A second year of Tropical Conservation Science

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Editorial

A second year of Tropical Conservation Science

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Tropical Conservation Science begins its second year by publishing a set of papers reporting on a variety of conservation subjects in the tropics. The papers encompass a broad geographic range that includes the Neotropics, East Africa, Madagascar, and Southeast Asia.

The following highlights major conservation issues examined in papers published in the current issue.

Oil palm cultivation and Amazon rainforests

There is an ongoing debate among scholars, environmentalists, corporate bodies, and government organizations over the impact of oil palm cultivation on biodiversity conservation and climate change [1-7]. The agricultural product that serves as a vital component in global consumerism—an essential ingredient in the manufacturing of edible oil, cosmetics, soap products, and snacks, while also serving as a viable alternative to fossil fuels—is catalyzing the destruction of tropical forests across Southeast Asia. The expansion of oil palm plantations has been particularly concentrated in Malaysia and Indonesia, and now accounts for more than 85 percent of global palm oil production [1,8,9]. But both countries are increasingly constrained by lack of available land suitable for intensive cultivation, and developers are looking further afield, including remote Asian islands, West and Central Africa, and the Amazon Basin.

In their paper, **Butler and Laurance** focus on the potential threats posed by the rapid expansion of oil palm agriculture in Amazonia and argue that oil palm agriculture could soon emerge as a major new threat to the Amazonian environment.

Territorial disputes and conservation

Territorial disputes between countries can lead to loss of biodiversity resulting from illicit settlements, illegal logging, unregulated hunting and fishing, unsanctioned land subdivision, and illegal harvesting of forest products. Further consequences can be property loss and threats to human life. The paper by **Perez et al.** addresses such little documented situations by examining the historical and political base of territorial disputes between Belize and Guatemala.

Harvest of endemic amphibians in Madagascar

Recent worldwide assessments indicate that one third or more of the 6,300 species of amphibians—frogs, salamanders, and caecilians—are threatened with extinction. This trend is likely to accelerate because most amphibians occur in the tropics and have small geographic ranges that make them susceptible to extinction [10]. Increasing pressure from habitat destruction and climate change is likely to have major impacts on narrowly adapted and distributed species and exacerbate the effects of virulent, emerging infectious diseases (e.g., chytridiomycosis) [11]. Further pressures on amphibians come from harvesting for human consumption.

In their paper **Jenkins et al.** approach this issue by documenting the harvesting of endemic amphibians in species-rich eastern Madagascar. The authors report that the extent of collection of endemic edible frogs from Madagascar's forests for the domestic food trade is poorly understood, and they provide evidence of a high demand. They note that the harvest of edible frogs provides important income for individual hunters, but that additional study is needed to investigate the harvest's impact on frog populations and to develop methods to link sustainable collection practices with forest management.

Butterfly diversity in El Salvador

The Central American country of El Salvador is the smallest (ca. 21,000 km2) and most densely populated country (ca. 300 people/km2) in the Americas. Although growing urbanization is leading to land use changes and abandonment of marginal rural farms, the condition of the country's natural resource base is dire [12]: 94 percent of the country's original forest cover has been lost, while extensive areas have been seriously degraded [13]. The challenges of small size and high population density and the need for biodiversity conservation are compounded by inherent consequences of land degradation. In spite of this, El Salvador recently set up a system of protected areas encompassing about 40,000 ha [12]. Information about plant and animal species in El Salvador is mainly limited to lists citing the occurrence of given species in specific geographic areas. For only a few groups or species is there any information on their biology, ecology, or conservation status. Notwithstanding this history, El Salvador continues to be a biodiversity-rich country, with 6,954 plant species (about 2.6% of those described worldwide) and about 1,539 vertebrate species (about 3.7% of the species on the planet) [12]. But far less is known about invertebrates.

In their study, **Bonebreak and Sorto** report the result of a rapid assessment survey (RAS) of butterflies at a locality in the Pacific coast of El Salvador. They report the presence of 84 butterfly species and estimate species richness for the study area at 100-200 species, a large number considering the small size of the study area and the short duration of the RAS to better document the butterfly biodiversity in El Salvador.

Bushmeat hunting and mammal conservation in Tanzania

The multibillion-dollar trade in bushmeat is among the most immediate threats to the persistence of tropical vertebrates, but the understanding of its underlying drivers and effects on human welfare is limited by lack of empirical data [14]. In Africa, bushmeat hunting is an important economic activity driven by high demand from peri-urban and urban centers as well as international trade. In addition, rural people often rely heavily on wild meat, but in many areas this important source of food and income is either already lost or being rapidly depleted [15], even in biodiversity hot spots. **Top-Jorgenssen et al.** report in their paper that bushmeat hunting constitutes the most immediate threat to wildlife populations in the Udzungwa mountains of the Eastern Afromontane biodiversity hot spot in Tanzania. They report that the effects of hunting appear to be proportional to the size of the mammal species and the intensity of hunting, which in turn is related to distance to, and size of, surrounding human

settlements. They conclude that reductions of hunting levels are paramount to the survival of large-bodied species.

