

1

Introduction—Wildlife Conservation and Management in South and Central America

MULTIPLE PRESSURES AND INNOVATIVE SOLUTIONS

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THE SOUTH AND CENTRAL AMERICAN CONTEXT

South and Central American (including Mexico) approaches to wildlife conservation are rooted in traditions of resource use derived from interactions between complex biological, cultural, and socioeconomic systems. South and Central American peoples inhabit a land rich in biological diversity and complexity, with several nations considered megadiversity countries (e.g., Brazil, Colombia, and Ecuador) (see Mittermeier, Robles-Gil, and Mittermeier 1997). The most extensive tropical forests and wetlands of our planet occur in South and Central America. Unlike the situation in many parts of the world, most of these ecosystems still function as intact ecological entities little disturbed by human activities (Mittermeier et al. 1998). The Amazon rain forest, for example, extends over 2500 km from east to west and about 2000 km from north to south. It is the largest continuous tropical forest on earth and the second largest forested ecosystem after the Eurasian Boreal forest. The world's largest wetland, the Pantanal, is located in south central Brazil and northern Paraguay, and the Andean Mountain range supports some of the most extensive montane forests and grasslands in existence. With the exception of high altitude Andean habitats and Atlantic forests, these “natural areas” are relatively unfragmented and continue functioning as continental level “natural” ecosystems. Many are considered as some of our planet's last great wilderness areas (Dinerstein et al. 1995; Mittermeier et al. 1998). The “intact” condition of South American biomes is unusual, given the high levels of species extirpations and ecosystem fragmentation that have occurred in North America, Europe, Africa, and much of the rest of the world.

The persistence of intact ecosystems in South America, and to a lesser degree in Central America, is to a large extent due to the region's unique mixture of peoples,

[2] Introduction

cultures, and history. Before the arrival of Portuguese and Spanish colonists, over a thousand distinct indigenous nations and cultures inhabited South and Central America (Steward and Faron 1959; Ramos 1998). Although many of these peoples disappeared after the European invasion, many others, including over 200 groups of “first peoples” in the Amazon region, still inhabit their traditional lands (Ricardo 1995; Ramos 1998). From these cultures South and Central America inherited the view of nature characteristic of peoples whose lives depended on understanding and integrating nuances of nonhuman creatures and ecological rhythms. These cultures maintain a world view in which nature is not “red in tooth and claw,” but is instead a society where all creatures are considered close relatives. Surviving indigenous peoples like the Embera (Ulloa, Rubio-Torgler, and Campos-Rozo this volume), the Yanomami (Fragoso this volume), Xavante (Silvius this volume), and others continue reminding the larger society that nonhuman nature is an integral part of human lives and spirituality.

These indigenous cultures live alongside the new Americans, descendants of African, Italian, German, Polish, East Indian, and other immigrants who followed or were brought over by the original Portuguese and Spanish colonizers to labor on the land. During 500 years of human intermingling, members of these groups fused and created a dynamic and vital “Latin American” ethnicity, each country exhibiting a unique strain that, despite linkages with European and Christian world views, is also deeply rooted in the local environmental conditions and landscapes (Pratt 1992). Thus the Llaneros of Venezuela are intimately tied to the llanos, for example, as are the Pantaneros of Brazil to the Pantanal. The Amazonian rural groups, variously classified as *caboclos*, detribalized indigenous peoples, or Amazonian peasants, have evolved their own distinctive, subsistence-influenced societies (Nugent 1993).

A new conservation philosophy or attitude has developed along with the new people. This philosophy differs significantly from Northern perspectives in that it is more resistant to converting nature into human-dominated landscapes and to completely replacing wildlife with domesticated animals. Just as North America, with its own blend of peoples and world views (which early on excluded and resisted most of the potential contributions of indigenous and African cultures) developed its own unique philosophy of conservation, so did the Latin American regions, with their blending of American Indian, African, European, and, to a lesser extent, Asian world views. This Latin American philosophy of conservation was first characterized during a special panel discussion at the 1997 International Conferences on Wildlife Management and Conservation in Latin America and the Amazon, held in Iquitos, Peru.

Cultural diversity goes hand in hand with diversity of socioeconomic systems, in the broad sense of the word. In the southern continent “highly advanced” (consider the international nature of the stock market in São Paulo, Brazil) and “highly traditional” (consider the kinship-based economic systems of the Yanomami and other indigenous peoples of South America) socio-ecological-economic systems co-

Introduction [3]

exist and cofunction. Between these systems lie others that incorporate different amounts of the “advanced” or “traditional” patterns. For example, the socio-ecological-economic systems of rubber-tappers and *riberieños* (river peoples) are similar to those of the Yanomami, while those of ranchers, farmers, and city slum dwellers are probably more similar to those of the inhabitants of São Paulo. To the outsider the coexistence of such divergent systems may seem discordant. Most South Americans, however, know and value the way in which all these systems continue functioning in their countries. It is in the context of this rich inter- and intraethnic milieu that wildlife and conservation biologists strive to influence local, national, and international policies regarding the use and abuse of “wild” species and “wild” spaces.

