parasitism but rare when researchers simulate parasitism by adding cowbird eggs to nests.\textsuperscript{15}

Where next? The workshop highlighted areas toward which future research needs to be directed. It is unclear why certain species or even assemblages of species are heavily parasitized in some regions but scarcely if ever parasitized elsewhere; for instance, grassland species are rarely parasitized in Illinois but are heavily victimized in Kansas, North Dakota and Manitoba. Similarly, we have incomplete understanding of host demographic parameters, such as mortality rates and dispersal distances, that are needed to assess cowbird impacts on widespread host species. The community-wide impacts of low to moderate levels of cowbird parasitism are largely unknown, and Caldwell Hahn (US Fish and Wildlife Service, Laurel, MD, USA) suggested that the community-level consequences of parasitism and, as if the brown-headed cowbird doesn't pose enough management and basic research questions, Alexander Cruz (University of Colorado, Boulder, USA) reported that another cowbird that parasitizes hundreds of host species, the shiny cowbird ($M$. bonariensis), invaded Florida in 1985 from the neotropics and may soon colonize much of North America!

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Exploring solutions for the tropical biodiversity crisis

In recent years, biodiversity has rapidly become one of the platforms of our vocabulary, and, as a concept, makes a key linkage between conservation biologists and the wider political universe. Having been sequestered by all major players in national and international arenas of conservation and sustainable development, however, biodiversity has come to mean very different things to many different people. It is not surprising, therefore, that any group of representatives from the many facets of academia, conservation NGOs and the international donor community is expected to have divergent ideas over the meaning of biodiversity conservation.

This is exactly what happened when a select number of 28 biologists, anthropologists, economists and politicians were brought together by the Duke University Center for Tropical Conservation for a workshop entitled 'After the Ark: Exploring Solutions to the Tropical Biodiversity Crisis' in December 1993. The meeting was staged in the most comfortable, yet unpretentious, setting of the White Oak Plantation, a 550-acre conservation center set aside in north Florida and south Georgia for the breeding and care of 60 threatened animal species. The purpose of this workshop was to (1) discuss the problems of biodiversity preservation in tropical forests, (2) explore realistic options for the implementation of a conservation agenda, and (3) deliver solid recommendations into the hands of policy makers.

In a refreshing break from the traditional speaker-oriented format, the organizers divided the workshop as follows. In the first phase, previously circulated position papers were reviewed and discussed in a plenary session. In the second phase, conflicts of interest and practical solutions were mapped out by appropriately balanced small working groups and presented thereafter by some of the panelists. The final phase sought consensus on how biodiversity protection can be made compatible with sustainable development or other forms of economic activity. John Terborgh and Carel van Schalk (Duke University, NC, USA) initially set the scene as staunch advocates of absolute protection from all forms of human disturbance in at least a small proportion of the world's shrinking tropical forest regions. They called for a renewed resolve to guard our Protected Areas, which should be seen as an essential component of any preservation strategy. In a second paper, Kathy MacKinnon (The World Bank, Washington, DC, USA) drew on her extensive experience in South-East Asia and reiterated a similar theme, arguing that implementing networks of protected areas is the most cost-effective solution for in situ conservation of gene pools, species and ecosystems. In the following paper, Katrina Brandon (Hyattsville, MD, USA) provided an overview of the policy and practical considerations challenging the assumptions of the so-called 'integrated conservation-development projects' (ICDPs). She argued that ICDPs, which represent a major current investment with rather uncertain returns, are a poor choice for areas where biodiversity is already on its way out, and should not be funded by large donors unless they include both policy and project level components. Brandon concluded that economic dependence on wildland resources is not necessarily the most likely way to ensure their long-term conservation.

Steven Sanderson (University of Florida, USA) and Kent Redford (The...
Nature Conservancy, Washington, DC, USA) treated the issues of biopolitics and contests for biodiversity ownership, sovereignty and property rights. If biodiversity use is to serve the purposes of preservation agenda for large landscapes and surrounding areas, and within those, property rights of small-scale harvest activity in the 15 countries that account for 75% of the remaining tropical forests.

Yet bilateral and multilateral funding agencies continue to overemphasize such projects to the detriment of competing plans to implement fully protected nature reserves. In Brazilian Amazonia, for example, extractive reserves, production forests and indigenous areas flying the flag of sustainable development are earmarked for very subsets needed to maintain our severely understudied and increasingly deteriorating national parks, biological reserves and ecological stations (IUCN categories I, II) – most of which have never gone beyond a paper decree – continue to be neglected. International conservation NGOs have also played a similar tune, in marked contrast to their earlier, more nature-oriented philosophy. For instance, 65% of the 1993 list of research projects approved for funding in 25 countries by the Biodiversity Support Program (a USAID-funded consortium of three leading international conservation organizations) are better described as integrated community development studies than as biological conservation science or practice.

Another important message coming out of this conference is a better distinction between pristine and primary forests, which are often thought to mean the same thing. Most of the world’s apparently undisturbed tropical forests – whether in the eyes of experienced observers or as interpreted from satellite and radar scenes – are far from intact. Once their important vertebrate game species have been removed by selective hunting, they no longer represent full complements of their source fauna. No doubt many ecosystem processes may continue to operate as replacement guild members are reshuffled to fill in the empty cells in species interaction matrices. But there are limits to species redundancies even in such complex terrestrial biotas. Secondary community shifts ultimately leading to ecosystem simplification will thus begin to take place as fruit crops fail and large seeds are no longer dispersed in the absence of large frugivores. Processes of widespread defaunation are common in even the least disturbed wilderness regions of the tropics, such as western Amazonia. This calls for the implementation of an inviolate system of strictly protected reserves, even if they represent a minor fraction of their surrounding multiple-use landscape, where our most sensitive species will most likely be driven extinct. This is not just a tropical phenomenon: grizzly bears mix as poorly with loggers, miners and mountain-bikers in the northern Rockies, as woolly monkeys and razor-bill curasows do with forest peoples of Amazonia.

Of course, other complementary alternatives for biodiversity conservation must also be considered. Keeping species alive in botanical gardens and zoos is a safe one, but the idea of reassembling extinct communities in the future is at best utopian optimism even if all their constituent species survive. Other catalyst species may be required, creating a 'Humpty-Dumpty effect' even with all the pieces, communities cannot be put back together again. Another option is that of biodiversity conservation in human-dominated landscapes, as envisaged by IUCN’s seminal World Conservation Strategy, which states that development that maintains the complexity and productivity of natural ecosystems could be perpetuated indefinitely. Opinions presented at this workshop, however, have shown just how difficult the marriage of conservation with even the most benign forms of ‘sustainable’ development really is.

To that extent, the contributions of this workshop, which are to be published, represent a significant political landmark, a conspicuous U-turn from the current epidemic of unsustainable development rhetoric to a sobering view that tropical forests need more, larger and better-protected conservation areas. In effect, well-defended and managed parks and nature reserves are the most concrete vaults of tropical nature. If they are dysfunctional let us repair them at whatever costs, for should we choose to throw them out we may end up with nothing.

Carlos A. Peres


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