

## Conservation in Low-Governance Environments

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### ABSTRACT

How do we preserve biodiversity in low-governance environments, where relevant legislation is either absent or not enforced and where commercial interests are arrayed against conservation? Part of the answer lies in discovering multiple sources of governance and adapting the tools of conservation biology to exploit them. We focus on indigenous and forest-dwelling colonist populations and on rain forest tourism.

*Key words:* indigenous populations; tourism; wild meat hunting.

IN APRIL 2010, over 20,000 goldminers and supporters took to the streets in Peru to protest government-imposed exclusion zones and bans on mercury-using dredges. Six of the protestors died in clashes. Loggers and miners now regularly threaten violence against the government parks agency, rain forest tour operators, NGOs, and individual conservationists (Ráez-Luna 2010) as they pursue profits from a several-year run up in commodity prices that has gold selling for over U.S.\$1100 an ounce.

Amazonian Peru is only one of many examples where conservationists find themselves outnumbered and outpowered by commercial resource extractors. Although the same battles over natural resources are fought in the developed world, most such conflicts are conducted in the relative safety of the courts, legislature, and media, and environmental laws stand a reasonable chance of enforcement by a working police system. Such high-governance countries have over time built a body of legislation that has fundamentally shaped the practice of conservation biology. For instance, in countries with a sophisticated legal apparatus covering property rights and protected areas, a major focus of research is systematic conservation planning to increase the efficiency by which habitats are acquired for protection. In contrast, the very legitimacy of natural protected areas in Peru is being challenged. Protest marches are only one facet. Oil companies have attempted to degazette part of a national

park (Kirkby *et al.* In press), and both oil and mining companies are prospecting in indigenous territories.

When the sheer defensibility of habitat is in question, how much long-term conservation success can we expect if biologists concentrate their efforts on, say, refinements in molecular markers for species delimitation? We continue to have a mismatch between the technical capabilities of modern conservation biology and the ability of low-governance societies to exploit them (Whitten *et al.* 2001). A truly heartbreaking example of this can be found in Madagascar, when political breakdown last year following a coup d'état allowed waves of logging and hunting to strip the country's national parks (Gerety 2009). Only a year before, one of the most comprehensive conservation plans that has ever been conducted was published in order to guide efforts to put 10 percent of Madagascar's land area under protection. Unfortunately, the expansion of protected areas was an initiative of the ousted administration. Do we expect the new government to back the same policy over the demands of well-armed and well-financed resource extractors?

Let us be clear. The tools of modern conservation biology can ultimately be more valuable to conservation in Madagascar, Peru, and other developing countries than they are in rich countries. After all, resources for conservation are most limited in countries that feel the opportunity costs of conservation acutely.

But these tools are not enough; the job is simply twice as difficult in low-governance environments. To achieve long-term conservation success, we must uncover and exploit all possible

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mechanisms of governance to maximize the social robustness of our solutions (Ostrom 2007). A useful analogy is the modern automobile industry, in which new car models are designed with a major emphasis on manufacturability, starting at the drawing board. It is not always enough to take existing tools from conservation biology and devise locally appropriate implementations after the fact. Sometimes, the tools themselves need to change. What follows is a brief formulation of what might be called governance-led conservation research: discovering sources of governance and designing solutions that exploit them. Our focus is on indigenous and forest-dwelling colonist populations and on rain forest tourism; both figure prominently in the Neotropics.

## FOREST DWELLERS AND THE DEFENSE OF TERRITORY

Indigenous territories account for half of all reserve acreage across the nine Amazonian countries, and overall cover 100 million ha or 21 percent of forested area in the Brazilian Amazon. Moreover, three quarters or more of Amazonian parks already contain people, and most protected areas being created today explicitly include people, notably in Brazil, where a vast network of national forests and extractive and sustainable development reserves are legally occupied by nontribal forest dwellers.

One can deem this situation a threat or a boon to conservation; the best answer is that it is both. Forest inhabitants exact costs to biodiversity via hunting, farming, and ranching, and by weakening the political justification for excluding outsiders from protected areas. On the other hand, forest dwellers can prevent incursion by commercial resource extractors, can prevent outsiders from clearing forest, and can serve as a political force opposing infrastructure projects and legislation that are inimical to conservation (Nepstad *et al.* 2006, Shepard *et al.* 2010).

As an example of the latter, Awajun and Wampis Indians recently clashed with armed state security forces in Bagua, Peru, resulting in dozens of deaths. The indigenous protestors had been blockading a highway to protest a series of decrees issued by President Garcia that opened legally titled indigenous lands to oil exploration, mining, logging, and other ventures. The government initially declaimed that 40,000 Indians would not be permitted to halt economic progress for 28 million Peruvians, but Garcia's government eventually withdrew the decrees after international media attention. This is hardly the only example. Most recently in Brazil, Arara Indians built settlements at the proposed Belo Monte dam site along the Xingú River to prevent its construction (Barrionuevo 2010). (The contrast with the mining protests is instructive: the government, like all states, sometimes promotes conservation and sometimes does not, which underlines why conservation cannot rely on any individual institution.)