Although researchers trained in North American and European management strategies are clearly influencing emerging policies of the South, the ecological, cultural, and economic setting of South and Central America make it both inevitable and imperative that effective wildlife conservation strategies will differ greatly from those that evolved in North America or Europe. The International Conferences on Wildlife Management and Conservation in Latin America and the Amazon (henceforth the Conferences), held biannually since 1992, have been a nucleus for the development and presentation of innovative management solutions applied by national academics, students, practitioners, businesspeople, indigenous Americans, and other local peoples.

THE CONFERENCES

J. G. Robinson and K. H. Redford’s 1991 “Neotropical Wildlife Use and Conservation” helped define the field of South and Central American wildlife management by describing issues of subsistence hunting, market hunting, and captive breeding. The five Conferences held since then have essentially charted the development of the field. The first conference was held in Belém, Brazil, in 1992; the second in Iquitos, Peru, in 1995; the third in Santa Cruz, Bolivia, in 1997; the fourth in Asunción, Paraguay, in 1999; and the fifth in Cartagena, Colombia, in 2001. The sixth conference will be held again in Iquitos in 2004. The meetings were hosted by local nongovernmental organizations (NGOs) and academic institutions (Museu Paraense Emílio Goeldi, Universidad Nacional de la Amazonia Peruana, Museo de Historia Natural Noel Kempff Mercado, Fundación Moises Bertoni, CITES-Paraguay, Fundación Natura, Ministerio del Medio Ambiente-Colombia, and Instituto Amazónico de Investigaciones Científicas-Sinchi). They were funded and supported by a diversity of national and international organizations (MacArthur Foundation, Wildlife Conservation Society, Sociedade Civil Mamirauá, Liz Claiborne Art Ortenberg Foundation, World Wildlife Fund, Instituto de Pesquisas Ecológicas, CNPq-Brasil, Tropical Conservation and Development Program-University of Florida, U.S. Fish and Wildlife Service, Universidad Nacional de Colombia, Instituto de Ecología de la Universidad Mayor de San Andrés, and UNDP/

[4] *Introduction*

GEF). Proceedings have been published in Latin America for all the conferences in Spanish and Portuguese (Fang et al. 1997; Valladares-Padua and Bodmer 1997; Fang, Montenegro, and Bodmer 1999; Cabrera, Mercolli, and Resquin 2000; Fundación Natura in press).

International researchers were key voices in the early meetings, as were national professionals in ecology and anthropology and representatives of indigenous peoples (e.g., Xavante leaders participated in the first meeting in Belém, Cocama-Cocamilla representatives in the second meeting in Iquitos, Siriono and Izocéño communities in the third meeting in Santa Cruz, and Aché representatives in the fourth meeting in Asunción). Although international researchers are key participants at the meetings, the majority of those in attendance have always been South and Central American professionals, academics, indigenous peoples, and graduate and undergraduate students. Over the last ten years, all of these people have been strongly influenced by the experiences of the meetings. Indigenous and other local peoples attended the meetings both to learn what Western science has to offer them about wildlife management, and to present their own perspectives. This level of inclusiveness at a professional meeting contrasts greatly with similar meetings held in North America but mirrors the blended nature of South and Central American societies. In many cases indigenous representatives are responsible for their own projects.

Our purpose with this book is to highlight South and Central American approaches to wildlife management and to make the information available to the English-speaking public. By collating a selection of Conference presentations, we are documenting both the current state and the historical development of a Latin American conservation and management strategy by people whose perspectives acknowledge the realities of South and Central America, both from biological and socioeconomic points of view. Through our selection of papers we ask, and answer: How can a South and Central America perspective of sustainability and wildlife conservation be incorporated into research and action? What are the questions people are asking in the “south,” and what are the solutions being pursued?

As editors we have chosen to emphasize a broad range of topics not completely covered in texts that focus on either hunting, protected areas, or resource use by local peoples. The papers presented here do not analyze the social and cultural factors that result from a subsistence-based economy, rather they link wildlife ecology with the livelihoods of rural people. Most of the researchers featured in our book are either South or Central American or people who have lived much of their lives in the region. Many of these researchers received their academic training in wildlife ecology at universities in the United States, Canada, or Europe. Their approaches therefore reflect the tension between temperate models and tropical realities that currently characterize the field of South and Central American wildlife management and conservation. This tension is another factor contributing to the unique cultural/philosophical perspective of the region.