Genetic features of woody herbs in northeast Vietnam

Woody herbs or subshrubs from the genera *Desmodium* and *Dendrolobium* are known for their use as forage and for their medicinal properties. They are used aggressively in agriculture as part of the "push-pull technology"—a strategy for controlling agricultural pests by using repellent plants and trap plants [see *http://en.wikipedia.org/wiki/Desmodium*]. Several *Desmodium* species contain potent secondary metabolites—chemicals which repel many insect pests—and allelopathic compounds which kill weeds. Due to their ability to adapt to low-fertility soils and to tolerate water drought, these species represent valuable plant genetic resources for forage production, soil protection, and improvement in marginal smallholder farming systems of subhumid and humid tropical regions. Moreover, the many legume species have a long history in traditional Asian health care, serving as a remedy for diarrhoea, dysentery, and several eye diseases.

In their paper, **Heider et al**. argue that information about the underlying genetic diversity of species is essential for sustainable use and efficient conservation efforts of plant genetic resources. They base their argument on the premise that empirical data of genetic diversity are necessary to assess and manage genetic resources in a sustainable way. These authors point out that the mountainous north of the country of Vietnam has experienced dramatic environmental and social changes during the last decades, threatening the biological diversity of the region. Desmodieae as well as other wild-growing plant species are a case in point as they are subjected to genetic erosion as a result of habitat destruction and resource overexploitation. The authors point out that since the vast majority of tropical forage legume cultivars are unimproved selections from wild populations, the enormous yet untapped legume diversity of the North Vietnamese mountainous regions should be explored in order to avoid reliance on a narrow germplasm base. Using molecular marker techniques—RAPD markers—to scan anonymous DNA of species with high secondary metabolite content, they assessed the genetic relatedness among accessions of four species of *Desmodium* and allied genera originating from Northeast Vietnam. The results of their study provide baseline data for further marker-assisted research and future collecting in the context of *ex situ* conservation strategies for the species of interest.

Conservation of medicinal plants in Tanzania

In Africa more than 80 percent of the continent's population relies on plant- and animal-based medicine to meet health-care needs. For the most part, the plants and animals used in traditional medicine are collected from the wild, and in many cases demand exceeds supply [16]. Trade and deforestation are major factors threatening medicinal plants. Additional pressures come from the heavy dependence on medicinal plants, rendering them vulnerable to overexploitation and triggering increased scarcity, and even loss, of certain species.

In their study **Msuya and Kidgehesho** report on traditional management practices in enhancing sustainable use and conservation of medicinal plants in the West Usambara mountains of Tanzania. The authors indicate that local traditional management practices play a significant role in the conservation and sustainable use of medicinal plants, and that these practices are closely linked to local cultural and religious beliefs. In many cases this has led to local domestication. The authors stress the need for more research on traditional knowledge as it relates to the use of medicinal plants. They also point out the need to merge traditional healing systems (through medicinal plants in primary health care, inspiring local support to conservation efforts) with modern (western) systems. In short, recognition of the value of traditional medicine and medicinal plants will foster sustainable methods of propagation and cultivation. Traditional knowledge and practices pertaining to medicinal plants will be preserved

as herbal medicines are increasingly used to complement other forms of community health care [17].

Harvest of the jararank'o lizard in Bolivia

Bolivia lies in the middle of South America, between the high Andes in the West, the hot and wet Amazonia in the North, and the dry Chaco in the South. These conditions account for a large variety of microclimates and ecosystems with particular flora and fauna. The biological diversity of Bolivia is still poorly known, even relative to that of other South American countries. In particular, there is sparse information on the country's 270 known species of reptiles, including the 40% that are lizards [18]. Habitat loss and indiscriminate harvesting of reptiles is an important conservation problem in Bolivia [18]. Among lizards, some species are used in traditional medicine to heal physical and emotional problems, resulting in depletion. **De la Galvez and Pacheco** report on the impact of harvesting on the jararank'o lizard of the tropical highlands of Bolivia. The authors found that lizard abundance was significantly higher in unharvested sites and that individuals of large size were more common in local markets. Depletion may be exacerbated by the species' biology: because the young are cared for by the mother, destruction of lizard dens during harvesting may accelerate population declines.

Closing comment

In summary, papers published in the current issue of TCS deal with the potential impact of oil palm cultivation on the persistence of tropical forests in the Amazon basin, how border territorial disputes between Guatemala and Belize affect conservation of tropical ecosystems in zones of political transition, the impact of harvesting of endemic amphibians in Madagascar, the diversity of butterflies in El Salvador, conservation and genetic mapping of accessions in woody herbs or subshrubs from northern Vietnam, mammalian density changes in response to bushmeat hunting in the Udzungua mountains of Tanzania, sustainable use and conservation of medicinal plants in the West Usambara mountains of Tanzania, and population assessment of the jararank'o lizard in Bolivia. The varied and complex conservation subjects exposed in each of the papers in this issue stress the influence of local and global economic drivers leading to land-cover changes that result in forest loss and to the extraction of plants and animals for commercial purposes. Similarly, the papers directly or indirectly examine the relevance of some land-use and forest resource management practices to peoples´ livelihoods that result in conservation of forest resources.

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