a conservation status may be a viable solution.

The Cuban Archipelago is one of the hot spots of mollusk diversity in the world, but **Vazquez and Perera** argue that many marine and land mollusks are at risk. In addition they point out that about 24% of mollusks found in Cuba are endemic. They further note that only 24 species of freshwater mollusks out of 42 occur within the limits of protected areas. These species might be threatened by increasing habitat loss due to human population growth and the construction of tourism installations near the natural populations. Another pressure is the introduction of exotic species that are shrinking the populations of some endemic species, probably by means of interspecific competition for food and space. According to their report, most of the endemic species reported may be threatened or vulnerable and there is a need for protected areas where these species live.

Bolivia is a highly diverse country harboring a rich assemblage of mammals, including 22 species of primates, but populations of many of them are threatened by habitat loss and fragmentation, local hunting, and illegal trade. In their paper **Mercado and Wallace** indicate that adequate country-wide conservation planning needs to identify priority areas based on primate species richness and rarity patterns. To ascertain this, they modeled the potential distribution of population of the 22 species in the country. They note that the northwest and the Pando department of Bolivia are critical areas for primate conservation because they contain the highest diversity of species, including species with the highest rarity score, such as *Callimico goeldii*, *Cebuella pygmaea*, and *Saguinus imperator*, and Western Beni where *Callicebus olallae* and *Callicebus modestus*, two Bolivian endemic species, occur.

In their paper **Sreekar and coauthors** stress the role of figs as a keystone resource to frugivores in tropical forests. Figs fruit year round and hence are available to a broad range of fruit-eating animals when other more seasonal fruit are scarce. However, the author point out, fruit-eating animals are also vulnerable to hunting and are increasingly difficult to observe at natural levels of abundance. Sreekar and coauthors studied the community of fruit-eaters at a large *Ficus caulocarpa* individual in a remote undisturbed forest in Borneo. They found that this fig tree, with very small figs, was particularly important in the diet of small birds, but less so for larger birds and mammals. They suggest that because of this, fig- and fruit-eater interactions may be more specialized than

was previously thought, based on reports from more disturbed sites in Asia. Because 34% of the birds they observed are ranked by the IUCN as threatened or at risk, it is likely that figs may be an important resource for many endangered species. Based on their finding, the conservation value of smaller reserves and degraded forest could be enhanced by planting fig seedlings.

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