CONTINENTAL-SCALE DIFFERENCES

In the tropical forests of Asia and Africa, there is much concern about the “bush meat crisis.” In these regions wildlife hunting for meat is driving many species to the verge of extinction (Martin 1983; Srikosamatara, Siripholdej, and Suteethorn 1992; Robinson and Bennett 2000.) In the tropics of South America, as in Africa and Asia, the pressure on animal communities also comes primarily from subsistence hunting. The commercial uses and sport hunting that are important in Africa (Hasler 1996; Hurt and Ravn 2000) and the commercial use of animals for the medicinal trade that are important in Asia (Martin and Martin 1991; Srikosamatara, Siripholdej, and Suteethorn 1992) are less important in South and Central America (Robinson and Redford 1991). These differences are largely due to a consistent and dedicated group of people who have promoted wildlife management and conservation throughout the Neotropics during the past three decades. This group of people, all participants in the Conferences, has helped avert a crisis. Thus, even though subsistence hunting is a key impact on wildlife in all tropical regions, the main difference between the continents is in the implementation of management, which has a much longer history in South America and has in the last decade been stimulated and coordinated by the Conferences.

Managing subsistence hunting and fishing remains a key issue for wildlife conservation in South and Central America. Subsistence peoples in the Neotropics usually live in rural communities in isolated areas. Extraction of animals for subsistence uses is often much greater than for commercial uses (Tello this volume; Crampton et al. this volume; Bodmer, Pezo, and Fang this volume). Community-based approaches to wildlife management have therefore been a focus for wildlife conservation in Latin America. In this volume we see how community-based approaches are vital to wildlife conservation. In South and Central America local peoples demonstrate a sincere willingness to manage their own wildlife resources, despite an “economic underdevelopment” and a lack of basic necessities. In the South it is not only the scientific Western world view that matters—the traditions of indigenous groups and rural communities hold equal sway with the precepts of Western science. This occurs not only because indigenous and rural people control large areas of undeveloped lands in South America, but because the society at large has incorporated aspects of the other world views into the mainstream. In this volume, several authors explore the benefits and complications that arise from developing wildlife management plans that explicitly incorporate distinct world views. Ulloa, Rubio-Torgler, and Campos-Rozo explore the complex social and cultural processes required to develop fully participatory management alternatives for the overlap zone between a national park and an indigenous reserve in Colombia.

Silvius explores the congruencies and divergences between the traditional management techniques of the Xavante people in Central Brazil and the management approaches of biologists trained in the Western tradition. Townsend, one of the

[6] *Introduction*

most successful promoters of the participatory method of management with indigenous peoples in South America, encapsulates in a pithy, and characteristically to-the-point manner the true definition of participatory management. The willingness of several countries to establish and find ways to manage such overlap areas is a key theme in Latin American conservation and perhaps one of the key lessons to emerge from the South. Crampton and colleagues contribute two articles that trace the development of community management by local, nontribal *riberinho* peoples in the Mamirauá Sustainable Development Reserve, from the historical overexploitation of turtles, manatees, and fish to the current system of lake rotations and internally set quotas.

Unlike the situation in developed countries, governments in the South often lack financial resources to adequately implement wildlife conservation and management, and rural areas of South and Central America are left to find their own solutions. There are not enough trained biologists to collect the required data to develop biologically sound management plans. Management plans, however, are often required for communities to retain legal rights to the resources on which they depend. Therefore communities take the initiative to develop the management plans and, with the often intermittent help of biologists and NGOs, set out themselves to collect the data they need to set realistic harvesting levels for wildlife and other resources.

Management plans are often based on analysis of sustainability. One of the first questions that a community will ask is “How many animals can we hunt?” Many studies conducted with local communities in Latin America are looking for ways to evaluate the sustainability of hunting. In this volume several papers deal directly with this question. Bodmer and Robinson review simple population models that are used by many projects throughout Latin America to evaluate sustainability of hunting. Naranjo and colleagues apply these models in Chiapas, Mexico, to evaluate the sustainability of hunting for rural and indigenous hunters. Novaro explores in more detail potential applications and theoretical predictions of the source-sink model for managing hunting in both disturbed and undisturbed areas. Puertas and Bodmer show how catch per unit effort can be used to link community participation in wildlife management plans with an analysis of hunting sustainability. González examines how subsistence and commercial uses affect the viability of bird populations in Amazonian flooded forests. Fachín-Terán, Vogt, and Thorbjarnarson look at the sustainability of the Amazonian turtle fishery, while Tello examines the sustainability of subsistence and commercial fishing in Peru’s Pacaya Samiria National Reserve.