However, no matter how effectively forest dwellers prevent incursions, the populations themselves reduce biodiversity in the tropical forests that they inhabit, primarily via hunting. A governance-led conservation biology wants to find ways to facilitate the long-term coexistence of tropical biodiversity with forest dwellers. This can only be done by solving the fundamental problem of

hunting in tropical forests, which is that it is a *hidden action*. Without the ability to observe or infer hunter behavior, it is not possible to design incentive programs to reward forbearance or punish over-exploitation (Ferraro 2008, Yu 2010). In the Neotropics, there is an easily monitored proxy for hunter behavior: the geographic distribution of human settlements, which, because subsistence hunters are central-place foragers, allows spatially explicit calculations of game depletion across a landscape (Levi *et al.* 2009). This opens the way to limiting the impact of hunting by limiting the spread of human settlements, for example, via investments in infrastructure, such as schools and potable water at existing settlements.

In systems where hunting is more commercialized and therefore less spatially restricted, such as in tropical Africa, an alternative approach is to design a system of fines that takes into account the difficulty of monitoring. Bioeconomic modeling of a game market in Ghana has suggested that imposing large fines on the sale of wild meat in markets, which by nature is a more public activity, could be sufficient to recover wildlife populations, even without forest patrols (Damania *et al.* 2005). Fines reduce expected profits from sales, so hunters should shift from firearms to cheaper but less effective snares. Also, the resulting loss of cash income should encourage households to reallocate labor toward other income sources, such as agriculture. The combination of these effects is expected to allow game populations to recover while home consumption of wild meat is unaffected or rises.

In sum, governance-led approaches to over-hunting start with an understanding of where enforcement and incentives can realistically be applied and design solutions that take advantage of those pressure points.

## NATURE-BASED TOURISM AS AN INVENTOR OF GOVERNANCE

Nature-based tourism in developing countries is a huge and growing business. Roughly 13 percent of the U.S.\$1.6 trillion/yr spent on tourism in non-OECD countries can be attributed to nature-based tourism. If just 0.1 percent of these revenues were diverted to conservation, it would match the combined spending on conservation in the developing world by official aid agencies and the UN Global Environment Facility (U.S.\$162–264 million/yr; Kirkby *et al.* In press). Little work, however, is done on the question of whether the *institution* of nature-based tourism promotes (or deters) the conservation of wildlands. In part, this lacuna derives from perverse incentives to biologists: tourism journals have low impact factors, if they have them at all, and the field is populated by researchers who have different research priorities, such as local economies and norms. Given the huge revenues that this industry can deploy, allied to its general incentive to preserve wildlands, we are remiss in not making tourism a focus of conservation research.

Some idea of the conservation potential of tourism is given by the industry in the Tambopata region of Peru. In 2005, 40,000 visitors generated profits of U.S.\$1 million and local spending of U.S.\$3.8 million out of revenues of U.S.\$6 million. As of 2008, lodges had leased over 50,000 ha of rain forest from the state to put into conservation concessions and engaged in costly actions to deter

incursions, including lawsuits, patrols, benefit-sharing agreements, and a media campaign against a state proposal to degazette part of the neighboring national park for oil prospecting (Kirkby *et al.* In press).

In Amazonian Peru then, it would appear that profits from tourism have combined with land tenure innovations to create a new governance structure. Revealingly, mining and logging interests see tour operators as rivals, and in the recent protests, operators had to pay for 100 police to protect their offices. Conservationists should see tourism as an independently financed partner that provides new opportunities for conservation and a new, collaborative research agenda. There are important questions regarding how best to help lodges improve the efficiency of habitat acquisition and to increase synergies with state protected areas, to manage charismatic fauna, and to design contracts to share the management burden of protected areas with the state (Damania & Hatch 2005).

## GOVERNANCE-LED CONSERVATION BIOLOGY

A conservation biology that emphasizes governance is one that finds great value in collaboration with social scientists and local populations to characterize sources of governance in tropical wildlands (Phelps *et al.* 2010) and to design and evaluate incentive programs for biodiversity protection under conditions of imperfect information (Damania & Hatch 2005, Ferraro 2008). This research program benefits from mathematical modeling and from close knowledge of sociopolitical systems, so we need to emphasize the training of quantitatively capable nationals from developing countries.

Biologists have a special responsibility for improving methods to infer hidden information (Levi *et al.* 2009). For instance, remote-sensing technology has long played the central role in measuring deforestation and is being improved to monitor standing tree volumes for carbon sequestration (REDD) payments. However, many forms of anthropogenic disturbance cannot be detected by remote sensing, and biodiversity correlates imperfectly with carbon stock, so we need direct measures of biodiversity that can be verified by neutral parties if we are to institute contracts to preserve biodiversity *per se*. A nice example is how the NGO Defenders of Wildlife has paid U.S. ranchers for images of large cats captured by camera traps. In other words, governance-led conservation biology finds little utility in traditional bird surveys, which rely too much on the honesty of the observer, but might make good use of soundscapes (Sueur *et al.* 2008), environmental DNA barcoding, and inferences from patterns of landscape fragmentation.

Finally, we need to reform academic governance. Institutional, personal, and intellectual barriers impede collaborations between social and natural scientists. Anthropologists, biologists, and economists are obliged to write for journals in their respective fields to advance their careers, and transdisciplinary collaboration is more lauded than actually rewarded. In the Chinese Academy of Sciences, faculty are paid bonuses calculated on impact factors. This makes an article in *Ecology Letters* three times as valuable as one in *Ecology and Society*. Is any of this efficient, or is it just convenient? Would the founders of conservation science have succeeded, or

even survived, in the modern academic environment with its manicured scientometrics? If not, we might be innovating conservation science in ways that do not benefit conservation practice.

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