Economics is an important part of wildlife use and conservation in the Neotropics. Rural economies depend on wildlife products, many of which are sold in urban centers. Viana et al. follow up on the overview essays by Crampton et al. to describe in detail the economic importance of one Amazonian fishery and the economic balance sheet of local involvement in fisheries management. Sahley, Vargas, and Valdivia describe the clash that occurs when a traditional use system, *vicuña*-shear-

Introduction [7]

ing for commercial wool production in Peru, is altered by political and other demands, resulting in an ongoing conflict between profit, culture, and ecology. Contrasting with the vicuña experience, and with the rejection of captive breeding by the Embera documented by Ulloa and colleagues, Nogueira and Nogueira-Filho summarize the intensive research that has made captive breeding of two native species, the collared peccary and capybara, economically viable and culturally acceptable in all of Brazil. Bodmer, Lozano, and Fang look at the relative importance of wildlife products in rural and urban areas and show the relative insignificance of the urban and international market with respect to the local rural market.

But community-based approaches are not the only focus of wildlife management and conservation in Latin America. Fragmentation and other forms of human encroachment are major concerns in many regions. In this volume Cullen et al. describe the synergy between hunting and fragmentation in the Atlantic Forest of São Paulo state, Brazil, and propose innovative ways in which land users, many of them illegal land invaders, can contribute to the reconstruction of an area whose environmental deterioration started long before they arrived. Working further south in the Atlantic Forest, Crawshaw et al. document the unexpected but potentially ephemeral survival of a jaguar population and highlight the importance of connecting existing large forest fragments that will allow metapopulation-level connectivity of large predators in island parks. Seijas uses GIS techniques to document the spatial patterns of human pressures on the Orinoco crocodile in one river basin in Venezuela, finding unexpected relationships between the presence of humans and crocodiles. Lemos records the wavelike pattern of change sweeping through a primate community following the flooding of a 500-km² area in the southwestern Brazilian Amazon. Pinder explores niche partitioning and coexistence for native ungulates and introduced cattle in the Brazilian Pantanal, while Fragoso discusses how the western penetration and continuing colonization of remote areas of the Amazon may be having severe impacts on ungulate populations through the introduction of exotic diseases.

The high levels of biodiversity and complex ecological communities that characterize many South and Central American ecosystems demand their own detailed ecological studies and management approaches. The single-species models that are suited to altered ecosystems in temperate zones are not feasible in South America if a management goal is to protect biodiversity and maintain ecosystem function. At the same time the large extent and availability of intact habitats make possible management based on the concepts of metapopulations and source-sink models, and several authors in this book discuss the implications of these models for wildlife conservation in South and Central America.

Local, nonmarket economies, as well as local, national, and global economies, are all involved with wildlife use and must be considered in conservation and management. Pressures on individual species occur at a multiplicity of socioeconomic scales, and therefore management recommendations that consider all these scales must be implemented. It is just as important to understand the decision-making

[8] *Introduction*

process of an Amazonian fisherman who, faced with a nesting turtle on a river beach, chooses either to kill it or to let it complete the reproductive cycle, as it is to understand the pressures on national governments that grant concessions to international corporations or become signatories to international conservation treaties. Noss and Painter describe this multiscale approach to conservation on several million hectares in the Bolivian Chaco, the result of an ambitious collaboration between the Izoceño-Guaraní people and the Wildlife Conservation Society.

International conservation pressure is influential in many regions, especially in the Amazon, claiming equal voice with local management goals in wildlife conservation and management. Where the United States and Canada achieved most of their development free of the constraints of international supervision and influence, South and Central American countries must often make decisions, both for and against protecting the environment, that are not influenced solely by their internal practices and traditions. (e.g., debt for nature swaps, U.S. aid agency projects, Global Environmental Facility of the United Nations Development Program projects, World Bank projects, Inter American Development Bank projects, International NGO projects, and World Conservation Strategy projects such as Biosphere Reserves). This influence is clearly seen in the case of French Guiana, one of the last nonindependent states in South America. Richard-Hansen and Hansen describe the intriguing process through which an overseas French national agency is relying on the outcomes of the Conferences to institute a territorial system of wildlife management in a place that almost completely lacks preexisting, locally adapted management strategies.

Finally, unlike the situation in North America and Europe, wildlife managers in the South play a role not only in natural resource management but also in the political, social, and economic development of their countries. Biologists and managers with Bachelor's, Master's, or Ph.D. degrees are among the educated elite in these countries. In the Brazilian state of Acre, for example, on the border with Peru and Bolivia, the government bills itself the "government of the forest." Several government functionaries, including the governor, are foresters or biologists. The concept of sustainability is thus permeating society from several sources, including the ideals of trained environmental scientists, as well as the needs of indigenous and other rural peoples.